
# Gas Governance Issues in Quality: Investigation Update

**Date issued: 1 August 2012**

GAS INDUSTRY COMPANY LIMITED

## About Gas Industry Co.

Gas Industry Co is the gas industry body and co-regulator under the Gas Act. Its role is to:

- develop arrangements, including regulations where appropriate, which improve:
  - the operation of gas markets;
  - access to infrastructure; and
  - consumer outcomes;
- develop these arrangements with the principal objective to ensure that gas is delivered to existing and new customers in a safe, efficient, reliable, fair and environmentally sustainable manner; and
- oversee compliance with, and review such arrangements.

Gas Industry Co is required to have regard to the Government's policy objectives for the gas sector, and to report on the achievement of those objectives and on the state of the New Zealand gas industry.

Gas Industry Co's corporate strategy is to 'optimise the contribution of gas to New Zealand'.

172179.11

# Executive summary

Gas Industry Co is reviewing arrangements for the management of gas quality and has previously published and consulted on an issues paper[1]. That work identified concerns that the arrangements for managing gas quality are complex and obscure. This is because gas quality is managed according to largely confidential provisions in a mesh of bilateral contracts. We concluded that further investigation of contractual and operational arrangements was required. Here we present an update on that investigation, and identify some opportunities for safety and reliability improvements to promote more confident and efficient gas markets.

Our investigation gives no reason to doubt that that gas quality is being managed by parties in the physical supply chain in a rigorous and professional manner. However, we believe that the small possibility that a gas quality incident could cause serious economic and reputational harm, coupled with 'common pool' features of gas pipelines, puts a particularly heavy onus on the industry to ensure a high degree of transparency. Also, the introduction of the Gas (Safety and Measurement) Regulations 2010 (Safety Regulations) has clarified the responsibility gas wholesalers and retailers have for gas quality. Demonstrating compliance with this responsibility will also require greater transparency.

Since gas wholesalers and retailers do not directly control gas quality, they propose introducing a 'Gas Information Exchange Protocol' (the Protocol) to verify compliance with the Safety Regulations. The Protocol allows for the gathering of gas quality information from parties in the physical supply chain. These parties are currently discussing the Protocol with retailers.

Depending on the final form of the Protocol, we believe it has the potential to improve transparency of compliance with the Safety Regulations, non-Specification gas incidents, and any variations to gas quality monitoring requirements agreed between suppliers. We therefore encourage industry participants to support the proposed Protocol, and ensure that its final form allows for full public transparency. We will follow its development with interest.

If the Protocol cannot be agreed, or does not provide the necessary transparency, we will consider other options. For example, we draw attention to the guidelines developed by the Australian Energy Market Operator (AEMO) to address short-term gas quality excursions outside the gas quality specifications. Gas Industry Co could also examine the scope for recommending a regulatory arrangement under the Gas Act to address gas quality issues.

Gas Industry Co invites submissions on this investigation. Submissions are due by 5pm, Friday 31 August 2012.

[1] *Gas Governance Issues in Quality: Issues Paper* at http://gasindustry.co.nz/work-programme/gas-quality?tab=1842

# Contents

# 1 Introduction

## 1.1 Purpose

The overall objective of Gas Industry Co's gas quality work is to ensure industry arrangements provide for gas quality in a manner that facilitates the safe, efficient, and reliable delivery of gas; and provide for risks relating to security of supply to be properly and efficiently managed by those parties best able to manage such risks. We believe this will promote confident and efficient gas markets.

From previous work, Gas Industry Co decided that it needed to develop a better understanding of current contractual and operational arrangements for managing gas quality. This paper presents an update on our enquiries into those matters, suggests areas where the safety and reliability of gas supply can be improved, and discusses options for making those improvements. In particular:

- **Sections 2, 3, and 4** present our findings in relation to gas quality control, monitoring, and reporting;
- **Section 5** summarises and discusses our findings;
- **Section 6** proposes opportunities for improvement, and some options for realising those improvements; and
- **Section 7** sets out our recommendations and next steps.

A glossary of terms is provided at the end of this paper.

## 1.2 Background

In September 2010, Gas Industry Co released the *Gas Governance Issues in Quality: Issues Paper* (Issues Paper) for consultation. The Issues Paper describes the high-level obligations for gas quality management provided for in regulations, standards, industry codes and contracts. Of particular note was the recent introduction of the Gas (Safety and Measurement) Regulations 2010 (Safety Regulations), which provide that the retailer or wholesaler who supplies gas to an end user's point of supply is responsible for ensuring the gas complies with the *Specification for reticulated natural gas* (NZS 5442:2008).

Respondents to the Issues Paper held differing views about the existence or extent of any problems with the management of gas quality (including monitoring, testing, reporting, and auditing

practices). Following consideration of submissions on the Issues Paper we released a paper entitled, *Gas Governance Issues in Quality: Issues Paper Analysis of Submissions* (Submissions Analysis Paper).

In December 2010, Gas Industry Co advised the (then) Associate Minister of Energy and Resources that, while regulation is not required at this time, further work with industry participants was necessary to assess and, if necessary, improve the existing arrangements.

## 1.3 Investigation process

In April 2011, Gas Industry Co wrote to producers, production station operators, transmission system operators (TSOs), Shippers, retailers, and Network System Operators (NSOs). We asked these parties to confirm what gas quality testing and monitoring they carried out, and what information, reporting, or assurance they were provided with or provided to other parties. The parties were also asked what gas quality-related contractual rights and obligations existed between themselves and their contracted parties.

Written or verbal responses to the questions were received from most parties. Clarifications were sought, where necessary, by telephone. On-site investigations were not considered necessary.

From upstream participants, responses were received from both TSOs (Vector and MDL), and the following Producers and operators (jointly referred to as injecting parties):

- Kapuni Gas Treatment Plant (KGTP)
- Origin Energy (Origin)
- Shell Todd Oil Services (STOS)
- Todd Energy New Zealand Limited (Todd)

These responses relate to gas received into the open access transmission pipeline from the following fields: Kapuni, Kupe, Maui, McKee/Mangahewa, Pohokura, Rimu, and Wiahapa. These fields account for approximately 92% of all gas received.

Information was not provided to Gas Industry Co in respect of gas received from: Kaimiro, Kowhai, and Turangi.

## 1.4 Context

The results of our investigations, and the discussion of those results, are best understood in the context of our previous work. Some important matters to bear in mind when reading this report are summarised below.

### The Gas Specification

The New Zealand Standard: Specification for reticulated natural gas NZS 5442:2008 (the Gas Specification) sets requirements for the 'characteristics and components' of gas and 'contaminants' that may be present in the gas. In this paper, the term 'gas quality' refers to both these aspects.

### Contractual rights and obligations

The Issues Paper included an overview of contractual arrangements in respect of gas quality. Figure 1 summarises the web of contractual relationships underlying the physical supply chain between gas producers and gas consumers. The Issues Paper noted the risks inherent in managing gas quality through a mesh of bilateral contracts. In particular the uncertainty arising from unwritten contracts, the obscurity caused by contract confidentiality, and the cost and difficulty of allocating liability for any non-specification incidents back to the party responsible.

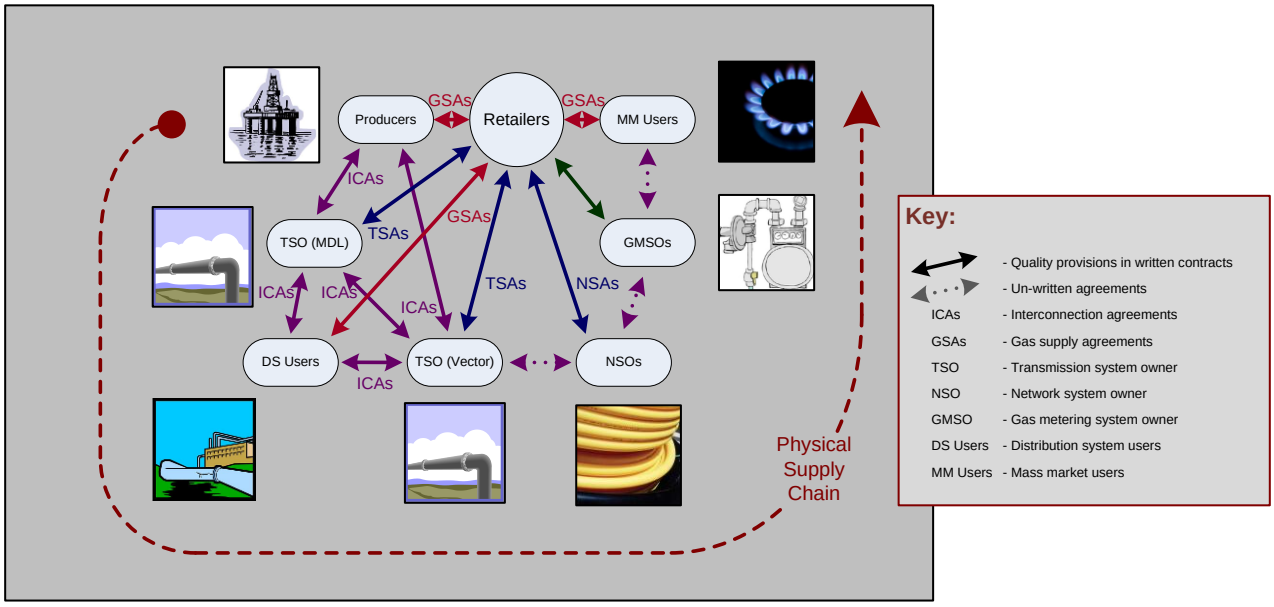



**Figure 1 Web of contractual relationships**

## 1.5 Control, monitoring and reporting

To provide a structure for presenting the current operational arrangements for managing gas quality, we distinguish between 'control', 'monitoring', and 'reporting'. 'Control' refers to control of the physical processes that affect gas quality, 'monitoring' refers to anything done to observe gas quality, and 'reporting' means passing information about gas quality from one person to another.

We think that it is necessary for each of these aspects to be distinguished to get a clear picture of gas quality management. For example, parties may be doing all that is necessary to control the composition of gas injected into the transmission pipelines but, without adequate monitoring, they may not be able to demonstrate that quality is being managed. Similarly, even if control and monitoring are adequate, system users may have no assurance of that without adequate reporting.

The performance of any party in the physical supply chain can affect large numbers of end-users, and potentially cause severe economic harm. In such a 'common pool' situation, we believe that it is not sufficient that gas quality is managed by reasonable and prudent operators (RPOs), it must also be monitored and reported. Only then will stakeholders in the common pool have assurance that standards are being maintained, and be able to assess what risk mitigation measures are appropriate.

Furthermore, we consider that the efficient provision of gas quality assurance demands that the requirements for control, monitoring, and reporting are readily assessable, clear, coherent and consistent.

## 1.6 Invitation for submissions

Gas Industry Co invites submissions on this investigation update paper. We are particularly seeking responses to the questions highlighted at various points in the body of the text. Submissions on the questions should be provided in the format shown in Appendix A. A Word version of this form is available for download from the Gas Industry Co website.

Submissions are due by 5pm, Friday 31 August 2012. Please note that submissions received after this date may not be considered.

We prefer receiving submissions in electronic form (Microsoft Word format and PDF). Submissions maybe uploaded on our website at www.gasindustry.co.nz. You will need to log in as a user and upload the submission on the consultation page by clicking on the submissions button. Gas Industry Co will acknowledge receipt of all submissions electronically. If you do not receive electronic acknowledgement of your submission within two business days, please contact Jay Jefferies on 04 472 1800.

Gas Industry Co values openness and transparency and therefore submissions will generally be made available to the public on our website. If you intend to provide confidential information in your submission, please discuss this first with Ian Wilson at Gas Industry Co on 04 472 1800.

Gas Industry Co will release a paper containing a summary of submissions as well as our analysis and conclusions.

# 2 Gas quality control

This section sets out the requirements to control gas quality, and summarises our understanding of current control practices. 'Gas quality control' in this context refers to control of the physical processes that affect gas quality.

## 2.1 Requirement to control gas quality

Gas quality is mandated by regulations under the Gas Act 1992 (the Gas Act). Under regulation 41 of the Safety Regulations all reticulated natural gas must comply with the Gas Specification. The Safety Regulations also require that reticulated gas is odorised, except for gas in transmission systems, and where gas supplied to large consumers (subject to certain conditions)[2].

The Regulations provide that the retailer or wholesaler supplying gas to the end user's point of supply is responsible for ensuring the gas complies with the Gas Specification and is odorised.

We reviewed a range of contracts associated with receiving gas into, transporting gas through, and delivering gas from, the open access transport systems. In addition to the regulatory requirements of the Safety Regulations, all these contracts required that gas complies with the Gas Specification.

Consistent with these obligations, we use the term gas quality to include all the features of gas that contribute to that gas meeting the requirements of the Gas Specification and Safety Regulations.

[2] Regulation 16(3)b of the Safety Regulations allows exemption (subject to the conditions noted below) from the odorisation of gas where it is to be supplied to consumers with facilities directly connected to the transmission system, designed to take more than **60GJ/hour** (providing they have documented systems to manage the risk). This should not be confused with a 'large consumer' under the Gas Governance (Critical Contingency Management) Regulations 2008, who is a consumer that is supplied directly from the transmission system and has the potential to consume more than 15TJ/day (**624GJ/hour** on a flat profile). Nor should it be confused with a 'large station' under the MPOC or VTC, which is a station designed to flow more than 5,000 scm/h (about **200GJ/hr**).
The conditions under which unodorised gas may be supplied to such large installation are that the owner or operator:

- effectively manages the associated risks for that installation (Regulation 16(3)b(i));
- can demonstrate that there are documented procedures to ensure that either—
    - the presence of gas in the atmosphere is readily detectable at concentrations equivalent to and in excess of one-fifth of the lower explosive limit of the gas; or
    - ignition of any released gas is prevented (Regulation 16(3)b(ii)); and
- has asked the gas supplier to supply non-odorised gas in accordance with a written agreement. (Regulation 16(3)b(iii))

## Gas characteristics and components

Table 1 sets out the limits on gas characteristics and components established by the Gas Specification.

**Table 1 - Gas Specification characteristic and component limits**

| Characteristics and components | Limit | |
|---|---|---|
| Wobbe Index | Minimum<br>Maximum | 46.0 MJ/scm<br>52.0 MJ/scm |
| Relative density | Maximum | 0.80 |
| Oxygen - for gas to be transported through medium and low pressure systems only | Maximum | 1.0 mol % |
| - In all other cases | Maximum | 0.1 mol % |
| Hydrogen | Maximum | 0.1 mol % |
| Hydrogen sulphide | Maximum | 5 mg/scm |
| Total sulphur (after odorant addition)[3] | Maximum | 50 mg/scm |
| Water | Maximum | 100 mg/scm |
| Total halogens | Maximum | 25 mg/scm |
| Hydrocarbon dewpoint temperature | Maximum | 2 °C at 5 MPa |
| Temperature | Minimum<br>Maximum | 2 °C<br>40 °C |

## Gas contaminants

The Gas Specification sets the limit for contaminants by the effect it has on equipment. The gas *'shall not contain materials… to an extent which might cause damage to, or interference with the proper operation of lines, meters, regulators…'* (Gas Specification section 4.2.1). The Gas Specification also suggests a limit for oil removal in compressor coalescing filters of 20ml/TJ, but does not specify the method or frequency of monitoring for contaminants (either oil or dust).

In addition, the transmission receipt and delivery point Interconnection Agreements (ICAs) we reviewed require filtration adequate to prevent solid or liquid contaminants from affecting metering equipment.

# 2.2 Current gas quality control practices

## Gas characteristics and components

The processing of wellhead products to Specification Gas generally involves oil and condensate removal, water removal, separation of LPGs and, if necessary, the removal of sulphur and carbon

[3] The amount of sulphur added at normal odorant injection rates is of the order of 6 mg/scm.

dioxide. Also, heaters and scrubbers are installed, usually at or near the wellhead. The scrubbers remove sand and other particles. The heaters warm the gas to prevent hydrate[4] formation.

The characteristics of wellhead products can vary considerably between fields. For example the Pohokura field produces a highly volatile light hydrocarbon condensate liquid, while the Kupe field produces a high wax content oil that is 'firm' at low ambient temperatures. The scale and economics of the different fields can also vary considerably. As a result, although all have the same treatment objectives, the detail, scale, and reliability of processing can be quite different.

In addition to processing done at the wellhead and at centralised processing plants:

- In September 2011, Todd Energy opened an LPG extraction 'straddle plant', with a production capacity of 27,000 tonnes of LPG per year, to process gas from the Mangahewa and Pohokura fields. The remaining lean gas is exported to the Maui pipeline.

- Contact Energy has recently commissioned a gas storage facility at the depleted Ahuroa reservoir near Stratford. Gas enters and leaves storage via a lateral off Vector's Frankley Road pipeline.

Because of the variety of upstream arrangements, gas quality at any single transmission pipeline injection point can vary depending on such factors as the degree of hydrocarbon extraction and plant operating conditions. In fact, we understand that occasional 'excursions' from the gas specification are not unusual. These are often 'transients', lasting only minutes, and therefore unlikely to have any significant effect on the quality of delivered gas. However, any such incident represents a breach of the strict requirement under every Interconnection Agreements (ICA) that only gas meeting the Gas Specification may be injected into the transmission pipelines.

Gas flowing through the Maui pipeline and Vector's Frankley Road pipeline is unodorised[5]. However Vector odorises the gas entering its pipelines from the Maui pipeline at the various interconnection points, except Frankley Road.

## Gas contaminants

Most production facilities do not have compressors and so the requirement for compressor oil carry-over to be removed is generally not applicable. Where there is compression, the compressors are coupled to coalescing filters. For example, at the McKee/Mangahewa (M&M) production facility, coalescing filters are designed to remove oil to <0.01ppmw (well within the Gas Specification).[6]

Gas compressors are also used on the MDL and Vector gas transmissions systems. The gas turbine compressors at MDL's Mokau compressor station and at Vector's Rotowaro compressor station are oil-free designs. The other compressors are reciprocating oil-injected machines that rely on

[4] Hydrates are solid or semi-solid compounds of methane and water, resembling ice crystals that can block valves, regulators and instrument sensor lines.
[5] The sulphur compounds in odorant can contaminate catalysts at petrochemical plants where gas is used as a feedstock (rather than as a fuel). Since both the Maui and Frankley Road pipelines supply petrochemical plants, it is preferred that they carry unodorised gas.
[6] Section 4.2.1 of the Gas Specification suggests a limit for oil removal in compressor coalescing filters of 20ml/TJ which is approximately 1.1ppmw (parts per million by weight).

coalescing filters to remove oil. For example, the Kapuni Gas Treatment Plant's gas export compressors are reciprocating compressors.

| | |
|---|---|
| *Q1:* | *As far as you are aware, are the requirements and current practices for controlling gas quality described accurately? If not, please explain why not.* |

# 3 Gas quality monitoring

This section sets out the requirements to monitor gas quality, and summarises the responses received on current monitoring practices. 'Gas quality monitoring' in this context means the things that are done to observe gas quality.

## 3.1 Requirement to monitor gas quality

### Gas characteristics and components

Section 5 of the Gas Specification sets out compliance requirements. In regard to 'testing' (which we refer to in this paper as 'monitoring'), the methods used must allow for the value of a characteristic or component to be determined with 95% confidence. The frequency will be such '…that any potential deviations beyond the limits are likely to be detected when they occur'. It could be argued that only continuous monitoring could allow deviations to be detected 'when they occur'. However, Section 5.3 of the Gas Specification also refers to the frequency being periodically reviewed, so we assume that periodic monitoring is acceptable. Also, Section 5.4 of the Gas Specification allows that the test frequency for a particular component can be lowered if that component is demonstrated to be absent or at very low levels relative to the limits.

Gas chromatographs and associated equipment that form part of gas metering systems are subject to on-going calibration and inspection requirements of the New Zealand Standard: Gas Measurement NZS 5259[7].

Both MDL's and Vector's ICAs stipulate minimum frequencies for monitoring gas components. They also allow that less frequent testing may be carried out if:

- the facility is designed and operated to prevent a component exceeding the Gas Specification limit; or
- if the Producer is reasonably able to demonstrate that components (such as hydrogen sulphide, total sulphur, oxygen and halogens) are not expected to be present, providing that the test frequencies still comply with the Gas Specification.

Section 17.3 of the MPOC requires Injecting Welded Parties to monitor all gas, in accordance with the Gas Specification, to demonstrate compliance. Section 17.15 sets out the frequencies that an

[7] The Standard applies to 'gas measurement systems' for 'fuel gases', both as defined in the Gas Act.

injecting party is required to monitor the various characteristics and components of gas itemised in the Gas Specification (see Table 1) before injecting it into the Maui Pipeline. Section 2.13 of Schedule 1 specifies certain additional characteristics and components of the gas that must be measured (at each sample) to allow calculation of a daily average.

Section 6.9 of MDL's Interconnection Policy also requires that interconnected parties will monitor, in accordance with the Gas Specification, all such gas so as to demonstrate compliance.

Section 1.8 of Schedule 1 to the MPOC provides that MDL has the right to remotely monitor metering and other equipment at any Welded Point or Station if MDL considers that necessary for the safe and reliable operation of the Maui pipeline.

As OATIS generally requires real time information flows, Section 2.16 of the MPOC requires that large stations[8] '… make available all measured and calculated parameters for remote monitoring via SCADA or other system.' This includes chromatograph measurements of the items listed in Table 2. The requirements apply to all existing large stations.

Unlike the MPOC, the VTC only relates to arrangements with shippers, and does not address arrangements with interconnected parties. These arrangements are addressed in Vector's ICAs. The current Vector Receipt Point ICA[9] requires the 'Interconnected Party' to monitor the characteristics and components listed in the Gas Specification.

The current monitoring requirements for parties injecting gas in to the Maui and Vector pipelines, and the required frequency of monitoring, are set out Table 2.

**Table 2 - required monitoring**

| **Gas entering Maui pipeline** | | **Gas entering Vector pipeline** | |
|---|---|---|---|
| Characteristic/Component | Specified Frequency of Monitoring | Characteristic/Component | Specified Frequency of Monitoring |
| (MPOC s2.13 & s17.15) (MDL ICA s6.9) | | Vector Receipt Point ICA 14/1/11 s5.22 & s7.10 | |
| nitrogen | when requested | Nitrogen | when requested |
| methane | when requested | Methane | when requested |
| ethane | when requested | ethane | when requested |
| propane | when requested | propane | when requested |
| iso-butane | when requested | iso-butane | when requested |
| normal butane | when requested | normal butane | when requested |
| iso-pentane | when requested | iso-pentane | when requested |
| neo-pentane | when requested | - | - |
| normal pentane | when requested | normal-pentane | when requested |

[8] In the MPOC 'large station' refers to a station designed to flow more than 5,000 scm/h (about 200GJ/h).
[9] Vector's current ICA was introduced in January 2011.Previous ICAs (dating back to 2002) were less comprehensive than current ICA, but still place an obligation on the interconnected party to only inject Specification Gas.

| Gas entering Maui pipeline | | Gas entering Vector pipeline | |
|---|---|---|---|
| hexanes and heavier components (either separately or as a combined Hexanes-plus fraction) | when requested | hexanes and other hydrocarbons of equal or greater molecular weight | when requested |
| - | - | carbon monoxide | when requested |
| - | - | carbon dioxide | when requested |
| - | - | normal-hexame | when requested |
| - | - | normal-heptane | when requested |
| - | - | normal-octane | when requested |
| - | - | normal-nonane | when requested |
| - | - | normal-decane | when requested |
| - | - | helium | when requested |
| - | - | argon | when requested |
| - | - | neo-pentane | when requested |
| Gross Calorific Value | continuously | Gross Calorific Value | continuously |
| Nett Calorific Value | continuously | Nett Calorific Value | continuously |
| Base Density or Specific Gravity | continuously | Base Density or Specific Gravity | continuously |
| Wobbe Index | continuously | Wobbe Index | continuously |
| oxygen | continuously | oxygen | continuously |
| hydrogen | as reasonably required, but at least quarterly | halogens and hydrogen | as reasonably required, but at least quarterly |
| hydrogen sulphide | as required, but at least quarterly | hydrogen sulphide | as reasonably required, but at least quarterly |
| total sulphur | as required, but at least quarterly | total sulphur | as reasonably required, but at least quarterly |
| water | as required, but at least daily | water | as reasonably required, but at least daily |
| hydrocarbon dewpoint | as required, but at least daily | hydrocarbon dewpoint | as reasonably required, but at least daily |
| - | - | temperature | continuously |

## Gas contaminants

Neither the Gas Specification, MPOC, VTC, nor the ICAs contain any express provisions for monitoring for contamination.

## 3.2 Current gas quality monitoring practices

### Survey results on quality monitoring

Table 3 Gas quality measurement in New Zealand summarises the survey results on gas quality monitoring practices from upstream participants in tabular form.

The items in the left hand column are quality parameters. Wobbe Index and Relative Density (also known as Specific Gravity, or SG) are gas 'characteristics' for which the Gas Specification sets limits. Oxygen, hydrogen, hydrogen sulphide, total sulphur, water and hydrocarbons are gas 'components' for which the Gas Specification sets limits (see Table 1). Carbon dioxide and Nitrogen are components which, together with Relative Density, are used in the calculation of delivered energy quantities[10]. The Wobbe Index is used to assess the suitability of the gas for particular applications.

Each column of the table shows the survey results relative to a specific gas source.

Each entry in the body of the table describes how frequently the gas parameter is measured.

**Table 3 Gas quality measurement in New Zealand**

| **Field or pipeline** | Maui | Kapuni | M&M | Pohokura | Kupe | Wiahapa | Rimu | Kaimiro | Turangi | Kowhai | MDL pipeline | Vector pipeline |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Operator*** | *STOS* | *Vector* | *Todd* | *STOS* | *Origin* | *Origin* | *Origin* | *GPL* | *GPL* | *GPL* | *TSO* | *TSO* |
| Wobbe Index | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p |
| Relative density | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p |
| Carbon dioxide | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p |
| Nitrogen | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p |
| Oxygen | A | × | × | A | M | × | C | ? | ? | ? | × | × |
| Hydrogen | TBA | × | × | TBA | M | × | × | ? | ? | ? | × | × |
| Hydrogen sulphide | FC | M | × | C gc | C gc | 3M | M | ? | ? | ? | × | × |

[10] Arrangements for gas metering can be quite complex, it is sufficient for current purposes to note the main distinctions. At large metering stations, such as at power stations, all the equipment necessary to calculate energy quantities is located on-site. Importantly, instruments at these large stations monitor the gas characteristics and components that are relevant to metering. These inputs are used by the on-site flow computer(s) to calculate energy quantities. At smaller metering stations only gas volumes are accurately measured on-site. The conversion to energy is performed elsewhere as a 'back-office' function. The parameters used for these back-office conversions are CO2, N2, SG and calorific value (CV), as published by the TSOs for each of the defined gas types in the transmission pipelines. These parameters are also used by retailers to calculate the energy delivered to each end users they supply. All of the calculations are based on algorithms permitted by the New Zealand gas standard: Gas measurement NZS 5259:2004.

| **Field or pipeline** | Maui | Kapuni | M&M | Pohokura | Kupe | Wiahapa | Rimu | Kaimiro | Turangi | Kowhai | MDL pipeline | Vector pipeline |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Operator*** | *STOS* | *Vector* | *Todd* | *STOS* | *Origin* | *Origin* | *Origin* | *GPL* | *GPL* | *GPL* | *TSO* | *TSO* |
| Total sulphur | FC | O | × | FC | 6M | × | × | ? | ? | ? | × | × |
| Water | C I | C | C I | C gc | C | C | C | ? | ? | ? | × | O |
| Hydrocarbon dew point | C I | C | C I | C gc | C gc | C | C | ? | C gc | C gc | × | × |

**Key**

A – Annual measurement
C – Continuous measurement (or effectively continuous for sample-based analysis)
FC – Samples analysed if there are changes to the field/wells that might affect the gas
I – Value inferred from other information
M – Monthly measurement (3M – three monthly, etc.)
O – Occasional measurement
× – Not measured
? – Information not provided
gc – Gas control receives a measurement signal via SCADA
p – Viewable on the public pages of OATIS

## Gas characteristics and components

All injecting parties who responded to our questionnaire monitor calorific value, relative density, water content and hydrocarbon dew point continuously (see Table 3). This is either done at production stations or Receipt Points. Measurement is generally performed by gas chromatographs, or dedicated instruments. However water and hydrocarbon dew point are sometimes derived by inference from other data, such as pressure and temperature in the production process[11].

Other components (oxygen, hydrogen, hydrogen sulphide and sulphur) are measured at varying intervals.

As discussed in section 3.1 of this Report, the MPOC and VTC do not require TSOs to monitor gas quality. However, as discussed in footnote 10, a few quality parameters are required to convert the quantities of gas delivered from the transmission pipelines from metered volume units into energy units. In theory, these parameters for the various gas mixtures leaving the transmission pipelines can be calculated from the known parameters of each gas type entering the pipeline, and the proportions of the mixture. However, measuring the parameters of the mixed gas streams is more accurate, especially when the mixtures are changing from time to time. This is why the TSOs monitor gas quality at a number of key locations on their pipelines. These locations are:

- Rotowaro Compressor Station

[11] The Gas Specification offers no guidance on whether inferring the dew point from other measurements is acceptable.

- Pokuru Compressor Station
- Kaitoke Compressor Station
- TCC Delivery Point
- Stratford 2 and 3 Delivery Point
- Otahuhu B Delivery Point
- Southdown Delivery Point
- Te Rapa Delivery Point
- Frankley Road Interchange

The gas chromatographs at these locations continuously[12] monitor the gas stream and provide readings to Gas Control through the SCADA system. Although the TSOs specifically require calorific value, relative density, CO2 and N2, the chromatographs also typically record various other components of gas composition.

## Gas contaminants

Survey respondents stated that there is no practicable method to determine the amount of compressor oil carry-over, and that reconciliation of compressor oil consumption and removal (in coalescing filters) would not yield accurate results. However, compressor oil use is monitored to assess the compressor performance and abnormally high levels are investigated. Also, if there is excessive oil carry-over from transmission compressors, it is detected during six-monthly delivery point maintenance checks[13].

Similarly, respondents did not consider that the direct monitoring of dust was a realistic means of managing the dust levels. The occurrence of dust was attributed to 'black powder' dust, which is typically static and only moves when pipelines are pigged. Most major pipelines are intelligently pigged[14] on a 5-10 year interval. Prior to intelligent pigging, several cleaning pigs are passed through the pipe to remove oil and dust from the pipeline. Pipelines less than 150mm in diameter are generally not intelligently pigged[15], but most are fitted with pigging facilities to allow cleaning if it is judged to be necessary.

In addition to upstream monitoring, the NSOs carry out regular maintenance checks at points throughout the networks and inspect for abnormal levels of liquids or dust during these checks.

---

[12] Gas chromatographs analyse a continuous series of discreet samples of gas taken from the gas stream.
[13] Filters at each delivery point are inspected on a six-monthly basis, providing empirical monitoring of oil or dust contamination.
[14] An intelligent pig is an inspection device that travels inside a pipeline, measuring the pipeline wall thickness and geometry.
[15] Depending on the design, the small radius of bends can make it impractical for an intelligent pig to pass through smaller diameter pipelines.

| | |
|---|---|
| *Q2:* | *As far as you are aware, are the requirements and current practices for monitoring gas quality described accurately? If not, please explain why not.* |

# 4 Gas quality reporting

This section sets out the requirements for reporting of gas quality, and summarises the responses received on current reporting practices. 'Gas quality reporting' in this context means the passing of information about gas quality from one person to another. This includes both assurance reporting and the reactive reporting that occurs in the event that non-Specification gas is suspected or detected.

## 4.1 Requirement to report gas quality

All parties in the supply chain are required to notify others if they suspect that non-Specification gas has entered the gas system. This requirement is consistently provided for in the MPOC, VTC, ICAs, network arrangements, and gas supply codes and contracts.

The Gas Specification does not address reporting requirements.

### Gas characteristics and components

Clause 1.12 of the MPOC requires that 'In relation to any Physical Welded Point or Station, MDL (or the Technical Operator) shall be entitled to receive such of the following data as MDL (or the Technical Operator) shall specify:

> …
>
> (f) gas composition and/or properties used in the determination of energy;
>
> (g) gas Gross Calorific Value, Base Density or Specific Gravity and Wobbe Index;
>
> (h) gas quality data, for example moisture content, where such data is available;
>
> …'

Also, in relation to gas injected or withdrawn from Vector's pipelines at large stations[16], Vector's ICAs[17] provide that Vector may request gas characteristic and composition data 'as soon as reasonably practicable'. An extensive list of characteristics and components is given (over 20 components).

The VTC provides for Shippers to require Vector to exercise its right (under an ICA) to request this information from an injecting party (on a Shipper's behalf). This provision includes parties injecting

[16] Consistent with the MPOC, the term 'large station' in the VTC means a station designed to flow more than 5,000 scm/h (about 200GJ/hr).
[17] See clause 5.22 of Vector's Receipt Point ICA and clause 5.23 of Vector's Delivery Point ICA.

gas into the Maui pipeline. It follows that any Shipper can require gas quality information from any party injecting gas into the Maui/Vector transmission system.

In addition, clause 12.5 of the VTC states:

> 'Vector, upon receiving a reasonable written request from a Shipper, shall exercise any contractual rights it has to require a party who injects gas into a Pipeline (or the party who injects gas into that party's pipeline) to demonstrate that such party has adequate facilities, systems and procedures in place...'.

So, in addition to gas quality information, Shippers can also obtain information about 'facilities, systems and procedures' for managing gas quality. (A Shipper who buys gas from a particular facility may already have rights to obtain this information under its gas purchase agreements. However, the VTC provision may be useful in circumstances where a Shipper does not have such rights, or wishes to obtain information relevant to a facility it does not buy gas from.)

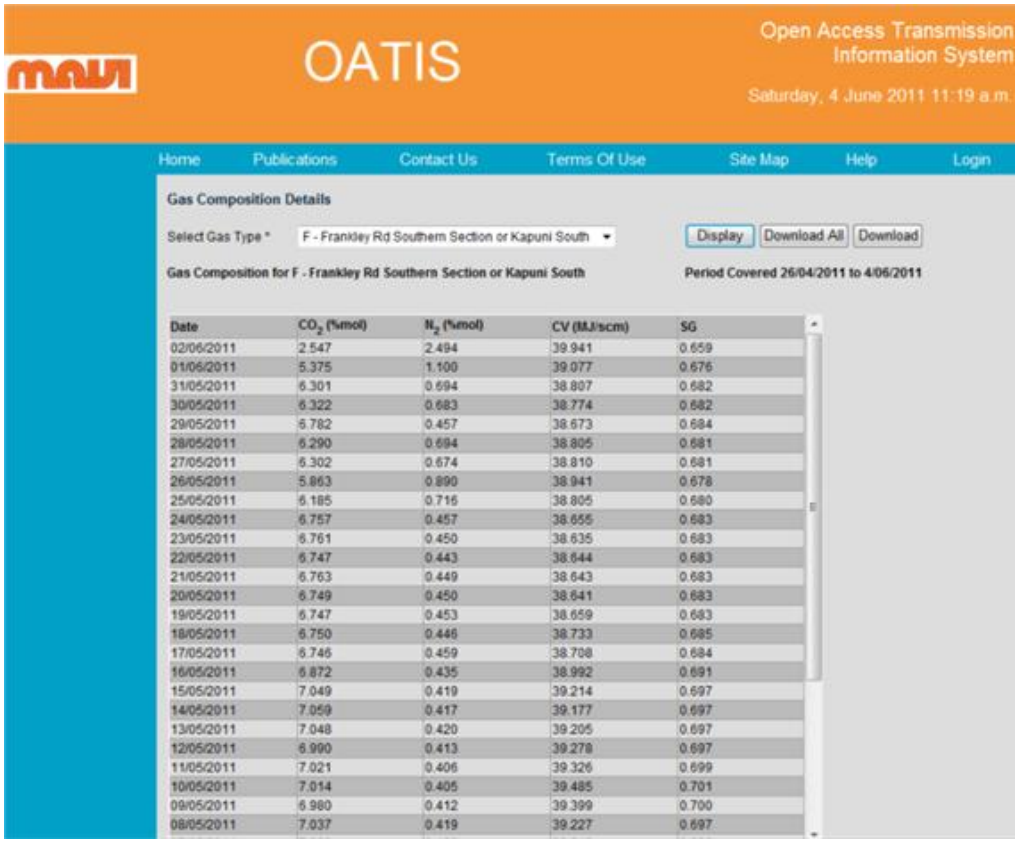
### Gas contaminants

Other than the general obligation to report the presence of non-Specification gas, neither the Gas Specification, MPOC, VTC, nor ICAs contain any provisions requiring the reporting of gas contaminants.

## 4.2 Current gas quality reporting practices

### Gas characteristics and components

Gas composition data that is used for metering calculations is displayed on OATIS for both Maui and Vector pipelines (see Figure 2). This daily information is publically available for each pipeline or system of pipelines and includes carbon dioxide, nitrogen, calorific value, and relative density (also referred to as specific gravity, or SG).




| Date | $CO_2$ (%mol) | $N_2$ (%mol) | CV (MJ/scm) | SG |
|---|---|---|---|---|
| 02/06/2011 | 2.547 | 2.494 | 39.941 | 0.659 |
| 01/06/2011 | 5.375 | 1.100 | 39.077 | 0.676 |
| 31/05/2011 | 6.301 | 0.694 | 38.807 | 0.682 |
| 30/05/2011 | 6.322 | 0.683 | 38.774 | 0.682 |
| 29/05/2011 | 6.782 | 0.457 | 38.673 | 0.684 |
| 28/05/2011 | 6.290 | 0.694 | 38.805 | 0.681 |
| 27/05/2011 | 6.302 | 0.674 | 38.810 | 0.681 |
| 26/05/2011 | 5.863 | 0.890 | 38.941 | 0.678 |
| 25/05/2011 | 6.185 | 0.716 | 38.805 | 0.680 |
| 24/05/2011 | 6.757 | 0.457 | 38.655 | 0.683 |
| 23/05/2011 | 6.761 | 0.450 | 38.635 | 0.683 |
| 22/05/2011 | 6.747 | 0.443 | 38.644 | 0.683 |
| 21/05/2011 | 6.763 | 0.449 | 38.643 | 0.683 |
| 20/05/2011 | 6.749 | 0.450 | 38.641 | 0.683 |
| 19/05/2011 | 6.747 | 0.453 | 38.659 | 0.683 |
| 18/05/2011 | 6.750 | 0.446 | 38.733 | 0.685 |
| 17/05/2011 | 6.746 | 0.459 | 38.708 | 0.684 |
| 16/05/2011 | 6.872 | 0.435 | 38.992 | 0.691 |
| 15/05/2011 | 7.049 | 0.419 | 39.214 | 0.697 |
| 14/05/2011 | 7.059 | 0.417 | 39.177 | 0.697 |
| 13/05/2011 | 7.048 | 0.420 | 39.205 | 0.697 |
| 12/05/2011 | 6.990 | 0.413 | 39.278 | 0.697 |
| 11/05/2011 | 7.021 | 0.406 | 39.326 | 0.699 |
| 10/05/2011 | 7.014 | 0.405 | 39.485 | 0.701 |
| 09/05/2011 | 6.980 | 0.412 | 39.399 | 0.700 |
| 08/05/2011 | 7.037 | 0.419 | 39.227 | 0.697 |

**Figure 2 OATIS gas quality screen shot**

Although the MPOC and Vector ICAs allow TSOs to request additional gas quality data, and some such data is routinely provided via SCADA (see Table 3), it is therefore not publically available (or routinely available to shippers).

Additional gas quality readings are provided to Gas Control via SCADA, as summarised in Table 1. KGTP advised that monthly reports of gas quality readings are also supplied to Gas Control. In addition, Origin provides daily production reports to its contracted parties. These reports include Wobbe Index, relative density and dew point values.

The rights to review or inspect measurement equipment provided for in the MPOC and Vector ICAs are seldom exercised. Only one retailer reported that it had exercised its right to require the TSO to obtain assurance from an injecting party. It received a statement of assurance, but did not receive quality readings due to confidentiality limitations.

## Gas contaminants

Survey respondents stated that there is no practicable method to determine the amount of compressor oil carry-over, or to determine the amount of solid contaminants. It was therefore not possible to report any measurements.

*Q3: As far as you are aware, are the requirements and current practices for reporting gas quality described accurately? If not, please explain why not.*

# 5 Discussion

This section summarises the findings of our investigation and discusses those findings.

## 5.1 Summary requirements and practices

Before discussing the results it is helpful to draw them together in summary form. Table 4 summarises the requirements and practices in relation to gas characteristics and components.

Table 5 summarises the requirements and practices in relation to gas contaminants.

**Table 4 - Summary of requirements and practices in relation to gas characteristics and components**

| | Requirements | Practices |
|---|---|---|
| **Control** | All contracts and the Safety Regulations require compliance with **Gas Specification** that sets Max/Min limits (see Table 1). | **Production/treatment stations**<br>Details vary with field, but generally the overall production station design allows for the production of Gas to be controlled in order to meet the Gas Specification<br><br>**Transmission pipelines**<br>The only physical process occurring in gas pipeline to affect gas quality is the addition of odorant by Vector. As previously noted, normal odorant injection rates are of the order of 6 mg/scm (compared to the Gas Specification limit of 50 mg/scm). |
| **Monitoring** | All contracts and the Safety Regulations require compliance with the **Gas Specification.** The Gas Specification requires monitoring of the characteristics and components listed in Table 1 frequency enough '…that any potential deviations beyond the limits are likely to be detected when they occur'.<br><br>MDL and Vector **ICAs** also set minimum frequencies for monitoring. | **Production/treatment stations**<br>Details vary with field, but generally station controllers monitor the key station parameters.<br><br>**Transmission receipt points**<br>Some data is available to TSOs via SCADA (see Table 3). Other data is available from interconnected parties on request.<br><br>**Transmission pipelines**<br>Metering-related gas composition parameters are monitored using gas chromatographs at selected locations.<br><br>**Distribution networks**<br>No regular monitoring is undertaken. |

| | Requirements | Practices |
|---|---|---|
| **Reporting** | All parties in the supply chain have contractual obligations to report any instances of gas that does not meet the Gas Specification.<br><br>**MPOC** provides that, if the Technical Operator asks for it, MDL is entitled to receive: gas composition; Gross Calorific Value, Base Density or Specific Gravity and Wobbe Index; and other available gas quality data.<br><br>**Vector's ICAs** provide that (for large stations) Vector may request gas characteristic and composition data. | **Production/treatment stations**<br>No routine reporting to other parties, but information is provided where contracts require.<br><br>**Transmission pipelines**<br>TSOs report daily metering-related gas composition parameters on OATIS. Gas Control has access to some other component information via SCADA, but does not report these to other parties.<br><br>**Distribution networks**<br>Have no collected information on gas quality to report. |

**Table 5 - Summary of requirements and practices in relation to gas contaminants**

| | Requirements | Practices |
|---|---|---|
| **Control** | All contracts and the Safety Regulations require compliance with the **Gas Specification**. In particular, gas should not contain contaminants that might cause damage to or interference with equipment. | **Production/treatment stations and Transmission receipt points**<br>Gas is scrubbed at the wellhead, and filtered before metering. Compressors, where present, are fitted with coalescing filters.<br><br>**Transmission pipelines**<br>Compressors are of oil-free design or fitted with coalescing filters. Pipelines of150mm diameter and larger are generally cleaned (using a cleaning pig) every 5-10 years, prior to intelligent pigging.<br><br>**Transmission delivery points**<br>Filters are installed at all metering stations.<br><br>**End user installations**<br>Filters are installed at large gas metering systems. |

| | Requirements | Practices |
|---|---|---|
| **Monitoring** | No explicit requirements | **Production/treatment** stations and **Transmission receipt points**<br>Filters/coalescers are inspected during routine maintenance.<br>**Transmission pipelines**<br>Filters/coalescers are inspected during routine maintenance. Ad hoc monitoring of compressor oil consumption is carried out.<br>**Transmission delivery points**<br>Filters are inspected at all metering stations during routine maintenance.<br>**Distribution networks**<br>Inspection for abnormal levels of liquids or dust during regular maintenance checks at test points throughout the networks.<br>**End user installations**<br>Filters are inspected at all large gas metering systems during routine maintenance. |
| **Reporting** | No explicit requirements | No routine reporting of contaminants is undertaken. However, a party may advise its supplier when contaminants are found. |

## 5.2 Discussion of findings in relation to control

As explained in the Issues Paper, the obligation to only deliver gas meeting the Gas Specification is set out in the Safety Regulations and contracts. The Safety Regulations put this obligation on the retailer or wholesaler supplying gas to an end user. However, neither retailers nor wholesalers have any direct control over gas quality. They rely on quality obligations in the service contracts they have with parties in the physical supply chain. In particular, they rely on parties who control the characteristics and components of gas entering the transmission pipelines, but also parties who control contaminants that can be introduced when gas travels through the pipelines.

This arrangement is not ideal for the following reasons:

- Parties in the physical supply chain—producers and line businesses—will wish to minimise their risk exposure, so are unlikely to offer wholesalers and retailers strong gas quality commitments in their supply and service contracts.

- Retailers and wholesalers do not always have strong negotiating leverage with gas producers or line businesses, so they may not be able to insist on robust gas quality clauses in their supply and service contracts. (We do not suggest that producers or line businesses can set 'take-it-or-leave-it' contract conditions, but note that they are generally in a stronger negotiating position, and do not need to accept the full wish-list of retailer and wholesaler conditions.)

- The incentives on retailers and wholesalers to demand strong gas quality commitments from their suppliers may not be strong. For example, the penalties for failure to meet the Safety Regulations obligation is a 'grade A offence' (regulation 41(5)), which would expose the company responsible to a fine not exceeding $50,000 (regulation 6). This is a very small penalty in comparison to the worst economic harm that may result from delivery of gas that does not meet the Gas Specification.

- Since retailer and wholesaler supply contracts are confidential, there is no transparency on gas quality provision in those contracts.

- There is not full transparency on gas quality provision in contracts between parties in the physical supply chain. Although some agreements, such as MDL's ICAs are in the public domain, other key contracts, such as Vector's Receipt Point interconnection arrangements are confidential to the parties. (However, we understand that Vector would be willing to make the agreements public if the relevant counter parties agreed.)

- Some arrangements in the physical supply chain are undocumented. As illustrated in Figure 1, the interconnection arrangements between Vector's transmission pipelines and downstream distribution networks are undocumented.

In addition to the sometimes weak and possibly confidential contractual provisions relating to gas quality control, there appear to be some undocumented control practices. In particular, we understand that it is not uncommon for injections of gas to deviate from the Gas Specification from time to time. This can occur because a treatment station operator:

- is not aware that gas is non-Specification;

- has insufficient warning to prevent the injection of non-Specification gas; or

- may consider the extent or duration of the non-Specification event to not justify an interruption or notification (even though the ICA forbids the injection of non-Specification gas).

Similarly, once a non-specification incident has occurred, the treatment station operator may allow the injection of non-specification gas to continue because:

- the deviation from Gas Specification is minor;

- the event is only likely to last for a short time;

- the mixed gas stream in the pipeline meets the Gas Specification; or

- there are overriding considerations, such as safety.

From survey results, only producers and treatment station operators control the characteristics and components of gas quality (with the exception of total sulphur, which is affected by the addition of odorant by Vector). In contrast, contaminants (dust and liquids) are controlled all along the supply chain, primarily through the use of filters and coalescers/separators and by controlling the accumulation of contaminants by regular cleaning of pipelines. Producers and TSOs inevitably introduce oil into the transmission system and oil is routinely found in pipelines when those pipelines are pigged. Similarly dust is formed in the pipeline (a corrosion by-product) but normally stays on the pipe wall, and is benign. If these contaminants accumulate and are then disturbed it is possible for the contaminant to affect the proper operation of pressure regulators, and meters, and to block filters.

Gas Industry Co has no reason to believe that gas treatment plant and pipeline operators are not making well considered decisions in relation to non-specification gas, but we are concerned that the basis on which such decisions are being made is not transparent, and that they may be made without a clear mandate. We are also concerned about the lack of incident reporting (discussed in section 5.4).

*Q4: Do you have any comments on the discussion in relation to the control of gas quality?*

## 5.3 Discussion of findings in relation to monitoring

The Gas Specification requires that the location and frequency of testing be set and periodically reviewed 'to ensure they remain representative and that any potential deviations beyond the limits are likely to be detected when they occur.'

MDL and Vector require continuous monitoring of Wobbe Index, relative density, carbon dioxide, nitrogen and oxygen; daily monitoring of water and hydrocarbon dewpoint; and quarterly monitoring of hydrogen, hydrogen sulphide and total sulphur. They also allow the monitoring interval to be extended where the injecting party can demonstrate that the components being monitored have never been present in the gas, or are not able, or not expected to be present in the future.[18]

In some cases the monitoring frequency requirements of the Gas Specification, MDL and Vector are not met (as highlighted in Table 6). For example, although MDL and Vector both require:

- oxygen to be measured continuously—it is commonly not measured, or only measured annually; and

- hydrogen, hydrogen sulphide, and total sulphur to be measured quarterly—hydrogen is typically not measured, and hydrogen sulphide and total sulphur are sometimes measured less frequently than quarterly.

[18] MPOC section 7.15, and Vector Receipt Point ICA section 7.10.

These reduced levels of monitoring have no doubt been agreed between the TSOs and interconnected parties, but there does not seem to have been any notification to other stakeholders. It would be prudent for injecting parties and TSOs to formalise the frequency of testing for components that are tested less frequently than the default intervals set out in the MPOC or Vector ICA. These possible instances of inadequate monitoring are highlighted in Table 6.

With the exception of monitoring of oxygen, hydrogen, hydrogen sulphide and total sulphur, Table 6 indicates that monitoring of most characteristics and components meet, and sometimes exceed, MDL and Vector requirements.

**Table 6 - Possibly inadequate monitoring** (highlighted)

| **Field or pipeline** | Maui | Kapuni | M&M | Pohokura | Kupe | Wiahapa | Rimu | Kaimiro | Turangi | Kowhai | Gas Specification requirement | MDL/Vector requirement |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***Operator*** | *STOS* | *Vector* | *Todd* | *STOS* | *Origin* | *Origin* | *Origin* | *GPL* | *GPL* | *GPL* | *TSO* | *TSO* |
| **Wobbe Index** | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | S gc, p | C gc, p |
| **Relative density** | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | S gc, p | C gc, p |
| **Carbon dioxide** | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | S gc, p | C gc, p |
| **Nitrogen** | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | C gc, p | S gc, p | C gc, p |
| **Oxygen** | **A** | **x** | **x** | **A** | **M** | **x** | C | ? | ? | ? | S | **C** |
| **Hydrogen** | **TBA** | **x** | **x** | **TBA** | **M** | **x** | **x** | ? | ? | ? | **3M** | **3M** |
| **Hydrogen sulphide** | **FC** | M | **x** | C gc | C gc | 3M | M | ? | ? | ? | **3M** | **3M** |
| **Total sulphur** | **FC** | **O** | **x** | **FC** | **6M** | **x** | **x** | ? | ? | ? | **3M** | **3M** |
| **Water** | C I | C | C I | C gc | C | C | C | ? | ? | ? | D | D |
| **Hydrocarbon dew point** | C I | C | C I | C gc | C gc | C | C | ? | C gc | C gc | D | D |

**Key**

A – Annual measurement
C – Continuous measurement (or effectively continuous for sample-based analysis)
FC – Samples analysed if there are changes to the field/wells that might affect the gas
I – Value inferred from other information
M – Monthly measurement (3M – three monthly etc.)
O – Occasional measurement

S – Sufficient '…that any potential deviations beyond the limits are likely to be detected when they occur' (s5.3 Gas Specification)
× – Not measured
? – Information not provided
gc – Gas control receives a measurement signal via SCADA
p – Public availability of information via OATIS

In relation to contaminants, pipeline operators monitor gas contaminants during routine (typically 6-monthly) maintenance checks. Where contamination is found, the long interval between checks could make it difficult to trace contamination to its source. However we accept that there are practical difficulties in monitoring contaminants on a continuous basis.

*Q5: Do you have any comments on the discussion in relation to the monitoring of gas quality?*

## 5.4 Discussion of findings in relation to reporting

Injecting parties are required to report certain gas composition information to TSOs. This is provided for in the MPOC and Vector's ICAs[19]. However, other than for metering related data (see Figure 2), this information is generally not requested by TSOs. Retailers and wholesalers may be able to obtain the information about the gas they buy from the producer(s) they contract with, but this information may not relate to the composition of the gas they deliver (because gas from different sources is co-mingled in the transmission pipelines).

While the obligation to notify others of suspected non-Specification gas is consistently provided for in industry codes and contracts, we understand that treatment plant and pipeline operators temper this requirement with their practical experience of what is likely to be a problem (as discussed in section 5.1). We therefore suspect that not all non-Specification events (including those caused by contaminants) are reported to other stakeholders.

### Gas Measurement and Safety Regulations: Retailer's Obligations

As noted in section 2.1, the Safety Regulations place various obligations on retailers. Retailers have found it difficult to confirm compliance with some of the obligations because they rely on parties in the physical supply chain to control and monitor gas quality. Even when they know the components and characteristics of the particular gas they buy, this may not relate to the gas they sell, because different sources of gas are co-mingled in the transmission pipeline (the 'common pool').

Under the regulations retailers are responsible for ensuring gas delivered to end users:

- complies with the Gas Specification;
- is odorised; and

[19] Here we refer to the pro-forma ICA's Vector has posted on OATIS. We do not know if these are similar to existing ICAs as Vector does not disclose these.

- is measured by a gas measurement system and not exceeding specified margins of error.

Retailers need to have some means of demonstrating compliance with these obligations. As noted, several retailers have proposed that a 'Gas Information Exchange Protocol' (the Protocol) be introduced. It would require the parties who are responsible for gas quality, odorisation and measurement to provide retailers with certain information to confirm compliance. This Protocol is currently being considered by the parties.

In relation to gas quality, the Protocol requires:

- In relation to Odorisation, **Vector and NSOs** are to provide:
  - annually,
    - copies of policies on: selecting test points; ensuring personnel are trained; how retailers will be advised of detection of non-compliant gas; odorant contingency and emergency response; and procedures for calibrating and maintaining odorant test equipment; and
    - confirmation of competence of employees and contractors;
  - monthly,
    - previous month's odorant test results;
  - on occurrence,
    - copies of the relevant sections of any Safety Management Systems audits;
    - non-compliance reports and resulting actions;
    - actions to address any policy deficiencies uncovered by audits;
- In relation to Gas Quality, **producers** are to provide:
  - annually,
    - procedures for measuring gas quality and maintaining test equipment;
    - confirmation of the competency of operators;
    - emergency arrangements when non-Specification gas is injected into the transmission pipeline;
  - monthly,
    - report on previous month's quality compliance;
  - on occurrence,
    - copies of the relevant sections of any compliance policy audits;
    - non-compliance reports and resulting actions;
- In relation to Gas Quality, **wholesalers** are to provide:
  - annually,
    - procedures for auditing adequacy of supplier facilities, systems and procedures;
    - emergency arrangements when non-Specification gas is injected into the transmission pipeline;
    - confirmation of competence of employees and contractors;
  - monthly,
    - report on previous month's quality compliance;

- on occurrence,
  - copies of the relevant sections of any compliance audits;
  - non-Specification incident reports;
  - actions to address any policy deficiencies uncovered by audits; and

- In relation to Gas Quality, **Vector** is required to provide:
  - annually,
    - copies of policies on publication of gas quality information.

| *Q6: Do you have any comments on the discussion in relation to the reporting of gas quality?* |
|---|

# 6 Opportunities for improvement

This section proposes opportunities for improvement, and some options for realising those improvements.

## 6.1 Improving transparency of compliance with the Safety Regulations

In section 5.4, we discuss the difficulties wholesalers and retailers have in demonstrating that they have met their obligations under the Safety Regulations. In relation to gas quality, these obligations are to ensure that the gas they supply is odorised and complies with NZS 5442. We also describe the Gas Information Exchange Protocol that retailers have proposed as a means of demonstrating compliance. Essentially the Protocol would require parties in the physical supply chain to report to retailers on a range of gas quality related policies, procedures, audits and associated metrics.

We consider the Protocol to be a pragmatic response to a challenging dilemma: how retailers can demonstrate that they have complied with obligations in relation to gas quality when they have no direct ability to control gas quality.

We are not aware of any reasons why any of the information the retailers have requested should be confidential. Gas quality information should, in our view, be available to all industry participants who are at risk from non-Specification gas. It is therefore important that the final form of the Protocol should not contain confidentiality requirements that would limit the ability of retailers to share the information with interested parties, such as their own customers.

## 6.2 Improving the transparency of excursions from Specification

In section 5.2, we discuss some undocumented control practices that could allow non-Specification gas to enter the pipelines without the knowledge of wholesalers or retailers (who are responsible for gas quality under the Safety Regulations). We believe these practices are a pragmatic response of operational personnel who recognise that it is not always necessary to curtail non-Specification gas. However, we are concerned that there is no transparent process for weighing up when a non-Specification event is benign, or serious enough to warrant curtailment. There is also no process for reporting how frequently non-specification events occur, how severe they are, or how long they lasted. This applies to non-Specification events arising from non-compliant characteristics, components and/or contamination.

One possibility to improve transparency in this area is to follow the approach of the Australian Energy Market Operator (AEMO) who has developed guidelines to cover short-term gas quality excursions outside the gas quality specifications[20]. These guidelines set notification, alert and curtailment limits for each component of the Australian gas specification. Together with AEMO's operational protocols for managing gas quality at system injection points, the guidelines establish a baseline for the reasonable and prudent control of non-specification excursions.

Another possible approach is to implement the Protocol currently being promoted by gas retailers. This approach may be less costly since it only involves disclosing existing policies or practices, and does not involve changing them to meet a common standard.

## 6.3 Improving transparency where TSOs and producers agree to reduced monitoring

It is reasonable that TSOs and producers should agree reduced monitoring in certain circumstances. For example, where it can be shown that a component is extremely unlikely to be present in the gas, there is little benefit in continuously monitoring it. However, such decisions, and the rationale for taking them is currently obscure to stakeholders. This is of particular concern to wholesalers and retailers who are responsible for gas quality under the Gas Safety Regulations.

One possibility to improve transparency in this area is for TSOs to publish the monitoring requirements for each gas source on its website.

Another possible approach is to ensure that this information is part of the 'policy' disclosure Vector is being asked to make under the proposed Protocol.

*Q7: Do you think we have correctly identified the opportunities for improvement?*

[20] Operating Procedure Gas Quality Guidelines, Document Ref: 224235, Australian Energy Market Operator Ltd.

# 7 Recommendations and Next steps

This section sets out our recommendations for improving gas quality arrangements and the next steps in this gas quality work.

## 7.1 Recommendations

This review identified some areas where gas quality control, monitoring, and reporting processes can be improved in order to ensure the safe, efficient, and reliable delivery of gas; and provide for risks relating to security of supply to be properly and efficiently managed by those parties best able to manage such risks.

After considering these areas for improvement, Gas Industry Co makes the following recommendations.

1. Parties in the physical supply chain should give prompt attention to the Protocol being promoted by gas retailers. We consider that this can be a low cost and unobtrusive means of providing more transparency of gas quality management.

2. If the Protocol is not successful, parties in the physical supply chain should jointly review alternative options for improving transparency of the management of gas quality.

3. If they have not already done so, TSOs and Producers should formally agree the frequency of testing of gas quality components where the frequency is lower than the default specified in the MDL and Vector's ICA.

4. Vector should ensure that it monitors (or otherwise demonstrates) that total sulphur in odorised gas meets the Gas Specification.[21]

As a result of the findings discussed in this report, we consider that the initiatives proposed in the Submissions Analysis paper should be re-prioritised.

The Submissions Analysis paper proposed an assessment of the costs and benefits of installing additional gas quality monitoring equipment. However, the results of the enquiries reported in this paper suggest that gas quality monitoring is generally being carried out in accordance with the Gas Specification and ICAs, but that the results from this monitoring are not readily available. Given

[21] This recommendation only applies to Vector because gas in the Maui pipeline is not odorised.

that the composition of gas should not significantly change once it is in the transmission system, and subject to transparent and robust reporting of the monitoring carried out by injecting parties, it appears that little benefit would be derived by TSOs installing additional gas quality monitoring equipment.

The Submissions Analysis paper also proposed a review of gas quality incident reporting and complaints procedures. We suggest that work on gas quality incident reporting (including contamination) is also put on hold to allow an opportunity for the Protocol to be considered and agreed.

In addition, the Submissions Analysis paper proposed a review of liability arrangements related to gas quality. We suggest that this work is less urgent, and the need for it can be re-assessed when the outcome of Protocol discussions is known.

In the event that an industry agreed solution to gas quality issues cannot be reached, or is unsuccessful in satisfactorily addressing concerns, Gas Industry Co notes that certain provisions of the Gas Act could be used to recommend a regulated solution.[22] However, any detailed consideration of a possible regulated solution is unlikely to be progressed until the outcome of industry arrangements is known.

Gas Industry Co notes there are a number of agencies that have a legislative mandate in relation to gas quality and gas pipelines, including the Ministry of Innovation, Business, and Employment, and the Commerce Commission. If it is ultimately considered that a regulated solution is desirable, Gas Industry Co will need to ensure that the interface with other agencies is carefully managed to avoid unnecessary overlap or duplication of governance arrangements.

*Q8: Do you agree with our recommendations in relation to gas quality?*

## 7.2 Next steps

Gas Industry Co would like to hear and consider stakeholder reactions to this paper before deciding what further work is required.

[22] For example, section 43F(2)(c) empowers Gas Industry Co to recommend regulations that prescribe reasonable terms and conditions for access to gas transmission or distribution pipelines.

# Glossary

| | |
|---|---|
| **calorific value** | A measure of the energy content of a gas expressed in megajoules per standard cubic meter (MJ/scm) |
| **Gas Control** | The group within Vector who can monitor and control certain pipeline parameters and operations via the SCADA system |
| **MPOC** | Maui Pipeline Operating Code |
| **OATIS** | Open access transmission information system, providing information for both Vector and Maui pipelines |
| **relative density** | The density of dry gas relative to dry air, both measured at standard conditions |
| **SCADA** | System Control and Data Acquisition system, operated by Vector from Bell Block, New Plymouth |
| **standard conditions** | A temperature of 15 degrees Celsius and an absolute pressure of 101.325 kPa |
| **VTC** | Vector Transmission Code |
| **Wobbe Index** | The number obtained by dividing the calorific value of a gas by the square root of its relative density, expressed in megajoules per standard cubic meter (MJ/scm) |

# Appendix A Format for submissions

To assist Gas Industry Co analyse responses, please use the table below to format submissions. The questions are the same as those contained in the body of this document. Submitters are free to include other material in their responses.

A word version of this template is available on Gas Industry Co's website here.

| QUESTION | COMMENT |
|---|---|
| **Question 1**: As far as you are aware, are the requirements and current practices for controlling gas quality described accurately? If not, please explain why not. | |
| **Question 2**: As far as you are aware, are the requirements and current practices for monitoring gas quality described accurately? If not, please explain why not. | |
| **Question 3:** As far as you are aware, are the requirements and current practices for reporting gas quality described accurately? If not, please explain why not. | |
| **Question 4:** Do you have any comments on the discussion in relation to the monitoring of gas quality? | |
| **Question 5:** Do you have any comments on the discussion in relation to the monitoring of gas quality? | |

| | |
|---|---|
| **Question 6:** Do you have any comments on the discussion in relation to the reporting of gas quality? | |
| **Question 7:** Do you think we have correctly identified the opportunities for improvement? | |
| **Question 8:** Do you agree with our recommendations in relation to gas quality? | |