

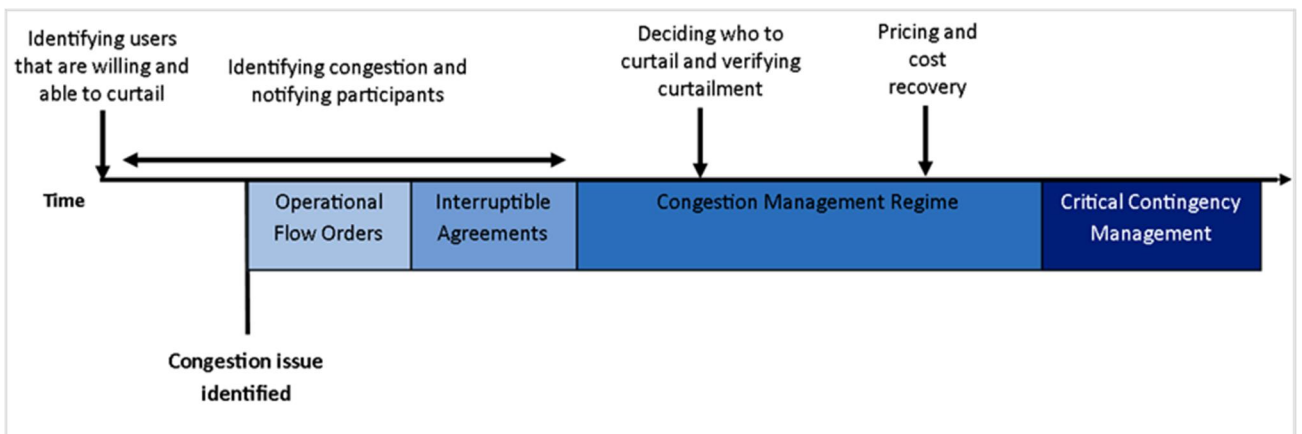
CONGESTION MANAGEMENT STANDARD OPERATING PROCEDURES

PURPOSE OF CONGESTION MANAGEMENT

The purpose of Congestion Management ("CM") is to:

- Define congestion
- Identify when a pipeline is approaching congestion
- Resolve congestion by providing a further means of curtailing offtake from a pipeline, before it becomes necessary to declare a Critical Contingency

The diagram shows where CM "fits" and when it should be invoked.



The sequence of events depicted in the diagram may vary from pipeline to pipeline and from time to time: for example, CM may be invoked sooner if there are no Interruptible Agreements on a congested pipeline.

A Critical Contingency should be seen as the last resort.

STANDARD OPERATING PROCEDURES

CM provides a new way of reducing offtake to \leq Physical Capacity, the aim being to avoid a breach of Vector's Security Standard and (ultimately) a Critical Contingency.

These SOPs are intended as a high-level guide. They rely on certain systems and procedures being in place (mainly) in Gas Control and should reflect Gas Control's normal operating procedures.

The objective is to predict impending congestion and, if practicable, prevent it.

1. SYSTEM MONITORING - GENERAL

- 1.1 For all DPs where inlet pressure is measured, ensure that SCADA low-low pressure alarms are set consistent with the CM Criteria set out in Appendix 2.
- 1.2 Attend to each SCADA pressure alarm, both High-Lows but especially Low-Lows.
- 1.3 Regularly review SCADA pressure vs time trends at all critical DPs, both on the day and over running 2 – 3 day periods. Address questions such as:
 - (a) Is there a diurnal pressure variation?
 - (b) Does the minimum pressure occur at more or less the same time(s) each day?
 - (c) Does pressure recovery occur, and does the maximum pressure occur at more or less the same time(s) each day?
 - (d) Establish the critical DPs on each pipeline, and how this may vary through the year.
- 1.4 Attempt to correlate pressure and hourly offtake at critical DPs. Address such questions as:
 - (a) Is there a clear (inverse) relationship between offtake and inlet pressure?
 - (b) Is there a lag between inlet pressure and offtake?
 - (c) Is the lag more or less constant?
 - (d) Is the pressure at a DP determined mainly by the offtake there, or at other DPs?
 - (e) Can the relationship between pressure and offtake be quantified, e.g. bars per TJ, for increasing and/or decreasing offtake?
- 1.5 Regularly monitor the CCO screen to check T_{MIN} at critical DPs.
- 1.6 In the event that T_{MIN} at a critical DP is $<$ the applicable CM criterion, review available information concerning near-term offtake there and elsewhere on the pipeline (if relevant). Address such questions as:
 - (a) Is current offtake likely to continue, or increase (absent any action by Gas Control)?
 - (b) Is any major end-user (such as a power station) expected to reduce its offtake, e.g. on the basis of their nominations or other information?

- (c) Is the offtake into a major distribution network expected to fall, e.g. after the morning or evening peak?
 - (d) Is the low T_{MIN} the result of a maintenance event (e.g. a compressor outage) or an operational reason? When is that causation expected to be removed, and how quickly will that correct T_{MIN} ?
- 1.7 If there are reasonable grounds for believing that the current negative dP/dt will slow down and that the low T_{MIN} will turn around, no action to curtail load need be taken.
- 1.8 If the prevailing negative dP/dt is expected to continue such that, absent any reduction in offtake, one or more CM criteria will be met, load-curtailement action should be taken, as set out in Section 3 below.
- 1.9 Continue monitoring to check that offtake and pressures “turn” as expected.

2. **PIPELINE SPECIFIC CONSIDERATIONS**

- 2.1 Review key pipeline-specific operating parameters from time to time, for example:

Rotowaro-north pipeline

- (a) Operate compression at Rotowaro to ensure that the Papakura East pressure-reducing station (“PEPRS”) outlet pressure is 66 bar g at all times.
- (b) If the PEPRS outlet pressure falls below 66 bar g even when the discharge pressure at Rotowaro is ≥ 84 bar g, very high system demand is indicated and congestion may occur.

3. **LOAD CURTAILMENT**

Action(s) to curtail load should be taken in the order set out in this section 3.

- 3.1 **Estimate the load reduction required:**

- (a) at the critical DP; or
 - (b) on the critical section of the pipeline,
- in terms of GJ/hour for [X] hours, or GJ/day.

- 3.2 **Check for offtake > contractual MHQ:**

On a pipeline that runs close to congestion at times of peak demand, a Shipper taking more gas than it is entitled to (i.e. exceeding its contractual MHQ) may cause a Low Pressure Event. At present it is only possible to determine this at Single-User DPs on SCADA.

- (a) Are there any such Single-User DPs on the affected pipeline (or section)?
- (b) If so, determine the Shipper’s contractual MHQ (using OATIS, Appendix 3 and current Interruptible Capacity (if any)) at such DPs.
- (c) If current offtake (GJ/hour) > contractual MHQ send the Shipper an OFO, requiring it to reduce offtake to its contractual MHQ.

- (d) Monitor the affected pipeline:
 - (i) is the Shipper complying with the OFO?
 - (ii) if the reduction is not enough to avoid congestion, quantify the additional offtake reduction required, and continue to section 3.3.

3.3 **Curtail Interruptible Load:**

Under the Code, Interruptible Capacity must be curtailed before any Contractual Capacity is affected.

- (a) Are there any Interruptible Agreements on the affected pipeline (or section)?
- (b) If so, curtail IC in accordance with the relevant IUC(s) and/or ISC(s).
- (c) Is such curtailment expected to be sufficient?
 - (i) if yes, monitor the affected pipeline to ensure dP/dt reduces and T_{MIN} increases;
 - (ii) if not, quantify the additional offtake reduction required, and continue to section 3.4.

3.4 **Invoke Congestion Management:**

CM must be implemented in compliance with LCAs and the Code.

- (a) Run LCAMS to:
 - (i) identify End-users (if any) who materially affect pressures on the affected pipeline;
 - (ii) enter the required load reduction (GJ); and
 - (iii) determine the order in which End-users may be called to curtail, and the GJ reduction each can be required to make.
- (b) Issue a Curtailment Notice to each of the End-users (at the End-user contact(s) in LCAMS) as required to make up the total reduction in offtake required, specifying in each case:
 - (i) the Curtailment Start Time (**not > 3 hours** from present time);
 - (ii) the Curtailment End Time; and
 - (iii) the required reduction in hourly offtake (GJ); and/or
 - (iv) the maximum hourly offtake for the duration of the Curtailment.

3.5 A Curtailment Notice must be given as specified in the LCA. (NB: An End-user is required to act on any Curtailment Notice given by telephone and is not to wait for a confirming email.)

3.6 As soon as reasonably practicable after issuing a Curtailment Notice, publish a critical notice on OATIS (copied to all Shippers and with both the Email Alert and SMS Alert

options selected) containing the instructions given to each End-user set out in clause 3.4(b).

3.7 Monitor (if practical) the End-user's compliance:

- (a) If the End-user is supplied from a Single-User DP on SCADA, look for a reduction in offtake;
- (b) If the End-user is supplied from a shared Delivery Point (i.e. a distribution network), look for a reduction in aggregate offtake.

3.8 Monitor the pipeline: is dP/dt reducing and T_{MIN} increasing?

- (a) If yes, continue to monitor carefully as the Curtailment End Time(s) approach;
- (b) If not, issue a Curtailment to further End-users, in the order stipulated by LCAMS. (NB: LCAMS uses historical End-user offtake data. An End-user may be using less than its "benchmark" offtake in LCAMS at the time CM is invoked.)

3.9 If offtake continues to exceed the affected pipeline's Physical Capacity a Critical Contingency may result. The CCMR will then take precedence over CM, and may overrule any instructions previously issued under CM.

4. **MAINTAIN DATA UP TO DATE**

4.1 Develop a process to regularly review and update the data set out in Appendix 3 and Appendix 4.

4.2 Update LCAMs:

- (a) Add and delete LCAs as required (ad hoc).
- (b) Add, delete or amend End-user details (ad hoc).
- (c) Update End-user hourly offtake information (regular process).

4.3 Depending on the design/capabilities of LCAMS, update capacity information from AI modelling to facilitate scenario analysis.

**APPENDIX 1:
DEFINITIONS**

Terms used in these SOPs have the meaning set out in the Table below.

Term	Meaning
<i>CCO</i>	Critical Contingency Operator
<i>CM</i>	Congestion Management
<i>CMO</i>	Congestion Management Operator
<i>CCMR</i>	Critical Contingency Management Regulations (Gas Governance (Critical Contingency Management) Regulations, 2008)
<i>Code</i>	Vector Transmission Code, as updated from time to time
<i>congestion</i>	A state where the aggregate offtake of gas from a pipeline exceeds its Physical Capacity to the extent that, without a reduction in offtake, a breach of one or more CM criteria is likely
<i>Contractual Capacity</i>	The maximum quantity of gas that a Shipper is entitled to take at a DP in an hour or on a day on a firm basis, in relation to Reserved Capacity and/or Supplementary Capacity
<i>Curtailment Notice</i>	The notice issued under an LCA, requiring an End-user to curtail its offtake
<i>Curtailment End Time</i>	The earliest time at which a specific End-user may cease its offtake curtailment
<i>Curtailment Start Time</i>	The latest time by which a specific End-user must have curtailed its offtake
<i>DP</i>	Delivery Point
<i>dP/dt</i>	Rate of change in pressure, expressed as bar/[time unit]
<i>End-user</i>	A gas consumer defined in an LCA who has agreed to curtail its load if required by the CMO
<i>Interruptible Capacity, IC</i>	The non-firm transmission capacity requested by a Shipper under an IUC or ISC that Vector agrees and approves
<i>ISC</i>	Interruptible Shipper Contract
<i>IUC</i>	Interruptible User Contract
<i>LCA</i>	Load Curtailment Agreement, between Vector and a Shipper in respect of one or more End-users, as listed in Appendix 5
<i>LCAMS</i>	Load Curtailment Agreement Management System: the software/system which holds current LCA and End-user information, which the CMO will use to identify which End-users to call, and in what order, when CM is invoked

<i>Low Pressure Event</i>	An event where the inlet pressure at a DP is \leq the relevant CM (or CCMR) criterion set out in Appendix 2
<i>MDQ</i>	Maximum Daily Quantity, usually expressed in GJ
<i>MHQ</i>	Maximum Hourly Quantity: either 1/16 th of Reserved Capacity or as defined in a Supplementary Agreement
<i>Operational Flow Order, or OFO</i>	An instruction pursuant to <i>section 10.2</i> of the Code, requiring a Shipper to reduce its offtake of gas to its Contractual Capacity
<i>Overrun</i>	Unauthorised Overrun Quantity: the GJ of MDQ in excess of a Shipper's Contractual Capacity
<i>Physical Capacity</i>	The maximum quantity of gas that a pipeline can physically transport (i.e. irrespective of Shippers' Contractual Capacity) without a breach of the Security Standard
<i>P_{MIN}</i>	The minimum permissible pressure at the inlet to a DP, as set out in Appendix 2
<i>Reserved Capacity, RC</i>	A Shipper's firm Contractual Capacity as set out on its Tracking Table in OATIS, expressed in units of GJ of MDQ
<i>RPO</i>	Reasonable and Prudent Operator, as defined in the Code, being the standard of performance that Vector is required to achieve in all its gas transmission system operations
<i>Security Standard</i>	Vector's document entitled "Gas Transmission: System Security Standard", which defines (amongst other things) the measures which constitute acceptable transmission system performance
<i>Shipper</i>	A user of Vector's gas transmission system, being a signatory to a Transmission Services Agreement under the Code
<i>Single User DP</i>	A DP that supplies a single end-user: the delivery line from the DP may be owned by the end-user, Vector, or another party
<i>SOPs</i>	These standard operating procedures, as amended from time to time
<i>Supplementary Agreement</i>	A transmission agreement that provides Contractual Capacity for the purposes of supplying gas to a specific end-user or site
<i>T_{MIN}</i>	The projected time for the pressure at a DP to reach P _{MIN} as set out in Appendix 2
<i>UOC</i>	Unallocated Operational Capacity, being that part of the Physical Capacity of a pipeline available to be allocated to Shippers as Contractual Capacity (i.e. maximum physical capacity less "operational reserve")

**APPENDIX 2:
CRITERIA FOR INVOKING CM**

The CMO will invoke CM based on criteria directly analogous to those the CCO uses in relation to a Critical Contingency, namely:

1. **Minimum Pressure (P_{MIN}):** whether the inlet pressure at any DP has reached the permissible minimum; and/or
2. **Time to Minimum Pressure (T_{MIN}):** whether, given the current rate of decline in pressure(s), the permissible minimum pressure at any DP is expected to be reached in ≤ the minimum permissible time.

Because a key objective of CM is to forestall a Critical Contingency, for each DP the P_{MIN} and T_{MIN} criteria for CM must be ≥ the respective CCMR criteria.

The CCMR minimum pressure criteria are expressed as a range, i.e. value ± X. The CM P_{MIN} criteria have therefore been set at the upper limit of the CCMR range in each case; the CM T_{MIN} criteria have been taken from Vector’s Security Standard.

Delivery Point	CM CRITERIA		CCMR CRITERIA	
	Minimum DP Inlet Pressure	Minimum Time to Minimum Inlet Pressure	Minimum DP Inlet Pressure	Minimum Time to Minimum Inlet Pressure
	(P _{MIN} , bar g)	(T _{MIN} , hours)	(P _{MIN} , bar g)	(T _{MIN} , hours)
Cambridge	32.5	5	30 ± 2.5	3
Gisborne	32.5	5	30 ± 2.5	3
Hastings	32.5	5	30 ± 2.5	3
Kapuni GTP	37.5	3	35 ± 2.5	3
Tauranga	32.5	6	30 ± 2.5	3
Taupo	32.5	5	30 ± 2.5	3
Waitangirua	37.5	10	35 ± 2.5	3
Westfield	42.5	4	40 ± 2.5	3
Whakatane	32.5	5	30 ± 2.5	3
Whangarei	32.5	5	25 ± 2.5	3
ALL OTHERS	32.5	5	30 ± 2.5	3

**APPENDIX 3:
SINGLE-USER DPs**

Current Single User DPs are set out in the table below.

Those DPs currently on SCADA are highlighted. This information must be updated in accordance with the SOPs.

RC for any Shipper at any DP on any day can be obtained from OATIS.

Pipeline	Single-User DP	End-user	Contractual MHQ (GJ)
Rotowaro-north	Glenbrook	NZ Steel	RC ÷ 16
Rotowaro-north	Hunua (Nova)	Nova Energy	RC ÷ 16
Rotowaro-north	Hunua 3	Greymouth Gas	RC ÷ 16
Rotowaro-north	Flat Bush	Nova Energy	RC ÷ 16
Rotowaro-north	Otauhu B Power Station	Contact Energy	
Rotowaro-north	Maungaturoto	Fonterra	
Rotowaro-north	Kauri	Fonterra	
Rotowaro-north	Marsden 1	NZ Refining Co	Interruptible
Rotowaro-north	Marsden 2	CHH	RC ÷ 16
Kapuni South	Okaiawa	Taranaki By-products	
Kapuni South	Hawera (Nova)	Nova Energy	RC ÷ 16
Kapuni South	Kaitoke	Corrections Dept.	RC ÷ 16
Kapuni South	Mangatainoka	Tui Breweries	RC ÷ 16
Kapuni South	Pahiatua DF (pending)	Fonterra	
Kapuni South	Takapau	Silver Fern Farms	RC ÷ 16
Kapuni South	Mangaroa	Corrections Dept.	RC ÷ 16
Kapuni South	Hastings (Nova)	Nova Energy	RC ÷ 16
Kapuni South	Tawa B (Nova)	Nova Energy	RC ÷ 16
Bay of Plenty	Waikeria	Corrections Dept.	RC ÷ 16
Bay of Plenty	Lichfield DF	Fonterra	RC ÷ 16
Bay of Plenty	Lichfield 2 (pending)	Fonterra	
Bay of Plenty	Kinleith	Les O'Leary	RC ÷ 16
Bay of Plenty	Kinleith (CHH mill)	CHH	RC ÷ 16
Bay of Plenty	Tirau DF	Fonterra	RC ÷ 16
Bay of Plenty	Rangiuru	Affco	RC ÷ 16
Bay of Plenty	Broadlands	Great Lake Tomatoes	RC ÷ 16
Bay of Plenty	Kawerau (ex-Caxton)	SCA Hygiene	RC ÷ 16
Bay of Plenty	Kawerau (ex-Tasman)	Norske Skog	RC ÷ 16
Bay of Plenty	Edgecumbe DF	Fonterra	RC ÷ 16
Morrinsville	Te Rapa Cogen	Contact Energy	
Morrinsville	Kiwitahi 1 (Peroxide)	Evonik	RC ÷ 16
Morrinsville	Morrinsville DF	Fonterra	RC ÷ 16
Morrinsville	Tatuanui DF	Tatua Co-op Dairy Co.	RC ÷ 16
Frankley Road	Kaimiro Delivery	Greymouth Petroleum	RC ÷ 16
Frankley Road	Stratford 2 (Peaker)	Contact Energy	
Frankley Road	Stratford 3 (Storage)	Contact Energy	
Frankley Road	TCC Power Station	Contact Energy	
Frankley Road	Ammonia-Urea (8201)	Ballance Agri-Nutrients	
Frankley Road	Ammonia-Urea (9626)	Ballance Agri-Nutrients	
Te Awamutu North	Te Awamutu DF	Fonterra	RC ÷ 16

**APPENDIX 4:
INTERRUPTIBLE AGREEMENTS**

Current Interruptible Agreement are set out in the table below. This information must be updated in accordance with the SOPs.

Delivery Point	Agreement	Type	Shipper
Otahuhu B	Otahuhu B power station	IUC	Contact
Pokuru 2	Kapuni to Pokuru	ISC	Genesis
Frankley Road-Bi	Kupe to Frankley Road	ISC	
Mokoia	Rimu Production Station	IUC	
Marsden 1	Refining NZ	IUC	Nova
Whakatane	CHH Whakatane	IUC	On Gas
Hastings	PanPac	IUC	
Pokuru 2	Kapuni to Pokuru	ISC	VGCL

**APPENDIX 5:
LOAD CURTAILMENT AGREEMENTS**

Current LCAs are listed in the table below.

Details in respect of **each current End-user** copied from current LCAs are attached.

This information must be updated in accordance with the SOPs.

Delivery Point	End-user	Shipper

Name			
Address			
ICP Number			
Receipt Point			
Delivery Point			
	Maximum Curtailment Quantity (GJ/hour)	Non-curtailable Quantity (GJ/hour)	Times when Curtailment is possible
Monday	500	75	08:00 – 17:00
Tuesday	500	75	08:00 – 17:00
Wednesday	500	75	08:00 – 17:00
Thursday	500	50	08:00 – 17:00
Friday	500	50	08:00 – 17:00
Saturday	n/a	n/a	n/a
Sunday	n/a	n/a	n/a
Minimum notice required			
2 hours			
Required Days between Curtailments			
0 / 1 / not restricted			
Maximum Curtailment Frequency			
		per Month	4 Days
		per Year	12 Days
No Curtailment Periods			
October – November, inclusive			
Availability Fee (\$/Day)			
Curtailment Fee (\$/GJ)			
First End-user contact:			
		Name	
		email address	
		Telephone	
Second End-user contact:			
		Name	
		email address	
		Telephone	

Name			
Address			
ICP Number			
Receipt Point			
Delivery Point			
	Maximum Curtailment Quantity (GJ/hour)	Non-curtailable Quantity (GJ/hour)	Times when Curtailment is possible
Monday	500	75	08:00 – 17:00
Tuesday	500	75	08:00 – 17:00
Wednesday	500	75	08:00 – 17:00
Thursday	500	50	08:00 – 17:00
Friday	500	50	08:00 – 17:00
Saturday	n/a	n/a	n/a
Sunday	n/a	n/a	n/a
Minimum notice required			
		2 hours	
Required Days between Curtailments			
		0 / 1 / not restricted	
Maximum Curtailment Frequency			
		per Month	4 Days
		per Year	12 Days
No Curtailment Periods			
		October – November, inclusive	
Availability Fee (\$/Day)			
Curtailment Fee (\$/GJ)			
First End-user contact:			
		Name	
		email address	
		Telephone	
Second End-user contact:			
		Name	
		email address	
		Telephone	

**APPENDIX 6:
OPERATIONAL FLOW ORDER**

A standard form OFO is set out below.

[Draft a standard form notice?]