Standard Operating Procedure

GTAC Pipeline Balancing and Line Pack Management

September 2018

Last Updated: 21 September 2018

First Gas Limited

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1. Overview

1.1. Introduction

This document sets out the current Standard Operating Procedures (SOP) describing how First Gas will manage Pipeline Balancing and Line Pack and outlines the actions that First Gas, Shippers and OBA Parties must take to help meet their balancing obligation under the GTAC. A copy of this document will be available on OATIS at all times. This SOP is a living document and accordingly may be updated and republished from time to time.

1.2. Definitions

Definitions used in this SOP have the meaning set out in the GTAC, unless otherwise stated.

1.3. Critical Contingency

First Gas is subject to the provisions of the Gas Governance (Critical Contingency Management) Regulations 2008 ("the Regulations"). Instructions from the Critical Contingency Operator (CCO) will take precedence over this SOP.

Please also note that, during a Critical Contingency (CC) First Gas may not act as contemplated or as provided for by this Standard Operating Procedure. This may be for a number of reasons, including circumstances affecting specific locations on the Transmission System or where multiple adverse events are occurring.

Section 45 of the Regulations defines the concept of a "regional" CC. Under the Regulations a CC is designated as being "regional" in the event of:

a. a substantial reduction to, or total loss of, the supply of gas to a part of the Transmission System; and

b. complete or partial isolation of that part of the Transmission System from any significant source of gas supply.

When the CCO declares a CC it will provide guidance in the declaration notice as to whether the CC constitutes a Regional Critical Contingency, or otherwise.

Whether a CC event is determined to be "regional" or not by the CCO will impact the operational response taken by First Gas pursuant to the GTAC and applicable SOPs.

1.4. Changes to this SOP

First Gas may amend and update this operational SOP from time to time due to operational changes. First Gas will give 30 Business Days' notice of any SOP changes to all Parties. A draft will be published on OATIS. All Shippers and OBA Parties will be welcome to comment on this draft. First Gas will consider any comments prior to publishing a Final revised SOP at the end of the 30 day notice period.

2. Capacity Check

2.1. Capacity Check

At each nomination cycle First Gas will complete a capacity check in relation to the proposed Delivery Zone/Delivery Point NQs. This capacity check will be modelled and automatically processed by OATIS.

All receipt point nominations and delivery point nominations where there is an OBA will be approved, curtailed or rejected by the relevant Interconnected Party. For all non-OBA receipt points, the Interconnected Party may confirm the nomination. If the Interconnected Party does not confirm the nomination within the time allowed, it will be assumed to be approved. First Gas will perform its capacity check after this confirmation.

The result of each capacity check must be 'pass' before the nominated capacity can be approved by First Gas.

The capacity check ensures that nominated delivery capacity does not exceed the operational capacity and that First Gas can provide the requested capacity without breaching operational limits, such as the Target Taranaki Pressure (TTP). The capacity check will include analysis of Agreed Hourly Profiles submitted by shippers on behalf of users with "peaky loads".

If the capacity check is not able to produce a 'pass' result even by altering relevant operational conditions, it will automatically initiate a process to curtail nominated capacity in the appropriate zone to the point where the capacity check can achieve a 'pass' result.

2.1.1. Capacity Check Curtailment Process

The Capacity Check Curtailment process is outlined in the Curtailment SOP. Please refer to this document for details.

3. Line Pack Composition

The Line Pack is defined as the total quantity of gas held in a defined section of pipeline, at any time and is a product of temperature, pressure, pipeline volume etc. It should be noted that the largest pipeline volume on the First Gas Transmission System is in the large diameter 400 pipeline between Oaonui and Huntly Offtake. This section of pipeline therefore creates a large portion of Transmission System flexibility. This SOP relates to the management of the Line Pack in the Oaonui to Huntly Offtake section of the 400 pipeline, not the rest of the Transmission System.

However, First Gas will publish on OATIS Upper and Lower Line Pack limits for all sections of the Transmission System.

The 400 pipeline Line Pack is made up of the following components (refer to Figure 1 for a graphical representation of the Line Pack composition):

- **Flow Line Pack**

  Gas required to fill the pipeline to minimum pressure, and to create a pressure gradient to flow the nominated quantities.

- **Shutdown Quantities**

  The quantity of gas required by End-users to shut down their plants with minimal risk of damage to that plant, supplied to First Gas by Shippers as per section 9.6 of the GTAC.

- **Emergency Line Pack**

  An amount of gas that is available for use in a major pipeline emergency, or major producer outage.

- **Base Tolerance**

  This is the system wide tolerance available at all times to cover Shipper and OBA Party Running Mismatches.

- **Additional Tolerance**

  A tolerance above and below the Base Tolerance, which normally becomes available when the Mokau Compressor Station is running.

  When the Mokau Compressor Station is running, Additional Tolerance of 20 TJ will normally be available to allow for extra flexibility for use by Shippers and OBA Parties to accommodate Running Mismatches.

  Running the Mokau Compressor Station also increases the Emergency Line Pack held in the 400 pipeline. Increasing the Emergency Line Pack reduces the security of supply risk in the event of a large producer(s) trip and unplanned outages. Refer to Figure 1: Line Pack Composition..

- **Overall Tolerance**

  The aggregate of Base Tolerance and Additional Tolerance

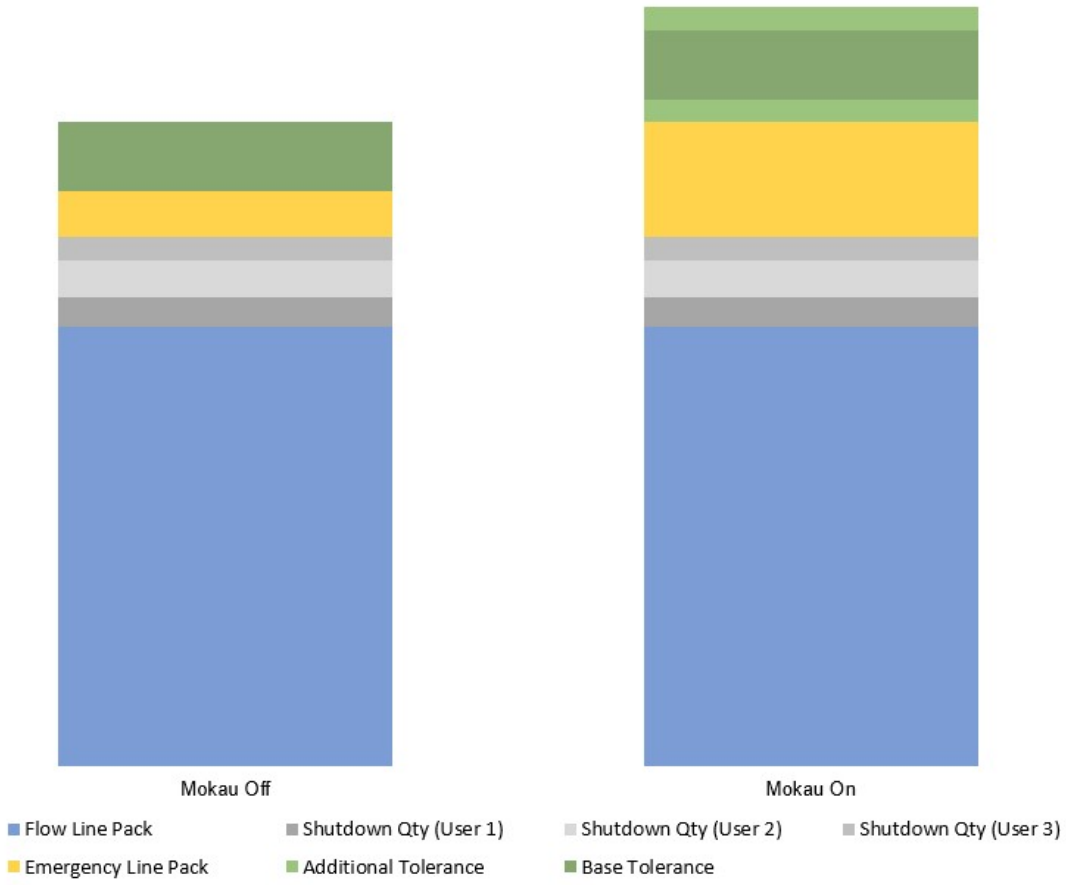

Figure 1: Line Pack Composition

3.1. Target Line Pack and Available Line Pack Tolerances

3.1.1. Overall System Tolerances

The 400 pipeline will be operated under either one of the following two configurations:

- Mokau Compressor Station On
- Mokau Compressor Station Off

The overall tolerance limits available for the 400 pipeline differ depending whether the Mokau Compressor Station is running. These limits are outlined in Table 1 below:

Table 1: Overall Tolerance Limits

Tolerance/Limit Type	Mokau Off	Mokau On
Overall Tolerance	30 TJ	50 TJ
Lower Line Pack Limit	250 TJ	280 TJ
Upper Line Pack Limit	280 TJ	330 TJ

When determining the Transmission System tolerances, the upper and lower TTP limits were considered, along with the Mokau Compressor Station turndown capability.

The Overall Tolerance is the amount available under GTAC for Running Mismatch Tolerance. This is allocated to individual Shipper and OBA Parties as per section 1.1 of the GTAC and section 3.1.3.

Shippers and OBA Parties will have access in OATIS to view their estimated current Running Mismatch (RM) position and their estimated forecast end of Day RM positions. This OATIS data will be produced by considering hourly flow data (including expected Shipper allocations at given points, using the default rule if necessary as per section 6.11 of the GTAC), nominations and predicted flow through to the end of the Day.

First Gas will use the estimated current RM positions and estimated forecast end of Day RM position data for Shippers and OBA Parties when carrying out actions as per section 4.2

3.1.2. Target Line Pack

First Gas will endeavour to manage the Line Pack in the 400 pipeline to the targets shown in Table 2 below and as shown in the graph in section 4.1.

Table 2: Target Line Pack Quantities

Line Pack Type	Mokau Off	Mokau On
Target Line Pack	265 TJ	305 TJ

3.1.3. Allocation of Running Mismatch Tolerance

This section describes how Overall Tolerance is divided between receipts and deliveries. The Overall Tolerance is spread across the Target Line Pack to give positive and negative flexibility around this central point. Hence the Overall Tolerance is divided by 2 to give the amount of Tolerance that can be allocated across receipts and deliveries on the system. Receipts into and deliveries out of the system receive an equal amount of tolerance. This is shown in Figure 2 below.

Figure 2: Allocation of Overall Tolerance through to Receipts and Deliveries

The allocation through to receipts and deliveries is shown in Table 3 below using the Overall Tolerance given in Table 1. First Gas will publish this information on OATIS as required.

Table 3: Allocation of Receipt and Delivery Line Pack Tolerance

Tolerance/Limit Type	Mokau Off	Mokau On
Overall Tolerance	30 TJ	50 TJ
Positive/Negative Tolerance	15 TJ	25 TJ
Receipt Line Pack Tolerance ($LPT_{RECEIPTS}$)	7.5 TJ	12.5 TJ
Delivery Line Pack Tolerance ($LPT_{DELIVERIES}$)	7.5 TJ	12.5 TJ

The allocation of Running Mismatch Tolerance (RM Tolerance) between individual Shippers and OBA Parties is described in the definition of RM Tolerance in section 1.1 of the GTAC. This is a dynamic allocation of tolerance based on the Shipper and OBA Party's proportion of flow on a day. There is a minimum allocation of 400 GJ. This information will be published on OATIS by First Gas.

4. Line Pack Management and Balancing Gas Actions

4.1. Line Pack Management

GTAC defines the Primary Balancing Obligations for First Gas, Shipper and OBA Parties in section 8. These obligations mean that Shipper and OBA Parties must minimise their RM. First Gas must also minimise its RM by ensuring they have purchased enough gas for operational purposes (e.g. UFG and fuel).

Due to these Primary Balancing Obligation requirements, First Gas will generally not buy or sell balancing gas to correct Shipper or OBA Party RM, unless it is becoming apparent that a breach of the Acceptable Line Pack Limits is likely to occur. If a breach of the Acceptable Line Pack Limits is likely to occur, or has occurred, First Gas may buy or sell balancing gas as outlined in section 4.2 of this document. Figure 3 below shows the general concept of Base Tolerance, Additional Tolerance and Acceptable Line Pack Limits.

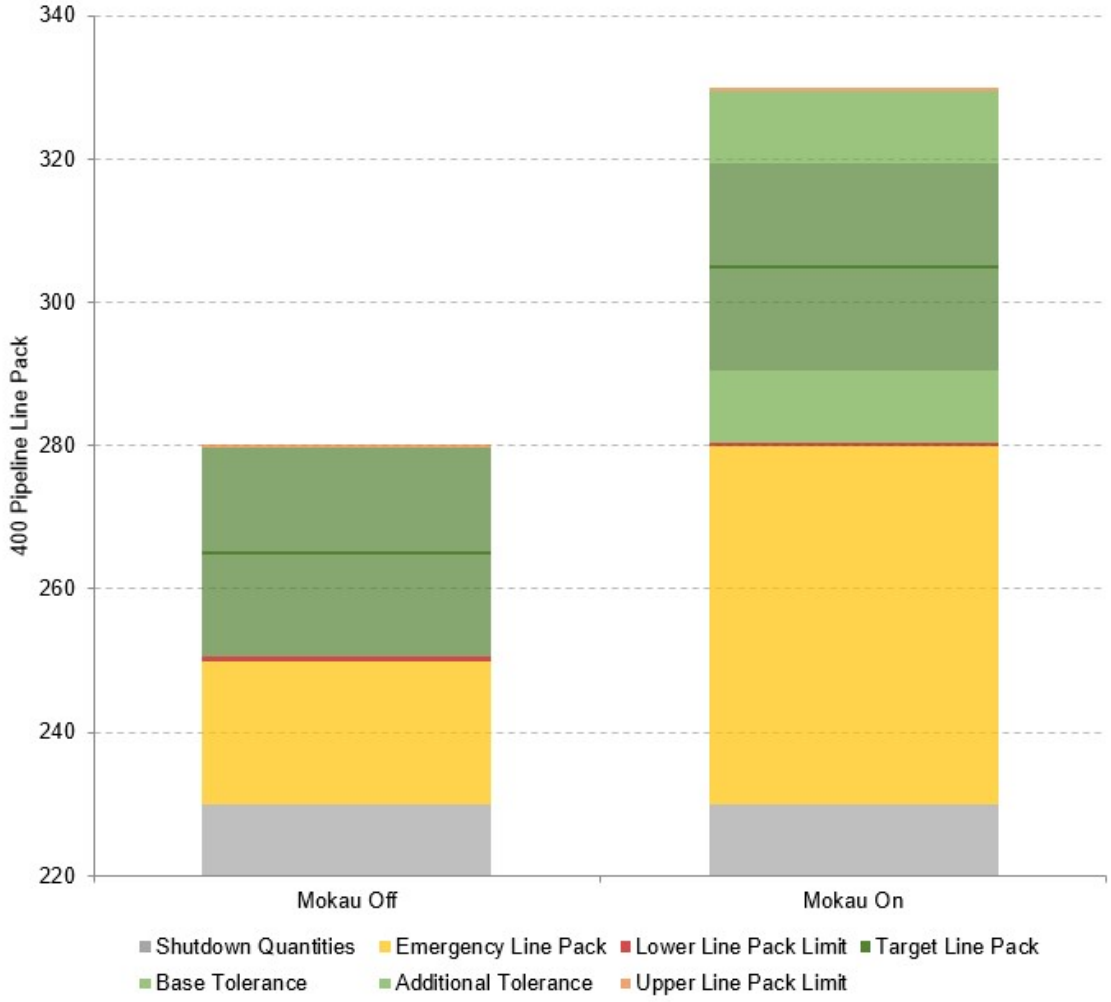

Figure 3: Target Line Pack and Acceptable Line Pack Limits

4.1.1. Acceptable Line Pack Limits and Target Taranaki Pressure

The Acceptable Line Pack Limits are set according to section 8.5 of the GTAC. First Gas will aim to maintain Line Pack between the Upper and Lower Acceptable Line Pack Limits and these limits will be published on OATIS.

Upper Line Pack Limit

The Upper Line Pack Limit is the practical maximum Line Pack, i.e. the point at which a High Line Pack (Breach) Notice will be issued in accordance with section 8.6 of the GTAC.

Lower Line Pack Limit

The Lower Line Pack Limit is the point at which the useable component of Line Pack has reached its practical minimum, i.e. the point at which a Low Line Pack (Breach) Notice will be issued in accordance with section 8.6 of the GTAC.

Target Taranaki Pressure

While Line Pack does not necessarily correlate to TTP, it is recognised that both Line Pack and TTP need to be considered in balancing gas decisions and actions. First Gas will consider TTP limits in all pipeline balancing and Line Pack management decision making. It should also be noted that the Upper and Lower Line Pack Limits are set with consideration given to the TTP limits. This is in line with the requirements relating to TTP in section 3.32 and 8.5 of the GTAC.

What this generally means is that if all parties manage their RM to ensure Acceptable Line Pack Limits are not breached, then a breach of TTP should not occur.

4.2. Balancing Gas Decisions and Actions

Figure 4 shows the Line Pack points where First Gas will consider buying or selling balancing gas. Point A on the figure shows the points at which First Gas will generally issue a High or Low Line Pack (Advisory) notice and Point B shows the Acceptable Line Pack Limits.

A description of these actions and associated notifications is outlined below the figure. While First Gas will issue notices if time allows, First Gas may buy or sell balancing gas prior to issuing a notice. However, First Gas may also buy or sell balancing gas at other times when it believes a breach of Acceptable Line Pack Limits may otherwise occur.

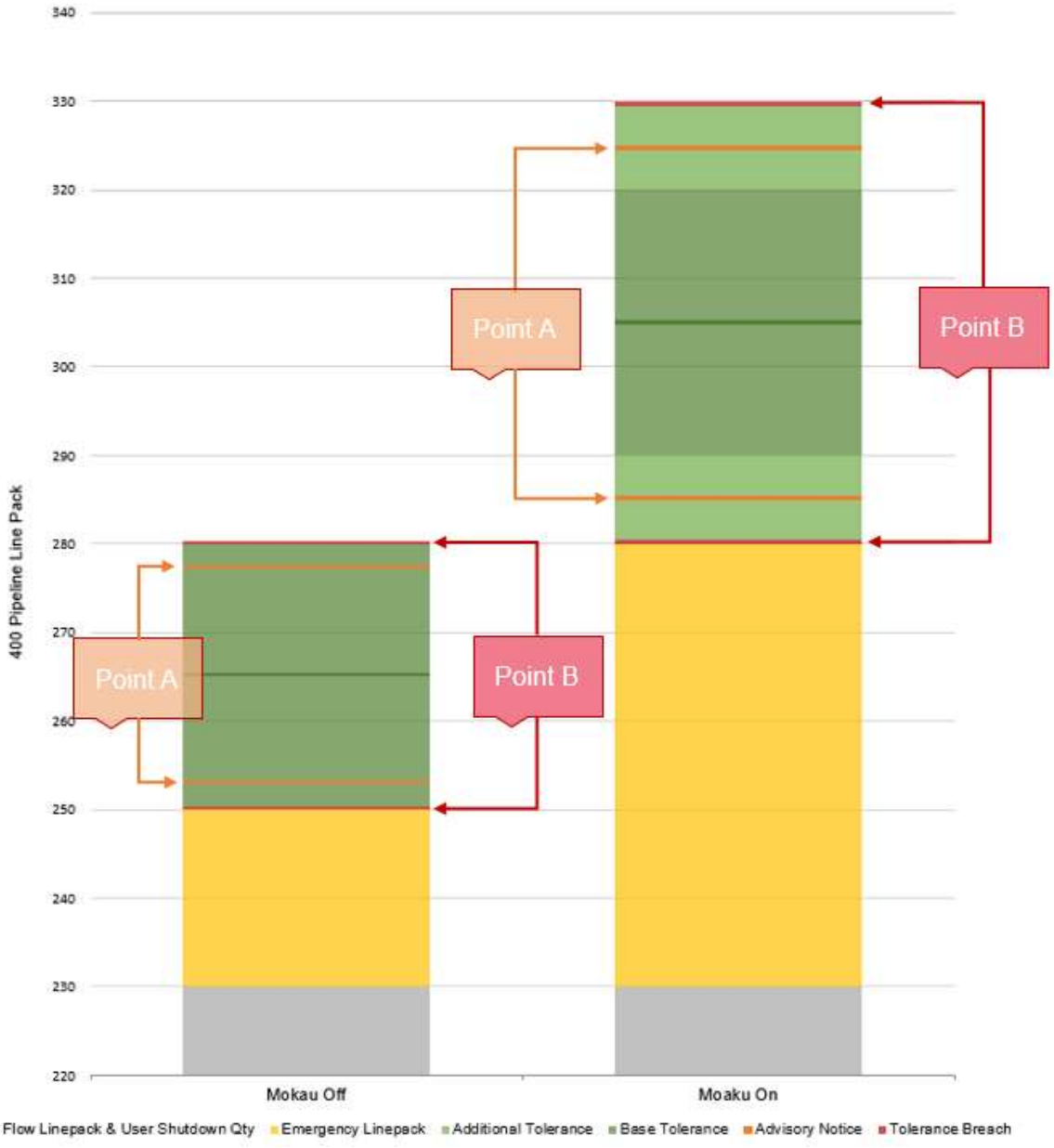

Figure 4: Balancing Gas Decision Points

Point A

If the Line Pack level reaches within 10% of the Overall Tolerance available in the same direction as an Acceptable Line Pack Limit or First Gas believes a breach of an Acceptable Line Pack Limit is likely to occur First Gas will notify Parties by publishing a High or Low Line Pack (Advisory) Notice. This type of notice may also be published if a TTP limit is likely to be breached. This notice is as described in Appendix 1 of this document.

This notice is an advisory notice only and is designed to give Shippers and OBA Parties time to review their RM positions and take corrective action to avoid the likely breach of the Acceptable Line Pack (or TTP) Limits from occurring.

In response to the High or Low Line Pack (Advisory) Notice, the following actions on Shippers, OBA Parties and First Gas should happen concurrently:

- Shippers and OBA Parties will review their estimated current RM positions and their estimated forecast end of Day RM positions, and work to take corrective action to minimise their RM if required.
- First Gas will review all Parties' estimated current RM positions and estimated forecast end of Day RM positions, and Approved Hourly Profiles, and may decide to buy or sell balancing gas if this is considered necessary.

Point B

If the Line Pack has breached the Acceptable Line Pack Limit, First Gas will notify Parties by publishing a High or Low Line Pack (Breach) Notice. This type of notice may also be published if a TTP limit is breached. This notice is as described in Appendix 1 of this document.

In response to the High or Low Line Pack Limit (Breach) Notice, the following actions on Shippers, OBA Parties and First Gas should happen concurrently:

- Shippers and OBA Parties will review their estimated current RM positions and their estimated forecast end of Day RM positions. Shippers and OBA Parties that have breached their RM tolerance allowance, in the direction of the Acceptable Line Pack Limit breached, should decide on an action plan to reduce their RM back to within their allowable tolerance.
- First Gas will:
    1. Review estimated current Running Mismatches on the pipeline in the direction of the Acceptable Line Pack Limit breach, and may contact Parties' whose mismatch is contributing to the Acceptable Line Pack Limit breach in order to understand the Parties intended action plan (in order to avoid both the Party and First Gas taking actions which result in over-correction of the adverse situation).
    2. Review upcoming Approved Hourly Profiles.
    3. Based on considering the outcomes of items 1 and 2 above, First Gas may buy or sell Balancing Gas, as required, to help correct the Line Pack back towards the Target Line Pack.
    4. If the steps above are unsuccessful in correcting the adverse situation, First Gas may also curtail flows in accordance with section 9 of the GTAC and the Curtailment SOP.

4.2.1. Mokau Compressor Operation

First Gas generally operates the Mokau Compressor Station continuously, which increases the Overall Tolerance and the Emergency Line Pack components.

The decision to run Mokau is at the discretion of First Gas.

First Gas may elect to start Mokau (while in a Mokau off situation) in order to assist in alleviating elevated line pack and/or TTP where this is preventing Interconnected Parties from injecting their scheduled quantities. This would be a short-term solution until such time as Parties have corrected

their RM positions. If this was to occur, the Overall Tolerance allocated on the 400 pipeline would remain at the Mokau-off level.

When First Gas makes a planned change from a Mokau-off to Mokau-on position, or Mokau-on to Mokau-off position, First Gas shall post a notice on OATIS 2 Days in advance of the change, and this notice shall specify that the Overall Tolerance Limits are changing. Shippers and OBA Parties are expected to work within the RM Tolerances accordingly.

If Mokau becomes unavailable for unplanned reasons, Overall Tolerance would remain at the Mokau-on level for the remainder of the Day. Any actions required to prevent adverse pipeline conditions developing due to Parties RM positions will be taken as per GTAC section 9, this SOP and the Curtailment SOP.

Appendix 1: Balancing Decision - Notice Templates

High or Low Line Pack (Advisory) Notice Template

Subject: High Line Pack Advisory Notice

The current total of all Parties' Running Mismatch is causing an increase in Line Pack which is likely to cause an Acceptable Line Pack and/or Target Taranaki Pressure Limit breach which may result in a detrimental effect on pipeline capacity and/or Interconnected Parties.

Please review your Running Mismatch position and take corrective action as soon as possible to ensure Transmission System conditions do not deteriorate further.

Subject: Low Line Pack Advisory Notice

The current total of all Parties' Running Mismatch is causing a decrease in Line Pack which is likely to cause an Acceptable Line Pack and/or Target Taranaki Pressure Limit breach which may result in a detrimental effect on pipeline capacity and/or Interconnected Parties.

Please review your Running Mismatch position and take corrective action, as soon as possible, to ensure Transmission System conditions do not deteriorate further.

High or Low Line Pack (Breach) Notice Template

Subject: High Line Pack Breach Notice

We are currently experiencing High Line Pack on the 400 pipeline and the Upper Acceptable Line Pack and/or Target Taranaki Pressure Limit has been breached.

Please immediately review your current Running Mismatch position.

If you have a positive Running Mismatch and you have breached your allowed Running Mismatch Tolerance, please ensure you decide on an action plan to resolve your Running Mismatch Tolerance breach.

Subject: Low Line Pack Breach Notice

We are currently experiencing Low Line Pack on the 400 pipeline and the Lower Acceptable Line Pack and/or Target Taranaki Pressure Limit has been breached.

Please immediately review your current Running Mismatch position.

If you have a negative Running Mismatch and you have breached your allowed Running Mismatch Tolerance, please ensure you decide on an action plan to resolve your Running Mismatch Tolerance breach.