



**Ministry of Business,
Innovation & Employment**

Review of the Maui Pipeline Outage of October 2011

October 2012

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Energy and Communications branch
Ministry of Business, Innovation and Employment
PO Box 1473
Wellington 6140
New Zealand
www.med.govt.nz

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Executive summary

The Maui gas transmission pipeline failed in October 2011 due to overload caused by landslide movement at the Pukearuhe site. This was the first significant outage of the pipeline since construction in 1977. While the repaired section of the pipeline remains within the landslide, improved mitigation measures have been implemented aimed at preventing failure in the short- to medium-term. A long-term solution is also being developed. Other landslide risks are being managed along the pipeline with eleven areas identified as “high-risk”. These landslide risks, including the Pukearuhe site, were identified and categorised well before the pipeline failure. The Pukearuhe site was identified as an intermediate risk. The pipeline failure has resulted in the pipeline owner increasing its management of the high risk sites through activities such as remote onsite monitoring, monthly flyovers and walkovers, assessments of manual survey points to check for land movement, and improved drainage.

It is the responsibility of the pipeline owner, Maui Development Limited, to ensure that the processes employed for managing the pipeline continue to meet legally required standards and that risks associated with the pipeline are adequately addressed.

The pipeline is certified by Lloyds Register as complying with the Health and Safety in Employment (Pipelines) Regulations 1999 (HSE Regulations). The certificate of fitness verifies that the pipeline and all equipment necessary for the safe operation of the pipeline complies with the standard or code to which the pipeline was designed, constructed, operated and maintained, in this case NZS/AS 2885 Pipelines – Gas and Liquid Petroleum.

Further geological assessment into the pipeline’s sensitivity is underway at the site of the failure. Completion of these assessments is expected within the next three months. The pipeline owner has also scheduled an internal inspection of the pipeline using a practice known as “intelligent pigging”. This will be a one-off process using technology to assess pipeline geometry and determine precise geospatial location. This intelligent pigging process is scheduled for this year and will provide a set of baseline data. Later intelligent pigging runs can then be used to identify any displacement from the baseline and assist in identifying areas that may need attention.

The outcome of the assessments will be integrated into the Safety Management Study (SMS) process as part of the Pipeline Integrity Management Plan (PIMP). The SMS and the PIMP are pipeline management activities that must conform to the requirements of the HSE Regulations and set out how the integrity of the pipeline will be managed. In addition to certification an approved independent body, conformance with the HSE Regulations may also be checked by an appropriately qualified health and safety inspector.

Given public interest in this issue, the Labour Group within the Ministry of Business Innovation and Employment (MBIE) will review these updated plans. The government has also asked that the pipeline owner and the pipeline operator present their plans for identifying and managing landslide and erosion risks to pipeline customers and end users by 30 June 2013.

The outage of the pipeline and subsequent interruption to the supply of gas to some consumers caused significant disruption to businesses and services in the top half of the North Island that rely on gas for their normal operation. The Ministry of Business, Innovation and Employment¹ has estimated that the gross economic cost of this disruption was \$200 million. These costs were heavily concentrated on the dairy industry and large industrials.

The shutdown of dairy processing plants that could not process milk without a gas supply highlighted the environmental risks associated with on-farm disposal of milk when it is not carefully managed. The Ministry for Primary Industries has assessed that the disposal of raw milk was reasonably well-managed during the incident, with few reports of milk entering waterways on farms. However, this was mainly due to the relatively short duration of the interruption to milk processing rather than the ability to exercise options for large-scale milk disposal or for using alternative energy sources to continue milk processing.

Fonterra is reviewing its energy sources as a result of the outage, and assessing investment in back up diesel energy sources at three of its Waikato processing plants. In addition, all of the regional councils in dairy producing regions provide advice on best practice arrangements for on-farm milk disposal.

Some health and disability services were affected, with the cancellation of some elective surgery at Counties Manukau District Health Board (DHB)'s Manukau SuperClinic for one day, the loss of hot water and heating in the outlying facilities of some hospital campuses, and the disruption of hospital linen services. Other service providers utilised emergency that enabled them to avoid or minimise disruptions. The communication of information was highlighted as the main concern for health services, and this issue is being addressed by the Gas Industry Company.

Risks to gas and other infrastructure presented by low-probability, high-impact events can be planned for, and good planning can help mitigate these risks. The October 2011 Maui pipeline outage has highlighted the importance of gas consumers having contingency plans that will minimise the impact of a loss of gas supply and other risks on business operations.

Clear, effective, and robust contingency processes are also important to ensure a coordinated approach for the effective management of critical gas supply outages. A mandated critical contingency system has been in place since January 2010. This system is managed by the critical contingency operator (CCO) and is governed by the Gas Governance (Critical Contingency Management) Regulations 2008 (CCM Regulations) made under the Gas Act 1992.

The Maui outage was the first major test of the CCM Regulations. Overall the critical contingency management system worked well. The CCO actively managed pipeline pressure to maximise availability. However, it was clear that a number of customers were not sufficiently aware of how the regulations worked and how the regulations impacted their individual businesses. A number of customers were reclassified as essential service providers during the outage, reinforcing the view that not all customers were aware of how the regulations worked. Preparedness of customers and retailers is one of the issues considered by the Gas Industry Company's review of the critical contingency management arrangements.

¹ Reference is made to the Ministry of Economic Development (MED) and the Department of Labour (DoL) throughout this report where actions dated before July 2012. MED and DoL became part of the Ministry of Business, Innovation and Employment from 1 July 2012.

Unsurprisingly, this first major test of the critical contingency system has highlighted improvements that can be made. However, there is no evidence that the fundamental construct of the CCM regulations should change.

The CCO's post-contingency performance report presented 19 recommendations to amend the CCM Regulations and documentation prescribed by the regulations to better achieve the purpose of the regulations. The first 13 recommendations are amendments to planning and guideline documents and have been implemented by the CCO, Vector Gas Limited, and Maui Development Limited following a change process defined by the CCM Regulations.

A review of the CCM Regulations has been initiated by the Gas Industry Company. This review includes the six remaining recommendations of the CCO's post-contingency performance report. These recommendations relate to:

- the bands used to designate the order in which consumers are directed to curtail their demand for gas during a critical contingency;
- the designation of regional status of a critical contingency;
- the process for partial restoration;
- knowledge and understanding of the critical contingency system;
- incentives for compliance with directions under the CCM Regulations; and
- potential improvements to the review and reporting process.

The Gas Industry Company's review also includes other issues such as ensuring that the priority given to "essential service providers" in a contingency event is tightly managed against the goal of ensuring transmission system survival and reinstatement following repairs. This work is well advanced with input from industry helping to shape proposed amendments to the CCM Regulations. The GIC will publish its proposed amendments and invite submissions.

This review concludes that New Zealand's gas supply is highly dependent on the Maui pipeline. The pipeline traverses unstable land north of Taranaki. Prior to the pipeline failure, the pipeline owner had processes for identifying and categorising landslide risks, and complied with the relevant HSE Regulations. Following the failure, increased monitoring is being undertaken and improved drainage has been installed. Further investigation work, such as the intelligent pigging exercise, is underway. This investigation work will lead to a reassessment of the pipeline's SMS and PIMP. Government has requested that these updated plans be reviewed by MBIE's Labour Group. The regulatory framework for managing contingency events was relatively effective but there are a number of improvements that are being developing by the Gas Industry Company.

A number of end users were not well prepared for the outage, in part because the gas supply has been very dependable. Economic impacts were significant, and should provide incentives for industry and end users to review their risks, contingency planning and investment in backup energy or other risk mitigations. Major cross-sector infrastructure investment through duplication of transmission pipelines is unlikely to be justified and would not address the range of business interruption risks faced. This means that risk management planning and investment by end users is more likely to be efficient and effective in most cases.

Background

The Maui pipeline

The Maui pipeline is a high-pressure gas transmission pipeline running from the Oaonui Production Station (south of New Plymouth) to Huntly Power Station (south of Auckland), with injection and off take points at various junctions along the network. It is the largest capacity high-pressure gas transmission pipeline in New Zealand.

It transports natural gas produced in the Taranaki region directly to large gas users such as electricity generators and petrochemical plants, as well as being the primary source of supply for other gas transmission and distribution pipelines.

The pipeline is owned by Maui Development Limited (MDL), which is a joint venture owned by Shell (New Zealand) Limited, Todd Energy Limited, and OMV (NZ) Limited. The terms and conditions for use of the pipeline are governed by the Maui Pipeline Operating Code (MPOC) together with Transmission Service Agreements and Interconnection Agreements. System and technical operation of the pipeline is contracted to Vector Gas Limited (Vector Gas). Vector Gas also fulfils the role of critical contingency operator under the Gas Governance (Critical Contingency Management) Regulations 2008 (CCM Regulations).

The pipeline began transmission of natural gas from the Maui gas field in 1979. There are currently six gas producers which directly inject into the pipeline and 18 gas consumers who take direct delivery of gas. As well as transporting gas from the Maui field the pipeline operates under an open access agreement where it transports gas owned by other parties from other fields. At present, 12 different parties ship gas through the Maui Pipeline.

A technical description of the pipeline is as follows:

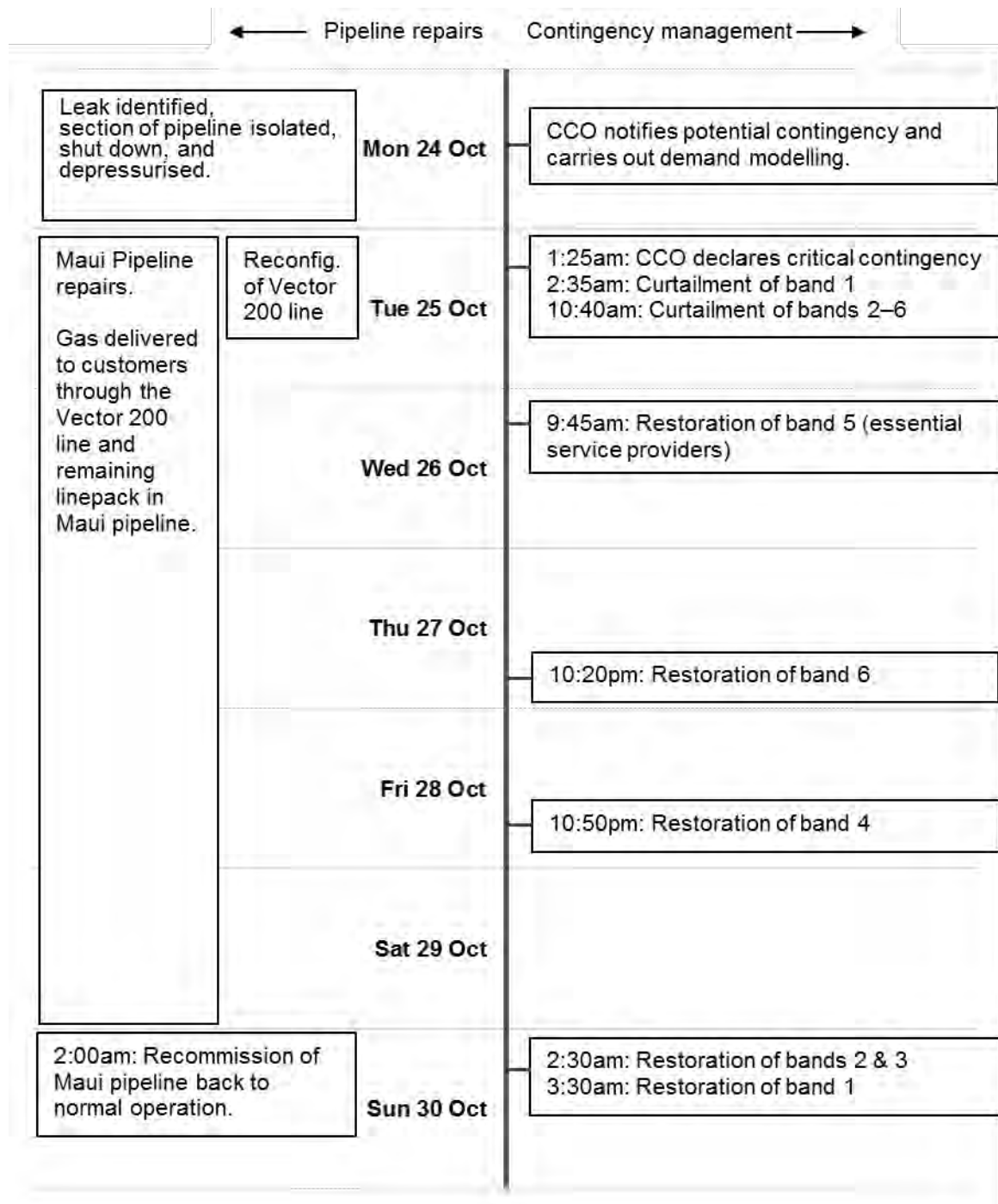
| | |
|-----------------------------|-----------------------------------|
| Service: | Treated natural gas – unodourised |
| Diameter: | 750mm - 850mm |
| Operating pressure: | 41 to 51 barg |
| Maximum operating pressure: | 67 barg |
| Material: | Carbon Steel X65 |
| Wall thickness: | 9.5mm |
| Operating code of practice: | AS/NZ 2885 Part 3 |
| Certifier: | Lloyd's Register |

Vector Gas also owns and operates a number of high-pressure gas transmission pipelines that are directly connected to the Maui pipeline, including one that runs parallel to the Maui pipeline. Gas from the Maui pipeline flows into Vector's transmission system and is used to supply major industrial plants, dairy factories and power stations. Gas transported through the Maui pipeline and into the Vector system is also used to supply local low-pressure distribution networks in Auckland, Wellington, Hamilton, Tauranga and many other towns and cities throughout the North Island. These distribution networks supply gas to homes, businesses and essential services such as hospitals.

On Monday, 24 October 2011, the pipeline operator, Vector Gas became aware of a suspected escape of gas from the pipeline in North Taranaki. At 1:25am the following morning a "critical contingency" was declared and consumers in areas north of the fault, with the exception of residential customers, were directed to curtail their use of gas. This critical contingency lasted until midday on Sunday, 30 October when the transmission system was again capable of supplying gas to all customers at previous levels.

At the conclusion of the critical contingency, the then Acting Minister of Energy and Resources asked the Ministry of Economic Development to carry out a review of the outage. This review is additional to post-event reporting requirements of the CCM Regulations and a review of the CCM Regulations carried out by the Gas Industry Company (GIC).

Figure 1: Time line of events



Purpose

The terms of reference for this review address:

- the cause of the outage
- the adequacy of gas pipeline maintenance and risk management practices
- the effectiveness of the CCM Regulations, with a focus on the curtailment bands
- the cross-department government response to the incident and what (if anything) could have been done differently post-incident to improve outcomes for consumers
- the preparedness of businesses for the outage, and for potentially more significant outages
- the economic and environmental impacts of the incident and implications for infrastructure risk management and business contingency planning.

The review reports to the Minister of Energy and Resources on the lessons learned and actions taken or recommended as a result of the outage to minimise the risk of future outages, ensure any outages are well managed, and ensure that the impact on consumers and the environment is minimised.

Scope

This review takes a broad perspective, drawing on a range of information sourced from a number of organisations involved in the incident. Conclusions of the review highlight lessons from the incident that will help minimise the risk of future outages, help ensure that outages are well managed, and ensure the continued resilience of gas supply.

The following organisations were consulted in the preparation of this report:

- Maui Development Limited
- Vector Gas Limited
- The Gas Industry Company Limited
- The Department of Labour
- The Ministry of Agriculture and Forestry (now the Ministry for Primary Industries)
- The Ministry for the Environment
- The Commerce Commission
- The Ministry of Health.

The Critical Contingency Operator (CCO) prepared two reports – as required by the CCM Regulations. The first is an incident report describing the events in detail and the level of compliance by consumers with the directions of the Transmission System Owner (TSO) and gas retailers. The second is a performance report which provided an opportunity for gas consumers and industry participants to provide their input. The performance report assesses:

- compliance by the CCO and TSO with the CCM Regulations
- the effectiveness of TSO's critical contingency management plans, the CCO's communication plan and information guide
- the extent to which those plans achieved the purpose of the Regulations.

The performance report also identifies potential amendments to the CCM Regulations, management plans, communications plan and information guide where the CCO considers those changes would better achieve the purpose of the CCM Regulations.

Together, these two reports enable an understanding of what happened during the incident and provide a platform to identify any room for improvement in the contingency processes. This review is informed by these reports.

Part I – The outage

Cause of the pipeline failure

The Maui gas pipeline failed on or about 20 October 2011. On 21 October, Vector Gas Limited, the technical operator of the pipeline, was notified that the landowner had observed a soft patch of ground over the pipeline location. Due to windy weather conditions at the time, the initial site visit by a Vector technician did not identify a gas leak, and the soft patch was suspected to be a drainage issue.

A second inspection on Monday, 24 October, after a further landowner notification, identified a significant leak. The affected section of pipeline was isolated, shut down and depressurised. The pipeline was then excavated and found to be displaced and compressed laterally. The displacement and compression had caused a longitudinal crack in the heat-affected zone of a pipe seam weld.

The incident occurred near Pukearuhe on the Taranaki coast, some 200 metres from an occasionally-occupied holiday home and about one kilometre from permanent residences. While the location is relatively remote from populated areas, much of this section of the pipeline's route forms part of the White Cliffs Walkway, a popular day tramp during summer.

Land movement

Investigations conducted by Vector Gas (as the technical operator of the pipeline), in conjunction with its geotechnical advisors, the Institute of Geological and Nuclear Sciences Limited (GNS), and metallurgical consultants, Quest Integrity Group, concluded that the pipeline failed due to overload caused by landslide movement. No material defect or flaw in the pipeline contributed to the failure.

The geotechnical report prepared after the event concludes that the pipeline was subject to the movement of a large, slow-moving landslide. This report also notes that a 25 metre section of the pipeline is within the edge of the landslide, and that the landslide will continue to move.

Investigations into the pipeline failure are detailed in the report by Vector Gas Limited (April 2012), *2011 Maui Pipeline Failure Technical Investigation Report*².

Repairs and remedial work

Repair

When the affected portion of the pipeline had been de-pressurised, a 30m x 4m excavation was required for the repair. Further excavation downstream was needed for geotechnical and mechanical reasons. On excavation, the failed section of the pipeline had a 47mm buckle (peak) from the 7 o'clock position to the 1 o'clock position, along with a 120mm x 4mm crack in the heat-affected zone adjacent to the seam weld at the 12 o'clock position.

The repair involved removing approximately 5m of line pipe, fabricating a new section of line pipe and then site modification to fit. All welds were fully non-destructive tested (NDT), with a 24-hour hold associated with hydrogen-assisted cold cracking followed by another full round of NDT.

² Available at www.mauipipeline.co.nz/wp-content/uploads/2012/05/2011-Maui-Pipeline-Failure-Technical-Investigation-Report.pdf

The repair was in accordance with the NZS/AS2885 standard and the other standards bound within this standard. It was approved by Lloyd's Register as the certifier.

An engineered non-cohesive backfill was designed and implemented at the scene to allow for future land movement and thereby minimise the effect of any land movement strain on the pipeline. Drainage has been implemented to remove existing water loading and reduce any future water hold up in the area of the landslide. A pond immediately above the failure location was removed.

Remedial work

Mitigation measures have been taken at the Pukearuhe site (where the pipe failed) to ensure pipeline integrity in the short- to medium-term. During and after the repair, work to mitigate any future landslide threat at the Pukearuhe site included:

- improved and additional drainage of the landslide area and surrounding areas
- embedding the pipeline in a loose granular material to facilitate movement
- relieving built-up stresses in the pipeline
- ongoing monitoring.

The technical investigation report notes that the landslide will continue to move in the future and the mitigation measures taken at the site are considered an effective short- to medium-term solution until a long-term solution is developed and implemented. The report recommends the following future work:

- further geotechnical assessment into the pipeline's sensitivity, at the Pukearuhe site and other potentially similar areas, to the effect of landslides, and the consideration, as appropriate, of the findings as part of the safety management study processes
- a one-off enhanced intelligent pigging³ to assess pipeline geometry and precise geospatial location, in addition to standard corrosion detection.

Plans for future work on the pipeline are discussed in Part 3 – Assurance.

Curtailment and restoration of gas demand

Curtailment

One of the main tools used to manage pipeline pressure during the event was to direct electricity generators and industrial and commercial gas users to stop using gas on the parts of the system to the north of the leak. This meant all areas north of King Country, and the Bay of Plenty. Directions to curtail gas demand are given by the CCO under power conferred by the CCM Regulations. Gas retailers are required to relay the curtailment directions to their affected customers and ensure the curtailment directive is acted on. The critical contingency arrangement is discussed in detail in part 3 of this report.

³ Pigging is the operation of a device called a "pig" that is propelled inside a pipeline by applied pressure for inspecting or maintaining the pipeline.

The CCO directed consumers to curtail their use of gas, beginning with band 1a and 1b consumers at 2:35am on Tuesday, 25 October. Band 1a and 1b consumers are defined as those consuming more than 15TJ⁴ of gas per day. The affected band 1 consumers included Huntly Power Station, Southdown Power Station and the cogeneration plant associated with the Te Rapa Dairy Factory.

At 3.52am, Transpower, the electricity system operator, issued a notice to electricity market participants warning that gas fired electricity generation north of Taranaki had been reduced to zero⁵:

Transpower wishes to advise that due to a Critical Gas Contingency, all gas fired generation in the North Island, north of Taranaki is to be reduced to zero MW or where available to alternative fuels only. This situation will cause a shortfall in North Island generation capacity throughout today and demand management will be required.

This notice was issued in accordance with Technical Code B, Schedule 8.3, Part 8 of the Electricity Industry Participation Code 2010, which sets out the basis on which the electricity system operator and participants must anticipate and respond to emergency events on the grid that affect the system operator's ability to plan to comply with, and to comply with, its principal performance obligations.

The CCO issued a further notice at 10.40am directing all remaining gas consumers (bands 2 to 6) to curtail demand immediately in affected areas. This meant that all gas consumers, excluding domestic consumers, but including essential service providers, were directed to curtail demand.

A smaller gas transmission pipeline owned and operated by Vector Gas (referred to here as the Vector 200 line) runs parallel to the Maui pipeline north of New Plymouth. This smaller pipeline was used to maintain limited gas supplies into the affected areas. Initial concerns that the Vector 200 line may have also been damaged were eliminated and Vector Gas was able to confirm that the pipeline was in a secure condition. Various re-configurations of line valves and compressor stations were undertaken and these are described in the CCO's incident report.

Restoration

On the morning of Wednesday, 26 October, an assessment of demand indicated that curtailment had been effective and that domestic consumption was lower than seasonal norms. The CCO determined that, due to a moderate increase in line pack in the Vector 200 line and increased confidence in its continued integrity, some demand from curtailed bands could be restored if used sparingly.

As a consequence, the CCO issued a direction at 9.45am on Wednesday, 26 October for band 5 consumers (essential service providers) to be restored, with the proviso that gas should be used sparingly in all circumstances.

⁴ A terajoule (TJ) is a unit of energy equal to one trillion joules.

⁵ Transpower, 25 October 2011, System Operator *Warning Notice 665241537*.

At 10.20am on Thursday, 27 October the CCO issued a direction for the restoration of demand for band 6 consumers, again with a proviso that gas should be used sparingly. Band 6 consumers are those with an annual gas consumption of 2TJ or less. The total number of band 6 consumers in the affected area was 8,997 and the CCO estimated that the total demand of these consumers would peak at 2.0 standard cubic metres per second (SCMS) or approximately 80 megawatts (MW), approximately 20 percent of the capacity of the Vector 200 line.

A direction for restoration of demand for band 4 was issued at 10.50am on Friday, 28 October with the proviso to use gas sparingly in all circumstances.

On the morning of Saturday, 29 October, the CCO determined that there was no additional capacity to restore demand to any more bands.

By 2.30am on Sunday, 30 October, the Maui pipeline was re-commissioned, re-pressurised, and returned to its normal operational configuration. In this state, restoration of demand was able to be completed with two directions from the CCO. The first direction was at 2.30am for demand to be fully restored to bands 2 and 3 and for the restriction to use gas sparingly in bands 4, 5, and 6 to be lifted from 3.00am. The second direction was at 3.30am for demand to band 1a and 1b consumers at Huntly Power Station, Southdown Power Station and Te Rapa dairy factory to be restored in agreed increments beginning at 4.00am.

This was the longest unplanned outage in the Maui pipeline's history, with a contingency in place for just over five days.

Government response

Local authorities

In addition to the industry-specific arrangements and responses described above, civil defence and emergency management (CDEM) responses were activated primarily in a monitoring role. The Taranaki CDEM emergency operation centre was activated on Tuesday, 25 October in a monitoring and information distribution mode only. A situation report was issued at 11.40 on Wednesday, 26 October. Incoming information was forwarded to the Taranaki CDEM situation report distribution list. Other regional CDEM plans were activated.

The Auckland Council CDEM activated the Auckland Emergency Coordination Centre at 1.30pm on Tuesday, 25 October. Its first situation report was issued at 5.00pm on Wednesday, 26 October and the second at 5.00pm on Thursday, 27 October. A teleconference with representatives of the regional CDEM Groups and other stakeholders was held at 11:00am on Thursday, 27 October.

Waikato CDEM activated its Group Emergency Coordination Centre in a monitoring and information distribution mode (mode 2 – regional). Its first situation report was issued at 12.30pm on Wednesday, 26 October, followed by the second at 6.30pm on 26 October and the third at 8.30am on Friday, 28 October.

Regional councils from Taranaki to Northland also responded to dairy industry concerns that the closure of milk processing facilities at the peak of the dairy season would lead to farmers dumping milk, with potentially adverse environmental impacts if this was not done in accordance with best practice.

The Taranaki Regional Council, for example, has a contingency plan for the emergency disposal of milk⁶. The plan ensures that the dairy farming community and regional council are ready to deal with an emergency situation that results in raw milk needing on-farm disposal. The plan outlines the preferred methods for disposal in order to minimise environmental effects when milk cannot be collected by the milk processor. Other regional councils have similar best practice guidelines, and DairyNZ also provides advice on milk disposal.

Effects on the dairy industry and the environmental impact of milk disposal are covered in more detail below in part 2 of this document.

Central government

The Acting Minister of Energy and Resources took an active role in communicating with the public and the media. A Ministry of Economic Development response team was assembled on the morning the contingency started, to support the Minister and coordinate information with the gas industry (including the CCO, Vector Gas, MDL and GIC). This coordination also assisted communication with other government agencies such as the Department of Labour, the Ministry of Agriculture and Forestry and the emergency management team at the Ministry of Health.

During the contingency, the Department of Labour briefed the Minister of Labour on the actions it had taken as regulator with jurisdiction under the Health and Safety in Employment (Pipelines) Regulations 1999. The Ministry of Agriculture and Forestry also briefed the Minister for Primary Industries on the effect of the outage on the dairy industry. The Chair of the Commerce Commission wrote to the Minister of Commerce, the Acting Minister of Energy and Resources and the Associate Minister of Commerce summarising the role of the Commerce Commission in applying regulatory instruments to MDL's gas pipeline.

⁶ www.trc.govt.nz/assets/taranaki/environment/land/pdfs/milk+disposal.pdf

Part II – Effects of the outage

Effect on gas consumers

Gas users affected by the outage included electricity generators, hospitals, milk processing plants, bakeries, restaurants, and industries reliant on process heat or steam from gas fired boilers. The effects were mainly economic, resulting from lost production due to a critical contingency having been in place for five days. Potentially adverse environmental effects from milk disposal on farms as a result of closed dairy plants during the outage were largely avoided, with only a small number of spills into waterways reported.

Electricity generation

Natural gas is used to generate electricity and several power stations are connected to the gas transmission system for this purpose. The power stations to the north of the leak that take gas for electricity generation are:

- Huntly
- Otahuhu
- Southdown
- Te Rapa cogeneration.

Under normal operating conditions, the conventional units at Huntly can use coal, gas, or both simultaneously as fuel. The two newer units at Huntly run exclusively on gas. Otahuhu is a gas fired plant with a maximum capacity of 404MW. Southdown is a gas fired cogeneration power station in Auckland. The Te Rapa cogeneration plant uses gas to produce both electricity and steam for a Fonterra dairy factory with surplus electricity fed into the grid.

Control rooms at all large consumers were informed that the CCO had declared a critical contingency and that the demand curtailment directions would follow for the Huntly and Southdown power stations, and the Te Rapa cogeneration plant. The power station at Otahuhu was not operating at the time as it was undergoing maintenance. Southdown, Huntly and Te Rapa were directed to fully curtail gas demand by 3.30am on Tuesday, 25 October. Huntly was able to alter its generation profile, switching fuel from gas to coal as its supplies of gas were reduced.

Table 1: Curtailment of electricity generators (source: CCO)

| Gas gate name | Band | Curtailment direction |
|--------------------------------------|------|--------------------------------------|
| Huntly Power Station (Units 1 and 2) | 1a | Curtail all demand by 03.30 25/10/11 |
| Huntly Power Station (Units 5 and 6) | 1b | Curtail all demand by 03.30 25/10/11 |
| Otahuhu Power Station | 1b | Curtail all demand by 03.30 25/10/11 |
| Southdown Power Station | 1b | Curtail all demand by 03.30 25/10/11 |
| Te Rapa Cogeneration plant | 1b | Curtail all demand by 03.30 25/10/11 |

Ministry of Business, Innovation and Employment statistics show that 18 percent of New Zealand's electricity supply was generated from gas in 2011. This proportion fluctuates, and has been as high as 26 percent in the last five years. With the fuel for these thermal generation plants unavailable, the capacity of thermal generation within New Zealand was greatly reduced. The dependency of the electricity system on gas supply is apparent.

Table 2: Net electricity generation (source: Ministry of Business, Innovation and Employment)

| Units: Gigawatt hours (GWh) | Calendar year | | | | |
|--|---------------|---------------|---------------|---------------|---------------|
| | 2007 | 2008 | 2009 | 2010 | 2011 |
| Hydro | 23,404 | 22,114 | 23,981 | 24,472 | 24,831 |
| Gas | 11,067 | 9,955 | 8,347 | 9,267 | 7,955 |
| Geothermal | 3,354 | 3,966 | 4,589 | 5,550 | 5,770 |
| Coal | 2,956 | 4,515 | 3,082 | 1,929 | 2,026 |
| Wind | 921 | 1,048 | 1,462 | 1,618 | 1,931 |
| Wood | 314 | 324 | 344 | 346 | 351 |
| Biogas | 214 | 205 | 216 | 217 | 215 |
| Waste Heat | 53 | 56 | 53 | 57 | 59 |
| Oil | 1 | 123 | 8 | 2 | 2 |
| Total generation | 42,284 | 42,306 | 42,081 | 43,457 | 43,138 |
| Gas as a percentage of total generation | 26% | 24% | 20% | 21% | 18% |

At the time of the gas outage, New Zealand hydro storage was below average for that time of year, but within normal risk levels from a security of supply perspective⁷. So, while sufficient electricity generation was available at the time from non-gas fired plant, two recommendations from the CCO's post-event performance report⁸ highlight the need for close communication between the gas and electricity markets in planning for, and during, critical events:

CCO to liaise with Transpower and the generators to put these additional communication steps in place, update the CCO Information Guide to describe the amended processes, revise operational CCO check lists and update the CCO contacts database.

CCO and Transpower to discuss pre-planning for likely gas transmission system outage scenarios and exercising Transpower emergency response processes.

⁷ Sources: Transpower, controlled storage and risk curves (www.systemoperator.co.nz/hydro-status), and WITS Free To Air, hydrology report (www.electricityinfo.co.nz/comitFta/ftaPage.hydrology)

⁸ Vector Gas Limited. (2011). *Critical Contingency Performance Report: Maui Pipeline Outage of 25 – 30 October 2011*. December 2011.

Transpower, the electricity system operator, reported after the event that the electricity system coped well with the outage and that the outage did not place any constraints on the system. Transpower has also stated that it is familiar with the critical contingency procedures and that there was good communication with the CCO during the contingency.

The system operator's Emergency Management Policy⁹ recognises the steps that the system operator must take in conjunction with the relevant gas industry operators at various stages during a gas transmission or supply failure to generators. GIC has also been in contact with the electricity industry's Security and Reliability Council to ensure that any new aspects arising from the pipeline outage relevant to the electricity system are covered by the respective industry plans.

Dairy production and environmental impact

The loss of gas supply had implications for the dairy processing industry, which uses gas as an input to production and, at the time of the outage, was at the peak of the milk production season. Dairy processing has very limited options for delaying production or storing raw milk. This creates a need to dispose of raw milk that cannot be processed. Disposal of milk carries environmental risks.

Impact on the dairy industry

As a result of this outage, major food processors (e.g. dairy factories and meat processors), food retailers and other major users of gas in the affected area had to shut down all or part of their operations for periods of between two and six days. This caused major commercial disruption and significant economic loss to many businesses.

Five Fonterra processing plants and Tatua's plant were directed to curtail their gas demand:

- Te Rapa (Waikato)
- Litchfield (Waikato)
- Edgecumbe (Bay of Plenty)
- Maungaturoto (lower Northland)
- Kauri (Northland)
- Tatua (Morrinsville).

At the time, Fonterra advised the Ministry of Agriculture and Forestry (MAF), now the Ministry for Primary Industries (MPI), that the production across its five plants was approximately 35 million litres per day. In response to the gas outage, production at Fonterra's coal fired plants was increased, and the company was able to process approximately 5 million additional litres per day. This left a balance of approximately 30 million litres per day needing to be dealt with in some other manner.

Of the other dairy plants in the area, neither Open Country Dairy nor Miraka were affected. Miraka was able to take some excess milk from Tatua.

Data supplied by Fonterra show that a total of 48.3 million litres of raw milk was disposed of on-farm as a consequence of dairy plants being unable to process the milk.

⁹ Transpower. (19 December 2011). *Emergency Management Policy*.

Table 3: On-farm raw milk disposal (source: Fonterra)

| Million litres | 25 Oct | 26 Oct | 27 Oct | 28 Oct | 29 Oct | Total |
|-----------------------|--------|--------|--------|--------|--------|-------|
| Northland | 3.3 | 5.1 | 1.8 | 0.1 | 0.0 | 10.1 |
| Waikato/Bay of Plenty | 14.3 | 16.4 | 5.1 | 1.3 | 1.0 | 38.2 |
| Total – all regions | 17.6 | 21.4 | 6.8 | 1.4 | 1.0 | 48.3 |

MPI estimates that the dairy industry suffered losses of approximately \$46 million at the farm gate (assuming a price of \$0.65/litre). Areas affected included the Waikato, Bay of Plenty, Auckland and Northland regions. Farmer's preparedness to manage milk storage and disposal would have been tested if the outage had continued for a prolonged period. A range of methods are available for managing uncollected milk including spray irrigation, appropriate storage pond capacity, burying milk and dropping to once a day milking. However, in a lengthy outage dairy stock could eventually have to be dried off. Drying off a significant number of New Zealand's dairy stock early in the season would result in a dramatic decrease in milk production and have large negative economic consequences.

Environmental impact and implications of the incident

Milk production carries unique risks due to the implications of suddenly stopping production. Dairy herds must continue to be milked to avoid serious health problems to the animal or "drying off" which means bringing a halt to the cow's lactation cycle and therefore stopping milk production for the season.

The inability of dairy plants to process raw milk during the incident and the subsequent disposal of 48 million litres of waste milk could have caused a major environmental incident. Milk disposal on farm presents a significant environmental risk. Milk is approximately 100 times more powerful as an organic pollutant than dairy-shed effluent (Department of Primary Industries, Victoria, Australia¹⁰). Discharging milk into watercourses kills aquatic life, by removing oxygen from the water as part of the milk's biological breakdown.

Fortunately, it appears that both factory and on-farm disposal of waste milk was reasonably well-managed during the incident. There were few reports of milk entering waterways on farms. This was due to the relatively short period during which milk was not collected from individual farms (less than 48 hours).

However, MPI considers that the shutdown of the dairy industry during the incident highlighted a major risk to the environment. This is due to the environmental damage that could have occurred as a result of the dairy industry's limited contingency options for an extended outage.

On-farm disposal of excess milk is seen as the primary contingency option in the event of a gas outage. Literature published by regional councils in milk producing regions and by DairyNZ¹¹ provides advice on preferred methods of milk disposal. This advice generally covers irrigation of water-diluted milk to land, and the use of effluent ponds.

¹⁰ Department of Primary Industries. (2008). *Dairy Effluent: Emergency Disposal of Milk on Farm*, State Government of Victoria, Australia. www.dpi.vic.gov.au/agriculture/dairy/managing-waste/emergency-disposal-of-milk

¹¹ For example: http://www.dairynz.co.nz/page/pageid/2145873802/Milk_Disposal

Dairy infrastructure risk management and business contingency planning

The potentially significant economic and environmental impact of a future incident of this nature has implications for the infrastructure risk management and business contingency planning of the dairy industry.

In the dairy processing industry, Fonterra is undertaking a review of its energy sources as a result of this incident. Fonterra is particularly exposed to a gas outage with over 70 percent of its North Island processing capacity being dependent on gas.

Fonterra considered a failure of the gas transmission lines to its Waikato, Bay of Plenty and Northland processing plants as the greatest risk. Fonterra rated the risk “significant” on its risk assessment matrix by virtue of it being “unlikely” but with “fundamental consequences to the business” (i.e. low probability with high impact). Fonterra is assessing the possibility of mitigating this risk by investing in back up diesel energy sources at its Waikato processing plants in Lichfield, Te Rapa and Kauri. Fonterra expects that this will protect against the effects of a gas outage for a large part of the dairy season. However, the feasibility of back up diesel may be hindered by limited storage and supply options available.

MPI sees room to further improve the system of on-farm disposal of excess milk in the event of any future incident. There are positive initiatives underway in this space in the Waikato region to upgrade and improve effluent storage and treatment facilities. The Ministry for the Environment is also aware of this type of work occurring across the country. In a future incident, these facilities could be used to store greater volumes of excess milk.

MPI also sees some potential to better educate farmers about how to appropriately dispose of excess milk on-farm. During this incident some farmers were not clear on how to manage disposal. This was generally rectified quickly through information provided to farmers by dairy industry support organisations like DairyNZ and the relevant regional councils.

Health and disability services

The Ministry of Health’s Emergency Management Team was informed of the critical contingency at 1.34pm on Tuesday, 25 October 2011 by the Bay of Plenty District Health Board. Shortly after, a national health emergency plan code yellow (stand by) was issued to district health board (DHB) single points of contact. A national teleconference was held at 3.00pm when it became clear that all commercial customers (curtailment bands 1-6) north of Taranaki had been directed to cease using gas.

DHBs enacted a range of measures to stop using gas and many were able to convert their thermal power generation from gas to diesel. Some sites, however, cannot run on dual fuel and this typically resulted in the loss of hot water and heating in outlying facilities. One immediate impact was that the Counties Manukau SuperClinic cancelled elective surgery for Wednesday, 26 October and transferred patients to Middlemore Hospital. However, the main impact on affected DHBs was in the supply of linen services.

On the Wednesday morning the CCO determined that gas demand had dropped off significantly and that there was sufficient residual pressure in the affected pipeline, supported by the rest of the network, to allow curtailment band 5 essential service providers to re-commence using gas.

Issues identified

The rapid identification of the fault and consumption modelling based on the residual gas pressure in the main line pack and the alternative smaller line allowed the CCO to restore access to essential services after 24 hours and shortly thereafter to other commercial users even while the repair was still being completed. This significantly reduced the impact of the event.

While there is a provision in the CCM Regulations allowing a consumer not to comply with a curtailment order where it directly or indirectly seriously threatens life¹², a more prolonged outage would still have had significant impacts on the healthcare system.

Affected DHBs activated Incident Management Teams and respective sections of their Business Continuity or Hospital Emergency Plans in order to manage the event and, in particular, plan for any prolonged outage. The outage occurred during a period of settled weather and mild temperature in the upper North Island which moderated some of the impact.

In general, responding agencies found it a complex environment with a range of different companies such as the pipeline operator, pipeline owner, CCO, the GIC, gas retailers, gas consumers, national and local government involved. As a result, some hospitals reported that there was a lack of clear authoritative information. This was alleviated by supplementing retailer communications with separate daily media conferences and update teleconferences arranged by Vector Gas and GIC for gas retailers and consumers, as well as separate briefings for ministers and government officials.

In order to understand who was affected and which of its critical suppliers were also affected, the Ministry of Health had to rapidly gather information from the devolved sector. This increased the time the Ministry needed to be able to gain a coherent picture, but fortunately this information was gathered effectively, through a well-practiced national health emergency planning framework which used operational processes established and tested during the H5N1 pandemic and Canterbury earthquake responses.

Many DHB thermal boilers are ‘dual fuel’ and could run on diesel, but often this was only available on the main site and many outlying facilities were ‘single fuel’. Identifying those affected took time. The use of stand-by diesel generation for electricity is routinely practiced and provided by stand-alone generators. Where it was possible to run generators on diesel this required an engineering intervention, and often required additional diesel storage to be provided (diesel storage being normally provided for the electrical stand-by generators).

Outlying facilities, even on a large campus, are often reliant on gas for hot water generation and a number of clinics and wards had to implement alternative arrangements, including the provision of temporary showers.

Planning by public and private hospitals allowed both acute and elective services to continue, but in the event of a prolonged outage acute services would have been prioritised. Wider-spread outages, for example affecting residential homes, would also have affected the ability of hospitals to discharge patients if they were unable to look after themselves effectively at home.

¹² Section 47, “No person is required to comply with a provision of this Part to the extent that compliance would unreasonably endanger the life or safety of that person or any other person.”

Beyond the DHB main hospital facilities, many health and disability services are delivered by community providers. Many of these providers are likely to be in curtailment band 6 and without dual fuel capability. Had the outage been prolonged this would have raised substantial issues in residential care settings with no access to hot water or heating.

During the planning for a prolonged outage at least one clinical supplier in Auckland was identified as a single-source New Zealand supplier. The process to get a medical supplies company or manufacturer categorised as an essential service provider and the treatment of these support services was unclear.

Hospital linen services

Spotless Laundry Services is the major supplier of linen to DHBs in the upper North Island, was not registered as an essential service provider. Spotless serves a range of customers (hotels, etc.), but of these customers only health facilities and ambulance services meet the definition of essential service provider.

Not all Spotless gas boilers are able to run on dual fuel, therefore linen services were severely disrupted until the company was allowed to start drawing gas. Spotless, in conjunction with Northern Region and Health Alliance¹³, developed a national logistic plan which would have supplemented linen supplies in the affected region from elsewhere in the country. Additional stock was also delivered into the system to increase the supply available.

Health Alliance was instrumental in ensuring that Taylor Spotless was subsequently registered as an essential service provider for health linen and able to commence limited operations at some of its plants. Once this was done, the Spotless plant at Point Chevalier, Auckland was able to continue with standard production and so there was no impact on the supply of sterile or standard linen. Taylors also converted one of its plants at Kelston to diesel overnight.

Planning for linen was taken out to a 10-14 day event horizon during the incident. This included options for sterile linen supply in Auckland and Waikato as well as establishing a linen supply service from Auckland to Wellington (with a 36-hour turnaround).

Linen for residential care homes would have been provided from Wellington as they are classed as a commercial hotel service.

Given how important linen is to hospitals and residential care facilities it is expected that the review of the CCM Regulations will consider the feasibility of designating these laundries as essential service providers. However, such changes will need to ensure that gas use is minimised, it is only for linen for hospitals/care facilities, and maximum use be made of any laundries outside of the affected area(s).

Communications

Affected DHBs raised the lack of a single and reliable source of information as their biggest concern. In the initial stages of the event, information regarding the gas supply issues largely came from informal and verbal sources. There was confusion regarding the likely length of the outage. The Ministry of Economic Development undertook to facilitate the sharing of definitive information from Vector regarding the length of the impact – one point of contact from the Ministry of Economic Development to the Ministry Emergency Management team was developed to address this.

¹³ Northern Region and Health Alliance coordinate non-frontline support services for Northland DHB, Waitemata DHB, Auckland DHB and Counties Manukau DHB.

Consumer management of gas supply – business continuity

A number of industrial users of natural gas are reviewing their existing business continuity plans in light of the outage. Feedback from these users warns that the extent and nature of any changes to plans (including any investment that might be required and the impact on supply of alternative energies) means that this process may take some time. Although those consumers were unable at this stage to say what specific changes would result, it is worth noting that the outage itself prompted a reassessment of existing business continuity practices.

There is also anecdotal evidence to suggest that the gas outage prompted other businesses to think about security of their gas supplies. An article published in *“The Main Report Business”*¹⁴ on 14 November 2011 included some advice from the Energy Management Association of New Zealand on steps that businesses could take to improve their ability to withstand a gas outage.

While major gas outages such as this are rare, it is apparent that the consequences can be significant, and the events of October 2011 prompted gas users to consider what alternative arrangements might be needed if gas is unavailable, and how the contingency arrangements apply to their respective businesses.

It is also worth noting that the loss of gas supply is only one of many possible interruptions to normal business activity.

Reliance on minimal load or essential service designation

The CCM Regulations set out a specific order for curtailment of gas supply in the event of an outage, based on the type of gas user, with the largest users generally being curtailed first. There are two important designations that can defer the need to curtail.

Some users qualify as “essential service providers” where they have annual usage above 2 terajoules and provide services necessary to further certain civil defence emergency response objectives. If a user is an essential service provider, it comes lower down on the curtailment order and so will generally be curtailed later, if at all, and restored to supply earlier. Most consumers must apply to their gas retailer to qualify as an essential service provider.

Similarly, the CCM Regulations recognise that some large gas users (over 10 terajoules per annum, who are generally curtailed earlier) may need a minimal amount of gas during a critical contingency, in order to avoid serious damage to their plant or to avoid serious environmental impact. Such users can apply to be approved as “minimal load consumers”. This approval gives the user leeway to manage an orderly wind down of its plant (in accordance with an agreed timeframe), to avoid damage to that plant or the environment.

There are also various exceptions to the requirement to comply with a direction to stop using gas if, for example, compliance would unreasonably endanger the life or safety of any person.

GIC has received feedback from gas industry participants and others that the criteria for determining essential service provider designations needs to be more tightly defined. It is expected that the forthcoming consultation document on options for amending the CCM Regulations will contain such an option.

¹⁴ The Main Report Group. (14 November 2011). *Manage Your Energy Inputs* in *The Main Report Business*.

Consumer compensation

Compensation as a result of a gas outage could only be available to a consumer through one of two channels. Firstly, the supply terms through the gas retailer. Secondly, a business interruption insurance policy that provides cover for any losses suffered due to interruption of the gas supply.

Typically, energy supply terms do not guarantee supply nor provide for compensation in events such as this outage. This does not appear to be well understood by many energy consumers or by the media. Hence, it is important that understanding is built around the need for robust planning for a range of contingency events to avoid costs and the potential value of business interruption cover where costs cannot be avoided.

Estimating the economic cost

The Ministry of Business, Innovation and Employment estimates that the gross cost of the outage to the economy was \$200 million. In assessing the economic impact of the outage we estimated the gross economic cost using an established methodology and data on the number of gas consumers, the duration of the outage, and average daily cost and vulnerability of firms to disruptions. Limitations of the methodology and data were considered.

The outage had a potentially significant effect on businesses in the upper North Island (the Waikato, Bay of Plenty, Auckland, and Northland regions). This estimate of gross economic costs uses the limited data available and was developed with input from affected industry bodies.

Methodology

In order to estimate the gross economic cost, we adapted the approach taken by a 2004 study of the economic cost of power interruptions to energy users in the United States of America¹⁵. This model calculates the costs as follows:

$$\sum N_i \times D_i \times C_i \times V_i$$

Where:

N_i is the number of users in each band of users

D_i is the duration of outage for that band (in days)

C_i is the average daily cost of the outage for firms in each band

V_i is the band's vulnerability to outages.

Data on N_i and D_i are available from utility companies. There are six bands of users, classified according to amount of gas usage, ability to switch to alternative fuels, and whether or not they provide essential services (e.g. hospitals). For each band, we know the number of users, some approximate indications of their size and industry, and the dates and times that gas supply was lost by and restored to them.

C_i is a calculation based on the amount of daily turnover that firms will forgo due to the gas leak – i.e. the difference between what they can produce with and without gas. For some firms, this difference will be small; for others it will be significant. In a limited number of cases (e.g. dairy factories), we can calculate this directly, but in other cases we make an estimate based on firm sectors and sizes within a band.

V_i is an estimate of firms' vulnerability to disruptions – i.e. their ability to react to the gas outage by either (a) switching to alternative fuel sources or (b) temporarily deferring production and making up the slack when gas supply is restored. It ranges from 0 to 1, with higher numbers indicating greater vulnerability. Firms that require gas in order to produce perishable goods, such as food-processing plants and restaurants, will be most vulnerable.

¹⁵ LaCommare, K. and Eto, J. (September 2004). *Understanding the Cost of Power Interruptions to U.S. Electricity Consumers*. Ernest Orlando Lawrence Berkeley National Laboratory.

This methodology produces a tentative estimate of **gross economic cost**. Net costs are likely to be considerably lower due to two factors that are difficult to directly estimate:

1. Affected firms will be able to recover some losses through insurance claims or, possibly, compensation claims against the utility company. Due to a lack of data about the proportion of firms with insurance cover, and the details of firms' policies, we were not able to estimate potential insurance payouts. However, it is likely that a proportion of the most-affected firms will have some degree of insurance against such events.
2. This analysis does not take account of substitution or flow-on effects from the gas outage, as those factors cannot be estimated without using dynamic economic modelling techniques. We have considered the effects only within single firms, and aggregated up from there. This fails to take account of:
 - a. The capacity of some firms to substitute for some of the production lost due to the gas outage – e.g. firms increasing production at facilities outside the affected region in order to compensate for the leak, or sales increasing at businesses that are less reliant upon gas even as they drop among gas-intensive businesses
 - b. Firms that have been forced by the gas outage to reduce their production may sell goods or services to other firms that are similarly affected, and, consequently, the total economic loss would be overestimated by simply summing up each firm's lost turnover.

Data

We combined a range of data sources in order to estimate economic costs, making a number of assumptions and estimates in the process.

- There were approximately 12,000 users across the six user bands.
- We were able to calculate costs directly for two bands:
 - Daily losses for Band 1, comprising four thermal power stations, were estimated based on (a) generating capacity, (b) estimated load factor, and (c) average cost of electricity over this period.
 - Overall losses for Band 5, essential users, were likely to be concentrated in dairy factories. They were calculated by multiplying Fonterra's data on milk spillage against the export price for a litre of processed milk. This is likely to be an underestimate of costs in this band, as other users (e.g. hospitals, prisons, and schools) did not face lost sales but may have incurred some costs.
- Band 2, comprising a small number of large industrial users with alternative power sources, was assessed as having zero vulnerability to gas outages (and hence no direct losses). However, they may have incurred some costs to switch from one power source to another.
- Daily losses and vulnerabilities to gas outages for the three other bands (3, 4, and 6) were estimated using publicly-available business demography and sales data from Statistics New Zealand.
 - We started by estimating the approximate distribution and size of firms in each band in the manufacturing, retail, and accommodation and hospitality sectors, based on the number of users in each band and qualitative indications of their industry and size.
 - Following that, we used publicly-available Statistics New Zealand data to estimate average firm size and turnover per employee per day in each industry sector.

- Finally, we made a qualitative assessment of the vulnerability of firms in each industry sector. This was based on a basic analysis of production methods and products in each sector.
- Estimates of daily losses and vulnerability to disruption were checked against responses to surveys conducted by industry bodies to ensure that they were plausible.
- After estimating lost sales and vulnerability to disruptions for each individual band, we arrived at an estimate for the total economic cost of the gas leak by multiplying daily losses in each band with the duration of the outage and adding up the totals.
- Finally, in order to test the robustness of this estimate, we measured the sensitivity of the final measure to large changes in our estimates of costs and vulnerabilities among bands 3, 4, and 6. This demonstrated that our estimate is of the right order of magnitude – i.e. that we would not expect the gross costs to be considerably different.

Estimates

Based on the above methodology and data, we estimate that the gross costs of the Maui Pipeline leak were approximately \$200 million over the five-day duration of the outage, or an average of approximately \$40 million a day. Costs are heavily concentrated among (a) dairy farmers and factories, which faced an estimated total loss of approximately \$37 million, and (b) large industrial users in Band 3, which faced a daily loss of up to \$25 million.

These estimates are limited in their accuracy due to the assumptions underlying them, but a sensitivity analysis has shown that they are of the right order of magnitude. Arriving at a significantly higher estimate of costs would require either having significant new data on the event or applying implausible assumptions to the existing data.

It is necessary to emphasise that this is an estimate of gross cost rather than net cost. Due to the uncertain effects of (a) insurance payouts and other compensation for firms' losses and (b) substitution and flow-on effects that may mitigate losses of production, it is likely to significantly overestimate the total, net loss to the New Zealand economy.

Comparisons

While the estimated gross economic cost represents a significant cost to the economy, investment in additional pipelines to provide redundancy is unlikely to be justified. We have not attempted to calculate a reliable estimate of the cost of an additional pipeline as the indicative cost is thought to be around \$1 billion. Business interruption can be caused by a range of events and ultimately any cost for a redundant pipeline would be met by consumers.

Part III – Assurance

This section discusses the regulatory arrangements in place that relate to the operation of gas transmission pipelines, and looks at lessons drawn and actions taken to reduce the likelihood of pipeline outages occurring, and to reduce the harm of outages if or when they occur.

Regulations

A number of regulations and guidelines apply to the operation of the Maui pipeline. These cover pipeline standards, safety, management of contingencies (such as outages), and price/quality regulation of gas pipeline services. The key regulations with respect to the outage of October 2011 are:

- the Health and Safety in Employment (Pipelines) Regulations 1999
- the Gas Governance (Critical Contingency Management) Regulations 2008.

HSE (Pipelines) Regulations

The Health and Safety in Employment (Pipelines) Regulations 1999 were enacted to replace the Petroleum Pipelines Regulations 1984. These regulations were made under section 21 of the Health and Safety in Employment Act 1992 and are administered by the Department of Labour. Their primary role is promoting the prevention of harm to all persons at work or in the vicinity of a place of work.

The 1999 regulations introduced a significant change in regulatory policy, requiring all pipelines to be operated with a current certificate of fitness issued by a recognised inspection body. The purpose of the certificate is to demonstrate to the regulating authority, the Department of Labour, by means of a recognised third party (the inspection body), that a pipeline and associated equipment is “fit for purpose”, by confirmation that it is designed, constructed, operated, maintained and/or abandoned in accordance with a recognised code or standard; or if parts are not covered by a code or standard, in accordance with generally-accepted and appropriate industry practice. The Department of Labour published guidelines for the certificate in 2002¹⁶.

The recognised standard in this case is NZ/AS 2885: Pipelines – gas and liquid petroleum. This standard comprises five parts:

- 2885.0: General requirements
- 2885.1: Design and construction
- 2885.2: Welding
- 2885.3: Operation and maintenance
- 2885.4: Offshore submarine pipeline systems
- 2885.5: Field pressure testing.

¹⁶ Department of Labour (February 2002). *Guidelines for a Certificate of Fitness for High-Pressure Gas and Liquids Transmission Pipelines*. Wellington

Overall responsibilities for the safety and integrity of the pipeline and associated equipment always remain the responsibility of the pipeline owner/operator. The third party certification, by means of a certificate of fitness, provides an independent audit of the owner/operator to verify that the pipeline and associated equipment complies with a recognised code or standard. This audit provides a “snap shot” of the pipeline at the time of certification.

The owner/operator is required to ensure and demonstrate that:

- each threat to the pipeline and each risk from loss of integrity of a pipeline is systematically identified and evaluated
- actions to reduce threats and risks from loss of integrity are implemented
- risks are reduced to as low as reasonably practical (ALARP)¹⁷
- a procedure is established to ensure that the identification of threats and risks from loss of integrity, and their evaluation, is an on-going process over the life of the pipeline, at intervals of no less than five years
- the assessment and management of risks is carried out by competent and experienced personnel.

The owner/operator is required to ensure that the design, construction, testing, operation, maintenance, repairs, suspension and abandonment of the pipelines are in accordance with the requirements of the appropriate standards and codes.

The Secretary of Labour may recognise a person or organisation as an inspection body provided that the requirements as specified in the regulations are met. Similarly the Secretary may withdraw recognition if it is appropriate to do so.

The owner/operator is required to notify the Secretary of Labour:

- before construction or operation of the pipeline
- before abandonment of the pipeline
- if a hydrostatic test is to be carried out
- of any fault, damage, or incident in relation to the pipeline that has caused or might have caused serious harm to pipeline workers or to other people in the vicinity of the pipeline.

Subsequent to an incident that has caused or may cause serious harm, Regulation 13 requires that:

An employer must take all practicable steps to ensure that the Secretary is notified as soon as practicable of any fault, damage, or incident in relation to the pipeline that has caused or might have caused serious harm to pipeline workers or to other people in the vicinity of the pipeline.

In the event of an incident where a pipeline has sustained damage, Regulation 11 requires the employer to take all practicable steps to ensure the pipeline is not operated unless the inspection body allows such operation.

¹⁷ The ALARP principle is that the residual risk shall be as low as reasonably practicable. For a risk to be ALARP it must be possible to demonstrate that the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained.

Beyond these requirements the regulations are silent on departmental responsibilities once an incident has occurred. So there is no requirement for a detailed written report on any incident unless there is an injury, in which case a written report will be required under the Health and Safety in Employment Act.

Operation and maintenance

The pipeline must be operated and maintained in accordance with the appropriate parts of the NZ/AS 2885 standard, and the pipeline must have a current certificate of fitness to operate. The certification process includes audit for compliance with the standard.

A pipeline integrity management plan (PIMP) sets out the pipeline monitoring and maintenance activities undertaken each year. These activities are intended to support the safe and reliable operation of the pipeline systems. The PIMP is reviewed annually taking into account monitoring data, and identifying any change to the level of risk from threats such as third party interference, corrosion, and natural hazards like landslips.

A safety management study (SMS) is prepared in accordance with NZ/AS 2885.1. The SMS is designed to be an extensive study of pipeline threats and their possible impact on the pipeline. It is a systematic review of the pipeline completed by a suitably qualified team. The technical investigation report describes this process:

The pipeline is reviewed metre by metre to identify the impact of threats and to evaluate the impact of a pipeline failure on adjacent properties.¹⁸

The SMS produces a list of actions for monitoring or mitigating threats. These actions could include:

- site monitoring
- specific studies to provide better knowledge in areas of uncertainty
- enhancements and repairs to improve pipeline integrity.

A SMS is undertaken on the Maui pipeline every 5 years. According to the technical investigation report, the most recent SMS was completed in early 2011.

Landslide and erosion

A geotechnical assessment of the section of pipeline from Urenui (on the northern Taranaki coast) to Otorohanga (in southern Waikato) was carried out in 2009 for Vector Gas by GNS. The recommendations of this assessment were reflected in the most recent SMS. The assessment identified 59 landslide or erosion hazards along the route of this section of the pipeline. Eleven of these were classified, using a qualitative risk assessment framework, as high risk, while the Pukearuhe site was classified as an intermediate risk. The term “threat” is used to describe a potential hazard to the pipeline in a multi-year timeframe.

These high risk sites are monitored and mitigation measures are taken where the monitoring shows increased risk.

Following the October 2011 pipeline outage at the Pukearuhe site, the pipeline threats along the Urenui to Otorohanga route were reassessed by GNS based on a helicopter flyover, with detailed examination at some specific sites. The assessment concluded that no new threat locations were identified and none of the previous threat levels had changed.

¹⁸ Vector Gas Limited (April 2012), *2011 Maui Pipeline Failure Technical Investigation Report*, paragraph 52.

Example of site monitoring

The sites assessed as high risk are actively and regularly monitored. Monitoring activities typically undertaken at the high-risk landslide sites are:

- monthly flyover (observation by helicopter following the route of the pipeline)
- monthly walkover
- remote onsite monitors providing monthly data download (rainfall, ground water depth, and GPS landslide points)
- snapshot measurement of drain flow rates
- six-monthly vegetation control, drain clearing, and weed spraying
- annual check on electronic equipment, walkover accompanied by a geotechnical engineer and subsequent report from geotechnical engineer, full survey of manual survey points (these are generally pegs placed over a much wider area than the identified boundaries of the landslide).

As an example of site monitoring, the photographs in figures 1 to 3 below show monitoring equipment in place at a landslide site along the pipeline.

Figure 2: Example of site monitoring equipment (source: Vector Gas)



Figure 2 above shows a monitoring beam with a GPS antenna on top and an automatic rain gauge in the background. The data from this monitor enables monitoring of any movement of the slip. A new fence has been installed due to the recent introduction of stock and horses by the landowner.

Figure 3: Example of data collection hardware point (source: Vector Gas)



Figure 4: Interception pot for snapshot measuring of drain water flow rate (source: Vector Gas)



Drainage

Drainage at the Pukearuhe landslide site has been improved. The improvements and rehabilitation of the drainage system at the site will prevent local surface and groundwater sources from aggravating the movement of the landslide. Details of the drainage improvement are discussed in the geotechnical assessment report of March 2012¹⁹.

¹⁹ Dellow, G. D., Archibald, G., Aubertin, F. (March 2012). *Geotechnical Assessment of the Site of the October 2011 Maui Gas Pipeline Failure near Pukearuhe, Northern Taranaki*. GNS Science.

Future work

MDL has advised that, at its request, two work programmes are being undertaken by Vector Gas. Firstly, the development of a long-term solution for resolving the impact of the landslide on the pipeline is started at the Pukearuhe site. Planning for this work is now underway. Secondly, that work is undertaken to provide additional integrity assessment knowledge of the Urenui to Otorohanga section of the pipeline:

- a one-off enhanced intelligent pigging to assess pipeline geometry and precise geospatial location, in addition to standard corrosion detection
- further geotechnical assessment into the pipeline's sensitivity, at the Pukearuhe site and other potentially similar areas, to the effects of landslides, and the consideration, as appropriate, of the findings as part of the safety management study processes.

Standard pigging is undertaken on a regular basis, with the last pigging operation carried out in 2008. The intelligent pigging process uses sensors to collect data as it passes through the pipeline.

Assessment and risk mitigation activities are also part of the pipeline's SMS and PIMP. The SMS and PIMP are pipeline management activities that must conform to requirements of the HSE Regulations. Completion of further geotechnical assessment of the pipeline's sensitivity underway at the Pukearuhe site is expected within six months.

The assessments will be integrated into the SMS process as part of the PIMP. The PIMP may be amended depending on the findings of the assessment. This is intended to provide the most appropriate mechanism for updating risk management practices. The certification process and the standards required under the HSE Regulations provide the assurance that the pipeline owner is managing risk to an appropriate standard. Government has asked that further assurance is provided by inspection of the SMS by a health and safety inspector.

Contingency events

The Gas Governance (Critical Contingency Management) Regulations 2008 give effect to the management of critical gas outages and other security of supply contingencies. The Regulations, made under the Gas Act 1992, provide for:

1. the development of critical contingency management plans
2. processes for managing a critical contingency
3. processes for determining gas imbalances resulting from a critical contingency and setting a price to apply to those gas imbalances
4. regular exercises to test the arrangements.

When a critical contingency is declared, a number of actions are required to take place:

A critical contingency generally occurs when gas supply is disrupted to all or part of the natural gas transmission system. Such a disruption can be caused by an outage in a gas production station that prevents gas from being injected into the transmission system or a fault (such as a leak) in a transmission pipeline that prevents gas from being delivered into or from the pipeline.

The pressure in the transmission system needs to be kept within a specific range, and a mismatch between gas demand and gas supply can cause gas pressures to drop. If the gas pressure drops to a level that jeopardises the safe delivery of gas, this in turn triggers a critical contingency to be declared under the Gas Governance (Critical Contingency Management) Regulations 2008. The regulations provide for specific gas pressure threshold limits to be set by the transmission system owner.²⁰

The CCO has the responsibility under the CCM Regulations for declaring and managing critical contingency situations. Once a critical contingency has been declared, the CCO's objective is to stabilise pressures and gas supply on the affected parts of the transmission system. The main tool that the CCO has in managing pipeline pressure is the ability to require industrial and commercial gas users to stop using gas on the affected parts of the transmission pipeline. The CCO's directions are relayed to retailers, which, in turn, instruct their customers to cease their gas usage as soon as possible.

Domestic (residential) gas users are not covered by the CCM Regulations and so cannot be directed to stop their gas use. However, a critical contingency may be of such severity that domestic users may be asked to decrease their gas use on a voluntary basis during a critical contingency. During the October 2011 contingency a general public appeal was made through a media release for gas to be used sparingly in the domestic sector²¹.

Objectives of curtailment arrangements

The objectives of the curtailment arrangements are to:

1. ensure that gas is supplied in a safe, efficient, and reliable manner
2. minimise net public cost
3. prioritise the supply of gas to essential service providers
4. allow for minimal load consumer supply
5. ensure efficient utilisation of gas in storage facilities
6. ensure effective operational management of a critical contingency.

Once a declaration is made by the CCO, the CCM Regulations enable the CCO to direct curtailment of gas use on any part of the system. Failure to comply with curtailment requests carries the risk that the CCO will be unable to stabilise the pressure in the transmission system. Ultimately, there could be a total loss of gas supply to all consumers and the need for months of restoration work as qualified gas fitters will be required to visit every consumer's home or premises to reactivate supply (purging gas lines, relighting pilot lights, etc).

The curtailment directions given by the CCO, and passed on by retailers to their customers, are carefully calculated to balance the desire of customers to continue operating with the need for the CCO to maintain adequate pressure on the transmission system. The CCM Regulations separate gas users into bands. These bands are defined by the level of gas usage measured in terajoules (TJ).

²⁰ Gas Industry Company, *Critical Contingency Management – FAQ's*. Accessed on 24 November 2011 from http://gasindustry.co.nz/sites/default/files/u254/ccm_faq_for_website_-_oct_2011_175363.1.pdf

²¹ www.gasindustry.co.nz/sites/default/files/u12/5_gas_supply_media_release_oct_11_175305.1.pdf

Table 4: Curtailment bands

| Band | Consumption | Description |
|-------------|--|---|
| 0 | N/A | Gas off taken for injection into storage |
| 1a | More than 15TJ per day | Consumers (excluding essential service providers) supplied directly from the transmission system and that have an alternative fuel capability. If minimum load consumer then manage wind-down of plant |
| 1b | More than 15TJ per day | Consumers (excluding essential service providers) supplied directly from the transmission system and that do not have an alternative fuel capability. If minimum load consumer then manage wind-down of plant |
| 2 | More than 10TJ per annum and up to 15TJ per day | Consumers (excluding essential service providers) with alternative fuel capability. If minimum load consumer then manage wind-down of plant |
| 3 | More than 10TJ per annum and up to 15TJ per day | Consumers (excluding essential service providers) without alternative fuel capability. If minimum load consumer then manage wind-down of plant |
| 4 | More than 2TJ per annum and up to 10TJ per annum | Consumers, excluding essential service providers. Minimal load consumers in curtailment bands 1a to 3 curtailed in full |
| 5 | More than 2TJ per annum | Essential service providers |
| 6 | 2TJ or less per annum | All remaining consumers (this does not include domestic consumers, which are not covered by the Regulations) |

This banding system broadly continues earlier industry arrangements and was implemented following public consultation on the draft CCM Regulations. The GIC also released guidelines on essential service and minimal load in February 2009. The guidelines consist of a set of principles and procedures for retailers and the GIC in designating consumers as essential service providers and minimal load consumers. Although these guidelines are not required by the CCM Regulations, the GIC's intention is to use them to ensure a consistent approach to the designation of large consumers and in considering disputes over designations for consumers generally.

Essential service providers

The CCM Regulations provide for certain classes of consumers to be designated as essential service providers, by application in writing to their retailer. One example of a gas consumer that may qualify as an essential service provider is a hospital.

Essential service provider means a consumer that has been approved as an essential service provider under regulation 44 or 46.

Under the regulations, consumers apply to their retailers for essential service provider status, and the application must be approved if:

1. the consumer provides services that are necessary to further the emergency response objective set out in clause 59(4) of the Schedule of the National Civil Defence Emergency Management Plan Order 2005
2. the consumer can demonstrate that its annual gas consumption is greater than 2 terajoules per annum.

The designation of essential service provider puts the consumer into Band 5 of the curtailment bands – a higher priority than it would have had otherwise. However, it is important to note that in a situation where the CCO needs to curtail all bands, it is likely that essential service providers may not be able to be supplied.

Even though gas outages significant enough to trigger critical contingencies are rare events, Gas Industry Co strongly suggests that organisations with a critical dependency should have alternative arrangements in place.²²

During the Maui pipeline contingency, consumers in all bands (and therefore essential services) on affected sections of the pipeline were directed by the CCO to curtail gas usage. Appendix 2 contains an extract of sections 44, 45, and 46 of the CCM Regulations, which define designations of essential service providers and minimal load consumers.

The designation of some consumers as essential service providers that occurred during the Maui pipeline contingency is discussed in the section below – *Critical Contingency Performance*.

Minimal load consumers

The CCM Regulations also provide for the designation of certain consumers as minimal load consumers. This means consumers that require a minimal amount of gas during a critical contingency in order to avoid serious damage to their plant, or to mitigate serious environmental damage, while completing orderly full shut-down of plant in the shortest time possible. As with designation as an essential service provider, applications to be designated as a minimal load consumer are made to the retailer. The designation of minimal load consumers is defined by section 45 of the CCM Regulations.

Post-event reporting

The CCM Regulations require the CCO to publish two reports once a critical contingency has ended: an incident report, and a performance report. The incident report must state:

1. The cause of the critical contingency
2. The duration of the critical contingency
3. The actions taken by the critical contingency operator and transmission system owner during the critical contingency
4. The level of general compliance by retailers and consumers with the directions of the transmission system owners and retailers during the critical contingency
5. Any other matters that the critical contingency operator considers are appropriate.

²² *Ibid.* 17, at 3.

Regulation 65(1) requires the CCO to publish a performance report that:

- assesses the CCO's and TSO's compliance with the Regulations and the effectiveness of the critical contingency management plans, the communication plan and the information guide
- assesses the extent to which it considers that the Regulations, the critical contingency management plans, the communications plan, and the information guide achieve the purpose of the Regulations
- identifies, where applicable, any amendments to the Regulations, critical contingency management plans, the communications plan and the information guide that it considers would better achieve the purpose of these regulations.

As the performance report notes, the report is about one particular aspect of the outage:

How various parties with responsibilities under the Regulations and associated documents that govern the management of critical contingencies performed during the outage. The report is not about the causes of the outage, the repair of the Maui pipeline, the impact of the outage on consumers, or the processes by which information related to the outage that was not part of the critical contingency process was communicated.

Critical Contingency Performance

The Critical Contingency Performance Report deals with how the various parties with responsibilities under the CCM Regulations and associated documents performed during the outage. This report was prepared by the CCO. Preparation of this report following a critical contingency is a regulatory requirement.

The CCO has assessed that it fully complied with the CCM Regulations, noting that the CCM Regulations are not clear on the treatment of partial restoration in regulation 53. Consequently, one of the report's recommendations is that the GIC consider amending the CCM Regulations to clarify the process for a partial restoration (recommendation 16).

The CCO has also assessed that it fully complied with the obligations of its Communication Plan, which sets out procedures for operational communications between the CCO and the TSO during a critical contingency, and its Information Guide, which sets out information flows between the CCO and key industry stakeholders during a critical contingency.

The review process required by the CCM Regulations could itself be improved. The CCO identified three issues with the review and reporting process, and recommended improvements to the process to address these issues:

1. the requirement for self-assessment of performance
2. the Regulations do not specify who the CCO is reporting to in its performance report
3. there is no distinction as to timing, content or process between different critical contingencies based on either duration or scale. Reviewing major incidents will require more input and take longer to prepare.

It should be noted that the CCM Regulations require the CCO to prepare and publish a performance report no later than 20 business days after the end of a critical contingency or as otherwise agreed between the CCO and GIC²³. Therefore, the Regulations currently provide more time to prepare the performance report if needed because of a major incident.

Designation changes during the critical contingency

During the critical contingency, gas retailers re-designated 33 consumers into band 5 (essential service providers). These re-designations were forwarded to the CCO for it to consider if demand could be restored to these consumers. The CCO considered these re-designations on a case-by-case basis and released restoration to each one under the revised curtailment direction issued by the CCO at 9:45am on 26 October.

The CCO commented in its incident report that this indicated that deficiencies may exist in the process for designating consumers as essential service providers.²⁴ In addition to possible deficiencies in the designation process, it could also indicate that:

- continuity planning by some businesses and services did not take into account the curtailment process;
- the essential service provider designation was not well understood; or
- retailers had not met their obligations under the CCM Regulations to communicate information concerning the existence of essential service provider designations.

The CCO Performance Report questions whether it is appropriate for essential service providers to be curtailed prior to band 6 consumers. The designation of essential service provider, the order in which essential service providers should be directed to curtail demand, and the order in which they should be directed to restore demand, needs clarification. Recommendation 14 of the CCO Performance Report addresses the work required on this.

In GIC's consultation paper on its review of the CCM Regulations, an option was put forward that would see "critical care providers" placed in a new band 7 that would have the highest priority. This suggestion was well-supported by submissions.

Compliance with curtailment requests

Compliance with curtailment instructions from the CCO, either given directly or through a retailer, is required by the CCM Regulations. Persons who consider that the CCM Regulations are not being complied with can allege a breach of the CCM Regulations to GIC. Alleged breaches will be referred for enforcement action under the Gas Governance (Compliance) Regulations 2008.

All retailers apart from one supplied the TSO with regular demand curtailment compliance updates in accordance with regulation 55. The format and quality of these updates were inconsistent, however, according to the CCO, this did not materially affect the transmission system's performance during the critical contingency.²⁵

²³ 65(1) of the Regulations.

²⁴ Vector Gas Limited (November 2011). *Critical Contingency Incident Report*. Page 11.

²⁵ *Ibid*, page 11.

Alleged breaches

The GIC, as Market Administrator, has assessed three alleged breaches of the CCM Regulations that were reported by the CCO. The Market Administrator's role is to determine whether each of the alleged breaches raises a material issue based on information provided in the breach notices and other information submitted by the CCO and the participant allegedly in breach. Two of the alleged breaches were assessed as raising material issues and were referred for investigation. In one case the investigator concluded that a breach has not occurred and in the second case a settlement was reached.

Recommendations of the performance report

The CCO's performance report presents 19 recommendations to amend documents or the regulations to better achieve the purpose of the regulations. These recommendations are shown in table 6 below, with additional comments added to give context and an indication of the current status.

MBIE endorses these recommendations, with some qualification on their intent as noted in comments in table 6 below. A review of the CCM Regulations by the GIC is addressing the CCO's recommendations that relate to potential improvements to the regulations. The Ministry of Business, Innovation and Employment will also monitor and report on progress made by the CCO, Vector Gas, MDL, and the GIC in implementing the recommendations of the CCO performance report that relate to amendments to documentation.

Table 5: Recommendations from the Critical Contingency Performance Report

| | Topic | Recommendation | Comment | For action by: | Status |
|---|---------------------|---|---|-----------------------|---------------|
| 1 | Communications Plan | CCO to prepare a proposed appendix for inclusion in the CCO Communications Plan to provide guidance on how Regulation 53(2) may be applied. | Regulation 53(2) provides for curtailment of only a subset of load within a curtailment band. Although it was not used during this contingency, guidance on how the CCO would apply this provision would be useful. | CCO | Complete |
| 2 | Communications Plan | CCO to prepare proposed amendments to the CCO Communications Plan regarding improvements to the noticing system in collaboration with the TSOs. | Related to recommendations 8 and 11 – improvement to contents and process for issuing notices. | CCO | Complete |
| 3 | Information Guide | CCO to prepare a proposed appendix for inclusion in the CCO Information Guide to provide guidance on how Regulation 53(2) may be applied | Same issue as recommendation 1, but for inclusion in the CCO Information Guide. | CCO | Complete |
| 4 | Information Guide | CCO to prepare proposed amendments to the CCO Information Guide regarding improvements to the noticing system in collaboration with the TSOs. | Same issue as recommendation 1, but for inclusion in the CCO Information Guide. | CCO | Complete |
| 5 | Information Guide | CCO to liaise with Transpower and the generators to put these additional communication steps in place, update the CCO Information Guide to describe the amended processes, revise operational CCO check lists and update the CCO contacts database. | Additional communication steps between the CCO, electricity generators, and Transpower for earlier notification. | CCO | Complete |
| 6 | Information Guide | CCO and Transpower to discuss pre-planning for likely gas transmission system outage scenarios and exercising Transpower | More regular liaison between the CCO and Transpower for pre-planning and participation in exercises. | CCO and Transpower | Complete |

| | Topic | Recommendation | Comment | For action by: | Status |
|----|-----------------|---|--|----------------|----------|
| | | emergency response processes. | | | |
| 7 | Vector Gas CCMP | Vector Gas to finalise revision proposals as soon as practicable and follow CCMP amendment process to implement any identified desired improvements. | Process and templates for retailers to provide compliance updates back to Vector Gas are difficult to use and could benefit from improvement. | Vector Gas | Complete |
| 8 | Vector Gas CCMP | Vector Gas to finalise proposed notice system improvements, amend CCMP to include the changes and then implement new arrangements. | Amendments are needed to the contents of and processes for issuing notices, specifically to the “cascade” process of notices from the CCO and in relation to delays between issue of CCO notices and the corresponding Vector Gas notices. | Vector Gas | Complete |
| 9 | Vector Gas CCMP | Vector Gas to prepare proposed amendments to the CCMP to include details on potential critical contingency notices and progress the CCMP amendment process. | Vector Gas issues notices at the potential critical contingency and termination of potential critical contingency stages, but its CCMP does not include details about this process. | Vector Gas | Complete |
| 10 | MDL CCMP | MDL to finalise revision proposals as soon as practicable and follow CCMP amendment process to implement any identified required improvements. | As with recommendation 7 – the process and templates for retailers to provide compliance updates back to MDL are difficult to use and could benefit from improvement. | MDL | Complete |
| 11 | MDL CCMP | MDL to finalise proposed notice system improvements, amend CCMP to include the changes and then implement new arrangements. | As with recommendation 8 – amendments are needed to the contents of and processes for issuing notices, specifically to the “cascade” process of notices from the CCO and in relation to delays between issue of CCO notices and the corresponding MDL notices. | MDL | Complete |
| 12 | MDL CCMP | MDL to prepare proposed amendments to the CCMP to include details on potential critical contingency notices and commence the | MDL issues notices at the potential critical contingency and termination of potential critical contingency stages, but its CCMP does | MDL | Complete |

| | Topic | Recommendation | Comment | For action by: | Status |
|----|-----------------|---|--|----------------|-------------|
| | | CCMP amendment process. | not include sufficient detail about this process. | | |
| 13 | MDL CCMP | MDL to include the step of telephoning large consumers regarding the issue of notices in the next revision of their CCMP. | MDL should include the step of telephoning large consumers regarding the issue of notices in its CCMP. | MDL | Complete |
| 14 | CCM Regulations | GIC to lead an industry consultation process (including a representative cross section of consumers) to consider the above points and any other subsequently identified issues and propose and implement any required amendments to the Regulations. | <p>This recommendation refers to issues that have been identified by the CCO with the curtailment bands (including essential service providers). The CCO asserts that:</p> <p><i>Based on our experience during the outage, and the views expressed by stakeholders, we consider that a thorough review of the curtailment bands and how individual consumers are classified is required to ensure that the system operates transparently and achieves the purposes of the Regulations.</i>²⁶</p> | GIC | In progress |
| 15 | CCM Regulations | <p>GIC to lead an industry consultation process to consider the following and any other subsequently identified issues:</p> <ul style="list-style-type: none"> a. if the regional status of a critical contingency should be designated when a critical contingency is declared; b. if a single entity should have the obligation to designate the regional status of the critical contingency; c. if the pricing and imbalance methodology could be applied to all critical | | GIC | In progress |

²⁶ Vector Gas Limited (December 2011). *Critical Contingency Performance Report*. Page 52.

| | Topic | Recommendation | Comment | For action by: | Status |
|----|-----------------------|--|---|----------------|-------------|
| | | contingencies hence removing the requirement to determine the regional status; and d. propose and implement any required amendments to the Regulations that result from the consultation process. | | | |
| 16 | CCM Regulations | The GIC gives consideration to amending the Regulations to clarify the process for a partial restoration. | During the contingency, the CCO determined that there was likely to be sufficient gas available to restore some consumers – a partial restoration. The regulations as drafted do not expressly allow a partial restoration. | GIC | In progress |
| 17 | Consumer preparedness | The GIC and Ministry of Business, Innovation and Employment (MBIE) give consideration to the most appropriate mechanism for increasing knowledge and understanding of the critical contingency system. | | GIC and MBIE | In progress |
| 18 | CCM Regulations | The GIC and MBIE to consider introducing greater incentives for compliance with directions under the regulations. | Each transmission system owner must comply with the CCO's directions (Reg. 54), and retailers and large consumers must comply with directions of a transmission system owner (Reg. 55). The Gas Governance (Compliance) Regulations 2008 provide for the monitoring and enforcement on industry participants of a number of gas governance rules including the CCM Regulations, with remedies provided by section 43X of the Gas Act. These provisions, however, do not cover | GIC and MBIE | In progress |

| | Topic | Recommendation | Comment | For action by: | Status |
|----|-----------------|--|---|----------------|-------------|
| | | | consumers (which are not industry participants). | | |
| 19 | CCM Regulations | The GIC and MBIE consider potential improvements to the review and reporting process contained in the regulations. | <p>The review process required by the CCM Regulations could itself be improved. The CCO identified three issues with the review process:</p> <ol style="list-style-type: none"> 1. the requirement for self-assessment of performance 2. the Regulations do not specify who the CCO is reporting to in its performance report 3. there is no distinction as to either timing, content, or process, between different critical contingencies based on either duration or scale. <p>It should be noted that the Regulations require the CCO to prepare and publish a performance report no later than 20 business days after the end of a critical contingency or as otherwise agreed between the CCO and GIC. Therefore, the Regulations currently provide more time to prepare the performance report if needed because of a major incident.</p> | GIC and MBIE | In progress |

Progress on recommendations of the performance report

Amending critical contingency management plans, communications plans, and information guides

On 11 September 2012, MDL and Vector Gas published revised critical contingency management plans (CCMPs), and the CCO published a revised information guide and a revised communications plan. The revised documents address recommendations 1 to 13 of the performance report for amendments to CCMPs, communications plans, and information guides. Amendment of these documents follows a specific process which includes industry consultation, appointment of an expert advisor, and approval by GIC. The process for amending CCMPs, communications plans, and information guides is defined in the CCM Regulations. Specifically, regulations 65 (3) and (4) state that:

(3) If the performance report identifies an amendment to a critical contingency management plan, the relevant transmission system owner must—

(a) prepare a proposed amendment to the critical contingency management plan that is consistent with the amendment identified in the performance report; and

(b) consult on the proposed amendment in accordance with regulation 26, except if the transmission system owner and the critical contingency operator agree that the proposed amendment is immaterial; and

(c) submit the proposed amendment to the industry body for approval in accordance with regulations 27 to 30.

(4) If the performance report identifies an amendment to the communications plan or information guide, the critical contingency operator must amend and publish a revised communications plan in accordance with regulation 35 or a revised information guide in accordance with regulation 37, as applicable.

Amending the regulations and related actions

The remaining six recommendations (14 to 19) may require changes to the CCM Regulations. The GIC is taking the primary role in considering the effectiveness of the Regulations, any additional work required on contingency management, and other aspects relevant to the GIC's oversight of the industry. This also provides the opportunity for consultation on any resulting changes.

The GIC is well advanced with its work acting on those recommendations and identifying any other issues that might require changes to the CCM Regulations. To date, the GIC has been working directly with industry participants to identify opportunities to improve critical contingency management in the New Zealand gas market. Developments in international practice have also been considered.

On 31 July, GIC published an analysis of submissions received on its discussion paper, *Review of Gas Critical Contingency Management: Post Maui Pipeline Outage*²⁷. The analysis summarises the eight submissions received and reviews the recommendations put forward in the discussion paper in light of those submissions. The next step is a statement of proposal that describes proposed changes to the CCM Regulations. GIC aims to release the statement of proposal by the end of October 2012.

²⁷

http://gasindustry.co.nz/sites/default/files/publications/review_of_gas_critical_contingency_management_-_analysis_of_submissions_on_the_concept_report_180406.5.pdf

GIC is also working through a number of related actions broadly aimed at capturing lessons from the outage, including processing alleged breaches of the CCM Regulations, and reviewing its guidelines on approval of essential service providers and minimal load consumers. Improving wider industry communication arrangements during contingency events is also being addressed.

Quality standards required by price-quality regulation

The quality standards required by price-quality regulation under the Commerce Act 1986 (the Act) and the new information disclosure requirements being developed are relevant when considering a long-term view of investment in infrastructure. Gas pipeline services are subject to default or customised price-quality regulation under section 55D of the Commerce Act 1986. The quality standards expected of gas pipeline businesses under the default price-quality regulation have not yet been formalised.

Businesses supplying gas pipeline services, as that term is defined in the Act, regulated under Part 4 are:

- Gas transmission businesses: Maui Development Limited, Vector Limited
- Gas distribution businesses: Powerco Limited, Vector Limited, GasNet Limited.

The Commerce Commission's draft determinations (one for gas transmission services and one for gas distribution services) and draft reasons paper setting out the reasons for those determinations were released for consultation on 21 November 2011 – shortly after the Maui pipeline outage. At the time of publishing, the Commission also recognised that the disruption to the supply of gas on the Maui pipeline was of great concern to industrial users, involved potential environmental damage and illustrated the significance of reliability of gas supply.

Section 53M(1)(b) of the Act provides that the initial default price path must specify the quality standards to be met by each regulated supplier. The Commission says that setting quality standards helps to ensure that the service quality that consumers receive is not compromised by efforts to reduce costs, and consequently, helps to meet the Part 4 Purpose; most notably the requirement of s 52A(1)(b) of the Act: that suppliers of regulated goods or services have incentives to improve efficiency and provide services at a quality that reflects consumer demands.

Furthermore, Section 53M(3) of the Act states that quality standards for the Initial DPP:

...may be prescribed in any way the Commission considers appropriate

Section 55I(2) requires that before the Commission exercises any of its powers under Part 4, it takes into account regulations and rules under the Gas Act 1992 (or any decision under those regulations or rules) that relate to quality standards or pricing methodologies and are applicable to the pipeline owner. Therefore, in reaching a draft decision on quality standards for gas pipeline businesses (GPBs), the Commission is required to have regard to the requirements of certain rules and regulations that are administered by the GIC. This includes the Gas Governance (Critical Contingency Management) Regulations 2008.

Regulatory instruments under Part 4 of the Commerce Act

Gas pipeline services supplied by MDL's gas pipeline are subject to price-quality and information disclosure regulation under Part 4 of the Commerce Act 1986 (the Act). The Commission is developing information disclosure requirements and price-quality paths under Part 4 that will apply to GPBs, including MDL, from 2012.

The purpose of Part 4 of the Act is to promote the long-term benefit of consumers by promoting outcomes that are consistent with outcomes produced in competitive markets, such that suppliers of regulated goods or services:

1. have incentives to innovate and to invest, including in replacement, upgraded and new assets
2. have incentives to improve efficiency and provide services at a quality that reflects consumer demands
3. share with consumers the benefits of efficiency gains in the supply of regulated goods or services, including through lower prices
4. are limited in their ability to extract excessive profits.

Each of the regulatory instruments that apply to GPBs is discussed below.

Information disclosure

The purpose of information disclosure is to ensure that sufficient information is readily available to interested persons to allow them to assess whether the purpose of Part 4 of the Act is being met.

MDL, like all other GPBs, is currently subject to the Gas (Information Disclosure) Regulations 1997 (GIDRs), which are administered by the Ministry of Business, Innovation and Employment. These regulations will cease to apply to GPBs once the information disclosure requirements being developed by the Commission take effect.

The new information disclosure requirements being developed by the Commission are more rigorous than the existing requirements, and we expect they will better achieve the purpose of Part 4. The new information disclosure requirements will enable interested parties to understand how assets are managed, the proposed levels of investment (including maintenance and replacement spending), the risks of asset failure, and how such risks are managed. In particular, the Commission intends to propose that:

- GPBs are required to develop and publish an Asset Management Plan (AMP). Among other things, this will require a supplier of regulated services to explain what assets are managed by the GPB; how it manages its assets; its plans for those assets including new developments, maintenance and renewals; and to identify the risks to the performance of those assets and how those risks will be managed. The current GIDRs do not require GPBs to develop and publish an AMP.
- GPBs are required to publicly disclose qualitative information concerning asset description, performance, age, condition, and expenditure, as well as the drivers for expenditure on different classes of assets. These asset management disclosures will support the AMPs by requiring that the information be disclosed in a consistent and standardised way that will facilitate monitoring and analysis (by the Commission and other interested parties).
- The performance information is expected to include information relating to the integrity and reliability of gas pipeline networks, such as the number of public reported escapes, the number of interruptions experienced and the frequency with which these occur. Under the GIDRs, GPBs are required to disclose information on unplanned interruptions.
- GPBs are expected to be required to apply and disclose the results of an Asset Management Maturity Assessment Tool, a self-assessment test that should ultimately allow aspects of each supplier's asset management capability to be assessed against a generic international standard and identify broad areas where improvements in asset management are needed and/or are possible.

Together, these requirements will improve the range, quantity and quality of information on a GPB's assets which is publicly available. The process of preparing that information and the subsequent resulting scrutiny of that information can:

- ensure people can better understand how a supplier is managing its assets, the risks to those assets and how those risks are managed
- improve the management of those assets.

The public disclosure of such information, and any resulting improvements in the management of assets by GPBs, cannot by itself avoid the risk of asset failures. For example, the responsibility for properly managing the assets and limiting the risk and consequences of any leak or failure resides solely with the regulated supplier of gas pipeline services.

The Commission is required to publish a summary and analysis of the information disclosed by GPBs. This summary and analysis enables the Commission to highlight and comment on the performance of suppliers of gas pipeline services, including performance in managing assets and risks and the cost of managing assets and risks. This work will improve understanding of the performance of GPBs.

The Commission published its final decisions on the commencement timing of new information disclosure requirements for annual disclosure and asset management plans on 29 August 2012.

Price-quality regulation

The Commission is also working to establish a default price path (DPP) for all GPBs (including MDL). The DPP must specify quality standards that must be met by GPBs. The DPP can include penalties for failing to meet the required quality standards, and rewards for meeting or exceeding the required quality standards.

The Commission's draft determinations (one for gas transmission services and one for gas distribution services) and draft reasons paper setting out the reasons for those determinations were released for consultation on 21 November 2011. Among other things, the draft determinations and draft reasons paper proposed the following:

- one quality standard, specifically response times to emergencies, should apply to suppliers of gas transmission services. This quality standard will require 100 percent of all emergencies to be attended in no more than three hours.
- an emergency means an incident for which one of the emergency services is called and which is reported to the GPB, an unplanned disruption in the supply of gas that affects more than five customers, and/or the need to evacuate premises as the result of escape or ignition of gas. The Commission defined a response time as meaning the time elapsed from when an emergency is reported to a GPB until a GPB's personnel arrives at the location of the emergency.
- future information disclosure requirements will improve the transparency and availability of information across the gas sector. This will be of use in determining additional quality standards at future DPP resets. The Commission did consider setting additional quality standards for the initial DPP, but indicated that the lack of reliable historical data which is available to set a standard was problematic.
- that a total revenue cap be the form of control that applies to providers of gas transmission services. This will provide GPBs with the certainty of knowing what their future revenue allowances (or caps) will be, while not exposing them to fluctuations in demand that influence the volumes transported across their networks which are often beyond their direct control.

At the time of publishing the draft determinations and draft reasons paper, the Commission also recognised that the disruption to the supply of gas on the Maui pipeline was of great concern to industrial users, involved potential environmental damage and illustrated the significance of reliability of gas supply.

The Commission published its draft decision on the initial default price-quality paths for suppliers of gas pipeline services in November 2011 with the intention of making final decisions by February 2012. This date was subsequently revised to December 2012. The new December 2012 date follows the development of input methodologies for electricity distribution services and gas pipeline services applicable to default price-quality paths. These input methodologies are due to be set by 30 September 2012 and concern the valuation of assets, allocation of common costs, and treatment of taxation.

Part IV – Conclusions

Cause of the leak

The pipeline failed due to overload caused by landslide movement. The third party expert metallurgical reports provide evidence that the failure was not contributed to by any defect or flaw in the pipe. The geotechnical report prepared after the event concludes that the pipeline was subject to the movement of a large, known, slow moving landslide. This report also notes that a 25 metre section of the pipeline is within the edge of the landslide, and that the landslide will continue to move.

Certification

Pipeline operation and maintenance requires management to the NZS/AS 2885 standard and independent certification, under regulations overseen by the Department of Labour. The certificate of fitness demonstrates to the regulating authority (Department of Labour) that the pipeline and associated equipment is “fit for purpose” by confirming that it is designed, constructed, operated, and maintained in accordance with the standards.

The Maui pipeline is certified as complying with the Health and Safety in Employment (Pipelines) Regulations 1999. The certifying authority (in this case Lloyd’s Register) provides an independent audit of the owner/operator, by means of the certificate of fitness, to verify that the pipeline and associated equipment is in compliance with the standard.

Work on the Maui pipeline to protect against landslides

The pipeline owner (MDL) and operator (Vector Gas) had undertaken significant investigations into landslide and erosion risks on the Urenui to Otorohanga part of the pipeline prior to the failure, including commissioning a study by GNS in 2009. These risks had been categorised, with 11 high risk sites identified. The Pukearuhe site was identified as an intermediate risk. Management of landslide and erosion risk is identified in risk management documentation as a key risk and monitoring and mitigation plans are in place across the pipeline in respect of these risks.

Given the pipeline failure occurred at a known risk site which was identified as an intermediate risk, it is appropriate that the pipeline owner and operator review the management of landslide risks.

The pipeline owner (MDL) and operator (Vector Gas) have reported on the causes of the event, immediate steps taken to stabilise the site, and outlined long-term plans for monitoring and management.

The mitigation measures taken at the site are intended to ensure pipeline integrity in the short- to medium-term. A long-term solution for resolving the impact of the landslide on the pipeline at the Pukearuhe site is due to be started this year, and planning for this work is now underway.

Additional integrity assessment of the Urenui to Otorohanga section of the pipeline route is to be undertaken. Further geotechnical assessments underway will be integrated into the SMS process as part of the PIMP. The certification process and the standards required under the HSE Regulations provide the assurance that the pipeline owner is managing risk to an appropriate standard. Given public interest in the pipeline risk, Government believes that two additional steps to provide public confidence are appropriate:

1. Review of any updated SMS/PIMP for the pipeline by the MBIE Labour Inspectorate. This would provide further input into the pipeline owners plans but would not relieve the owner and operator of their responsibility to manage the pipeline safely and securely.
2. The pipeline owner should present to gas users their plans for managing landslide and erosion risks. This should be aimed at providing confidence that risks are known and being managed appropriately. In particular, MDL and Vector should focus on what changes they have made to managing these risks and why. It is suggested that GIC facilitate this exercise and it should occur before 30 June 2013, with follow presentations if further investigatory work remains to be completed. Given broad interest in this issue across large industrial through to residential customers, any such presentations should be publically available.

Effects

Estimates show that the economic impact of this event was significant, with economic effects concentrated on the dairy industry and large industrials. The gross economic cost is estimated at \$200 million. The shutdown of dairy processing plants highlighted the environmental risks associated with on-farm disposal of milk when an energy source for processing milk is unavailable. Health services in the upper North Island were also disrupted.

Planning for outages

This event has highlighted the risks to infrastructure presented by low-probability, high-impact events. There are economic costs and environmental impacts that are potentially significant. The loss of gas supply is only one of many possible interruptions to normal business activity. The excellent record of the Maui pipeline may have resulted in some businesses not fully considering the risk of an extended gas supply outage.

Although the critical contingency system provides a mechanism to respond to an unplanned reduction in delivered gas, there is potential for businesses that depend on gas, including dairy farmers and milk processors, to improve planning on how to mitigate the risks of temporarily losing gas supply. This could be through alternative energy sources or back up arrangements for business continuity.

Milk production carries unique risks due to the disproportionately high implications of stopping production. After reassessing its risk exposure, Fonterra is assessing investment in back-up diesel energy sources at its Waikato processing plants in Lichfield, Te Rapa and Kauri. This is expected to protect against the effect of a gas outage for a large part of the dairy season and reduce the likelihood of needing to dispose of waste milk as a result.

Information on the critical contingency process to support business continuity planning is also important. The large number of customers reclassified as essential services during the outage reinforces the view that some businesses were not sufficiently aware of how an extended gas outage would be managed and how their business would be impacted. Education and review of customer classification forms an important part of the post-event work.

The contingency system

Clear, effective, and robust, contingency processes are important to ensure a coordinated approach for the effective management of critical gas outages. The CCM Regulations define the roles, responsibilities and process to follow. These regulations put in place a CCO with powers to oversee supply and demand and to direct curtailment of demand in a predetermined order.

During the October 2011 outage, the contingency system was generally successful in achieving an orderly curtailment and restoration of demand while the breach in the pipeline was assessed and repaired. The CCO's post-event performance report highlighted 19 recommended improvements to the contingency system. The first 13 recommendations are amendments to plans and guides which are being implemented by MDL, Vector, and the CCO. The remaining six recommendations are being addressed by the GIC in its review of the CCM Regulations.

Overall there is nothing to suggest that the fundamental framework of the regulations is not appropriate. The focus should be on learning from the event and improving the regulations and their implementation.

Review of CCM Regulations

The scope of the GIC's review of the CCM Regulations includes the six recommendations made in the CCO Performance Report that potentially involve changes to the regulations (recommendations 14, 15, 16, 17, 18 and 19). It also includes the wider issues of industry and market awareness of critical contingency management processes, how best to communicate with stakeholders and the public before and during an event.

Specifically, the review of the CCM Regulations considers:

- the recommendations of the CCO Performance Report
- how the curtailment bands work, whether they are appropriate for optimal management of critical contingencies, and if changes are needed
- the response to the critical contingency by gas consumers, and particularly whether large consumers have backup arrangements in place to be resilient against gas outages
- the "on the fly" essential service provider designations made during the Maui outage, and the appropriateness of such designations as a response to a critical contingency event
- current arrangements for essential service provider and minimal load user designations, with a focus on possible alternatives to current requirements on retailers to provide those designations for their customers
- any changes that should be made to the CCM Regulations to improve the effectiveness of critical contingency management.

The GIC is well advanced in its work implementing these recommendations and identifying any other issues that might require changes to the CCM Regulations. On 31 July 2012, GIC published an analysis of submissions received on its discussion paper, *Review of Gas Critical Contingency Management: Post Maui Pipeline Outage*. This analysis summarises the eight submissions received and reviews the recommendations put forward in the discussion paper in light of those submissions. The next step is a statement of proposal that describes proposed changes to the CCM Regulations. GIC aims to release the statement of proposal by the end of October 2012.

Amendment of plans and guides

The CCO, Vector Gas, and MDL have amended their CCMPs, communications plans, and information guides following the process defined in the CCM Regulations. These amendments are primarily improvements to the documentation of communications processes.

New information disclosure requirements

The new information disclosure requirements being developed by the Commerce Commission are more rigorous than the existing requirements, and have the potential to improve understanding of the risks of gas transmission asset failure and how risks are managed.

The Commission's draft determination of 16 January 2012 provides for asset management plans of gas transmission businesses. These plans must provide details of risk policies, assessment, and mitigation.

Asset risk management forms a component of a GPB's overall risk management plan or policy, focusing on the risks to assets and maintaining service levels. AMPs should demonstrate how the GPB identifies and assesses asset-related risks and describe the main risks within the network. The focus should be on credible low-probability, high-impact risks. Risk evaluation may highlight the need for specific development projects or maintenance programmes. Where this is the case, the resulting projects or actions should be discussed, linking back to the development plan or maintenance programme.

Recommendations

We recommend that you:

1. Note that MBIE will monitor the GIC's review of the Gas Governance (Critical Contingency Management) Regulations 2008.
2. Note that a health and safety inspector from the Labour Group of MBIE will review the SMS to provide additional assurance that the pipeline owner is adhering to the standards required by the HSE Regulations.
3. Note that MBIE has asked the pipeline owner to present their plans for identifying and managing landslide and erosion risk to customers by 30 June 2013.

Appendix 1: Regulations designating essential service providers and minimal load consumers

Excerpt from the Gas Governance (Critical Contingency Management) Regulations 2008:

44 Designation of consumers as essential service providers

- (1) The purpose of this regulation is to identify consumers who are essential service providers.
- (2) Each retailer must, as soon as is reasonably practicable after the commencement date, notify its consumers that, if they wish to be classified as essential service providers, they must apply to the retailer in writing and that the application can be made at any time.
- (3) A retailer must approve a consumer's application to be an essential service provider if both of the following criteria are met:
 - (a) the consumer provides services that are necessary to further the emergency response objectives set out in clause 59(4) of the Schedule of the National Civil Defence Emergency Management Plan Order 2005; and
 - (b) the consumer can demonstrate that its annual gas consumption—
 - (i) was greater than 2 terajoules in any 12-month period within the 2 years before the consumer's application; or
 - (ii) will be greater than 2 terajoules in the 12-month period after the consumer's application.
- (4) Each retailer must, within 10 business days of receiving a consumer's application to be an essential service provider, determine whether to approve or decline that consumer's application and give notice of its determination to—
 - (a) the consumer; and
 - (b) if applicable, the gas distributor whose distribution system is used to distribute gas to that consumer.
- (5) If a retailer reasonably considers a consumer who has been approved as an essential service provider no longer meets the criteria set out in subclause (3), the retailer must give notice requiring the consumer to reapply under this regulation for approval as an essential service provider.
- (6) To avoid doubt, a consumer notified under subclause (5) remains an essential service provider unless it—
 - (a) fails to reapply within 20 working days of receiving such notice; or
 - (b) receives notice under subclause (4) that the retailer has declined its reapplication.

45 Designation of consumers as minimal load consumers

- (1) The purpose of this regulation is to identify consumers who require a minimal amount of gas during a critical contingency in order to avoid serious damage to plant, or mitigate serious environmental damage, while undertaking an orderly shut down of plant in the shortest time possible.

(2) Each retailer must, as soon as is reasonably practicable after the commencement date, notify its consumers that, if they wish to be classified as minimal load consumers, they must apply to the retailer in writing and that the application can be made at any time.

(3) A consumer must include the following information in an application to be a minimal load consumer:

(a) the absolute minimum level of gas supply level required to avoid serious damage to plant or mitigate serious environmental damage; and

(b) the period of time required for an orderly and complete shut down of plant.

(4) A retailer must, within 10 business days of receiving an application to be a minimal load consumer, determine whether to approve or decline that consumer's application and give notice of its determination to—

(a) the consumer; and

(b) if applicable, the gas distributor whose distribution system is used to distribute gas to that consumer.

(5) A retailer must approve a consumer's application to be a minimal load consumer if all of the following criteria are met:

(a) the consumer would have no alternative arrangements that are economically feasible if gas supply was curtailed; and

(b) the consumer is operating a major item of capital plant and that plant would sustain serious damage or significant environmental damage would likely be caused if gas supply was curtailed; and

(c) the consumer can demonstrate that its annual gas consumption—

(i) was greater than 10 terajoules in any 12-month period within the 2 years before the consumer's application; or

(ii) will be greater than 10 terajoules in the 12-month period after the consumer's application.

(6) Within 10 business days of notifying a consumer that its application to be a minimal load consumer has been approved, the retailer and the consumer must agree in writing on—

(a) the absolute minimum gas supply level required to mitigate serious damage to plant or significant environmental damage; and

(b) the period of time for which it requires a gas supply to effect an orderly and complete shutdown of plant.

(7) If a retailer reasonably considers a consumer who has been approved as a minimal load consumer no longer meets the criteria set out in subclause (5), the retailer must give notice requiring the consumer to reapply under this regulation for approval as a minimal load consumer.

(8) To avoid doubt, a consumer notified under subclause (7) remains a minimal load consumer unless it—

(a) fails to reapply within 20 working days of receiving such notice; or

(b) receives notice under subclause (4) that the retailer has declined its reapplication.

46 Referral of designation decision to industry body

(1) If a consumer disputes the decision to approve or decline its application to be either an essential service provider under regulation 44 or a minimal load consumer under regulation 45, the consumer may by notice refer the matter to the industry body for review.

(2) As soon as practicable and no later than 10 business days after receiving notice under subclause (1), the industry body must review the decision by the retailer to approve or decline the application by the consumer and either—

- (a) confirm the retailer's decision; or
- (b) refer the application back to the retailer for reconsideration; or
- (c) approve or decline the application itself in accordance with regulation 44 or 45, as applicable.

(3) To avoid doubt, this regulation does not apply if the industry body has previously referred the application back to the retailer for reconsideration.

(4) The industry body must, in respect of large consumers, carry out the functions of the retailer under regulations 44 and 45 (and those regulations apply with all necessary modifications).

Excerpt from the National Civil Defence Emergency Management Plan Order 2005:

59 Principles

(4) Emergency response objectives include—

- (a) preservation of life; and
- (b) prevention of escalation of the emergency; and
- (c) maintenance of law and order; and
- (d) care of sick, injured, and dependent people (first aid, medical, and evacuation facilities, and welfare); and
- (e) provision of essential services (lifeline utilities, food, shelter, public information, and media); and
- (f) preservation of governance (continuity of the machinery of government); and
- (g) asset protection, including buildings and historic heritage assets (including structures, areas, landscapes, archeological sites, and wahi tapu); and
- (h) protection of natural and physical resources (to the extent reasonably possible in the circumstances); and
- (i) preservation of economic activity.

Appendix 2: References

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Appendix 3: Glossary

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|-----------------|--|
| AMP | Asset management plan |
| ALARP | As low as reasonably practicable |
| BOD | Biological oxygen demand – the amount of oxygen needed by biological organisms in a body of water to break down the organic material present |
| CCM Regulations | Gas Governance (Critical Contingency Management) Regulations 2008 |
| CCMP | Critical contingency management plan |
| CCO | Critical contingency operator |
| CDEM | Civil defence and emergency management |
| DHB | District health board |
| DPP | Default price path |
| GIC | Gas Industry Company |
| GNS | Institute of Geological and Nuclear Sciences Limited |
| GPB | Gas pipeline business |
| HSE Regulations | Health and Safety in Employment (Pipelines) Regulations 1999 |
| MAF | Ministry of Agriculture and Forestry |
| MBIE | Ministry of Business, Innovation and Employment |
| MDL | Maui Development Limited |
| MED | Ministry of Economic Development, which became part of the Ministry of Business, Innovation and Employment from 1 July 2012 |
| MPI | Ministry for Primary Industries |
| MW | Megawatt |
| NDT | Non-destructive tested |
| PIMP | Pipeline integrity management plan |
| SCMS | Standard cubic metres per second (a measurement unit of flow rate) |
| SMS | Safety management study |
| TJ | Terajoule (one trillion joules) |
| TSO | Transmission system owner |