REMOVAL OF TAUPO CRITICAL CONTINGENCY THRESHOLD

Report Prepared for:

GAS INDUSTRY CO

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EXECUTIVE SUMMARY

Firstgas has proposed an amendment to Schedule 1 of the Gas Governance (Critical Contingency Management) Regulations 2008 to remove Taupo as a point of measurement for a critical contingency threshold.

Gas Industry Company Limited (GIC) has engaged P&P Engineering Consultants Limited (P&P), as the current provider of Critical Contingency Operator services, to undertake modelling and assess the implications of this proposal on critical contingency management for that part of the transmission system.

Firstgas proposes to operate the transmission system between Reporoa and Taupo at 10 barg. This will enable the injection of biomethane from the First Renewables facility at the Broadlands gas gate without additional compression. The existing minimum operating pressure for the Taupo point of measurement is 30 barg so conditions for a critical contingency declaration would be reached if the transmission system between Reporoa and Taupo were operated at this lower pressure.

Firstgas considers that the Taupo gas gate can be removed as a point of measurement in Schedule 1 of the CCM Regulations without a material impact on the purpose of the Regulations. This is based on the following:

- An event upstream of the Reporoa gas gate would result in a critical contingency being declared at another point of measurement prior to the minimum operating pressure at Taupo being met. The injection of biomethane at Broadlands will provide additional system resilience for the Taupo section of the transmission system.
- An event downstream of the Reporoa delivery point is unlikely to have a materially different impact if this section of the system is operated at lower pressure as there is little gas available at all operating pressures.

P&P has concluded that, for events upstream of Reporoa:

- Reporoa will become the new trigger point for any CC events affecting that part of the system, this will be a reasonable proxy for Taupo and removing Taupo and Broadlands from being a CC trigger under the CCM Regulations will have minimal impact on the timing of the declaration of an event.
- The amount of linepack available for any response to the part of the system affected will be reduced by up to 43,000 scm.

For events downstream of Reporoa:

- No CC event will be triggered and the CCM Regulations will not be able to be used to manage any events on the 38km of transmission pipeline between Reporoa and Taupo.
- The amount of linepack available for any response to an event on the Reporoa to Taupo pipeline will be significantly diminished.

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APPENDICES

Rev	Date	Description	Prepared By	Checked By	P&P Approved	Client Approved
2	13/10/2023	Final	GA/JL/SG	RD	RD	TK

1.0 INTRODUCTION

Firstgas has proposed an amendment to Schedule 1 of the Gas Governance (Critical Contingency Management) Regulations 2008 to remove Taupo as a named point of measurement for a critical contingency threshold.

Gas Industry Company Limited (GIC) has engaged P&P Engineering Consultants Limited (P&P), as the current provider of Critical Contingency Operator services, to undertake modelling and assess the implications of this proposal on critical contingency management for that part of the transmission system.

Firstgas proposes to operate the transmission system between Reporoa and Taupo at 10 barg nominally. This will enable the injection of biomethane from the First Renewables facility at the Broadlands gas gate without additional compression. The existing minimum operating pressure for the Taupo point of measurement is 30 barg so conditions for a critical contingency declaration would be reached if the transmission system between Reporoa and Taupo were operated at this lower pressure.

Firstgas considers that the Taupo gas gate can be removed as a point of measurement in Schedule 1 of the CCM Regulations without a material impact on the purpose of the Regulations. This is based on the following:

- An event upstream of the Reporoa gas gate would result in a critical contingency being declared at another point of measurement prior to the minimum operating pressure at Taupo being met. The injection of biomethane at Broadlands will provide additional system resilience for the Taupo section of the transmission system.
- An event downstream of the Reporoa delivery point is unlikely to have a materially different impact if this section of the system is operated at lower pressure as there is little gas available at all operating pressures.

1.1 The Scope

The scope provided by the GIC was as follows.

Gas Industry Co is engaging the Consultant to provide an assessment of the impact of removing the Taupo point of measurement from Schedule 1 of the CCM Regulations.

For an event that occurs on the Bay of Plenty pipeline upstream of Reporoa

1. At current operating pressures:
    a. Model loss of containment/pipeline isolation and reduced pressure at the following locations
        i. Between Pokuru and Lichfield
        ii. Between Lichfield and Rotorua/Taupo offtakes
        iii. Between Rotorua/Taupo offtake and Reporoa DP
        iv. Between Rotorua/Taupo and Kawerau compressor station.
    b. For each of the events, what would be the approximate time until loss of supply at the Taupo gas gate (assuming peak demand)? Is loss of supply at Taupo likely to occur prior to declaration of a critical contingency at another point of measurement?

    c. For each of the events, would curtailment of demand under the CCM Regulations have a material impact on time to loss of supply to Taupo?
2. If the Taupo section of the transmission system is operated at less than 10 barg what is the impact on questions a to c above?
3. To what extent will the injection of biomethane at Broadlands impact question 2 above?

In the event of a localised failure (i.e. downstream of Reporoa)

1. At current operating pressures:
    a. Model loss of containment/pipeline isolation and reduced pressure downstream of Reporoa.
    b. For each of the events, what is the approximate time to loss of supply at the Taupo gas gate (assuming peak demand)?
    c. For each of the events, would curtailment of demand under the CCM Regulations have a material impact on time to loss of supply to Taupo?
2. If the Taupo section of the transmission system is operated at less than 10 barg what is the impact on a. to c. above?

2.0 BACKGROUND

2.1 Regulatory and operational context

Critical Contingency Management
The purpose of the CCM Regs is "to achieve the effective management of critical gas outages and other security of supply contingencies without compromising long-term security of supply."

The CCM Regulations relate to the operation and function of the transmission system. The Transmission system operates between 20 barg to 86 barg. Distribution systems operate up to a maximum of 20 barg.

The principle of the Regulations is to prevent pressure in the transmission system dropping below a point where the supply to distribution networks would be compromised and/or operation of the transmission system would be compromised.

Transmission Pipeline System
A nominal minimum pressure of 30 barg has been set at a number of points on the transmission system. The logic of this is to allow for a pressure differential across a delivery point to ensure that 20 barg can be maintained at the inlet to the distribution network.

In addition, main line valves (MLVs) on the Transmission system are designed to automatically isolate pipeline sections when pipeline failure occurs. MLVs are positioned at maximum intervals of 32 kilometres throughout the length of the gas transmission system and are typically set to close if the pressure at the MLV drops to 25 barg. It is important to maintain a pressure above this level to prevent a MLV closing unnecessarily.

Gas Distribution System
The majority of Firstgas distribution networks are operated below a "start pressure" of 20 bar. The significant majority of Firstgas distribution networks operate at 4 barg. (Ref: FGL Asset Management Plan https://firstgas.co.nz/wp-content/uploads/Firstgas-Distribution-Appendices-FINAL-1.pdf).

Distribution systems do not typically rely on linepack to provide gas for maintaining supply in the event of a failure on the system. Failure of the pipeline between Reporoa and Taupo operating at 10 barg would likely result in the pipeline being isolated and the supply to the downstream networks being significantly compromised. A network sector isolation methodology would need to be applied to safely isolate and recommission the affected network(s).

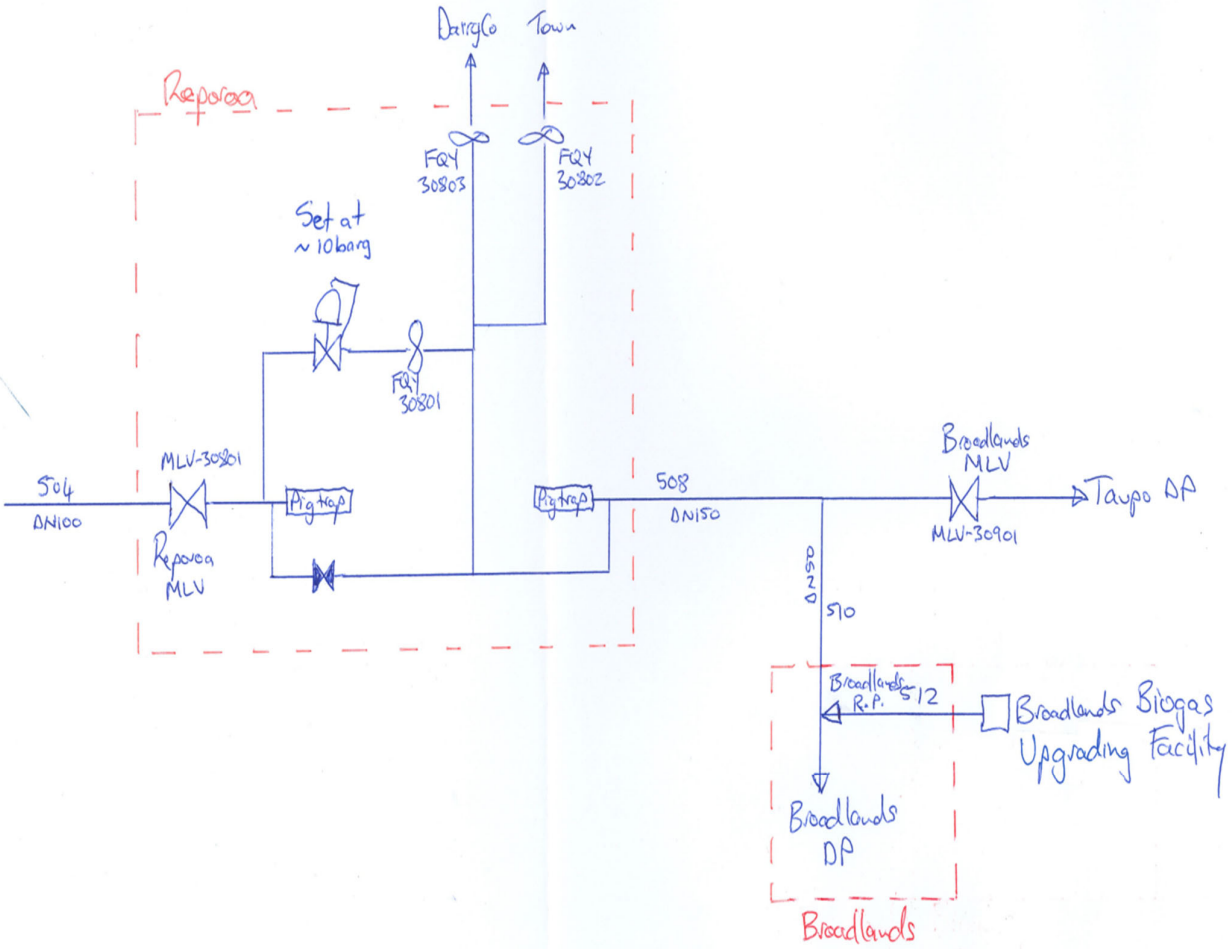
Operating the Transmission pipeline between Reporoa and Taupo at 10 barg means it is effectively operating as a distribution system.

2.2 Additional information from Firstgas

A meeting was arranged with Firstgas to find out more about the biomethane project. A summary of the extra information supplied was as follows:

- The new biomethane plant will be a new receipt interconnection point at Broadlands. The existing Broadlands gas gate will remain a separate delivery interconnection.
- The biomethane plant involves two processes, the first to produce raw biogas and the second to produce biomethane to transmission specification standard.
- Some of the biogas from the first process will be used in its raw state, for example for electricity generation.
- The only consumer at Broadlands is a glasshouse. In future this consumer is expected to use CO2 directly from the biomethane facility so may need little or no gas from the transmission system. Infrastructure will however remain in place so it can continue to use transmission gas if/when required.
- The biomethane plant will convert gas and inject it into the transmission system after other uses, such as electricity generation and direct use of the raw biogas, have been met.
- The inlet pressure to Reporoa gas gate will remain unchanged and will continue to be linked to the SCADA system.
- The reduction in pressure down to 10 barg occurs immediately after the inlet at Reporoa. All the system downstream from here (the Reporoa gas gate including the dairy factory, Broadlands gas gate and Taupo gas gate) will operate at 10 barg, with the failure point considered to be 6 barg.
- No gas will be able to go upstream of the point at Reporoa where pressure reduction occurs down to 10 barg.

After the meeting Firstgas also provided the following diagram:


Dargaville Town
Reporoa
FQY 30803
FQY 30802
Set at ~10barg
FQY 30801
MLV-30801
504
DN100
Pig trap
Reporoa MLV
Pig trap
508
DN150
Broadlands MLV
MLV-30901
Taupo DP
DN250
510
Broadlands R.P.
512
Broadlands Biogas Upgrading Facility
Broadlands DP
Broadlands

3.0 MODELLING APPROACH

3.1 Methodology

Two types of modelling were undertaken.

Initially the focus was on the effect of removing Taupo from being a CC threshold point. A set of scenarios covering the whole Bay of Plenty system were computed using a basic 'panhandle' model to consider the impact on a possible CC declaration.

However, it became clear that Reporoa would continue to be a CC threshold point which, for scenarios upstream of Reporoa, would act as a reasonable proxy for CC declarations without any significant impact on the timing of an event declaration. For events downstream of Reporoa no event would be triggered and the CCM Regulations would never be used.

The project focus therefore switched to consideration of the linepack lost on the pipeline between Reporoa and Taupo, resulting from the reduction in operating pressure from approximately 60 barg to 10 barg. For each scenario the part of the system that would effectively become an isolated bottle was determined, the linepack that would be available for the response and the load that would be dependent on the isolated bottle. This made it possible to calculate survival times without any curtailment, with a band 3 curtailment and with a band 3-6 curtailment.

3.2 Scenarios

Scenarios have been limited to the Bay of Plenty system. Scenarios located elsewhere on the system are not expected to raise any additional risks or issues.

Two sets of scenarios were considered. The first set were considered with regard to the triggering of CC thresholds. There is a scenario for each main section of the Bay of Plenty system as far as Kawerau compressor station. Downstream of Kawerau the Taupo lateral would not be affected by the event and no additional risks or issues would arise. The first table in section 4 outlines each scenario for failure points across the Bay of Plenty.

The second set of scenarios considered relate to the ability of the system to survive an incident with the reduced linepack. The focus was on the relative amounts of linepack available for a response in the current operating mode versus the future operating mode and the implications for managing an event response, measured in relative survival times. The scenarios are focused on the Taupo lateral. There would also be an effect on upstream events, but the amount of linepack lost would remain static for all upstream scenarios and the impact on survival times would vary greatly on the scenario, such that calculating the upstream scenarios would add little value.

3.3 Assumptions/Inputs

The pipeline data (length and diameter) used for modelling is shown in appendix A.

Under current operating practices the pipeline lateral between the Rotorua/Taupo offtake and the Taupo gas gate typically operates at or near 60 barg.

It is assumed that consumers at Reporoa, Broadlands and Taupo will be curtailed under the CCM Regulations, regardless of whether these gas gates are using transmission gas from upstream of Reporoa or not, at the time of the event.

Our modelling assumes NIL injection of treated biomethane at the new Broadlands receipt point.

The scenarios have all been considered as if they are 'absolute' breaches of the pipeline such that the downstream section must be isolated and becomes a bottle. Other scenarios that result in reduced flows have not been modelled, they would have longer survival times, depending on the amount the flow is reduced by.

Curtailment data has been taken from the retailer data supplied to the CCO under the CC Regulations.

The failure point of the system under current operation is treated as 30 barg, under future operation it is assumed to be 6 barg downstream of Reporoa.

The scope specified that modelling should be done using a large load. We reviewed daily data for the 3 delivery points for the y/e 31/8/23. The load at Reporoa is dominated by a dairy factory, so we have used a high daily load for Reporoa during a period when the dairy factory was operating. Broadlands is a single user and we have selected a day when they were operating at a large load. Taupo has no band 3 load, and we have a selected a day of weekday winter use.

We have then divided the daily use by 24 hours to create an average hour's load, we haven't tried to create an hourly profile. Taking a simple flat profile approach will either over or underestimate actual load, depending on the timing of an incident.

We have used the retailer data provided to the CCO under the CCM Regulations to approximate the load spread across curtailment bands.

3.4 Limitations

The modelling is limited to static modelling, no dynamic modelling has been undertaken. Dynamic modelling is thought unlikely to alter the overall conclusions of this paper.

Linepack available for response has been calculated by taking the linepack at normal operating pressure and deducting the linepack still in the system at the failure pressure. However, typically a CC event response does not start to occur at normal operating pressure. There will already have been some pressure decay and loss of linepack before a response starts, so the survival times calculated for all scenarios for both current and future states are all overstated.

Curtailment has been assumed to commence immediately and completely. In reality there would be a delay in declaring an incident, a delay in communicating a curtailment and a delay in complying with a curtailment. In this regard the survival hours for the 'with curtailment' calculations are significantly overstated.

4.0 MODELLING OUTCOMES

4.1 The impact of Taupo no longer being a CC threshold trigger

The first set of scenarios were reviewed for the effect of Taupo being removed from schedule 1 as a trigger point for a CC event.

Pipeline Section	Event	Primary Threshold Location Breach	Taupo Affected at Current Pressure	Reporoa Affected at Current Pressure	Taupo Affected at 10Barg
Pokuru to Lichfield	Loss of containment/Pipeline Isolation	Tauranga, Mt Maunganui or Whakatane depending on conditions at the time	Yes	Yes	Yes
	Reduced operating pressure	Tauranga, Mt Maunganui or Whakatane depending on conditions at the time	Yes	Yes	Yes
Lichfield to Rotorua/Taupo Offtake	Loss of containment/Pipeline Isolation	Rotorua or Taupo if isolation is downstream of Kinleith or Whakatane depending on demand conditions at the time	Yes	Yes	Yes
	Reduced operating pressure	Rotorua or Taupo if isolation is downstream of Kinleith, or Whakatane depending on demand conditions at the time	Yes	Yes	Yes
Rotorua/Taupo Offtake to Reporoa	Loss of containment/Pipeline Isolation	Taupo	Yes	Yes	No
	Reduced operating pressure	Taupo	Yes	Yes	No
Rotorua/Taupo Offtake to Kawerau CS	Loss of containment/Pipeline Isolation	Whakatane	No	No	No
	Reduced operating pressure	Whakatane	No	No	No

The Taupo critical contingency pressure threshold could be affected by a pipeline event on the 504 or 508 laterals or the 500 pipeline upstream of the Rotorua/Taupo offtake that reduced or interrupted the supply of gas. Any such event upstream of Reporoa that had the potential to breach the Taupo threshold would also inevitably breach the Reporoa threshold.

Declaration of a critical contingency not only arises from a breach of a pressure threshold but also if a breach is considered inevitable.

Whether the critical contingency pressure threshold on the transmission system is at Reporoa or Taupo has relatively minor implications for the management for a critical contingency affecting this part of the transmission system.

The primary impact is a loss of residual linepack which reduces the overall survival time for the part of the system affected. 38km of pipe at 10 barg instead of 60 barg which could equate to approximately 43,000 scm of gas that would not be available to support managing an event upstream of Reporoa.

Firstgas modelling for a failure of compression at Pokuru during a peak demand week indicates that the rate of change for all the pressure thresholds in the Bay of Plenty system follow a similar gradient. The most rapid decline in pressure occurs at Mt Manganui and Whakatane. The pressure decline at Taupo and Reporoa follows a similar gradient for the first 6 – 8 hours before the pressure levels out due to supply from the Maui pipeline or 200 pipeline. Under this modelled scenario, it is likely that one or more of the other thresholds would be breached before the Taupo or Reporoa pressure thresholds.

Under the scenario of a full isolation of the 500 pipeline between Pokuru and Lichfield meter station. It is likely that the Mt Manganui, Whakatane or Tauranga threshold would breach before the Taupo or Reporoa pressure thresholds.

Under the scenario of a full isolation of the 500 pipeline between Lichfield meter station and Rotorua/Taupo offtake, it is likely that the Rotorua or Whakatane threshold would breach before the Taupo or Reporoa pressure thresholds.

Full isolation of the 500 pipeline downstream of the Rotorua/Taupo Offtake towards Kawerau Compressor station would have no impact on the Taupo or Reporoa pressure thresholds.

4.2 The impact of lower linepack on the Taupo lateral

The second set of scenarios were reviewed for the effect on survival time of incidents in various locations, if the Reporoa to Taupo section of the 504 pipeline was operated at 10 barg instead of 60 barg.

Event Location	Isolation Points	Linepack available	Result	Max Linepack Available (scm)	
				60 – 30 barg	**10 – 6 barg**
Broadlands MLV to Taupo	Broadlands MLV and Taupo gas gate.	None.	Taupo isolated with no bottle available. Broadlands gas gate and Reporoa still supplied via the 504 Lateral.	Nil	Nil
Reporoa to Broadlands MLV	Reporoa MLV and Broadlands MLV	Broadlands MLV to Taupo	Broadlands DP isolated with no bottle available. Reporoa would need a person at site to isolate it from the 508Lat to allow Reporoa DP to be supplied from the 504Lat. Taupo supplied from the bottle between Broadlands MLV to Taupo.	13,919	1,467
Rotorua Taupo Offtake to Reporoa	Rotorua Taupo Offtake 504 Lateral MLV and Reporoa MLV	Reporoa to Taupo	Reporoa, Broadlands DP, and Taupo all supplied from the bottle between Reporoa MLV and Taupo	27,346	2,882
Earthquake Flat MLV to Ash Pit Road MLV	Earthquake Flat MLV Ash Pit Road MLV Rotorua Taupo Offtake 503 Lateral MLV Rotorua Taupo Offtake 504 Lateral MLV	Rotorua/Taupo offtake to Taupo	Reporoa, Broadlands DP, and Taupo all supplied from the bottle between Rotorua Taupo Offtake MLV and Taupo	33,032	8,568

Event Location	Isolation Points	Linepack available	Result	Max Linepack Available (scm)	
Downstream of Ash Pit Road MLV	Ash Pit Road MLV	None required for 504Lat and 508Lat	Reporoa, Broadlands DP, and Taupo all continue to be supplied from the 500Line and 504Lat	Not affected	Not affected
Upstream of Earthquake Flat MLV	Earthquake Flat MLV	All 500 Line and 500 Laterals downstream of Earthquake Flat MLV.	Curtailment as per current situation. Note: 508 Lateral being reduced to 10barg removes the 508Lat line pack from the whole scenario	As per current situation	Available linepack reduced by up to 43,000 scm.

Survival time (hours)

			current state - 60 barg down to 30 barg			future state - 10 barg down to 6 barg		
Incident location	Linepack available	Dependent Delivery Points	No curtailment	With Curtailment (Band 3 only)	With Curtailment (Band 3 to 6)	No curtailment	With Curtailment (Band 3 only)	With Curtailment (Band 3 to 6)
Reporoa to Broadlands MLV	Broadlands MLV to Taupo	Taupo	21	21	41	2	2	4
Rotorua Taupo Offtake to Reporoa MLV	Reporoa to Taupo	Taupo, Broadlands + Reporoa	8	39	75	1	4	8
Earthquake Flat MLV to Ash Pit Road MLV	Rotorua/Taupo offtake to Taupo	Taupo, Broadlands + Reporoa	10	47	90	2	12	23

The area shaded grey on the table has been computed for completeness but could be considered non-sensical. In the future state a CC event for the first scenario would not be triggered and no CC curtailment would occur.

4.3 The impact of biomethane injection

The biomethane will be injected into the system at a new, separate receipt point close to the current Broadlands gas gate. The gas will be available to supply load at Taupo, Broadlands or Reporoa, but not upstream of Reporoa, as it won't be able to pass the location where the pressure reduction from transmission down to 10 barg occurs.

There is no information at present about how much biomethane will be injected, or how often the plant will be operating, so doing any quantifiable modelling is not possible. We understand that even when biogas is being produced not all of it will be turned into transmission specification gas and injected into the transmission system. Some will be used for other purposes as untreated biogas, and some will be used to produce electricity. The engineering solution has been built to manage treated biomethane being anywhere between 0% and 100 % of the transmission gas load on the Reporoa to Taupo lateral.

At 0% of the transmission gas usage on the Reporoa/Taupo lateral, the effect on survival times will be NIL.

At 50% of the transmission gas usage on the Reporoa/Taupo lateral, the survival times will be doubled for the cases of a pipeline incident occurring upstream of Reporoa.

At 100% of the transmission gas usage on the Reporoa/Taupo lateral, the survival times will become indefinite, providing the incident location hasn't isolated any consumer demand from the Broadlands receipt point. Biomethane will only be available to assist in mitigation of an incident upstream of Reporoa.

4.4 Sensitivity to key assumptions

4.4.1 No band 3 load

The band 3 load in this part of the system consists of two consumers, a dairy factory at Reporoa and a glasshouse at Broadlands. In our modelling we have assumed that both are at high load. It could still be a high use day in Taupo, but with the dairy factory off and the glasshouse either off or not requiring transmission gas. We have therefore modelled this scenario of there being no band 3 load.

The linepack available for response remains unchanged.

Survival time (hours) without band 3 load

Incident location	Linepack available	Dependent Delivery Points	current state - 60 barg down to 30 barg			future state - 10 barg down to 6 barg		
			No curtailment	With Curtailment (Band 3 only)	With Curtailment (Band 3 to 6)	No curtailment	With Curtailment (Band 3 only)	With Curtailment (Band 3 to 6)
Reporoa to Broadlands MLV	Broadlands MLV to Taupo	Taupo	21	21	41	2	2	4
Rotorua Taupo Offtake to Reporoa MLV	Reporoa to Taupo	Taupo, Broadlands + Reporoa	19	19	37	2	2	4
Earthquake Flat MLV to Ash Pit Road MLV	Rotorua/Taupo offtake to Taupo	Taupo, Broadlands + Reporoa	23	23	45	6	6	12

The first scenario is unchanged as there is no band 3 load at Taupo. For the other scenarios the linepack lasts longer before curtailment because there is less load, but the band 3 curtailment has NIL effect.

4.4.2 Lower current state failure point

There was considerable discussion about whether our modelling should assume 30barg or 6 barg as the point of failure for the current state scenario. We have therefore modelled the alternate state using 6 barg as the failure point, for comparison, although there is doubt that this is a valid scenario.

This alternate scenario greatly increases the linepack available in the current state, therefore increasing the survival hours. The future state remains unchanged.

Linepack available for response (SCM) with 6 barg as current failure point

Incident location	Linepack available	current state - 60 barg down to 6 barg	future state - 10 barg down to 6 barg
Reporoa to Broadlands MLV	Broadlands MLV to Taupo	23,280	1,467
Rotorua Taupo Offtake to Reporoa MLV	Reporoa to Taupo	45,736	2,882
Earthquake Flat MLV to Ash Pit Road MLV	Rotorua/Taupo offtake to Taupo	55,246	12,392

Survival time (hours) with 6 barg as the current failure point

Incident location	Linepack available	Dependent Delivery Points	current state - 60 barg down to 6 barg			future state - 10 barg down to 6 barg		
			No curtailment	With Curtailment (Band 3 only)	With Curtailment (Band 3 to 6)	No curtailment	With Curtailment (Band 3 only)	With Curtailment (Band 3 to 6)
Reporoa to Broadlands MLV	Broadlands MLV to Taupo	Taupo	35	35	68	2	2	4
Rotorua Taupo Offtake to Reporoa MLV	Reporoa to Taupo	Taupo, Broadlands + Reporoa	13	65	125	1	4	8
Earthquake Flat MLV to Ash Pit Road MLV	Rotorua/Taupo offtake to Taupo	Taupo, Broadlands + Reporoa	16	78	151	4	18	34

5.0 INTERPRETATION OF THE RESULTS

5.1 Taupo and Broadlands no longer CC trigger points

Taupo will need to be removed from Schedule 1 of the CCM Regulations, so that it is not a specified threshold in the CCMP with its own range of times/pressures, but it will also need to be removed from the definition of “any other gas gate”.

Broadlands will also need to be excluded from the CCM Regulations (currently caught within the definition of “any other gas gate” with a Critical Contingency threshold of 5 hours to 30 barg.)

Reporoa will continue to be included in the regulatory definition of “any other gas gate”. Under the current CCMP this has a threshold of 5hrs to 30 barg, the same threshold that is currently set for Taupo. If Taupo and Broadlands are removed from the CCM Regulations as trigger points for a CC event, effectively Reporoa will become the CC trigger point for this part of the system.

For the system upstream of Reporoa the Reporoa gas gate will act as a good proxy for the Taupo threshold point triggering any event that the Taupo or Broadlands points might have triggered. The removal of Broadlands and Taupo as CC threshold triggers for the declaration of a CC event will therefore have minimum effect on the effectiveness of the CCM Regulations.

However, for any event downstream of Reporoa there will be no CC threshold point to trigger a CC event. Therefore, the CCM Regulations cannot be used to manage an event and, in particular, cannot be used to curtail load. Firstgas also own the distribution system at Taupo and Broadlands. They will have to rely on their distribution emergency management plan and their Use of System Agreements with the gas retailers for the management of any event downstream of Reporoa.

It is worth being aware that the transmission pipeline between Reporoa and Taupo is approximately 38km long, so it is not an insignificant amount of transmission pipeline that will not be protected under the CCM Regulations as a consequence of this change.

5.2 Operation of Reporoa to Taupo pipeline at lower pressure

In the current operating mode, the lateral from Reporoa to Taupo typically has an operating pressure of approximately 60 barg. In the future state First Gas plan to operate it at 10barg. Firstgas advise that the minimum operating pressure at which it will fail would be 6barg. This would significantly reduce linepack in this part of the system leaving minimal gas for managing an incident by approximately 90%.

For example, the proposed change in pressure would change the survival times from 21 hours to 2 hours for the Taupo gas gate without any curtailment, if there was an incident between Reporoa and Broadlands.

This risk is mitigated by the fact that there would be the potential for additional supply from the new biogas plant, but we are not able to quantify this. There is no data available

on what volumes of biogas might be produced, of this what volumes will be converted into transmission pipeline specification gas and injected into the pipeline or what the plant availability is likely to be. (For example, will it be operated 24/7, 7 days a week?). Also, it would only be available to assist if the incident was upstream of the Reporoa MLV.

The use of untreated biogas might also displace the need for some transmission pipeline gas so that future loads are lower, but again we have no data on this.

6.0 CONCLUSION

Firstgas considers that the Taupo gas gate can be removed as a point of measurement in Schedule 1 of the CCM Regulations without a material impact on the purpose of the Regulations. This is based on the following:

> An event upstream of the Reporoa gas gate would result in a critical contingency being declared at another point of measurement prior to the minimum operating pressure at Taupo being met. The injection of biomethane at Broadlands will provide additional system resilience for the Taupo section of the transmission system.
>
> An event downstream of the Reporoa delivery point is unlikely to have a materially different impact if this section of the system is operated at lower pressure as there is little gas available at all operating pressures.

P&P has concluded that, for events upstream of Reporoa:

- Reporoa will become the new trigger point for any CC events affecting that part of the system. This will be a reasonable proxy for Taupo and removing Taupo and Broadlands from being a CC trigger under the CCM Regulations will have minimal impact on the timing of the declaration of an event.
- The amount of linepack available for any response to the part of the system affected will be reduced by up to 43,000 scm.
- Biomethane production at Broadlands could be used to assist in mitigating any security of supply risk for Reporoa, Broadlands, and Taupo gas gates, but only if the incident is upstream of the Reporoa MLV.

For events downstream of Reporoa:

- No CC event will be triggered and the CCM Regulations will not be able to be used to manage any events on the 38km of transmission pipeline between Reporoa and Taupo.
- The amount of linepack available for any response to an event on the Reporoa to Taupo pipeline will be significantly diminished.

It should be noted that the survival times assessed in this report are considered non-conservative as the analysis assumes:

- A CC is declared with the transmission network at 60barg (i.e. no gas / pressure lost in the time taken to declare and respond).
- Curtailment occurs immediately (i.e. no gas / pressure is lost in the time taken to contact gas users and in their time to turn off).

APPENDICES

APPENDIX A – MODELLING INPUTS

Pipeline Segment		Length	Nominal Diameter
From	**To**	**(m)**	**(m)**
Pokuru CS	Kihikihi DP	11300	0.300
Kihikihi DP	Waikeria DP	6300	0.300
Waikeria DP	Parawera Rd MLV	3300	0.300
Parawera Rd MLV	Arapuni West MLV	20200	0.300
Arapuni West MLV	Arapuni East MLV	500	0.300
Arapuni East MLV	Lichfield MS	12800	0.300
Lichfield MS	Lichfield MLV	5000	0.300
Lichfield MLV	Lichfield DP	1700	0.300
Lichfield DP	Tokaroa DP	10900	0.300
Tokaroa DP	Kinleith DP	6800	0.300
Kinleith DP	Rahui MLV	1500	0.200
Rahui MLV	Nicholson Rd MLV	15400	0.200
Nicholson Rd MLV	Earthquake Flat Rd MLV	12300	0.200
Earthquake Flat Rd MLV	Rotorua Taupo OT	2600	0.200
Rotorua Taupo OT	Rainbow Mt DP	6200	0.200
Rainbow Mt DP	Ash Pit Rd MLV	9800	0.200
Ash Pit Rd MLV	Ngamotu Rd MLV	15400	0.200
Ngamotu Rd MLV	McKee Rd MLV	10800	0.200
McKee Rd MLV	Gisborne OT	10800	0.200
Gisborne OT	Kawarau CS	100	0.200
Kawarau CS	Ruatoki North MLV	27900	0.100
Ruatoki North MLV	Burnett Rd MLV	17800	0.100
Burnett Rd MLV	Opotiki MLV / OT	20700	0.100
Opotiki MLV / OT	Oponae SS / MLV	26300	0.100
Oponae SS / MLV	Trafford Hill MLV	23700	0.100
Trafford Hill MLV	Oliver Rd MLV	23600	0.100
Oliver Rd MLV	Waihuka MLV	24000	0.100
Waihuka MLV	Kaitaratahi SS / MLV	19900	0.100
Kaitaratahi SS / MLV	Gisborne DP	17300	0.200
Lichfield MS	Putaruru DP	4400	0.150
Putaruru DP	Heatherington Rd MLV	9700	0.150
Heatherington Rd MLV	Okoroire DP	3400	0.100
Okoroire DP	Kaimai Summit SS	16800	0.150

Kaimai Summit SS	Tauriko DP	22000	0.100
Tauriko DP	Pyes Pa MLV	4000	0.100
Pyes Pa MLV	Mt Maunganui OT	17700	0.100
Mt Maunganui OT	Papamoa DP	2500	0.100
Papamoa DP	Te Puke DP	10800	0.100
Te Puke DP	Rangiuru DP	8300	0.080
Heatherington Rd MLV	Tirau DP	2000	0.080
Tauriko DP	Pyes Pa DP	1300	0.100
Pyes Pa DP	Tauranga DP	6600	0.100
Mt Maunganui OT	Mt Maunganui DP	4900	0.080
Rotorua Taupo OT	Rotorua DP	18000	0.080
Rotorua Taupo OT	Reparoa DP	18200	0.100
Reparoa DP	Broadlands DP	9600	0.150
Broadlands DP	Broadlands MLV	9500	0.150
Broadlsnds MLV	Taupo DP	19800	0.150
Gisborne OT	Kawerau DP	4900	0.300
Kawerau DP	Te Teko DP	9300	0.100
Te Teko DP	Edgecumbe DP	9500	0.100
Edgecumbe DP	Whakatane DP	13700	0.100
Opotiki MLV / OT	Opotiki DP	4400	0.080