Farrier Swier
Consulting

Level 24
500 Collins Street
Melbourne
Victoria Australia 3000

Tel 613 9612 1900
Fax 613 9612 1999
www.farrierswier.com.au

Emergency Management and Gas Outages: Economic Issues

Report Prepared for the Gas Industry Company Limited

Final Report

7 March 2006

Farrier Swier Consulting

in association with Johnson Winter & Slattery

J W S

Table of contents

1. Introduction

1.1 Background

The Gas Act 2004 provides for co-regulation of the gas industry by the government and an industry body. The Gas Industry Co (Gas Industry Co) is established to fulfil the role of the industry body under the Act.

The Gas Industry Co is currently reviewing emergency management and outages in the gas industry. The existing Natural Gas Outage and Contingency Plan (NGOCP) needs to be updated to reflect the ongoing changes in the market structure and supply arrangements of the gas industry in New Zealand.

The Gas Industry Co has engaged Farrier Swier Consulting, in association with Johnson Winter and Slattery, to advise on the commercial issues involved in updating the NGOCP. Farrier Swier Consulting, a consulting firm based in Melbourne, has substantial experience in utility reform and market development, economic regulation and public policy development. Johnson Winter and Slattery is an Australian legal firm of corporate and commercial lawyers.

1.2 Purpose

The Terms of Reference for this advice are set out in Annex 1. The overall objective of this work is:

> to develop a soundly based policy for pricing under outage and contingency situations.

In consultation with the Gas Industry Co, it was agreed to draft this report and set out the recommendations in the form of a consultation document. This decision reflects a view that there is no obvious "right answer"; the most appropriate solution depends on judgements and weightings attributed to different competing criteria and constraints. The solutions must also fit with the overall strategic approach to gas industry reform.

This report aims to set out detailed background information and analysis to enable stakeholders to provide informed input as a basis for a decision by the Gas Industry Co on the most appropriate approach.

1.3 Structure of Report

Section 0sets out the Summary and Recommendations. Section 3. sets out the background and context. Section 4. analyses the problems with the current arrangements. Section 5. sets out options for compensation. Section 6. discusses the criteria for considering the options Section 7. sets out relevant gas market experience and analysis of gas markets Section 8. sets out the legal analysis of risk allocation gas supply contracts and transmission agreements.

Section 9. set out the assessment of the compensation options and makes recommendations.

Section 10. sets out a more detailed discussion of the desirable features of the wholesale gas market including how it might operate in outage and emergency situations. Section 11. discusses whether the arrangements should be voluntary or mandatory. Section 12. discusses changes required to the existing arrangements to implement the recommended options.

Detailed Information collected in the process of preparing the report is set out in Annexes set out in a separate volume as follows.

Annex

1 Terms of Reference

2 NGC's Transmission Services Agreement Balancing Gas arrangement

3 Demand Bidding Model

4 International Experience

5 Rationale for setting Administered Price Cap value in the Victorian MSOR

6 Case Studies of Emergency events

7 Curtailment Tables

8 Definition of System Force majeure events in the Victorian MSOR

2. Summary and Recommendations

Introduction

The Gas Industry Company (Gas Industry Co) is currently reviewing emergency management and outages in the gas industry. The existing Natural Gas Outage and Contingency Plan (NGOCP) needs to be updated to reflect the ongoing changes in the market structure and supply arrangements of the gas industry in New Zealand.

Scoping the Problem

Gas safety and pipeline system integrity is of paramount importance. However it is beyond the scope of this report to assess these issues in any detail. It is assumed the existing arrangements ensure gas safety and pipeline system integrity, and that the focus for any new market or pricing arrangements are as an "overlay", focused on promoting more economically efficient means for dealing with outages and emergency events. The detailed implementation of any new market or pricing arrangements should not compromise gas safety and pipeline system integrity including through incorporating appropriate "backstop" system operator curtailment powers

The problems with the current NGOCP in the event of a major outage or emergency are that;

- compliance with system operator requests are voluntary;
- efficient short-term system operations are not encouraged (for example efficient sequencing of interruption and reconnection in a major outage or emergency event);
- long-term economic productive and dynamic efficiency is not encouraged (for example efficient investment in back up gas supply capacity, storage or alternative fuel sources); and
- there may be a greater need for the interruption of mass market customers than would otherwise be the case.

Emergency Gas Pricing and Compensation

The Terms of Reference require that advice be provided on "compensation regimes that apply in comparable arrangements overseas and options for deriving compensation values". The overseas regimes reviewed do not generally use the term "compensation" but rather refer to "pricing" and "imbalance" arrangements of which emergency gas pricing is one component. Only one regime (Victoria) explicitly applies the concept of compensation and this is only in relatively narrow circumstances. Internationally, pricing and imbalance have the result of "appropriate" compensation, even though that term is not used.

It is therefore useful to clearly distinguish between (i) a general framework of imbalance pricing and emergency gas pricing and emergency curtailment arrangements that should apply in the New Zealand environment; and (ii) a narrowly focused concept of compensation that may or may not be incorporated in the regime to address any "gaps" in the general pricing framework.

Options Considered

The options for pricing / compensation considered in the report are as follows:

- Replacement gas at a later time (status quo);

- Posted prices - A price (or prices) would be published in advance that would apply during the duration of an emergency event ;
- Imputed prices - Similar to posted prices but prices would be determined according to a formula to reflect the imputed value for opportunities foregone in other markets;
- Market prices at time of interruption - This presupposes the existence of a spot gas market;
- Ex-post "fair price" determination - "Emergency gas price(s)" or "compensation amounts" would be determined "ex-post" based on a defined set of principles. Defined participants would be indemnified to place them on the same financial footing as they would have been before the direction. The price/compensation amounts would be determined either by the system operator, an appointed expert or an arbitrator; and
- Demand Bidding - This involves establishing a market based mechanism whereby shippers on behalf of gas users can establish a price at which each gas user is prepared to have a defined volume of their nominated gas load curtailed.

The report also provides advice on factors to be considered in the design of a whole gas market that is currently under consideration by the Gas Industry Co.

The options for the compensation-scheme funding payments are to be determined as part of binding rules or determined between the parties on a contractual basis. If determined by binding rules, the principle should be that, funding of compensation to the extent practicable, should be attributed to shippers in negative imbalance ("causer pays"). To the extent that cause cannot be attributed then it should be recovered in some equitable way by a charge to all users.

Criteria for assessing options

The following criteria are used for considering the pricing options:

- Fairness;
- Long term economic efficiency (productive, dynamic);
- Short term economic efficiency (operational); and
- Degree of change, cost and complexity.

The meaning of the efficiency, cost and complexity criteria are reasonably clear and commonly accepted. However, the meaning of the fairness criteria is not straightforward.

The Terms of Reference required advice on the meaning of "fair" in the Government Policy statement. The meaning of "fair" includes "free from bias, fraud or injustice". The meaning in this context is clear and is related to well established principles of administrative law and best practice regulation. The meaning of fair also includes whether emergency gas price outcomes can be considered "equitable" or "legitimate". These are subjective concepts, where different parties may have different views.

The view of whether emergency gas pricing arrangements are legitimate will depend on:

- whether the gas industry stakeholders can reach a consensus; and

- that other parties with legitimate interest in the outcome (for example customers) do not object strongly.

It is suggested there are two "standards" for considering whether emergency gas prices are fair:

- "Pure market approach" (being no/minimal interference with market forces); and
- "Risk management approach" (where certain defined risks are considered unmanageable).

In each of the international gas markets reviewed, some constraints are placed on the operation of market forces for determining gas prices in outage and emergency situations. A fundamental issue gas industry stakeholders need to consider is if prices in a wholesale gas market could be determined in a completely unconstrained way, whether the risks would be manageable.

Factors to be considered in the assessment of whether risks are manageable include availability of natural hedges; availability of external insurance; liquidity in any wholesale gas market; arrangements to ensure prudential soundness of a wholesale gas market under emergency conditions; availability of real time information to enable participants to manage their risks prior to and during an emergency event; and existence of market power and the effectiveness of commercial processes and the Commerce Act to address serious imbalances created by the exercise of market power.

Legal analysis of contracts

The TOR requested advice on the legal issues associated with supply interruptions and emergencies.

Gas Supply Agreements (GSAs).

The GSAs are confidential. We have therefore analysed clauses typically included in gas supply agreements to address the issue of interruptions to supply under the contract. Based on our experience, force majeure and interruption to supply clauses are generally expressed in broad terms, using concepts which are not readily applied in practical situations – in particular, concepts of "reasonableness". As a result the correct application of such clauses is often unclear. They rarely provide an effective mechanism to respond to gas supply interruptions. Nor, because of their ambiguity, do they provide an effective mechanism for customers of gas suppliers to understand the precise nature of the rights they have against their suppliers and enforce those rights.

Transmission Agreements.

The NGC Transmission Services Agreements and the Maui Pipeline Operating Code provide some direction as to how available transmission capacity is to be allocated in an emergency. However the direction provided is very general and it will be difficult for a shipper to challenge the appropriateness of an allocation made by the system operator given the breadth of the discretion vested in it.

International Experience

Our review of experience in gas markets in South Australia, Western Australia, Victoria; New South Wales and the United Kingdom suggest that:

- Arrangements are mandatory but there are differences as whether the governance of the wholesale and retail rule making functions are

through cooperative industry arrangements, a government owned system operator or subject to determination by a regulator.

- While the details and terminology varies, each market reviewed, (other than NSW), has centrally organised market oriented arrangements for pricing of imbalances in the retail market; and in some cases for both the retail and wholesale markets.

Price risk management through short term gas trading

The determination of the desirable features of a wholesale market under gas shortage or gas emergency conditions needs to consider how users might wish to manage risk in a wholesale gas market to manage gas shortages. The wholesale gas market design should encourage efficient use of physical options held by electricity companies and major users to assist in efficient management of gas supply shortfalls. Short-term gas trading is likely to provide the most economic value at times of stress in the gas market, the electricity market or in both markets simultaneously by enabling physical options to be efficiently priced and traded.

Gas spot price dynamics in gas supply shortfalls

Fundamental analysis of demand and supply and international experience indicate it is likely that market determined gas prices could fluctuate over a wide range depending on the specific details of supply and demand conditions and the extent of the supply disruption. This is relevant to considering the viability of administered pricing options such as posted prices or imputed prices.

Information and nominations

Determining what information issues need to be addressed in a wholesale market to effectively manage gas shortages requires a detailed analysis. A starting point would be a "gap" analysis between the current information arrangements and the information needs of participants necessary to be able to manage their price risk under a wholesale gas market. As such this is beyond the scope of the Terms or Reference.

A key issue in our experience is the need for improved real time information in the gas networks downstream of the transmission pipelines. This raises a number of issues including:

- how decisions on investment in improvements SCADA and metering are made and funded;
- ensuing access to metering data is not impended by meter ownership issues; and
- profiling for non-metered customers.

Assessment and recommendations on emergency gas pricing options

Wholesale Market

It is recommended that an appropriately designed, "fit for purpose" wholesale gas market is the best option for managing gas outages and emergencies. The market should ensure short term incentives for operational efficiency, and long term incentives for productive and dynamic efficiency in managing the risk of gas outages and emergencies.

The Gas Industry Co should give priority to progressing current work on developing a wholesale gas market design, and implement changes as soon as practicable.

Ideally (i.e. having regard to cost and complexity) the wholesale market design should explicitly take into account the need to handle major outages, without the need for market suspension for anything other than major gas emergencies.

Interim approach to making decisions on changes to the NGOCP

As the implementation of a wholesale market will take some time to complete, decisions are required as to what steps, if any, should be taken in the interim. In our view the most appropriate short term solution requires judgements that weigh up competing criteria and strategic priorities.

The approach we have adopted was to identify options in two stages:

- Firstly, we identify options that warrant further consideration from a conceptual perspective but before considering the broader strategic issues.
- We then recommend options based on our view of the overall strategic issues. (It is noted that the Gas Industry Co and/or industry stakeholders might take a different view of the strategic issue than we have taken).

The analysis and recommendations of the options is as follows:

Posted Price

The calculation of a posted price may be problematic as agreement and acceptance by all involved parties will be difficult to achieve in practice. It does not produce equitable outcomes and may create operational distortions. This approach is not adopted in any of the jurisdictions we have reviewed. There are a number of better options and we recommended this option not be considered further.

Demand Bidding

A demand bidding approach is attractive in terms of market efficiency. However we consider the case for a demand bidding option is weak, given the substantial implementation work that would be required and the duplication of effort needed for the development and implementation of a wholesale gas market. This approach is therefore not recommended for further consideration.

Replacement gas at a later time (status quo)

In our assessment, it is not viable to continue with the status quo option in the medium to long term. However, there is a case for continuing with the status quo (replacement of gas approach) in the short term if the Gas Industry Co:

- confirmed our assumption that there was no threat to safety or system integrity in any circumstances;
- were satisfied the risk of significant gas emergencies was reasonably low in the period until a wholesale gas market can be implemented;
- considered on balance, it was more likely to achieve the Gas Act and GPS efficiency objectives by focusing efforts on a permanent solution (i.e. a wholesale market), and that this could be achieved reasonably quickly;
- considered that in practice, participants would behave in a reasonable way to cooperate with the System Operator in an emergency event; and

- consider that it (the Gas Industry Co) would not face risks to its credibility in the event that a major gas emergency event did occur.

This option warrants further consideration

Imputed price approach

An imputed price approach could be considered further. More detailed definition and analysis of practical implications would be required in order to evaluate this option. In theory, an imputed price is more flexible than a posted price approach. It can take account of changes in other markets, in particular the electricity market. However the practical analysis and decision-making issues confronting decision makers (the Gas Industry Co or government) should not be underestimated. This option therefore warrants further consideration.

Ex-post determination

This option involves limited up front effort as it is fair in terms of effective risk management, and procedural fairness. While it does not directly provide incentives and information to encourage short term operational efficiency, current barriers to shippers in positive imbalance cooperating with the system operator would be removed. Long term efficiency may be promoted to some extent, since the option provides signals for parties to take steps to manage their risks. This option should therefore be considered further

Recommendations taking account of strategic considerations

In the interim (whilst awaiting implementation of a wholesale market) and taking into account overall strategic considerations, we recommend options that require limited up front effort on behalf of the Gas Industry Co and industry. These options are:

- Replacement of gas (status quo); or
- Ex-post fair price determination.

An imputed price approach is not recommended given the effort that would be required in its development and in gaining industry agreement.

Wholesale Gas Market

There a range of important design issues that lie outside of the terms of reference.

Wholesale gas market design issues that are related to outages and emergency management are as follows:

Ex ante and ex post pricing. These differ in the degree to which the clearing price accurately reflects demand and supply conditions; the nature of the risks that need to be managed by parties; the information that would need to be provided to determine prices and assist parties manage their risks. Careful analysis of linepack run down rates under various contingencies is required in understanding the problems / benefits associated with different approaches.

Credit risk triggered by high spot prices under significant supply shortfalls will need to be understood in considering prudential arrangements for a wholesale market.

Price caps are an option to enable participants to manage risk under extreme situations, and limit windfall gains and losses. If it is decided to impose price caps on setting the clearing price during normal market operation, these should be set at a level that does not impact on market clearing under significant outage situations through controllable loads offering interruption, or by marginal gas production sources offering capacity.

The wholesale gas market should have well defined events to trigger market suspension, with market suspension only occurring as a last resort.

If force majeure and interruption to supply clauses in New Zealand gas supply agreements are not effective to respond to gas supply interruptions (as we suspect is the case), then we recommend that emergency gas pricing is not determined by reference to those clauses, but rather according to an objective market-related approach.

A potential concern with a wholesale gas market within an illiquid market is the potential exercise of market power, where there are very few parties, or only one, that is able to respond. This concern might be best addressed by considering what constraints might be placed on a wholesale market for the determination of prices, for example through incorporation of price caps.

The Gas Industry Co could explore with buyers and sellers whether amendments to gas supply contracts could be negotiated so that any contractual prohibitions on resale do not unreasonably limit the ability of buyers to interrupt.

Information and notification systems must ensure that parties with exposures to imbalance prices and other fees and charges are provided with timely and reliable information so they are in a position to manage their risk in "close to real time", through physical control of gas injections and withdrawals and trading with other parties.

Consideration should be given to initiating a regular process of collation and publication of planning information on gas production capacity and peak demand, and interruption capability and the overall capability of the system to manage risks under different contingencies.

Should arrangements be voluntary or mandatory?

In New Zealand, as with all other jurisdictions reviewed, safety and system integrity require that *operational* arrangements must be mandatory. In our view, the viability of any efficient *financial* 'scheme' to price imbalances (and potentially, to inform the development of efficient curtailment schedules) depends on clear accountabilities, certainty, enforceability, appropriate supporting prudential arrangements and universal application.

In addition, it is desirable to have consistency between financial and operational arrangements. This is because a high degree of connectivity can facilitate more flexible, responsive and efficient curtailment arrangements.

In our view, compliance with efficient financial arrangements should also be mandatory, in order to achieve effectiveness, prudential viability, fairness and accountability.

It should be noted that 'mandatory' does not necessarily mean "regulated". Viable binding arrangements can be achieved through contracts, regulation or some combination of the two. The key areas of divergence are the methods by which arrangements are developed and compliance is enforced.

Options for implementing a mandatory scheme include an unregulated contract; a contract plus "threat of regulation"; contract with regulatory support; regulation under the existing legislation; and statutory rules, regulations, or legislation.

Factors affecting the choice of the option include: the relative bargaining power of the parties, the acceptable time frames for making decisions, whether there is a potential issue with overriding of existing contracts, whether or not parties other than the contract parties are affected by the contract terms and whether the parties have appropriate enforcement incentives.

The model selected will also depend on the pricing solution that is adopted, and broader regulatory trends and preferences. The more complex or controversial the solution is, the lower the likelihood of achieving negotiated, industry-led implementation.

Our recommendation - that in the medium term pricing arrangements should be determined through a wholesale market - is relatively complex to develop and implement. It is not clear the extent to which negotiated industry led implementation is achievable. However there are examples (e.g. South Australia) where binding aspects of the wholesale market arrangements (e.g. pricing for swing balancing for the retail market) have been able to be developed through a cooperative industry process.

Two options are considered possible as interim solutions whilst awaiting the wholesale market development: status quo and ex-post fair pricing determination. The status quo may well not be regarded as a feasible option in practice as one stakeholder has already withdrawn formal support of the NGOCP, citing deficiencies in this arrangement as one of the key reasons. If there is broad industry agreement in principle to a short term option for the ex-post fair pricing option, then the detailed implementation should be relatively straight forward and not controversial. Hence, it is more likely to lend itself to a contractual or code approach.

Generally, there is a long lead time for developing and implementing statutory provisions, rules and/or regulations, given the associated regulatory impact analysis and processes. This timing consideration implies that a contractual approach may be more practical and efficient as an interim solution. However, anecdotal evidence suggests that consensus has been difficult to achieve in the New Zealand gas industry the past. If this is correct, then the preferred model would involve some form of regulation that:

- compels a designated person or industry body (such as the GIC) to consult and develop arrangements; and
- system users to sign up to and be bound by those arrangements as a condition of using the system.

Implementation arrangements for ex post determination option

Changes should be implemented through multilateral obligations (Emergency Imbalance Arrangements), that are mandatory for all entities that may have positive or negative imbalances. If it is considered that agreement cannot be reached in a timely manner, then regulatory support for the arrangements will be required. That support should be as flexible as possible, using enabling rather than prescriptive regulation.

The compensation scheme itself should be subject to financial caps: an upper cap to prevent unmanageable financial risks; and a lower threshold level of financial harm that must be incurred before a compensation determination is triggered.

To the extent practicable, the compensation scheme would be funded by those in negative imbalance through the duration of the emergency event; not through an insurance pool established in advance.

This model deals only with failure of gas supplies at the injection point, and the resulting positive and negative imbalances of shippers. If supplies were interrupted due to a failure in the transmission system, the resulting risk allocation would be determined in accordance with relevant transmission contracts (e.g. through a breach of technical obligations, or force majeure provisions).

The model requires a binding multilateral obligation between all shippers and the transmission companies. It must compel their co-operation in the ex post determination process, and compliance with decisions made. It also requires a direct relationship that allows individual parties to enforce payment obligations against others. The arrangement would need to be binding on all entities which can have positive or negative imbalances.

Any party or signatory to Emergency Imbalance Arrangements that suffers direct financial loss as a result of emergency directions and which exceeds the minimum financial cap could notify the Gas Industry Co that it requests a compensation determination. The request should be made in writing, together with an outline of the losses suffered and steps taken to mitigate those losses, within 2 months of the restoration of normal gas flows following the emergency.

One triggered, the Gas Industry Co should offer all parties a further 1 month in which to provide information on any direct financial loss suffered as a result of the relevant emergency directions.

The process should draw on widely accepted precedent, such as a dispute resolution model that is currently viewed as working effectively in the New Zealand gas or electricity industries.

The model should address matters including the form and content of an application, time periods for responses, and allocation of costs.

The appointed decision maker must independent, competent, and adequately resourced. There are various options available for choice of decision-maker As a starting point as suggest an approach whereby parties to the in the Emergency Imbalance Agreement agree who the decision maker is, or if agreement cannot be reached, allowing the Gas Industry Co to nominate the decision maker.

Parties to the Emergency Imbalance Agreement must be bound to supply in a timely manner such detailed information as the decision maker may require in order to assess a compensation claim.

The process should allow for appropriate handling of confidential information.

Parties should have a duty to mitigate their losses, and any compensation otherwise payable should be reduced to the extent that the decision maker (at its discretion) considers that the affected party has not taken reasonable steps in mitigation

Notwithstanding the financial caps, there may be a case for allowing broader smearing of costs across the industry to the extent that it is not possible to attribute cause. We suggest further financial modelling and analysis of experience and incidents to date would guide a decision on whether the scheme should provide for some costs smearing.

3. Background and Context

This section sets out the background to this report, summarises the Natural Gas Outage and Contingency Plan, government policy and legislation, the role of the Gas Industry Co, the Initial Third Party Access arrangements, and the development of a secondary gas market. It also sets out summary information on the demand supply balance and discusses the types of outage and emergency events.

3.1 Historical development of the gas industry

The Maui field was discovered in 1969 by a joint venture of Shell, BP and Todd. In 1973, the Crown entered into agreements with the joint venturers to purchase a 50% share in the discovery forming Maui Development Limited (MDL). In 1990, the Crown restructured its involvement in the Maui gas arrangements. Under the restructured arrangements, the Crown remained the Buyer under the Maui Gas Contract but established six new or amended sales and purchase agreements with four downstream users (Maui Legacy contracts).

The Maui Gas legacy contracts expire in 2009 or sooner. The Maui Legacy contracts were developed before third party pipeline access was introduced. After this time we understand that all gas contracts will be structured to be consistent with a competitive gas market and third party access to gas pipelines.

The Maui field constituted such a large proportion of gas supply, that risk management related to emergency and outages was necessarily "internalised" within MDL and through interruption arrangements with downstream users. We understand that while the relationships for emergency management were grounded in contracts, in practice there was a large degree of informal cooperation within the industry.

With the winding down of Maui gas, its output is expected to be replaced by a larger number of smaller gas fields (and possibly LNG imports). This will necessitate more formalised outage and emergency arrangements that take account of the more complex coordination task required by the industry.

3.2 Natural Gas Outage and Contingency Plan

The NGOCP is an industry-based plan, which aims to provide a basis for operation of the gas transmission system in a predictable and orderly manner throughout a period of a significant loss of gas supplies, either nationally or to a region. Clause 1.2.1 of the plan states that the "purpose of the plan is to identify the information and actions to prepare for and respond to the social and emergency situation so that the risks can be effectively managed".

The NGOCP currently is a voluntary arrangement applying to all areas of the gas supply and transmission sector. It outlines the steps to be taken in the event of a major gas outage, whether national or regional, and whether due to loss of supplies from source (fields) or due to transmission capacity limitations. The NGOCP does not cover contingencies caused by gas distribution network problems other than the impact of contingencies upstream of, or at, gate stations. Contingencies within distribution networks are dealt with by individual network operator emergency response plans.

It is assumed that, in a contingency, the key requirements are: to stabilise the transportation systems; preserve line pack; and to prevent pressures falling to pre-set levels that might trigger

automatic shutdowns. Under the NGOCP all parties volunteer to take whatever reasonable actions are appropriate and within their control, and to co-operate where necessary to achieve "stabilisation".

The Gas Industry Co states[1] that

> "Achieving stabilisation is considered to be most easily achieved by shutting down "Major Plant" (i.e. power stations and petrochemical plants), bringing additional gas supplies on line (if possible) and then, if necessary, progressively shedding load in the reticulated sector to achieve a balance between deliverability and demand. "It is generally accepted that interrupting mass-market consumers and essential-service providers risks network failure that would make the gas-restoration process more protracted. However, this means there are no incentives for suppliers of mass-market consumers and essential service providers to arrange back-up supplies. Moreover, those consumers are effectively given priority access to gas during contingencies at no additional cost."

The existing situation has changed significantly since the time that the NGOCP was first designed: New Zealand is moving into a regime with multiple sources of gas; Huntly is already largely committed to coal-firing; and the participants are now operating under commercial imperatives.

Accordingly, the Gas Industry Co considers the present plan is viewed as being unsustainable in the longer term and needs to be updated or replaced with an alternative that recognises the commercial realities and makes appropriate arrangements to ensure that safe, reliable and efficient emergency management processes are in place.

3.3 Government policy and legislation

Following a review, the Government published a *Policy Statement on Gas Governance* in October 2004[2]. The stated industry objectives and outcomes are set out in Box 1.

Box 1: Government Policy Statement on Gas Governance

Objectives and Outcomes

The Government's overall policy objective for the gas industry is:

> To ensure that gas is delivered to existing and new customers in a safe, efficient, fair, reliable, and environmentally sustainable manner.

Consistent with this overall objective, the Government is seeking the following specific outcomes:

- The facilitation and promotion of the ongoing supply of gas to meet New Zealand's energy needs, by providing access to essential infrastructure and competitive market arrangements;
- Energy and other resources are used efficiently;
- Barriers to competition in the gas industry are minimised to the long-term benefit of end-users;
- Incentives for investment in gas processing facilities, transmission and distribution, energy efficiency and demand-side management are maintained or enhanced;
- The full costs of producing and transporting gas are signalled to consumers;

[1] Request for Proposal – Emergency Management & Gas Outages: Economic Issues, Gas Industry Company, November 2005

[2] Government Policy Statement on Gas Governance, Hon Pete Hodgson, Minister of Energy. October 2004

- Delivered gas costs and prices are subject to sustained downward pressure;
- The quality of gas services and in particular trade-offs between quality and price, as far as possible, reflect customers' preferences;
- Risks relating to security of supply, including transport arrangements, are properly and efficiently managed by all parties;
- Consistency with the Government's gas safety regime is maintained; and
- The gas sector contributes to achieving the Government's climate change objectives by minimising gas losses and promoting demand-side management and energy efficiency.

3.4 Gas Industry Co

The Gas Industry Co is able to make recommendations to the Minister of Energy on a range of matters affecting governance of the gas sector including rules and regulations on the wholesaling, retailing, processing, transmission and distribution of gas. However, it is the Gas Industry Co's desire to promote industry-based contractual arrangements where practical.

The Gas Industry Co has the power to recommend to the Minister of Energy rules and regulations under section 43F which provide for the establishment and operation of wholesale markets, set terms and conditions for access to both gas processing facilities and transmission and distribution pipelines and require new investments in gas transmission pipelines. Section 43F(2) of the Gas Act provides for the establishment of "arrangements relating to outages and other security of supply contingencies".

3.5 Initial Third Party Access

As part of the industry-led initiative to develop an open access regime for the Maui gas transmission pipeline owned by Maui Development Limited (Shell New Zealand, OMV New Zealand and Todd Energy), an agreement was reached with NGC for the development of an "open access" operating system.

Under the agreement, NGC will use a single information platform to operate open access arrangements for both the NGC pipeline system and the 313 km onshore Maui pipeline from the Maui production station in south Taranaki to Huntly power station, south of Auckland. The balancing arrangements under the NGC Transmission Services Agreement are summarised in Annex

3.6 Development of a secondary gas market

The Gas Industry Co has established a Wholesale Markets Working Group which is tasked with investigating and making recommendations on the development of a secondary market for the trading of excess and shortfall quantities of gas. The working group will also examine how the specification of the gas allowed into the common network should be determined and will look at developing an appropriate, efficient and effective balancing and reconciliation mechanism.

The working group will also investigate access arrangements provided by distribution networks and assess those arrangements against the Government Policy Statement (GPS) competition objectives. It will also consider the merits of a more standardised approach across various distribution pipelines to reduce the costs of entry for retailers and enhance retail competition.

3.7 Demand Supply Balance

A key issue for this study is the structure of gas supply and demand the implications for emergency and outage management.

Demand can be categorised into electricity generators; electricity cogeneration plants; petrochemical plants; industrial and commercial load and domestic load. A rough indication of the demand / supply balance is shown in Box 2. This shows the gas supply demand balance based on the MED Data File for the year ended March 2005.

In order to focus on the issue relevant to this study, demand has been divided into:

- Load that is not subject to NGOCP curtailment arrangements (Schedule A), being electricity generation and petrochemical plants; and
- Load that is subject to NGOCP curtailment arrangements (Schedule A) being industrial and commercial load; and domestic load.

Supply sources are shown on the right hand side.

Box 2

Gas demand - supply balance

Load Shedding Category	Consumption Class		%		Gas Supply Source	%
Load not subject to NGOCP curtailment: Schedule A	**Electricity Generation**				Maui	65.8
	- Contact / Genesis	24.6			Kapuni	15.1
	- Other incl. Cogen	16			McKee	5.4
	Total electricity		40.6			
	Ammonia Urea		4.9		TAWN	5.5
	Methanex		24.4		Mangawhawa	4.9
			69.9		Rimu	3.1
Load that is subject to NGOCP load shedding: Schedule A						
Load shedding Categories A – F	Industrial and Commercial		25		Ngatoro	0.1
Load shedding Category G	Domestic		4.9		Kaima	0.1
Total consumption subject to load shedding table[3]			**29.9**		Kaimiro	0.1
TOTAL			**100**			**100**

Source: MED Energy Data File 2005

[3] Schedule A of the Natural Gas Outage and Emergency Management Plan

By comparison with other jurisdictions, it is notable that controllable electricity, petrochemical and cogen loads represent a relatively large proportion of total demand market whereas domestic loads represent a relatively small proportion.

3.7.1 Electricity Generation Capacity

The capacity of Gas Fired Electricity Generators and Cogeneration plants are shown in Box 3.

Box 3

Gas Fired Electricity Generators and Cogeneration capacity

Owner	Name	Type	Capacity (MW)
Electricity Generators			
Genesis	Huntly	Gas / Coal	960
Genesis	Huntly P40	Gas OCGT	40
Genesis	Huntly e3p (proposed)	Gas CCGT	385
Contact	Taranaki	Gas	357
Contact	Otahuhu B	Gas	380
Contact	New Plymouth	Gas / Oil	400
Bay of Plenty Electricity	Edgecumbe	Gas	10
Cogen			
Whareora Kiwi Dairy Plant	Kiwi Dairy	Gas Cogen	65
Kapuni Energy Ltd	Kapuni	Gas Cogen	27
Mighty River Power	Southdown	Gas Cogen	137
Genesis / Anchor Dairy	Te Awamutu	Gas Cogen	52

Source: MED Energy Data File 2004

It is notable that Contact Energy represents a large proportion of total capacity and that Genesis will add substantially to gas fired generation capacity following the commissioning of Huntly e3p.

3.7.2 Comment

The information shown above needs to be interpreted with caution.

Firstly the supply data shows the contribution of each gas field's total annual gas production to the annual total, whereas it is total available gas production capacity relative to demand at any point in time that is important in managing outage and emergencies. Similarly, the demand information shown is total annual demand whereas it is the total demand and the extent of flexibility in demand that is important in this context.

Secondly the system is undergoing significant changes in demand (e.g. the temporary closing down of Methanex) and changes in supply (wind down in Maui production)

As discussed below it is the practice in some jurisdictions (e.g. Victoria, UK) for the system operator to undertake planning studies of peak demand, production capacity and analysis of

contingency events. This information can provide information to the market and government on potential shortfalls in capacity and possible opportunities for investment.

3.8 Types of Outages and emergencies

There are a number of different types of emergency and outage situations that need to be considered and these can be categorised in different ways. For the purpose of this report we have categorised outages and emergencies as follows:

- Gas supply outages
  - Total failure of Maui Output
  - Failure of supply small gas fields
  - Partial failure of Maui
- Transmission Failures
  - Failure of a regional pipeline (No alternative pipeline)
  - Failure of pipelines where there is looping (e.g. between Huntly and Auckland)

The information in Box 4 can be used to analyse the implications under these different types of gas supply outages. It is noted that this is a simplified analysis to draw out key points. More detailed forward looking analysis could usefully be undertaken.

Box 4

Types of Gas Supply and Transmission outages and emergencies

Type of Failure	Analysis	Economic Implications	Changes over time
Gas supply failure (Failure in gas field, processing plant)			
Total failure of Maui Output	Virtually all Major Plant would need to be curtailed immediately and available gas from remaining small fields would be reallocated to supply mass market customers (and potentially gas fired generators providing frequency control to the electricity grid).	Efficient curtailment schedule for major plant not a major consideration – virtually all major plant would need to be curtailed.	Total failure of Maui will become a less relevant issue as Maui production runs down An issue is the extent to which any of the available and largely depreciated capacity in Maui could or should be kept in operation to provide capacity back up both to MDL contracts (eg Kapuni) or the system over all
Failure of supply small gas fields	Failure of any one of the other gas fields including Kapuni can be handled through - additional supply from Maui to the extent available; and	Efficient curtailment sequencing for Major Plant is a relevant issue Emergency gas pricing / compensation is relevant	Failure of smaller volumes of gas production becomes more relevant consideration over time as Maui production winds down.

	- to the extent there is still a shortfall, curtailment of only a modest proportion of Major Plant load.	to allocation of risk within gas supply agreements.	
Partial failure of Maui	Given the large size of Maui, there are a wide range of scenarios. Depending on the amount of lost Maui capacity, the required load reduction could be up to virtually all of the Major plant load	Efficient curtailment sequencing for Major Plant is a relevant issue. Emergency gas pricing / compensation is relevant to allocation of risk within any new Maui gas supply agreements.	Partial failure of Maui will become a less relevant issue as Maui production runs down.

Type of Failure	**Analysis**	**Economic Implications**
Transmission		
Failure of a pipeline regional pipeline (No alternative pipeline)	Pipeline balance needs to be maintained by bringing down load to equal available supply, of any.	In the event of a failure of a regional pipeline generally there a very few major loads in most regional area, and it is likely that all these will need to be curtailed immediately. Therefore efficient sequencing of curtailment may not be an issue. Curtailment is therefore best managed consistent with contracts and the processes outlined in the NGOCP. Any improvements in the management of transmission availability risk is best addressed through negotiation of any new or amended Transmission Service Agreements.
Failure of a pipeline where there is looping (eg between Huntly and Auckland)	Pipeline balance can be maintained by bringing down only part of the load with the alternative pipeline being able to met the remaining load.	In the event of a failure of looped pipeline efficient curtailment sequencing for Major Plant may be a relevant issue. Any improvements in the management of transmission availability risk is best addressed through negotiation of any new or amended Transmission Service Agreements.

4. Analysis of problems with current arrangements

4.1 Introduction

The NGOCP has been prepared, by the gas industry, with the aim of providing a basis for operation in a predictable and orderly manner throughout a period of a significant loss of gas supplies nationally or to a region. Its purpose is to identify the information and actions to prepare for and respond to the social and emergency situation so that the risks can be effectively managed. The plan links with other contingency arrangements so that the economic impact is minimised and alternative supplies are utilised appropriately until the gas supply is restored[4].

The Terms of Reference for this study states that the main problem is "that the existing plan has no regard for commercial interest or market principles".

4.2 Gas safety and pipeline system integrity

Internationally, gas safety and pipeline system integrity is of paramount importance given the impact, including to public safety, of inappropriate depressurisation of pipelines. This is evident both in terms of the business philosophy of all elements of the gas supply chain and in terms of investment in appropriate training, systems and processes and so on.

We consider it reasonable to assume that, consistent with international practice, that the New Zealand gas industry also places a very high priority on gas safety and pipeline system integrity.

We note for example that the NGC Transmission Services Agreement[5] and the Maui Pipeline Operating Code[6] contain curtailment provisions that appear to enable the pipeline system operator to take necessary action to ensure safety and pipeline integrity in the event of gas supply or pipeline interruptions.

The Terms of Reference do not highlight any concerns with gas safety and pipeline system integrity. We therefore consider it is beyond the scope of this report to assess the Gas Safety and pipeline system integrity issues in any detail. Nor does the report comment on the present regulatory arrangements for gas safety.

However it would also be inappropriate to ignore gas safety and pipeline system integrity. This report therefore makes the following assumptions:

- The existing arrangements provide adequate backstop powers to pipeline and distribution system operators to ensure gas safety and pipeline system integrity.
- Any changes to implement new market or pricing arrangements are an "overlay" focused on promoting economic efficiency in dealing with outages and emergency events.

[4] Section 1.2.1, Gas Contingency Plan, Version 2.3 30 November 2005

[5] Interruption of Transmission provisions are set out in section 11 of the NGC Transmission Services Agreement

[6] Interruptions provisions are set out in Section 15 of the Maui Pipeline Operating Code (8 August 2005)

- The detailed implementation of any new arrangements would not compromise gas safety and pipeline system integrity, including the incorporation of appropriate "backstop" system operator powers.

For these reasons we have not included gas safety and pipeline system integrity in our assessment of the options.

> **The detailed implementation of any new market or pricing arrangements should not compromise gas safety and pipeline system integrity, including through incorporating appropriate "backstop" system operator curtailment powers.**

Against this background, the problems with the existing NGOCP arrangements are set out below.

4.3 Description of problems with NGOCP

4.3.1 Parties may not comply with voluntary agreements

Compliance with the NGOCP is voluntary. The main problems with a voluntary agreement are that parties, especially Major Plants might refuse to comply (or respond too slowly) with requests given by the pipeline operator pursuant to the NGOCP.

To the extent necessary the pipeline operator will fallback on curtailment provisions in the Transmission Agreement to maintain pipeline pressures and ensure safety and system integrity.

However the NGOCP may not be effective in achieving its objective of "minimising the economic impact in the event of a significant loss of gas supplies" since such curtailment instructions are unlikely to be consistent with an overall efficient curtailment.

4.3.2 Short term economic inefficiency (operational)

The NGOCP does not promote efficient short-term system operations in a major outage or emergency event. In particular:

- It does not promote efficient sequencing of interruption and reconnection.
- The systems operator is unlikely to have the information to make decisions that would result in an optimal sequencing of interruption.
- Directed loads may not respond in a timely way to the Operator's directions or may not respond at all.
- It may lead to a conservative approach by the pipeline operator to issuing directions rather than giving maximum scope for the market to manage the shortfall situation.

NGOCP does not promote efficient sequencing of interruption and reconnection. In an ideal situation it is likely for example that gas fired generators (GFGs) would be interrupted and reconnected in a sequence that minimises overall economic loss. For example gas fired electricity generators with the highest variable cost should be interrupted first and reconnected last. Likewise, it may be the case that other Major Plant should be interrupted before smaller industrial and commercial customers and reconnected in an order that minimises economic loss of output (assuming that the value-added per unit of gas input is lower for Major Plant then for smaller industrial and commercial customers.)

System operator is unlikely to have appropriate information. Major plant will ultimately be directed by the pipeline operator to ensure pipeline security. Lack of voluntary compliance with the provisions of NGCOP may make directions more likely. As the pipeline operator has less information on the opportunities to minimise economic loss, as compared to the players, it is likely to make less economically efficient decisions then the players themselves.

Directed load may not respond. Even if the systems operator did have the necessary information to determine an optimal sequencing of interruption and reconnection, directed loads may not respond in a timely way to the Operator's directions or may not respond at all.

Conservative approach by the pipeline operator to issuing directions. If the pipeline operator cannot count on voluntary action by major plant, then it may act conservatively and issue directions earlier than it otherwise could. This may result in a loss of efficiency.

4.3.3 Long term economic inefficiency (productive, dynamic)

Under the current arrangements there is a lack of incentives for suppliers to the mass market to mitigate supply risk. To the extent that major plant do voluntary comply with the system operator's requests to curtail, the retailers serving mass market consumers are shielded from the risk of interruption. These retailers therefore have little or no incentive to take mitigating action against the risk of non performance by their supplier.

There are a range of options for managing outage risk. These are set out in Box 5.

One of the objectives to be considered in wholesale market design and in design of any compensation arrangements is establishing incentives for outage risks to be managed in a productively efficient[7] and dynamically efficient[8] manner.

Box 5. Options for managing outage and emergency risks

There are a diverse range of options for managing the risk associated with outages of individual gas fields, processing plants and gas pipelines.

In a competitive market, gas buyers play a key role in making decisions on managing the risk of outages as part of for their own gas purchasing requirements, and indirectly to ensure sound risk management for the gas industry as a whole.

Options for managing outage risks include:

- Decisions on the level of robustness to outage risks in the design and operation of existing and new gas fields and processing plants.
- Decisions on the level of redundancy built into new gas field and processing plants and upgrades of existing gas field and processing plants.
- Decisions on maintaining highly depreciated production and processing capacity available where this is associated with small volumes of remaining gas
- Investment in dual fuel capability (e.g. oil fired generation) by GFGs, Cogens and Major industrial users
- Investment in gas storage. In particular LNG storage might be a future option for New Zealand. Underground gas storage may be another option
- Interruption of GFGs and substitution of lost electricity production from reserve generation capacity in the wholesale electricity market
- Interruption of petrochemical plants with, potentially the ability to manage risks of lost production through substitution of production from other production plants

[7] Using the means for managing outage risks that use the least cost production techniques.
[8] Promoting improvements and innovation in the management of outage risks.

As New Zealand moves to the post Maui environment comprising a range of small gas fields there is both a need and an opportunity to facilitate efficient decisions on the best mix of risk management measures to manage gas supply risks and transmission risks.

It was suggested in the course of this study that relatively little is known about the optimal mix of outage risk management options.

In part this may be because the flexibility in the Maui system is obscuring any physical gaps in means to manage outage risk and because the dominance of the Maui contracts is obscuring any related price signals.

5. Options for compensation

This section discusses the concept of compensation, outlines the compensation pricing options considered in this paper and describes each option.

5.1 The concept of compensation

The Terms of Reference requires that advice be provided on "compensation regimes that apply in comparable arrangements overseas and options for deriving compensation values".

The overseas regimes we have reviewed do not generally use the term "compensation." The only regime that explicitly incorporates the concept of compensation is the Victorian Market and System Operating Rules (MSOR). In the context of the Victorian MSOR compensation can be seen as a narrowly targeted concept designed to cover "gaps" within a market oriented framework for pricing of imbalances and setting emergency prices.

In the MSOR, participants may claim compensation if they consider they have been financially disadvantaged as a result of a direction by the system operator (VENCorp) to inject gas or by VENCorp's application of an administered price cap. This does not apply where VENCorp directs a participant to curtail.

All the regimes reviewed[9] use the following key concepts:

- Terms such as *imbalance prices* or *spot prices* during "normal market operations".
- Terms such as *emergency* or *market suspension gas pricing arrangements* that apply during an emergency (or when the market is suspended as a result of the defined emergency or force majeure event) and are associated with *curtailment* according to predefined *curtailment tables*.

These emergency pricing and curtailment arrangements are designed with regard to the same factors that are being considered by the Gas Industry Co in this study although the regimes (with the exception of Victoria) do not use or define the term "compensation" explicitly.

It is useful to clearly distinguish between a general framework of *imbalance pricing* and *emergency gas pricing* and *emergency curtailment arrangements* that should apply in the New Zealand environment; and a narrowly focused concept of compensation that may or may not be incorporated in the regime to address gaps in the general pricing framework.

5.2 Overview of emergency gas pricing options

5.2.1 Introduction

The Terms of Reference required a number of options to be considered being:

- Replacement gas at a later time

[9] The NGC Transmission Services Agreement and the Maui Pipeline Operating Code also use terminology that refers to prices.

- Posted prices
- Imputed prices (i.e. imputed prices from opportunities foregone in other markets (e.g. electricity))
- Market prices at time of interruption (presupposes existence of spot gas market)

It is understood that a wholesale market is not a feasible option in the short term. The Terms of Reference has requested that we evaluate implications for wholesale market design. This evaluation is set out in Section 10.

Other options identified in the process of preparing this report are;

- Ex post "fair price" determination, and
- Demand Bidding.

5.3 Emergency gas pricing and compensation options - international experience

Our review of international experience suggests it is useful to categorise these options according to whether:

- Prices are "administered" (i.e. they are centrally determined) ex ante (in advance) with the prices either being a single price, or a price cap
- Prices are determined on an indemnity basis ex post, or
- Prices are determined through some market mechanism.

Box 6 categorises the options and identifies examples of where these options are used.

Box 6

Categorisation of emergency gas pricing and compensation options

Category	Option	Sub options	Examples
Administered price determined ex ante	▪ Replacement of gas at a later time		New Zealand currently
	▪ Posted prices	Posted price	None
		Price cap during, normal market operation	Victoria South Australia Western Australia Australia National electricity Market (Value of Lost Load)
		Price cap in emergency	Victoria: Administered price cap
	▪ Imputed prices		None

Category	Option	Sub options	Examples
Compensation determined indemnity basis ex post	▪ Ex post "fair price" determination	Determined by independent party	Victoria for directional participants to inject gas Australian national electricity market rules for direction of generators to provide services
Market determined price	▪ Determined by reference to contracts		South Australia Western Australia
	▪ Wholesale market		Victoria South Australia Western Australia UK
	▪ Demand Bidding		Energy Response, Australian electricity market, a voluntary off market service provider.
	▪ Market price on the day before the emergency		UK

5.4 Description of emergency gas pricing and compensation options

This section provides a description of each option. Some of the options are fleshed out in more detail later in the report.

5.4.1 Replacement of gas at a later time

This is essentially the status quo. Shippers in negative imbalance during an emergency event would replace gas used during the emergency to the shippers that are in positive imbalance. Replacement would take place once the emergency is over. This option does not attempt to set a value for gas used in emergency.

5.4.2 Posted prices

A posted price is one of more price(s) published in advance that would apply during the period of an emergency.

It is envisaged that Shippers in negative imbalance during an emergency event would pay for gas used during a declared emergency at the posted price(s). Shippers that are in positive imbalance would receive the posted price(s) for their imbalances. It is assumed that imbalances would be calculated in the same was as they are currently calculated under relevant instruments (e.g. the NGC Transmission Services Agreement and the Maui Pipeline Operating Code).

Within this option there are a range of variations to this option that could be considered:

- Single posted price
- Multi-tier posted price
- Price caps

The simplest option would be a single posted price that applies regardless of the loads curtailed.

A more complex variation would be a multi-tier posted price that could be linked to the curtailment table, with the posted price depending on some assessment of the value of gas associated with the marginal category of load curtailed during each balancing period.

For example (depending on the assumed opportunity value):

- If GFGs were curtailed, a posted price could be set based on some opportunity value for electricity production forgone;
- If petrochemical loads were curtailed then a higher posted price would apply based on an assessed value of petrochemical production forgone;
- If interruptible industrial and commercial loads were curtailed then a higher posted price would apply;
- and so on, with progressively higher posted prices applying, as the System Operator progresses down the curtailment table to balance supply and demand. A variation on a posted price is a maximum price cap. Other methods could be used to set the price, provided that the calculated price under other methods does not exceed the price cap. This is a common tool for constraining the operation of market forces in other markets. Price caps can be set during normal market operation and during a gas emergency ("emergency price cap"). Examples of price caps are set in Box 7.

Box 7 Example of Price Caps in other markets

Price caps in normal market operation	The South Australia and Western Australian retail gas markets are presently proposing introduction of price caps to enable participants to manage exposures to large swing service costs. The Victorian gas market sets a price cap on the determination of the gas spot price at the Value of Lost Load which is currently $800 /GWh.
Price caps under emergency conditions	The Victorian MSO Rules set an Administered price cap during an emergency of $80 /GWh. The Australian National Electricity Rules set a price cap for the determination of wholesale electricity prices of $10,000 /MWh. The UK gas market sets the emergency gas price at the price prevailing on the day before the emergency is declared.

5.4.3 Imputed price

This option would be similar to the posted price option but instead of an absolute price(s) being set in advance, prices would be determined to reflect the imputed value for opportunities foregone in other markets.

This option would attempt to define a more economically relevant price then under the posted price option and allow for price fluctuations in other markets. In particular this option would be intended to allow for fluctuations in the value of electricity.

In order to achieve the objective of ensuring an economically relevant price, it may be necessary to determine an imputed value formula depending on the marginal load curtailed.

For example

- If electricity generators were the marginal load curtailed during a balancing period, the compensation price would be based on formula that calculated the imputed value of gas based on the average electricity spot price during that period;
- If a petrochemical plant was the marginal load curtailed, the compensation price would be calculated based on an imputed value for gas in petrochemical production (based on some publicly available price indicator for ammonia urea or methanol).

This option is developed further in section 9.4.2.

5.4.4 Ex post determination

Under this option an "emergency gas price(s)" or "compensation amount(s)" would be determined "ex post" based on a defined set of principles. The price/compensation amounts would be determined either by the system operator, an appointed expert or by an arbitrator.

This option is used in the Victorian gas market and in the Australian National Electricity Market.

- Provisions in the Victorian gas market rules allow participants to claim compensation if they consider they have been financially disadvantaged as a result of a direction by VENCorp to inject gas or by VENCorp's application of an administered price cap.
- Provisions in the Australian National Electricity market rules provide for compensation for generators when they need to be directed by the market operator, for example to provide frequency control. Under the National Electricity Market Rules, NEMMCO must appoint an expert to determine an appropriate compensation amount.

Under this option, the process for determining the compensation amounts is envisaged to be that:

- An emergency gas price / compensation amount would be paid for each balancing period during the emergency event by shippers in negative imbalance to shippers in positive imbalance.

- Shippers in positive imbalance would put forward a claim for determination of the emergency gas price together with supporting evidence.
- The approach would be based on the insurance principle of indemnification.

Indemnification is generally defined as:

> "a promise, usually as a contract provision, protecting one party from financial loss". This is sometimes stated as a requirement that one party is "to hold harmless" the other. Indemnification is a type of insurance, which protects one party at the expense of the other. Indemnification can be either by direct payment or reimbursement for the loss. Indemnification clauses cannot usually be enforced for intentional tortious conduct of the protected party.

Under this approach, compensation should place defined participants on the same financial footing as they would have been before the direction (no better or worse off than if the direction had not occurred).

Compensation should be at least be payable for direct costs incurred to be determined based on contractual costs.[10] An issue to be considered is whether there should also be compensation for opportunity costs. Some might consider that compensation for opportunity costs is required to ensure that affected parties are fully compensated. An alternative view is that compensation for opportunity costs is inappropriate as it might enable significant windfall gains in an emergency situation.

5.4.5 Demand side bidding

This option involves establishing a market based mechanism whereby shippers on behalf of gas users can establish a price at which each gas user is prepared to have a defined volume of their nominated gas load curtailed. A possible model for this option is set out in detail in Annex 2

The aim of a demand bidding model is to produce a market based curtailment schedule which the system operator can draw upon to the extent necessary to balance the system during a major outage or emergency situation.

An emergency balancing price is determined based on the marginal load curtailed. This price is paid to those loads curtailed and would be recovered from shippers in negative imbalance.

This would enable the Major Plant in particular to determine appropriate prices for curtailment based on their own commercial position including, gas supply contracts, whether dual fuel is in place; an assessment of the risk of non-supply; and other commercial factors such as their electricity market contract position.

There would be various options for establishing demand side bidding:

- A Demand side bidding system could be managed by the System Operator which could be;

[10] This approach is adopted for the compensation arrangements in Victoria's MSOR. See section 4.10.1 of Annex 3 and also Annex 5.

- Integrated into the wholesale market design, or a
- Stand alone system.
  - Managed separately from the System Operator as a commercial enterprise with the entity "selling" demand side response to the gas system operator who would recover the costs through imbalance charges. (See Box 8)

Box 8 Commercial Demand side aggregation service

In Australia, a commercial entity (Energy Response Pty[11]) offers an open access aggregation service for Demand Side Response for all participants in the National Electricity Market (NEM) and all electricity consumers. Dedicated systems have been developed to register, aggregate, schedule, dispatch and settle DSR in the NEM.

An advantage of this approach is that aggregator is a specialist service provider and can develop services that best meet the needs of users and retailers.

The attractiveness of a commercial service is dependent on the incentives and risks created by the spot electricity market, a sufficiently large base of customers to defray the costs and need for the service being reasonably predictable.

It is questionable whether such an arrangement would be commercially viable within the New Zealand gas market, and whether the New Zealand gas market is sufficiently mature, although it may be worth giving this option further consideration.

5.4.6 Market prices at time of interruption

This option presupposes existence of spot gas market. The Terms of Reference for this report required we evaluate the implications of outage and emergency management for Wholesale Markets design. This is set out in Section 9.2.

5.5 Options for determining obligations to make payments for emergency gas / compensation

This terms of reference required advice on determining how compensation should be funded including "causer pays" and "a general insurance pool".

5.5.1 International Experience

The different situations that might need to be considered and the approaches adopted in different jurisdictions are set out in the following Box 9.

Box 9

International approaches for emergency gas pricing and funding

Event	Principle	Examples	Comment

[11] http://www.energyresponse.com

Event	Principle	Examples	Comment
Gas supply failure	Causer pays	Victoria	Net buyers from the spot market pay gas spot price. Under emergency conditions the spot price is capped at the Administered Gas Price, currently $80/GJ
		UK	Cash out price for users with a negative Daily Imbalance is set to the SMP Buy prevailing on the day the emergency commenced Quantities determined by way of Emergency Curtailment Quantity (ECQ) title trade and associated 'trade' payment. The ECQ title trade seeks to assign the quantities of gas associated with emergency curtailment actions undertaken by Transco NTS
	Market suspended; fault determined by reference to commercial / contractual position	South Australia Western Australia	REMMCO provide a contract note to the user and the swing service provider setting out the details of the quantities of swing gas priced and used. Pricing determined off market by reference to commercial / contractual position.
Major rescheduling due to significant changes in demand / supply	As far as practicable, uplift charges are allocated to those participants whose actions gave rise to the ancillary payments. Where ancillary payments are not readily attributable to actions by individual participants then uplift charges are smeared.	Victoria	May not be relevant in New Zealand This is an issue in the Victorian gas market due to the potential for combinations of unpredictable changes in demand, supply shortfalls and limited linepack. Gives rise to the need for within-day rescheduling. The gas market is being reformed to put in place the market incentives to address this problem.

5.5.2 Options

The options for gas supply related failures are as follows.

Causer pays

Obligations for making payment of emergency prices or compensation amounts should, to the extent practicable, be attributed to shippers in negative imbalance.

Any costs that that cannot be attributed should be recovered by way of a charge to all users ("cost smearing" or an Insurance Pool) recovered in some equitable way, such as in proportion to the amount of gas used during the emergency event. Cost smearing can be arranged in advance through an Insurance pool or arranged ex post.

Resolve by reference to contracts and commercial principles

Determination of fault and the allocation of costs is "off market" by reference to contracts and commercial principles. This is discussed further in section 8.1

6. Criteria for considering options

The following criteria are proposed for considering the pricing options.

- Fairness
- Long term economic inefficiency (productive, dynamic,)
- Short term economic inefficiency (operational)
- Degree of change, cost and complexity

6.1 Fairness

The Government's overall policy objective for the gas industry is "to ensure that gas is delivered to existing and new customers in a safe, efficient, fair, reliable, and environmentally sustainable manner[12].

The Terms of Reference requires an assessment of how to interpret the term "fair." Specifically in the context of this study, this requires determining the meaning of "fair" prices or compensation during major gas supply shortfalls or transmission disruptions.

6.1.1 Interpretation

As a starting point, we can consider the meaning of "fair" in its ordinary English meaning. The Oxford English dictionary defines "fair" as "free from bias, fraud or injustice; equitable or legitimate".

The meaning of "freedom from bias, fraud or injustice" is reasonably clear. There are well established principles of administrative law and best practice regulatory decision making that we expect government and stakeholders would apply in any decision making that affects emergency gas pricing. These principles include transparency, independence, natural justice and allowing for consultation.

The meaning of "equitable" and "legitimate" are more subjective concepts. Different jurisdictions, interest groups and policy makers may have differing interpretations of whether emergency gas price outcomes are equitable or legitimate. These interpretations may evolve over time with changing circumstances and new information. Different gas market participants are likely to have their own views of what is equitable and legitimate. Ultimately, it is a central role for Parliament to determine if there is a situation that is considered inequitable or lacks legitimacy which justifies statutory intervention.

6.1.2 New Zealand precedents

There are several New Zealand statutes that refer to fairness (for example: Companies Act, Employment Relationships Act and the Fair Trading Act.[13]) The Commerce Act 1986 is relevant as it concerns the regulation of market power.

[12] Government Policy Statement on Gas Governance, Hon Pete Hodgson, Minister of Energy, October 2004

[13] See the NZIER to the Electricity Commission considering the same issue in respect of electricity market design. "Market Design Report Initial Stock-take Paper prepared for the Electricity Commission" August 2005, NZIER

Precedents that are particularly relevant to gas emergencies are government policies on security of supply in the wholesale electricity market, and residential earthquake insurance. These examples establish statutory frameworks for government involvement in risk management around low probability but high impact events. In these cases, there are risks that government considers incapable of being effectively managed by individual participants and market arrangements. See Box 10.

Box 10 Examples of government policy for managing risks associated with low probability but high impact events.

Electricity Security of Supply

The security of supply provisions in the Government Policy Statement on electricity governance[14] requires the Electricity Commission to manage reserve electricity generation so that Expected Supply under a 60 year return period drought (of any duration) will be sufficient to meet Expected Demand so as to avoid need for emergency intervention.

The establishment of the Security of Supply policy reflects a political judgement that a reliance on market processes alone for managing the risk of dry years, would not provide an acceptable level of comfort that adequate generation reserve capacity would be made available and perhaps that the electricity spot price "spikes" during dry years are politically / socially unacceptable.

The Electricity Commission's policy for bidding in reserve generation effectively places a price cap on electricity spot prices[15].

Residential Property Insurance for major disasters

The Earthquake Commission Act 1993 established the Earthquake Commission. The Earthquake Commission is a Crown Entity that provides insurance to residential property owners for damage caused by major disasters such as earthquake, natural landslip, volcanic eruption, hydrothermal activity, and tsunami; in the case of residential land, a storm or flood; or fire caused by any of these.

Insurance for these events is automatically (compulsorily) provided for all residential property owners that have home and/or contents fire insurance policy. The Earthquake Commission has established a fund which is backed up by reinsurance from overseas groups and a Government Guarantee.

This example reflects a view that without government involvement there may be market failure and outcomes that are socially inequitable. For example without government involvement insurance for disasters might be unobtainable; or if such insurance were available, the social implications of residential property owners being uninsured would be socially unacceptable.

6.1.3 Framework

Considering the examples outlined above and international experience in gas market design we suggest there are two broad approaches for considering whether emergency gas pricing is fair:

- "Pure market approach" being no/minimal interference with market forces, and/or
- "Risk management approach".

6.1.4 Pure market philosophy

Under this approach, emergency gas prices determined under competitive market conditions would be considered deemed "fair" (i.e. equitable and legitimate) subject to general competition

[14] Final Version, Hon Pete Hodgson Minister of Energy, October 2004
[15] "Initial Security of Supply Policy" Electricity Commission, June 2005.

law. That is, provided prices are determined through voluntary participation in a market by buyers and sellers and there is no breach of general competition law, then the resulting prices can be considered fair.

New Zealand's general policy approach is a preference for reliance on the operation of markets subject to general competition law, the *Commerce Act 1986*.

NZIER, in considering wholesale electricity market design, proposed a number of specific criteria that would not be "fair" reflecting such a pure market philosophy:

- Having to pay charges for products or services that are unreasonable given the extent to which they cause the need for, use or benefit from the product or service, and
- Not being able to participate in or gain from trade when a participant is willing to bear all the costs of doing so.

Under a pure market approach, the determination of gas prices / compensation for a significant outage or emergency would be resolved in the first instance through a wholesale gas market where spot gas prices would not be subject to any price cap.

In the absence of using the price established in the wholesale gas market, compensation would be determined by reference to contracts, with disputes resolved through the courts. Determination of prices or compensation would of course also be subject to any claimed breaches of the Commerce Act.

A pure market approach could be seen to be fair in the sense that the valuation of imbalances is determined according to voluntary market contracts, with parties having the incentive and opportunity to manage their risk exposures in advance.

6.1.5 Risk management approach

A "risk management approach" to determining emergency gas prices means that some (well designed) constraints are placed on the operation of market forces to enable participants to manage risks that otherwise are considered unmanageable by participants individually and/or the market overall.

A risk management approach should aim to allow market forces to operate where possible, but establish thresholds for market failure such that when risks become unmanageable some centrally determined constraints on pricing are imposed.

In all the gas markets we have reviewed, some constraints are placed on the operation of market forces for determining gas prices during in outage and emergency situations, although the details vary significantly. (See Box 7 above.)

A risk management approach could be seen as "fair" in circumstances where risks are considered to be unmanageable due to some form of "market failure", and / or where remedies available under laws such as the Commerce Act are considered incomplete, too uncertain or too slow.

Drawing on international experience with gas market design, "market failure" in a major outage or emergency could be considered to arise in the following circumstances:

- There may be a lack of natural hedges, (for example due to the small size of the market) and/or external insurance may not be available.
- In the absence of a sufficiently liquid wholesale gas market there may be little or no practical ability for participants to voluntarily agree to trade short term imbalances, including through the "trading" of additional gas supply and market based interruption.
- In an emergency situation, parties are likely to be concerned about the prudential positions of those they are trading with. The concern will be that parties that are exposed to high negative imbalance charges may be unable to meet their trading obligations. This concern will be compounded if there is lack of real time information on imbalances with imbalances calculated only after the fact. It is common in "thin" markets for trading activity to slow down or dry up completely in situations where there are such concerns over prudential risk. Constraints on emergency gas pricing might provide greater confidence in the overall prudential soundness of the market, which in turn will assist in parties trading to manage their risk.
- There may be insufficient time to undertake any "fair" market based process for trading imbalances due to the urgency of the situation and the need for the System Operator to take immediate action. This may be compounded by a lack of clear information available to the system operator and the market on the emergency (e.g. its seriousness, how long it might be for repairs to be completed, etc). In these circumstances "risk managed" decisions may need to be made that balance the overall interests of the integrity of the market with the interests of individual participants.
- There may be short-term market power issues that are not easily addressed through remedies under the Commerce Act. In the long-term market power issues can be resolved through competitive developments in the gas market and the wider energy market. However a major outage or emergency situation may create short-term market power since there may be very few parties who are willing or able to provide gas or interruption to the market. These parties may therefore be in a position to exercise market power in the determination of emergency gas prices. The identification of whether market power is being exercised in contravention of the Commerce Act in these circumstances can be very difficult to determine and prove.

6.1.6 Legitimacy

Another aspect of fairness is the perceived "legitimacy" of the proposed arrangements. Whether a particular set of arrangements for determining emergency gas prices are fair (in the sense of

being equitable and legitimate) depends on who makes that determination and the process that has been followed.

Given the government's commitment to a co-regulation approach, it is probably reasonable to expect that if the gas industry stakeholders can reach consensus on what it considers to be a "fair" set of emergency gas pricing and this is done through a credible process then the government could very well accept that the proposed arrangements are "legitimate".

If on the other hand the industry stakeholders are not able to reach such a consensus, or other parties with legitimate interest in the outcome (for example customers) are not satisfied, then it is less likely that any proposed arrangements made by the Gas Industry Co will be accepted as legitimate by government. The government is therefore more likely to decide that some neutral body (e.g. the Minster or a regulator) will need to be empowered to make a determination.

6.1.7 Summary

The meaning of "fair" includes "free from bias, fraud or injustice". The meaning in this context is clear and is related to well established principles of administrative law and best practice regulatory decision making.

The meaning of fair also includes whether emergency gas price outcomes can be considered "equitable" or "legitimate". These are subjective concepts, where different parties may have different views.

The view of whether emergency gas pricing arrangements are legitimate will depend on:

- whether the gas industry stakeholders can reach a consensus; and

- that other parties with legitimate interest in the outcome (for example customers) do not object strongly.

There are two "standards" for considering whether emergency gas prices are fair:

- "Pure market approach" being no/minimal interference with market forces.

- "Risk management approach" where certain defined risks are considered unmanageable.

In all the international gas markets reviewed, some constraints are placed on the operation of market forces for determining gas prices during outage and emergency situations.

A fundamental issue gas industry stakeholders need to consider is therefore whether or not under an unconstrained wholesale gas market process, that risks would be manageable.

Factors to be considered in determining whether price risks related to major outage and emergency events are / are not manageable include:

- **Availability of natural hedges;**
- **Availability of external insurance;**
- **Liquidity in any wholesale gas market;**
- **Arrangements to ensure prudential soundness of a wholesale gas market under emergency conditions;**
- **Availability of real time information to enable participants to manage their risks prior to and during an emergency event; and**
- **Existence of market power and the effectiveness of commercial process and the Commerce Act to address serious imbalances created by the exercise of market power.**

6.2 Long term economic inefficiency

As discussed in Box 2 above, a desirable feature of any emergency gas pricing or compensation arrangement is that it provides incentives for selecting efficient investments and operating practices in supply side reserve capacity; and a means of effectively managing demand side risk.

The New Zealand gas market will, over the next few years, be in transition to the post Maui environment. This will involve many decisions on how to replace the flexibility and redundancy currently provided by Maui (or perhaps to keep some Maui capacity available?) For this reason we suggest that this criterion should be given particular consideration.

Assessment of the options should consider promoting long term economic inefficiency. This includes:

- **incentives for selecting efficient investments and operating practices for supply side reserve capacity; and**
- **investment in means of effectively managing demand side risk.**

6.3 Short term, operational efficiency

As discussed in section 4.2, some desirable features of any emergency gas pricing or compensation arrangements are that it:

- Facilitates efficient sequencing of interruption of loads and once an emergency is over, encourages efficient sequencing for reconnection of loads;
- Provides information to decision makers that facilitates an optimal sequencing of interruption and reconnection of loads;
- Ensures that where loads that are directed by the system operator to curtail, they obey curtailment instructions in a timely manner; and
- Encourages the system operator to give as much time as possible to allow the emergency situation to resolve itself before issuing directions.

Assessment of the options should consider ways to promote short term economic inefficiency. This includes consideration of:

- **Facilitating an efficient sequencing of interruption of loads;**
- **Provision of appropriate information to decision makers;**
- **Timely compliance with curtailment requests/instructions and**
- **Encouraging the emergency situation to resolve itself before issuing directions.**

6.4 Degree of change, cost and complexity

An important practical factor to be considered is the degree of change, cost and complexity.

This includes the extent of changes required in systems and processes, the degree of complexity in decision making, particularly where judgements are required, the costs involved in implementation and the simplicity or complexity of any arrangements for market participants.

Assessment of the options should consider the degree of change, cost and complexity.

7. Gas markets experience and analysis

This section sets relevant analysis and experience. Section 7.1 sets out international experience of comparable arrangement overseas. Section 7.2 sets out analysis of gas price risk and price risk management. Section 7.3 discusses Information and Nominations.

7.1 Review of international experience

The Terms of Reference requires a review of comparable arrangements overseas, including:

- Voluntary *vs.* mandatory arrangements
- Types of compensation regimes
- Form and basis of compensation
- Information and notification systems

Annex 2 sets out the details of this review of international experience for a number of jurisdictions that have competitive gas industries. The scope of the international review was agreed with the Gas Industry Co. Jurisdictions reviewed are South Australia, Western Australia, Victoria; New South Wales and the United Kingdom.

7.1.1 Wholesale and retail market institutional arrangements

Wholesale and retail market institutional arrangements establish roles and responsibilities for the development and operation of market based arrangements for balancing the gas system during normal periods, the management of major outages and emergency management.

A number of functions are required to support a fully competitive wholesale and retail gas market the principle ones being provision of reconciliation, balancing and metering services; customer transfer arrangements; compliance and rule development / rule change.

In all jurisdictions, obligations on industry participants to establish the necessary wholesale and retail arrangements are mandatory, although the details of the way these obligations have been created varies.

There are significant differences in some aspects of the arrangements including:

- whether wholesale and retail rules are in separate instruments (e.g. South Australia, NSW) or integrated in a single set of rules (Victoria);
- whether the governance of the wholesale and retail rule making functions are through cooperative industry arrangements (e.g. South Australia, NSW) or through a government owned system operator (Victoria);
- whether approval of rules and rule changes are subject to independent regulatory oversight (South Australia, Victoria, Western Australia, UK) or oversight by a government department (NSW); and
- the level of regulatory involvement in approval of wholesale and retail rules.

In Australian states other then Victoria

- Loads directly connected to transmission pipelines (such as gas fired power stations) are subject to wholesale market arrangements established through each transmission pipeline's Access Arrangements that are approved by the Australian Competition and Consumer Commission (ACCC) pursuant to the National Gas Pipeline Code; and
- For loads connected to the gas distribution networks, obligations to develop and operate retail market arrangements are set out in state government legislation and are subject to oversight by the independent state regulator or government department. Industry owned and managed retail market management companies (REMCo – South Australia and Western Australia, GMC – NSW and ACT) operate the retail market arrangements and administer the retail market rules.

In Victoria, the majority of consumers (i.e. loads directly connected to transmission pipelines, and distribution networks) are subject to a single set of rules, the Market and System Operations Rules (MSO Rules) which govern the operation of the Principal Transmission System and the wholesale gas market. The independent system operator, VENCorp, is a state owned body. The MSO rules are currently authorised by the ACCC pursuant to the Trade Practices Act.

In the United Kingdom, OFGEM is seeking to reform Gas Retail Market Governance through three separate initiatives (the Metering Strategy, Network Codes and Improving Customer Transfers). The initial objective is to develop an industry Supply Point Administration Agreement (SPAA) between gas suppliers, to incorporate voluntary agreements, which may then be mandated. Gas suppliers will be required to become signatories by the introduction of a licence condition. OFGEM's objective is to withdraw from prescriptive regulation of the metering and supply markets.

7.1.2 Pricing and settlement arrangements under normal conditions

While the details and terminology varies, each market reviewed, other than NSW, has centrally organised market oriented arrangements for pricing of imbalances in the retail market where pricing for imbalances are based on market determined bids and offers. As noted, in Victoria there is a single arrangement applying to both the retail and wholesale markets.

Within this broad approach, there are two distinct forms of pricing mechanisms. The most common is a *dual imbalance* pricing mechanism where different imbalance prices apply depending on whether the shipper is in negative or positive imbalance. This mechanism encourages shippers to manage their injections and withdrawals to minimise exposure to imbalance charges and if necessary to undertake trading through some other mechanisms (e.g. bilateral trading. The South Australia and Western Australia Retail Market Rules provide for a swing service through the submission of bids to a "bid stack" administered by REMCo. This swing service is separate from the gas itself. In the UK where a shipper is out of balance at the end of the day, any imbalance volume is cashed-out at prices determined by trades on the On-the-day Commodity Market (OCM).

In Victoria, VENCorp uses the information provided in nominations and "inc"/"dec" offers to produce schedules for the daily operation of the gas system and a single clearing spot price. Rather then than participants being encouraged to manage imbalances themselves through managing injections and withdrawals and trading, imbalances are managed automatically by the system operator with participants managing their risks through their decisions on bid and offer prices.

7.1.3 Location

Different approaches can be taken to determining the location of the spot price determination and dealing with locational related costs. Different approaches include:

- A single spot price for all injection and withdrawal points within a defined network. This approach is used in Victoria currently with AMDQ (Annual Maximum Demand Quantity) rights, uplift and ancillary payments used to manage location specific costs and impacts;
- A single hub point. The UK gas market uses the concept of the national balancing point where all gas in the NGT system is deemed to be traded
- Multi-hub points. Victoria is contemplating moving to a multiple hub based pricing system so that different spot prices will be determined at different locations. The aim of this approach is to enable more accurate pricing and signalling of transmission related effects including the impact of transmission constraints, so as to reduce the need for out of market "uplift" payments.

7.1.4 Price Caps

The Victorian MSOR and the South Australian and Western Australian retail rules incorporate (or (are proposed to incorporate), price caps on the gas spot price and the swing service respectively.

The Victoria gas spot market has incorporated a price cap since its inception in 1999. REMCo is currently in the process of seeking approval for price caps to be incorporated in the Retail Market Rules for South Australia and Western Australia. This initiative has come from Market Participants.

7.1.5 Gas emergency legislation

Every jurisdiction reviewed has statutory arrangements that enable a government authority (the Minster or department head) and in some cases, the system operator, to issue directions in the event of a gas emergency relating to the use of available gas.

In some cases the powers are very broad and specific factors for how gas is to be allocated in an emergency are not spelled out. It seems likely that the primary purpose in all cases is ensuring safety and integrity in an emergency event. In the South Australia legislation, a specific factor is the "efficient and appropriate use of the available gas."

Gas emergency legislation does not deal with the pricing and commercial outcomes of gas emergencies.

7.1.6 Role of market arrangements in managing emergencies

In Australia and the United Kingdom there is a recognition by policy makers and regulators of the interrelationship between the effectiveness of the market arrangements and the likelihood that emergency directions will be required to manage an emergency event.

It is recognised that the more effective are the market arrangements the less likely it will be that emergency direction powers will need to be exercised. There is a clear trend in the Australia and United Kingdom to strengthening the role of market mechanisms to enable gas and electricity markets to manage gas outage events and reduce the likelihood that gas outages need to be deemed as emergency events.

7.1.7 Emergency Management arrangements

Gas emergency management arrangements in Australia and the United Kingdom are coordinated either by a government agency (South Australia, New South Wales) or under delegated authority provided to the system operator (VENCorp in Victoria; NGT Transco in the United Kingdom)

In each state, a government body is responsible for coordinating the preparation of emergency procedures, and either providing advice to the Minister in giving emergency direction or (in the case of Victoria) giving emergency direction directly.

There has been much debate in the UK over recent years, as to whether the current emergency arrangements in the gas industry were appropriate. A new (merged) Gas and Electricity Industry Emergency Committee (GEIEC) has been established in order to reflect the need to consider the increased interactions between the gas and electricity markets.

7.1.8 Pricing arrangements when there is notice of an impending emergency

When an unexpected outage event occurs, there may (or may not) be a period of time before it is clear whether it is necessary to declare an emergency. In some cases it will be clear that a major event has occurred and an emergency should be declared immediately. In other cases it may not be clear whether the event is serious enough to warrant declaration of an emergency. (There may be uncertainties on the extent or duration of the event and there may be potential for adequate market responses to be forthcoming).

Arrangements in Australia and the UK are aimed at ensuring that the transmission operator is able to conserve / maximise available linepack. In each of the jurisdictions, when there is a notice of an impending emergency, normal pricing arrangements would continue to apply with the gas shortages causing market determined imbalance gas prices. Incentives are thereby created for additional gas to be made available and for major loads to interrupt (provided the value of interruption is less then the price cap) in order sell swing gas to those who require it.

7.1.9 Arrangements when an emergency is declared

In the jurisdictions reviewed there is a clear definition of an emergency or force majeure event in the retail rules (and in Victoria the MSO Rules). When an emergency event is declared normal gas market operations are suspended.

Practices differ as to how imbalance prices are determined when an emergency is declared. In South Australia and Western Australia normal pricing arrangements for Swing Services are suspended and instead pricing is determined “off market” based on contractual rights and

obligations. REMCo provides information on imbalance quantities and leaves the pricing of imbalances to be resolved commercially.

In Victoria and the UK the rules set out how prices are to be determined for imbalances.

In the UK, OFGEM recently approved new emergency cash out pricing arrangements to set cash out prices related to prices prevailing on the day the emergency commenced.

In Victoria under abnormal circumstances, specified by the MSO Rules as being "force majeure" events, VENCorp declares an administered price period which imposes a cap on the market price for the day (currently set at $80/GJ); and there is a 5 stage hierarchy of strategies set out in the rules for VENCorp to determine market price.

In Victoria the MSOR also allows participants to claim compensation if they consider they have been financially disadvantaged as a result of a direction by VENCorp to inject gas or by VENCorp's application of an administered price cap. "Compensation payments" are payments made in addition to those payments made at the market price for the gas injected. Compensation does not apply in the case of load curtailment. Compensation is based on the insurance principle of indemnification. Compensation is based on proven direct costs incurred by the participant in injecting gas to comply with VENCorp's schedule instruction or direction.

7.1.10 Curtailment

Each jurisdiction has in place curtailment tables that are binding in the event of a defined emergency event. The details of the curtailment tables are set out in Annex 3.

7.2 Price risk management through short term gas trading

The terms of reference require discussion of the desired features of a wholesale market under gas shortage or gas emergency conditions. It is therefore useful to consider how users might wish to manage risk in a wholesale gas market to manage gas shortages. This is discussed in Box 11.

Box 11 Physical options to manage gas shortage risks

It is common in other gas markets for electricity companies to sell gas from their portfolio, to others who may value it more highly rather then use it in a gas fired power station.

An electricity company's obligations to meet electricity supply commitments can be met through (1) purchasing electricity through the spot or forward electricity markets from non-gas fired generators; (2) converting the gas fired generator from gas to another fuel, such as fuel oil or coal (3) or "purchasing" interruption from large electricity customers.

Major Industrial Users holding a long term gas supply agreement might either switch to fuel oil or temporarily curtail production so as to sell surplus gas to other users that value gas more highly.

Each of these examples can be considered a physical option that has a value to its owner.

7.2.1 Liquidity

It might be argued that New Zealand, because of its small size, will never have a particularly active or liquid wholesale gas market. While this is likely to be true, it is important to recognise that short term gas market trading is likely to provide the most economic value at times of stress

in the gas market, the electricity market or in both markets simultaneously by better facilitating these physical options to be efficiently priced and traded.

In order for the wholesale gas market design to contribute to efficient management of gas supply shortages it should encourage efficient use of physical options held by electricity companies and major users to assist in efficient management of gas supply shortfalls.

Short term gas trading is likely to provide the most economic value at times of stress in the gas market, the electricity market or in both markets simultaneously by enabling physical options to be efficiently priced and traded.

7.2.2 Gas spot price dynamics in gas supply shortfalls

The assessment of pricing options (below) needs to consider the dynamics of the underlying value of gas in outage and emergency situations.

Fundamental analysis of demand and supply, and international experience indicate there is likely to be a wide range of different market determined short term / spot prices that will be efficient in different outage and emergency situations.

Box 12 sets out a highly stylised economic analysis of demand and supply. This is based on cost data drawn from the Victorian gas market. The dynamics of the demand and supply curves in New Zealand are clearly different and need to be understood. However the key conclusion to be drawn from this analysis are that given the likely shape of the demand and supply curves, and given the likely changes in the position of the supply curve in a gas supply shortfall, and possible changes in the position of the demand curve, (particularly as a result of fluctuations in the electivity market, that an efficient market clearing price is likely to vary over a substantial range during gas supply shortfalls depending on the specific circumstances of the event.

This proposition is illustrated by data from the New Zealand electricity market, and the UK and Victorian gas markets:

- Chart 1 sets out the average New Zealand daily electricity spot price, showing that spot electricity prices can fluctuate substantially. Given electricity generation accounts for around 40 % of total demand, and is likely to play a major role in setting of market prices in gas spot prices in a major outage or emergency situation, market determined gas prices are likely to be strongly influenced by electricity spot prices.
- Chart 2 shows day ahead prices for the UK gas market[16].
- Chart 3 below sets out data on significant pricing events in the Victorian gas market in recent years.

Box 12: A simple economic framework for analysing emergency gas pricing

A simple economic framework can be set out for analysing pricing and compensation issues related to gas

[16] See Pg 168 of "Natural Gas Pricing in Competitive Markets" IEA Publications 1998" Pg 168 for a detailed discussion the factors affecting volatility in the UK day ahead and on the day gas markets. http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1193

outages and emergencies.

Making suitable[17] natural gas available for transportation across a transmission system for use by consumers requires:

- a source of raw natural gas;
- supply of processed gas by either
  - investment in fixed assets for extraction and gas processing; or
  - investment in storage facility (e.g. LNG) and holding costs for stored gas
- some operating expenditures.

Gas production and processing and gas storage facilities are relatively capital intensive. The analysis of the economies of gas supply during outages and emergencies is therefore dominated by the cost of fixed investment in production and processing capacity of storage. The value of the raw gas itself and any operating costs are a relatively small proportion of the total cost of supply.

In order to focus on the most important issues it is appropriate to ignore the value of raw natural gas and the operating expenditures and focus on investment costs. (A more realistic analysis should however consider the value of raw gas and operating costs).

The supply curve is likely to be relatively flat over most of the range and then will rise sharply to reflect the marginal cost of reserve capacity.

The demand curve shows the total gas processing and extraction capacity that is demanded at different prices. The demand curve can be decomposed into segments with different relationships between the value of capacity and the total amount of capacity demanded by different customers segments.

Mass market customers (Domestic and small industrial and commercial gas consumers without dual fuel capacity) can be assumed to place a high value on capacity because of the high value of reliable gas supply to these consumers and the potentially serious inconvenience if gas supply needs to be interrupted. The demand curve for capacity for domestic consumers can be shown as very price inelastic. The Victorian gas spot market assumes a Value of Lost Load of $800/GJ.

Electricity generators on the other hand can be assumed to place a relatively low value on gas production and extraction capacity. Firstly, electricity production from gas fired generators can be substituted for by either other non gas electricity generation, or electricity demand response. Secondly, gas fired generators may already be converted to dual fuel (i.e. firing on fuel oil) or, if not, could invest in conversion to dual fuel.

The cost of investment and operation of dual fuel places a cap on the value of gas production and extraction capacity to gas fired generators. The demand curve for GFGs can therefore be depicted as relatively price elastic.

Other customers group can be assumed to place a value on gas capacity that is somewhere between that of mass market customers and GFGs.

The chart below shows a stylised demand and supply curves with some cost relationships drawn from Victorian studies[18].

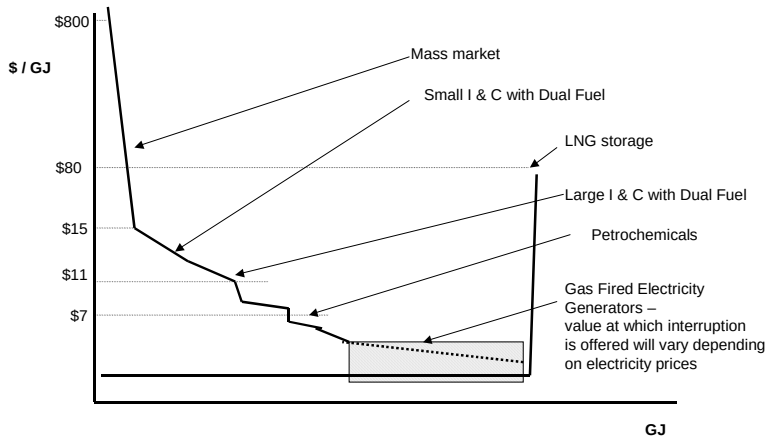
Note that these curves ignore the issue of whether transient market power could be exercised during significant gas supply outages.

This is not intended to be accurate depiction but simply to give indicative idea of the demand and supply curves.

[17] I.e. Natural gas that complies with gas quality specification. In some jurisdictions it is possible in an emergency to inject quantities of off specification gas,

[18] Value of Lost Load = $800/GWh; Marginal cost of interruption for and IC customers with dual fuel: Light Oils $12.60/GJ (Small Customers) to $15.20/ GJ (small customers); LPG $7.60/GJ (large customers) to $11.40/ GJ (small customers). Price to recover the option value of LNG = $80/GWh

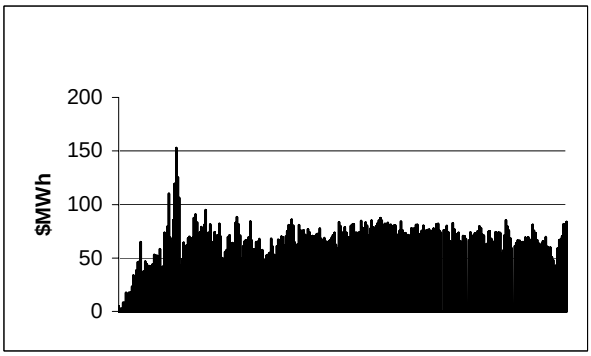
Stylised demand and supply curve for capacity



The key conclusion to be draw from this analysis is that given (1) the likely changes in shape of the demand and supply curves that (2) changes in the position of the supply curve that an efficient market clearing price is likely to vary over substantial range

Chart 1

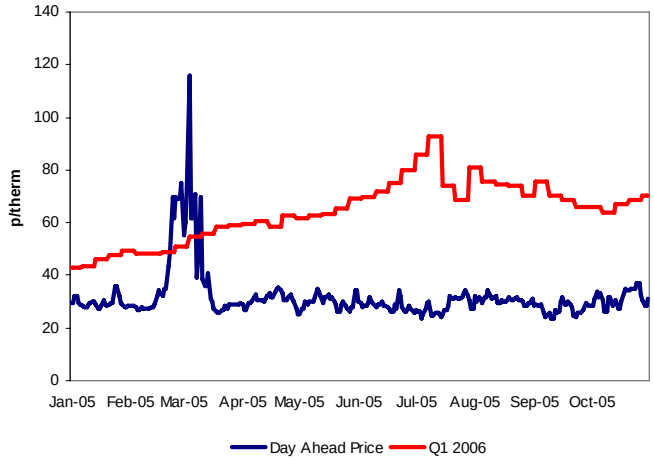
Average Daily Electricity spot price, Otahuhu Node, 2005



Source: Comit

Chart 2

Day ahead gas prices – United Kingdom

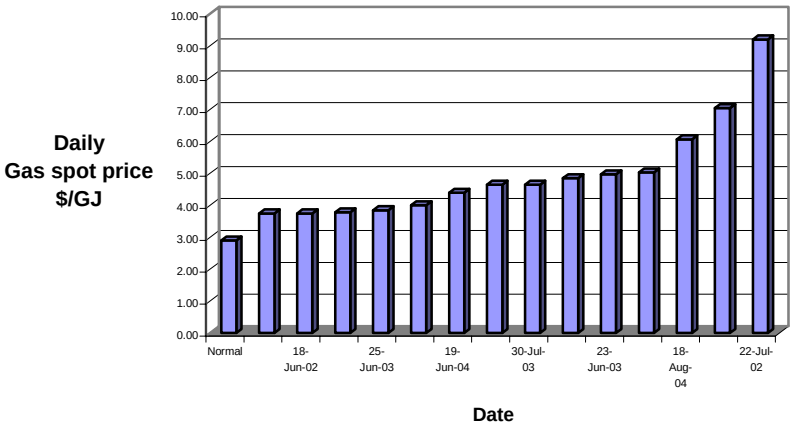


Source: National Grid - 10 Year statement 2005, charts[19]

Chart 3

Significant Pricing Events in the Victorian Gas Market 2002- 2005

[19] http://www.nationalgrid.com/uk/Gas/TYS/current/tys_charts2005.htm



Source: Analysis based on VENCorp "Significant Pricing Event Reports" available on the VENCorp website.

7.2.3 Summary

Fundamental analysis of demand and supply and international experience indicate it is likely that market determined gas prices could fluctuate over a wide range depending on specific supply and demand conditions and the extent of the supply disruption.

7.3 Information and nominations

7.3.1 International experience

The terms of reference required consideration of information and notification systems.

Details of Information and Nomination arrangements are set out in the Annex.

Information, notification systems, responses by shippers and operator directions are an essential part of any economic and commercial arrangement. Key informational and operational elements for any gas system with multiple gas sources include; forecasting, nominations, checking consistency of total nominations with available pipeline capacity, provision of information on imbalances, physical management by shippers of injections and withdrawals; information provided on major events and emergencies, "backstop" operator directions and curtailment, settlement of imbalances, and other ancillary fees and charges (including "out of the market" compensation / funding.)

A key objective of any well designed information and notification systems is to ensure that parties with exposures to imbalance prices and other fees and charges are provided with reliable information so they are a position to best manage their risk in "close to real time" through physical control of gas injections and withdrawals and trading with other parties.

A key structural design issue is whether retail and wholesale information systems are provided by a single body (as in Victoria by VENCorp and in the United Kingdom by xoserve) or whether they are provided separately (as in South Australia, Western Australia and NSW).

Separate provision of information and notification services involves the transmission pipeline companies providing information and notification services to their directly connected parties; and a single retail entity (e.g. REMCo, GMC) providing information services to the retail market.

The details and sophistication of the information and nominations systems vary extensively based on a number of factors including the method and frequency whereby balancing is allocated; the level of linepack; the volatility of demand and the frequency with which nominations must be adjusted. Another factor is the size of the market and the ability of the parties to bear costs.

7.3.2 Gap assessment

Determining what information issues need to be addressed in a wholesale gas market to effectively manage gas shortages requires detailed analysis. A starting point would be a "gap" analysis between the current information arrangements and the information needs of participants necessary to be able to manage their price risk under a wholesale gas market. As such this is beyond the scope of the Terms or Reference.

We would observe that, traditionally, the quality of information in gas networks lag behind that of transmission pipelines. A key issue in our experience with the development of the Victorian gas market is the need for improved real time information in the gas networks downstream of the transmission pipelines. This raises a number of issues including:

- how decisions on investment in improvements SCADA and metering are made and funded;
- ensuing access to metering data is not impended by meter ownership issues; and
- profiling for non-metered customers

8. Legal analysis of risk allocation in Gas Supply Contracts and Transmission

The Terms of Reference required analysis of relevant legal issues. In particular, advice was sought on:

- Distinguishing contingencies that may give rise to compensation claims from those that would be covered by existing contracts, and
- Implications of existing contracts for the design of a compensation scheme.

Section 8.1 summarises the clauses typically included in gas supply contracts to address the issue of interruptions. Section 8.2 analyses contractual issues related to interruption to offtakes due to a failure under an unrelated gas supply agreement. Section 8.3 analyses interruption provisions in transmission agreements.

8.1 Interruption to supply - standard gas supply terms

The relevant Gas Supply Agreements in New Zealand are confidential. However, we are confident that the relevant provisions would be similar to those in Gas Supply Contracts that we are familiar with in Australia. This section summarises the clauses typically included in gas supply contracts to address the issue of interruptions to supply under the interruption of supply provisions in standard gas supply contracts.

8.1.1 Force majeure clauses

Generally the issue of interruption to supply is dealt with by means of a force majeure clause. Such clauses will provide that a party is relieved from their obligations under a contract to the extent they are unable to perform those obligations due to an event beyond their reasonable control. The clauses usually list specific examples of force majeure events, including:

(a) acts of God;

(b) industrial action;

(c) breakdown or failure of machinery; and

(d) acts of government agencies.

The clauses will usually impose an obligation upon the party claiming force majeure to provide the counterparty to the relevant contract with specified information relating to the event of force majeure. The clauses will also generally provide that the protection of the clause ceases to apply from the time the party claiming force majeure could have overcome the relevant event of force majeure by the exercise of reasonable endeavours.

The clauses inevitably raise the following practical issues:

- Allocations
- Information Asymmetry
- Endeavours to Overcome Force Majeure Events

- Other Interruption to Supply Clauses
- Take or Pay Relief/Liability

8.1.2 Allocations

Despite the fact most gas suppliers have multiple customers, the clauses rarely set out how a gas supplier is to allocate a shortfall in gas supplies caused by force majeure between those customers. It is unclear how, absent an express provision setting out an allocation procedure, a supplier is meant to allocate a supply shortfall between its customers. There is some case law on this issue, which suggests the supplier should allocate a shortfall using a methodology which is reasonable, having regard to the circumstances and practices of the industry in which the supplier operates.

A reasonable methodology does not necessarily equate to a methodology which maximises economic efficiency or public benefit. For example, a pro-rata apportionment based on Maximum Demand Quantity (MDQ) may constitute a reasonable methodology. However from the perspective of the public benefit allocation of gas in priority to emergency uses and to users who cannot utilise alternative fuels would appear preferable.

A gas supplier will obviously have an incentive to allocate available gas supplies to users most likely to suffer loss or bring a claim against the supplier and away from users who are unlikely to suffer loss or have the incentive (or means) to bring a claim.

8.1.3 Information asymmetry

While the clauses usually require the party claiming force majeure to provide information to its counterparties as to the nature of the force majeure event and the steps being taken to overcome it, the counterparty will usually find it has insufficient information to assess whether a claim of force majeure is justified. For example; was a gas plant breakdown genuinely beyond the gas supplier's control or was it due to negligent maintenance of that plant by the gas supplier?

Information in relation to the claimed force majeure event will always be presented in such a manner as to suggest the event was in fact due to force majeure. Rarely do contracts contain provisions requiring a gas supplier to supply more information in response to a request by its counterparty, let alone allow the counterparty to inspect documents or carry out an expert investigation or audit.

The result of this is that a counterparty is unlikely to challenge, by legal action, a claim of force majeure unless:

(a) they have sufficient industry knowledge to make them confident the claim is unlikely to be genuine; or

(b) the sums involved are sufficient to justify the risk of an unsuccessful claim.

8.1.4 Endeavours to overcome force majeure events

Force majeure clauses also tend to be ambiguous as to exactly what steps a party claiming force majeure is required to take to overcome the force majeure. They will often refer to a party using reasonable endeavours or taking reasonable measures to overcome the event. However what this means in practice is generally unclear. In particular, is a party required to incur expenditure disproportionate to the value of a contract to remedy an event of force majeure? If a gas

supplier is unable to supply gas from their usual source of supply, are they required to source gas from an alternative substantially more expensive source?

This lack of clarity also makes it difficult for a counterparty to assess whether a gas supplier has complied with its obligations to remedy a force majeure event.

8.1.5 Other interruption to supply clauses

In addition to a general force majeure clause, gas supply contracts often contain specific interruption rights. For example, a right on the part of the supplier to interrupt supplies due to:

(a) emergencies; and

(b) requirements of applicable law.

There will often also be a right to interrupt supply for planned maintenance up to specified levels (for example, defined by reference to hours per year).

These clauses generally raise the same issues as force majeure clauses. Often, unlike force majeure clauses, they do not impose upon the gas supplier an obligation to use reasonable endeavours to overcome the relevant event causing the interruption. It is usually only implicit that supply must recommence once the relevant event necessitating the interruption has abated.

8.1.6 Take or pay relief/liability

Where gas supplies are not delivered to a customer due to force majeure then usually they are provided with relief (to the extent of the quantity of gas not delivered) from any take or pay obligations in their purchase contract – that is, the obligation to pay for, irrespective of whether it was taken, a minimum quantity of gas each year.

Where gas supplies are not delivered due to the negligence or default of the gas supplier, the customer will have a right to claim damages from the gas supplier subject to any limitation of liability clauses in the relevant contract. Gas supply contracts generally restrict the damages claimable such that the counterparty cannot claim damages on account of loss of revenue or liability it incurs to third parties. Generally, therefore, the counterparty is limited to claiming the incremental costs of using alternative fuels to replace the undelivered gas (or the incremental costs of acquiring gas from a more expensive source).

8.1.7 Summary

Force majeure and interruption to supply clauses are generally expressed in broad terms, using concepts which are not readily applied in practical situations – in particular, concepts of "reasonableness". As a result the correct application of such clauses is often unclear. They rarely provide an effective mechanism to respond to gas supply interruptions. Nor, because of their ambiguity, do they provide an effective mechanism for customers of gas suppliers to understand the precise nature of the rights they have against their suppliers and enforce those rights.

8.2 Interruption to offtakes due to failure under an unrelated gas supply agreement

This section discusses the financial implications where a major load is forcibly curtailed by the system operator due to the failure to supply from a gas supplier under another unrelated gas supply contract. This is relevant to the discussion of an indemnity approach to compensation.

In this situation, the implications will depend on the degree of flexibility in the gas supply contract and the ability to trade the contract. If the contract is a take or pay contract (with fixed charges regardless of take) then unless the contract offtake obligation is traded (say to a party that is suffering a gas supply shortfall), the major load will incur charges not matched by any benefit and there may be a claim of direct financial loss.

Given that without a wholesale gas market it will be difficult to organise trading in advance, there may be a lack of clarity as to who should bear any fixed charges under take or pay.

If the gas supply contract is flexible, (gas can be banked for use another day) there will be no fixed take or pay charges incurred, and no direct loss arises.

Under a market based approach, these issues can be taken in to account in the prices that are set by the participants in the market. However where compensation needs to be calculated under an indemnification approach, consideration will need to be given to the flexibility of the gas supply contracts, whether any fixed costs were incurred and who should bear the fixed costs.

The principles of a compensation arrangement should include provisions that shippers in negative imbalance should bear any fixed costs under other parties GSAs.

The calculation of compensation under an indemnification approach, will need to take into account the flexibility of the gas supply contracts, whether any fixed costs were incurred and who should bear the fixed costs.

The principles of any compensation arrangement (not calculated through a market based approach) should include provisions that shippers in negative imbalance should bear any fixed costs under other parties GSAs.

8.3 Transmission contracts – interruption/curtailment of transportation service

Interruption to supply clauses in transmission contracts generally raise the same issues as interruption to supply clauses in gas supply contracts. Transmission contracts generally contain force majeure clauses and these clauses essentially raise the same issues as described in section 8.1. Transmission contracts also usually allow supply to be interrupted or curtailed:

(a) in emergencies;

(b) to comply with applicable law; and

(c) to preserve the integrity of the relevant pipeline system.

These principles are reflected in the NGC New Zealand Limited Transmission Services Agreement (clauses 11 and 19) and the Maui Pipeline Operating Code (clauses 15 and 27).

8.3.1 NGC New Zealand Limited Transmission Services Agreement

Clause 11 allows transmission services to be interrupted/ curtailed due to:

(a) emergencies (including to implement, or avoid the need to implement, the Industry Contingency Plan);

(b) force majeure;

(c) the integrity of the transmission system or another pipeline being affected by a shipper exceeding its contractual entitlements, Operational Imbalance with the Maui Pipeline or due to depletion of line pack; or

(d) maintenance.

There are various constraints on these interruption rights. For example, 30 days notice must be given of an interruption for scheduled maintenance. Reasonable notice must be given of other interruptions or curtailments if possible. The period of curtailment/interruption must be minimised to the extent reasonably practicable and NGC must, if reasonably practicable, consult with the Shipper so as to minimise the impact of the interruption on the Shipper's business.

Clause 19 (the force majeure clause) is in relatively standard terms – it provides relief to both NGC and the Shipper where they are affected by Force Majeure.

In terms of allocations, clause 11 of the NGC New Zealand Transmission Agreement expressly requires transmission services to be curtailed on a "fair basis" as determined by NGC acting as a Reasonable and Prudent Operator. Clause 19.5 requires capacity curtailments due to Force Majeure to be allocated by NGC in good faith amongst its shippers (provided that where the Industry Contingency Plan is invoked NGC is to allocate transmission services in accordance with that plan).

In summary the NGC New Zealand Transmission Agreement does provide some direction as to how available transmission capacity is to be allocated. However in our view the direction provided is very general and it will be difficult for a shipper to challenge the appropriateness of an allocation made by NGC given the breadth of the discretion vested in it.

8.3.2 Maui Pipeline Operating Code

Generally the provisions of the Maui Pipeline Operating Code are similar to the Transmission Services Agreement.

Clause 15.1 allows gas transmission to be interrupted or curtailed:

(a) to prevent non-specification gas entering the pipeline;

(b) for maintenance (other than scheduled maintenance, the rights to interrupt for scheduled maintenance being dealt with in clause 18);

(c) for Force Majeure; or

(d) due to other events (including emergencies) which have detrimentally affected transmission services.

Similar obligations in relation to consultation and notice as set out in the Transmission Services Agreement apply in the case of such interruptions/curtailments.

Clause 27 is a standard force majeure clause, generally similar to the equivalent in the Transmission Services Agreement.

Under clause 8.28 and 8.29 of the Operating Code where there is a curtailment/interruption in services, then available capacity is to be allocated pro-rata based on nominations. That is, the Operating Code sets out a more prescriptive allocation mechanism. The main issue with use of such a mechanism is that it may be overly prescriptive to effectively be applied in all situations – for example, where a curtailment affects only part of the Pipeline or where, at the time of a curtailment, a shipper has already exceeded the allowance that would be allocated to it under the curtailment.

Transmission Agreements do provide some direction as to how available transmission capacity is to be allocated, however the direction provided is very general and it will be difficult for a shipper to challenge the appropriateness of an allocation made by NGC given the breadth of the discretion vested in it.

9. Assessment and recommendations on emergency gas pricing options

This section sets out our assessment of the options and our recommendations.

Section 9.1 recommends that an appropriately designed, "fit for purpose" wholesale gas market is the best long-term option for managing gas outages and emergencies. It also recommends aspects of gas emergency and outage management that should be considered in the wholesale gas market design. Section 9.2 discusses the approach to making decisions on changes to the NGOCP in the short term. Section 9.3 sets out the options considered, identifies options that considered unsuitable as short term solutions and suggests options that warrant further consideration. Section 9.4 recommends short term options after taking account of the broader strategic considerations (including the work associated with developing and implementing a wholesale gas market).

9.1 Wholesale gas market

9.1.1 Wholesale market is the best long term option

In our view an appropriately designed "fit for purpose" " wholesale gas market is the best option for managing gas outages and emergencies.

A Wholesale Markets Working group is developing recommendations for a wholesale gas market design. This design will need to consider various design issues and some of these are outlined in 10.1.

In regards to dealing with managing outages and gas emergencies, it would be desirable for the market design to enable bidding in and valuation of interruption offered by controllable gas loads and short term / spot gas supplies. Non bid-based curtailment[20] should be limited to mass market loads that are not controllable.

A well designed gas market should enable market forces to address outages and emergencies in anything other than the most extreme situations. The current demand side of the New Zealand gas market comprises a large amount of controllable load (gas fired power stations and petrochemical loads). As this load should be prepared to interrupt at relatively "low" prices[21], a market system should be able to address large national gas outages.

An appropriately designed, "fit for purpose" wholesale gas market is the best option for managing gas outages and emergencies. The market should ensure short term incentives for operational efficiency, and long term incentives for productive and dynamic efficiency in managing the risk of gas outages and emergencies.

The Gas Industry Co should give priority to progressing current work on developing a wholesale gas market design, and implement changes as soon as practicable.

[20] That is curtailment not based on bids.

[21] As compared to other jurisdictions where the demand side often comprises a large proportion of mass market loads with very high valuations for unserved energy.

Ideally (i.e. having regard to practicality, cost and complexity) the objectives for the wholesale market design should explicitly take into account the need to handle major outages, without the need for market suspension for anything other than major gas emergencies.

9.2 Approach to making decisions on changes to the NGOCP in the short term

As discussed, it is recommended that priority should be given to developing and implementing a "fit for purpose" wholesale gas market as the best means of managing outages and emergency events.

As this will take some time to complete, decisions are required as to what steps, if any, should be taken in the short term. In our view the most appropriate short term solution requires judgements that weigh up competing criteria, issues and priorities. We have therefore considered a small range of options, and highlighted the pros and cons of each.

The following section (9.3) sets out options that we have considered and rejected. Section 9.4 sets out the option we recommend should be considered further (before considering the broader strategic issues), and section 9.5 makes recommendations taking into account the overall strategic issues.

9.3 Options considered and rejected

Options that we have considered and rejected are:

- Posted prices; and
- Demand bidding.

The reasons for rejecting these options are outlined in the following sections.

9.3.1 Posted prices

a How might a posted price be determined?

Evaluation of this option requires more detailed consideration of how posted prices might be determined. Our considerations are provided below.

As discussed, in New Zealand's present circumstances (section 5.4.2), a high weighting should be given to providing long term signals for investment in appropriate supply side capacity and demand side responses. We consider it important not to set posted prices at a level that limits incentives for controllable loads to be curtailed or for investment in efficient reserve gas supply capacity.

Given this factor, a range of posted prices for the national gas system could be determined by undertaking modelling along the following lines:

- Calculating a range of maximum gas supply capacities under a range of scenarios;
- Projections for coincident peak demand under a range of scenarios;

- Evaluating a range of contingency events;
- Calculating marginal interruption values for different levels of required curtailment and calculating the marginal cost of marginal gas supply;
- Some form of risk based assessment technique to take into account a range of different supply and demand scenarios (such as Monte Carlo analysis). This analysis could be extended to account for a range of different marginal values of interruption, based on analysis of a range of electricity market outcomes; and
- Determining an average posted price associated with each category load interrupted that is necessary to induce the appropriate balancing of interruptions and marginal investments to occur under a broad range of scenarios.

Further analysis would be required on how to set posted prices for regional interruptions.

In practice, this approach is likely to be highly problematic.

Firstly, as discussed in section 7.2.2, we suspect that the "underlying" efficient gas prices are likely to vary over a substantial range depending on the specific circumstances of the gas supply and demand shortfall and the state of the electricity market. However we have not analysed possible actual gas price outcomes in New Zealand; further consideration and analysis of this point may therefore be appropriate.

Secondly, such analysis is relatively complex, requiring significant judgements and assumptions. There may be substantial debate as to whether the results are "right" or even reasonable. In particular, there may be a high level of subjectivity in determining the range of contingency events that should be considered.

Thirdly, it will be difficult to take account of the structure of gas contracts.

b Fairness

This option is problematic in terms of meeting either "pure market" or "risk management" standards of fairness. The posted price is not determined through a market process. Moreover, given the wide range for potential market prices, in many cases the option will not align with reasonable participant risk management requirements.

c Short term operational efficiency

This approach does not provide any information to enable the System Operator to determine an efficient curtailment schedule.

This approach could also create perverse operational distortions. If the posted price is set "too high" relative to the true value of interruption, then interruptible loads could have incentives to take actions to encourage the system operator to trigger an emergency event that otherwise might not be necessary, in order to enjoy the benefit of the "high" posted price. If an event occurs where the underlying value of gas is much higher than the posted price, then parties may be reluctant to curtail.

If there is a wide range over which the true market clearing price might vary, then a posted price may often be "badly wrong" and therefore operational distortions may be common.

d Long term economic inefficiency (productive, dynamic)

It is difficult to assess the implications for long-term economic inefficiency without undertaking further analysis.

e Conclusions

In summary, we consider that in practice a posted price approach:

- May be problematic to calculate on a basis that was agreed or was likely to be accepted as reasonably efficient;
- Does not produce equitable outcomes; and
- May create operational distortions.

In addition, a posted price approach is not adopted in any of the jurisdictions we have reviewed.

There are a number of better options and we recommended this option not be considered further.

It is recommended a posted price approach not be considered further.

9.3.2 Demand bidding

a Introduction

This option involves establishing a market based mechanism whereby shippers on behalf of gas users can establish a price at which each gas user is prepared to have a defined volume of their nominated gas load curtailed.

b Fairness

This option is assessed as being consistent with fairness. It is consistent with a market-determined approach, and provides flexibility for participants to manage their risks.

c Short term operational efficiency

This option promotes short term operational efficiency as it produces a market-based curtailment schedule which the system operator can use to manage emergency events.

d Long term efficiency

This option would promote long term operational efficiency. It provides pricing information that would assist in assessing the value of interruption, and would enable tradeoffs between demand side and supply side options to be evaluated.

e Simplicity

This option will require substantial work which may tend to duplicate work that is required to implement a wholesale gas market. Given the current wholesale gas market development program, the case for this option is weak.

A stand-alone demand bidding approach has not been adopted in any of the jurisdictions reviewed or anywhere else that we are aware of.

We consider that the case for this option is weak, given the substantial implementation work that would be required, and the inefficient duplication of work associated with the development and implementation of a wholesale gas market.

We consider the case for a demand bidding option is weak, given the substantial implementation work that would be required and the duplication of effort needed for development and implementation of a wholesale gas market.

9.4 Options recommended for further consideration

This section discusses suggested options to be considered further as having some merit in principle.

9.4.1 Replacement gas at a later time (status quo)

a Introduction

Shippers in negative imbalance during an emergency event would replace gas used during the emergency to the shippers that are in positive imbalance. Replacement would take place once the emergency is over. This option does not attempt to set a value for gas used in emergency.

b Fairness

This option is assessed as not meeting the "pure market" standard of fairness. The decision to replace gas at a later time is imposed and not determined through any voluntary market process.

We consider this option is unlikely to fit with participants' reasonable risk management requirements. Electricity generators for example may be unable to efficiently manage the risk of interruption. We assess this option as unfair in terms of providing a reasonable basis for participants to manage risk.

c Short term operational efficiency

As discussed in section 4.3.2, this option does not encourage short term economic efficiency

d No incentives for long term economic inefficiency

As discussed in section 4.3.3, this option does not encourage long term economic efficiency

e Simplicity

This option is simple as it does not require any changes and there are no implementation costs.

In our assessment, it is not viable to continue with the status quo option in the medium to long term.

However, there is a case for continuing with the status quo in the short term if the Gas Industry Co were satisfied that:

- **there was no threat to safety or system integrity in any circumstances**

- **the risk of significant gas emergencies was reasonably low in the period until a wholesale gas market can be implemented**
- **on balance, it was more likely to achieve the Gas Act efficiency objectives by focusing efforts on a permanent solution (i.e. a wholesale market), and that this could be achieved reasonably quickly**
- **in practice, participants would behave in a reasonable way to cooperate with the System Operator in an emergency event**
- **the Gas Industry Co would not face risks to its credibility in the event that a major gas emergency event did occur.**

9.4.2 Imputed prices

a How might an imputed price be determined?

Under this option emergency gas prices / compensation values would be determined to reflect the imputed value for opportunities foregone in other markets. In order to evaluate this option, it is necessary to consider in more detail how an imputed price might be determined.

It is envisaged that, if electricity generators are the marginal load to be curtailed, a formula would be determined to calculate the value of gas that reflects the value of electricity production forgone. The formula could take account of assumed electrical conversion efficiency for an average gas fired generation plant[22]. Imputed prices could also be calculated for other controllable loads such as petrochemical plants based on assumed conversion factors.

The range of issues that would need to be considered include:

- The average conversion ratios for electricity and other loads such as petrochemicals are estimated, and there may be differing views as to what the appropriate ratio should be;
- Actual conversion rates are likely to differ between electricity generators and will not necessarily reflect the average assumed conversion ratio. One option would be to determine individual imputed values for major loads and
- The adequacy of compensation may depend on the pricing structure of gas contracts and interpretation of Force Majeure and interruption clauses.

[22] Note the Maui Pipeline Operating Code defines a "Premium Fuel Value Fee" which provides a definition of an assumed electrical conversion efficiency. This provides one data point for considering fuel efficiency for A Premium as a fee per GJ posted on the MDL IX that is the higher of the Negative Mismatch Price and the gas price equivalent of the electricity spot price during the Day. The gas price equivalent of the electricity spot price will be determined by the assumed electrical conversion efficiency for a New Zealand gas fired generation plant (deemed to be 140 kWh/GJ) multiplied by the highest mean electricity spot price for any two hour period on the Transmission Day at the nearest node to any major gas fuelled electricity generation plant whose generation capability is greater than 30MW.

b Simplicity

In practice, it is expected that the decision making process for resolving these questions will involve considerable analysis and debate. The decision makers on the imputed value formula(s) may face a significant information asymmetry problem, as it may be difficult to independently verify the value of the parameters in the imputed formula.

c Fairness

As with the posted price option, this option is problematic in terms of meeting the "pure market" standard of fairness. The imputed price is not determined through any market process but determined and imposed through an administrative process. The extent of actual alignment with participant risk management requirements could only be determined through analysis and consultation.

d Short term operational efficiency

This option may provide some information to the system operator to assist in minimising the total economic loss from an emergency event. The system operator could use the imputed prices to schedule interruptions in order to minimise the total cost of compensation.

This option appears less likely than the posted price option to create perverse operational distortions, since there should be a closer alignment between the gas price and the true value, but whether this is the case in practice needs to be investigated more closely.

e Conclusions

In summary, in the absence of more detailed definition and analysis, we consider that an imputed price approach is difficult to evaluate in terms of its practical effect without further developing and analysing the option

In principle, an imputed price may provide more flexibility than a posted price approach and may take account of changes in other markets, in particular the electricity market. Without further analysis and consultation with participants, we think it is premature to rule out this option.

However we consider that the practical analysis and decision making problems confronting decision makers (the Gas Industry Co or government) should not be underestimated.

Finally we note that an imputed price approach is not used in any of the jurisdictions we have reviewed, or any other jurisdiction to our knowledge.

An imputed price approach could be considered further.

More detailed definition and analysis of practical implications would be required in order to evaluate and compare options.

In theory, an imputed price is more flexible than a posted price approach. It can take account of changes in other markets, in particular the electricity market.

However the practical analysis and decision-making issues confronting decision makers (the Gas Industry Co or government) should not be underestimated.

9.4.3 Ex post "fair price" determination

a Introduction

Under this option an "emergency gas price(s)" or "compensation amounts" would be determined "ex post" based on a defined set of principles, in particular, the insurance principle of indemnification. Price/compensation amounts would be determined either by the system operator, an appointed expert or by an arbitrator.

b Fairness

An ex post fair price determination does not meet a "pure market standard" for fairness.

However in the short term (i.e. in the absence of wholesale market) it has advantages compared to other options. Compensation is based on direct loss, so that affected parties are no worse off than if the event had not occurred. It is consistent with a "risk management approach" to fairness. The concept of indemnification is well understood in insurance and law and is therefore procedurally fair.

c Short term operational efficiency

An ex post determination does not directly provide incentives and information to encourage short term operational efficiency. However, since affected parties would be compensated for direct loss, there should be no impediments to their cooperation with the system operator (and other institutions such as the electricity market authorities) to take actions that align with the overall interest of the market.

d Long term efficiency

An ex post determination does provide some signals for parties to take steps to manage their risks. The costs of compensation would be recovered, to the extent practicable, from those that caused the event: those parties will have incentives to take appropriate steps to manage their risks.

e Simplicity

This option involves limited up front effort, and in particular does not require detailed market analysis or formula development (as with the posted price and imputed price options).

If a determination were required, the assessment of ex post compensation would involve considerable effort on the part of the expert or arbitrator. However the cost of the determination process could be limited by establishing clear decision-making deadlines. These costs are only incurred in the event a contingency actually takes place.

It should be noted that this option may only be a "bridging" option until a wholesale market is developed to replace it; it may be considered unlikely that a determination will be required.

An ex post determination of an emergency gas price is a viable option that should be considered further.

This option involves limited up front effort, it is fair in terms of effective risk management, and procedural fairness.

While it does not directly provide incentives and information to encourage short term operational efficiency, there would be no barriers to affected parties cooperating with the system operator (and other institutions such as the electricity market authorities) to take actions that align with the overall interest of the market.

Long term efficiency may be promoted to some extent, since the option provides signals for parties to take steps to manage their risks.

9.5 Recommendations taking account of strategic considerations

This section sets out our recommendations for short term actions, taking into account the overall strategic situation facing the Gas Industry Co.

As noted in section 9.1.1, we suggest that the Gas Industry Co should focus efforts on developing and implementing a "fit for purpose" wholesale gas market as soon as practicable, as the best way of dealing with the operational and financial implications of gas outages and emergencies.

Given this position, we think that the more attractive short term options from a strategic perspective are those that require limited up front effort, and are reasonably clear and certain in their operation. Subject to our assessment of the strategic situation for the Gas Industry Co being reasonable, we recommend the Gas Industry Co select either:

- Replacement of gas (status quo); or
- Ex post fair price determination.

The pros and cons of these options were discussed above.

For the short term and taking into account overall strategic considerations, we recommend options that require limited up front effort on behalf of the Gas Industry Co and industry, being:

- **Replacement of gas (status quo)**
- **Ex post fair price determination.**

10. Wholesale Gas Market

The Terms of Reference required input on the design implications for a wholesale market arising from outages and emergencies. Section 10.1 discusses design issues that will need to be considered that extend beyond this Terms of Reference for this study. Section 10.2 discusses Wholesale Gas Market design issues that are directly related to outages and emergency management include. Section 10.3 discusses how a wholesale gas market might deal with outages and emergencies.

10.1 Design issues outside Terms of Reference

The details of a WGM is being considered by a Working group and will need to consider various design questions. Some of these include;

- How will legacy contract rights, if any, and the transition from legacy contracts to "new" contracts be managed?
- To what extent should the trading arrangement be separate from, or, integrated with, the pipeline balancing arrangements? For example a completely separate trading arrangement could be designed to assist parties comply with pipeline balancing requirements, in particular to avoid balancing penalties and Operational Flow Orders. There would be no connection between these. At the other extreme, the market trading arrangement could be fully integrated with the pipeline balancing arrangements. Intermediate approaches would include balancing penalties being cashed out at the market related clearing price.
- Would the Maui and NGC pipelines be subject to integrated arrangements or would these operate separately?
- Would the treatment of loads connected at the distribution and transmission systems respectively be based on fundamental technical and economic characteristics of the load (e.g. whether or not controllable, metering arrangements, costs of metering etc) or would the arrangements also vary depending on the level of network connection
- Would spot prices be determined:

  – without reference to a physical location / hub point;

  – at a single hub point; or

  – at multiple hub points ?

- How will firmness of transmission capacity interface with the market, if at all; for example; would transmission firmness be determined by reference to existing contractual risk allocations, or should the transmission pipelines be exposed to price risk for risks that are under their control.

A number of strategic questions could also be asked including:

- What are the overall objectives of the trading arrangements and what is the priority and balance between them?
- Is the approach to the process of change management either pragmatic and / incremental or is it a "ground up design" that is based on first principles?

10.2 Wholesale gas market design issues related to outages and emergency management

Wholesale gas market design issues that are directly related to outages and emergency management include

- Ex ante *vs* ex post pricing
- Prudential arrangements under significant supply shortfalls
- Whether or not there are price caps during normal market operation
- Price caps during normal market operation
- Market liquidity
- Resale prohibitions in gas supply contracts
- Information and Nominations
- Capacity planning information

10.2.1 Ex ante *vs.* ex post pricing

An important market design issue is whether the clearing price for imbalances[23] is determined ex ante or ex post.

The following discussion is in the particular context of considering outages and emergencies, but also has relevance for considering any unexpected event that occurs within the balancing period.

Ex ante pricing – definition

An ex ante price is determined prior to a trading interval, and would be consistent with nominations. We understand that an ex ante price could be established consistent with the current arrangements.[24] There are different options as to how an ex ante price could be determined. It could be determined through an organised voluntary bilateral trading market as well as over the counter trading, perhaps with some form of published price index. Alternatively it could be determined through some mandatory centrally cleared market. The details of the timing of price determination would depend on the market design. For example ex ante prices could be determined on the day prior to the subject gas flow day.

[23] The term "imbalance" means a mismatch as applied to the NGC Transmission and the Maui Pipeline Operating Code (MPOC) as well as Operational Imbalances of the MPOC.

[24] For example ex ante trading could be "trading on nomination" on the day prior based on the OBA allocation mechanism on Maui trading points (Rotowaro, Frankley Road).

Ex post pricing – definition

An ex post price is determined based on actual gas flows rather than nominations. One way for this price to be determined would be a centrally cleared "net" market, (similar to Victoria). Under this arrangement, parties would submit nominations and "inc" and "dec" bids and offers. The incs and decs represent prices at which a party would be prepared to buy / sell a defined quantity of gas in a trading interval. Parties can submit a schedule of incs and decs. The system operator would use the information provided in the "incs" and "decs" to determine a clearing price and traded quantities which maximise the value of trading. In this way, parties can set inc and dec prices and manage their trading position such that any trades determined by the system operator are consistent with each parties valuation of marginal quantities of gas. The details of the timing for determining an ex post price would vary according to the market design. For example the ex post prices could be determined on the day after the gas flow day. This form of ex post price determination would require additional data from each party; increments indicating what price each party is prepared to pay for any increase over nominated flows; and decrements indicating what price each party is prepared to forgo gas from its nominated flows.

Now, consider the situation where:

- the clearing price for imbalances is determined ex ante
- a major outage or emergency occurs after the clearing price for the balancing period is determined and a material time before the beginning of the next balancing period; and
- the system operator considers that action needs to be taken within that balancing period to curtail load and/or increase supply.

Implications of this situation are:

- The availability of line pack is a critical determinant of how quickly action needs to be taken. It is suggested that careful analysis of linepack run down rates down under various contingencies is the first required step in understanding the nature of this problem and the problems / benefits associated with different approaches.
- There will not be a price signal that encourages the market to resolve the situation within the balancing period (since the clearing price reflects the "normal" market demand and supply equilibrium rather than the "emergency" demand / supply balance).
- The market design could include some form of ancillary service whereby the system operator could call on additional contracted resources (analogous to the existing balancing gas arrangement) with this cost recovered from shippers in negative imbalance at the end of the period.
- In addition or alternatively there could an ex post determination of compensation for an participant who is directed by the system operator, (similar to the proposed interim solution). The compensation

provision in the VENCorp market and system operator rules also addresses this situation.

Consider now the ex post pricing option. This will mean that the spot price will reflect the actual clearing of demand and supply including the reduced supply as a result of the outage / emergency) - rather then the expected demand and supply prior to the balancing period.

Because it reflects the actual supply demand balance, ex post pricing in principle is more allocatively efficient and reduces the need to rely on centralised decision making and/or "off market ancillary service or compensation mechanisms.

The main disadvantage of ex post pricing is that it creates a more difficult forecasting and risk management challenge for participants and therefore a greater need for information to facilitate effective risk management.

Under ex post pricing, price risk is transferred from the system operator to market participants. There would need to be more sophisticated "close to real" information on actual and forecast of imbalances and provision of other information to assist users to predict the ex post price. There will be an associated cost in provision of this information.

Note that the degree of difference in economic effect between ex ante and ex post pricing is affected by the length of the balancing period. The shorter the balancing period, the smaller is the degree of difference between the two approaches in terms of economic effect.

Ex ante and ex post pricing differ in the degree to which the clearing price accurately reflects demand and supply conditions; the nature of the risks that need to be managed by parties; the information that would need to be provided to determine prices and assist parties manage their risks. Careful analysis of linepack run down rates under various contingencies is required in understanding the nature of this problem and the problems / benefits associated with different approaches.

10.2.2 Prudential arrangements under significant supply shortfalls

A key design issue for the wholesale gas market is whether the market involves counterparties individually managing credit risk, or whether it is a pooled wholesale market which matches up buyers and sellers through a central market clearing process with some centralised prudential arrangement to manage credit risk.

It is beyond the scope of this paper to explore this issue. A key issue in considering extended gas supply shortfalls, however, is that the market determined spot gas price (or an administered price cap) is likely to be set at relatively high levels for the period of the shortfall, creating a risk of default by parties in negative imbalance.

The nature of credit risk triggered by high spot prices under significant supply shortfalls will need to be understood in considering prudential arrangements under any centralised market clearing process. This issue also raises the question of the potential role for price caps. This is discussed in the next section.

Credit risk triggered by high spot prices under significant supply shortfalls will need to be understood in considering prudential arrangements for a wholesale market.

10.2.3 Price caps during normal market operation

The wholesale gas market design will need to consider what, if any, constraints on market forces will be required to determine prices during normal market operation.

Based on international experience, there may be a case for considering price caps in the normal operation of the market.

The objective of price caps would be to provide a means for participants to manage risk under extreme situations and limit significant windfall gains and losses. If price caps are imposed, these should be set at a level that does not impact on the market clearing, through controllable loads offering interruption, or by marginal gas production sources offering capacity.

Price caps are an option to enable participants to manage risk under extreme situations, and limit windfall gains and losses.

If it is decided to impose price caps on setting the clearing price during normal market operation, these should be set at a level that does not impact on market clearing under significant outage situations through controllable loads offering interruption, or by marginal gas production sources offering capacity.

10.2.4 Price caps during market suspension

The wholesale gas market rules should clearly define events that trigger market suspension, with market suspension only occurring as a last resort. This is in line with international practice.

Options for setting prices during market suspension include:

- Market based approaches
  - Emergency gas price is set at the most recent price prior to market suspension (UK approach)
  - Emergency gas price determined by the system operator according to a hierarchy approach with an administered price cap (Victoria)
- Contract based approach
  - System operator determines imbalances with pricing of imbalances determined by reference to contracts (South Australian and Western Australian approach).

As discussed in section 8.1 above, in our experience force majeure and interruption to supply clauses in gas supply agreements rarely provide an effective mechanism to respond to gas supply interruptions. We have not specifically reviewed the New Zealand gas supply agreements as these are confidential. However, we consider it likely that these agreements will suffer from the same shortcomings.

Assuming this is the case, then we recommend that gas pricing during market suspension is not determined by reference to the force majeure and interruption to supply clauses in the gas supply agreements, but rather according to some objective market-related approach along the lines of either the UK or Victorian approaches.

The wholesale gas market should have well defined events to trigger market suspension, with market suspension only occurring as a last resort.

If force majeure and interruption to supply clauses in New Zealand gas supply agreements are not effective to respond to gas supply interruptions, then we recommend that emergency gas pricing is not determined by reference to those clauses, but rather according to an objective market-related approach.

10.2.5 Market liquidity

A potential issue is the effectiveness or feasibility of a wholesale gas market solution due to lack of liquidity in the gas market, due to its small size and a limited number of participants.

In our view, concerns as to lack of liquidity in the wholesale market need to be considered against what alternatives there are for reasonably efficiently handling outages and emergencies.

The alternative to a wholesale market is in effect some centrally administered process. In our view, a centrally administered process suffers from (a) a lack of information at the centre as to the most effective means of addressing imbalances and (b) lack of flexibility in pricing. A well designed market process, even within a market that is illiquid, should encourage parties to be prepared to make additional gas available and for loads that can interrupt to do so, provided the clearing price is able to rise to levels sufficiently remunerative to encourage this to occur.

A concern with establishing a wholesale gas market where the market is illiquid is the potential exercise of market power, where there are very few parties, or perhaps only one that is able to set a very high price.

As discussed above, this concern might best be addressed by considering what constraints might be placed on a wholesale market for the determination of prices, for example through incorporation of price caps.

A potential concern with relying on a wholesale gas market for managing emergencies within an illiquid market is the potential exercise of market power, where there are very few parties, or only one, that is able to respond. This concern might be best addressed by considering what constraints might be placed on a wholesale market for the determination of prices, for example through incorporation of price caps.

10.2.6 Resale prohibitions in gas supply contracts

We understand that some gas supply agreements clauses prohibit buyers from reselling gas. This may limit the ability of buyers to interrupt and sell back contracted gas into the wholesale market.

We suspect that the purpose of gas resale prohibitions is to provide negotiated discounts to reflect particular benefits provide by the buyer (e.g. large volumes; incremental volume that would not otherwise be demanded; benefits of a long-term contract etc). It is reasonable that gas sellers wish to avoid discounts being enjoyed by other parties.

If our understanding of the purpose of gas resale prohibitions is correct, then we consider that sellers should have little objection to buyers reselling gas at “high” prices during an outage or emergency. When reselling in such circumstances, the buyers are not undermining the commercial basis on which discounts were negotiated.

The Gas Industry Co could explore with buyers and sellers whether amendments to gas supply contracts could be negotiated so that any contractual prohibitions on resale do not unreasonably limit the ability of buyers to offer interruption to the market.

The Gas Industry Co could explore with buyers and sellers whether amendments to gas supply contracts could be negotiated so that any contractual prohibitions on resale do not unreasonably limit the ability of buyers to offer interruption to the market.

10.2.7 Information and nominations

This issue was discussed in section 7.3 above.

Any well designed information and notification system must ensure that parties with exposures to imbalance prices and other fees and charges are provided with timely and reliable information so they are in a position to manage their risk in "close to real time", through physical control of gas injections and withdrawals and trading with other parties.

10.2.8 Capacity planning information

Currently there is significant focus by central agencies (MED) on collating information and statistics on gas production and reserves, but there is little publicly available planning information on peak demand and the available capacity to meet demand; or contingency planning.

The process of capacity planning and load interruption to meet significant contingency events has value to individual participants, but there is also a level of shared benefit to the market overall. Planning costs may be reduced through a level of central provision and coordination.

Therefore, consideration should be given to initiating a regular process of collation and publication of planning information on gas production capacity and peak demand, interruption capability and the overall capability of the system under different contingencies. United Kingdom and Victoria have capacity planning processes in place.

If such a planning process is considered worthwhile, the detailed arrangements should meet participants' needs to enable them to manage their risks, while dealing appropriately with confidential information. Participants should bear the costs of preparing this information.

Logically, such a planning role would be undertaken by NGC as the system operator of the NGC and Maui Transmission pipeline systems. The Gas Industry Co could act on behalf of market participants to specify the nature of the planning process, the outputs, and to determine costs.

Consideration should be given to initiating a regular process of collation and publication of planning information on gas production capacity and peak demand, and interruption capability and the overall capability of the system to manage risks under different contingencies.

10.3 Examples of how a wholesale gas market might deal with outage and emergency conditions

The Gas Industry Co suggested that it would be useful to set out some practical examples of how a wholesale gas market (WGM) design might operate in outage and emergency situations.

10.3.1 Wholesale gas market design assumptions

In order to provide some practical examples, it is necessary to define how the wholesale gas market would operate. Resolving the design issues noted in section 10.1 above are beyond the scope of this report. Nevertheless it is necessary to set some basic assumption. We envisage that the essential elements of the wholesale market necessary to handle outages and major emergencies would cover the following areas:

- **Bids and offers.** It is assumed that a centralised trading arrangement enables participants to make bids and offers for increments and decrements to nominations. There are different options but any option must enable gas supply injections and withdrawals by controllable loads to be managed in response to market clearing prices.
- **Market clearing prices.** The trading arrangement would involve some centralised process for clearing the market and producing a market clearing price. The market could, for example, be based around a swing service concept. Alternatively it could be based around offers for increments and decrements for gas injections and bids for increments and decrements for gas withdrawals. Optionally, clearing prices could be subject to a price cap.
- **Information to support price discovery.** The trading arrangements should support price discovery ahead of and during each balancing period. The arrangements need to provide reasonable forecasts of clearing prices and announce actual estimated clearing prices in close to real time. This pricing information is needed to enable parties to manage their risk.
- **Information on imbalances in close to real time.** The trading / pipeline information systems need to provide information in close to real time on individual imbalances so that participants (or the system operator on their behalf) is able to take actions to manage their risk through physical actions (e.g. injecting additional gas or interrupting load) or through adjusting trading positions.
- **Market suspension.** There should be clearly defined market suspension provisions.

10.3.2 Examples

Box 12 below sets out highly simplified examples of how a wholesale market might operate in different outage and emergency situations. This is necessarily high- level and speculative as the precise details will depend on the detailed design options chosen for the market. The examples

seek to illustrate the information that needs to be made available, the importance of price forecasts and the options and decisions that need to be made in response to that information.

Box 12

Simplified examples of how a wholesale market might operate in different outage and emergency situations.

Example 1 – Small gas field outage

A small gas field in Taranaki experiences a total failure necessitating total shut down of around 5% of total supply.

The market operator, the system operator and the counterparties to the contract are immediately notified.

The market operator draws on previously notified bids and offers and publishes a revised market clearing price forecast. The counterparty is also provided with information that enables them to estimate their negative imbalance at the end of the balancing period and their exposure to balancing penalties (or the cash out amount if this exists).

The counterparty to the failed contract will have a number of options:

- Call on existing back up gas supply contracts and / or interrupt own load;
- Arrange for replacement gas through the central gas spot market that is delivered either through offers for additional gas supply or offers for interruption;
- Seek bilateral deals either directly or through a broker; and/or
- If a cashout balancing arrangement exists they can also do nothing; that is, allow the system operator effectively to effectively purchase gas or interruption through the gas market on their behalf.

The forecast gas price and real time information available on imbalances enables the counterparty to make decisions on their best options to avoid balancing penalties being paid, or being exposed to operational flow orders.

Example 2 - Major gas supply outage

The Maui field experiences a major failure. As in example 1 the market operator, the system operator and the counterparties to the contract are immediately notified.

The market operator draws on previously notified bids and offers and publishes a forecast of the range of prices that might apply.

All available reserve gas supply immediately comes on line either because it is called on under contracts or, where it is uncontracted, knowing that high spot prices can be earned through the period of the outage.

Counterparties to the relevant Maui contracts that (a) have controllable load and (b) are prepared to interrupt at less then forecast prices also immediately interrupt load so as to minimise exposure to market clearing prices.

The increased gas supply and curtailment is notified to the market and system operators.

The market operator then calculates the amount of residual interruption that will be required to balance the market, and drawing on the bid stack determines the specific interruptible loads that should be interrupted and determines a revised forecast market clearing price. Notices are issued by the market operator to parties indicating their offers for interruption are successful.

During the period of the outage there are adjustments to interruptions as new information comes to hand and revised price forecasts are published.

At the end of every balancing period the market operator publishes the actual clearing prices and issues settlement notices to buyers and sellers.

During this period careful attention is paid by the market operator to compliance with prudential management

rules to manage the risk of default by the parties in negative imbalance.

A key design question is whether or not price caps should be provided for in this situation, given that very few parties are likely to be setting the market clearing price.

Example 3 – Transmission outage: No looping

A Transmission line to a regional area fails. As there is no looping of the transmission system, most loads need to be interrupted as per Schedule A of the NGOCP in order to maintain system pressures.

The pricing outcomes will depend on

- design decisions on the market suspension provisions in the market arrangements
- interruption and force majeure provisions in the relevant transmission contract; and
- whether it is considered the transmission company has any control over the failure.

A possible outcome of these decisions is that the market cannot be expected to operate in such circumstances and the market should be suspended, at least for region affected.

In our experience, force majeure provisions in transmission agreements are drawn very broadly, so there is limited exposure to the pipeline of the financial consequences of any failures that are inside its control.

Given the uneven bargaining position between the pipeline owner and users, if there is any attempt to change that balance of risk from what it has been historically, it seems likely that this will require consideration of introducing some form of regulatory involvement in determining transmission terms and conditions.,

Example 4 – Transmission Failure Looping

A transmission pipeline fails. Pipeline looping exist in the affected part of the network so additional supply can be provided through the unaffected pipeline loops and loads only need to be interrupted to a limited extent.

The pricing outcomes will depend on design decisions on including :

- design decisions on the market suspension provisions in the market arrangements;
- design decisions on whether prices are determined on a single hub basis a multi hub basis; and
- and as above interruption and force majeure provisions in transmission contracts and whether it is considered the transmission company has any control over the failure.

If prices are determined on a multi- hub basis and the failure occurs between two hubs then for less serious interruptions it should be possible for the market to continue to operate without suspension.

11. Should arrangements be voluntary or mandatory?

The terms of reference asks us to consider whether the arrangements should be 'mandatory vs voluntary."

This question is related to the relatively narrow context of emergency pricing. The same question may be considered in many other aspects of New Zealand gas industry reform, potentially with different conclusions reached, or general preferences emerging which are beyond the scope of this report. Nevertheless, the analysis and features below may also be relevant to broader debates.

11.1 Compliance with operational and financial arrangements

Arrangements for managing imbalances, emergency curtailment, and pricing (in both normal operations and during emergencies) involve both operational arrangements and financial arrangements.

We suggest that this context raises a number of specific questions, namely:

1. Should operational arrangements be binding on all participants?
2. Should financial arrangements be binding on all participants?
3. Do operational and financial arrangements need to be consistent?
4. If so, how should arrangements be developed and enforced?

11.2 Compliance with operational arrangements

In New Zealand, as with all other jurisdictions reviewed, safety and pipeline system integrity require that operational arrangements *must be mandatory*.

For example as discussed above, the NGC Transmission Services Agreement gives broad powers to NGC to interrupt or curtail due to emergencies, force majeure, or where the integrity of the transmission system is affected by a shipper exceeding its contractual entitlement or maintenance. Similar powers are provide to the system operator in other jurisdictions.

11.3 Features of efficient financial arrangements

In our view, viability of any efficient financial 'scheme' to price imbalances (and potentially, to inform the development of efficient curtailment schedules) depends on:

- clear accountabilities,
- certainty,
- enforceability,
- appropriate supporting prudential arrangements (both for individual market participants and the scheme as a whole), and
- universal application (i.e. co-operation and participation from all affected parties, including those that may suffer financial detriment).

In addition, it is desirable to have consistency between financial and operational arrangements. This is because a high degree of connectivity can facilitate more flexible, responsive and efficient curtailment arrangements.

Conversely, the scheme would not be viable if:

- the scheme was poorly defined, lacked certainty and credibility,
- critical participants could elect not to participate, and/or
- participants could default on financial arrangements without consequences.

11.4 Compliance with financial arrangements should be mandatory (binding)

We consider that compliance with efficient financial arrangements should also be mandatory, in order to achieve effectiveness, prudential viability, fairness and accountability.

Therefore, the arrangements should be mandatory; i.e. all affected parties must be bound to enter the arrangements and comply with them.

As set out in section 11.5 below, 'mandatory' does not necessarily mean "regulated". Viable binding arrangements can be achieved through contracts, regulation or some combination of the two.

These conclusions are consistent with all jurisdictions that we have reviewed. The key areas of divergence are the methods by which arrangements are developed and compliance is enforced. These are discussed below.

11.5 How should the arrangements be made mandatory?

It is not necessary to lock in at this stage a preferred method to develop and enforce the pricing solution.

There is a range of options available. As noted above, "mandatory" does not necessarily mean "legislated" or "regulated". For example, compliance with financial arrangements could be:

- a condition of use of the transmission system, enforced by the system owner/ operator under its standard contract; or
- a condition of a separate code (possibly determined by an impartial industry body, regulator, or government officer); where
    - compliance with the code is a condition of using the transmission system; and
    - the code itself creates enforcement rights for market participants.

Even within the range of legislated or regulated solutions, there is a wide range of options, including, for example:

Complex, detailed, prescriptive, potentially time consuming regulation	More flexible, less prescriptive enabling regulation
"Black letter" laws, e.g. ▪ detailed regulatory processes and obligations ▪ set out in an Act or Regulation ▪ owed to and enforced by a regulator/ government officer	Instrument with regulatory support, e.g. ▪ binding, multilateral obligations ▪ set out in an instrument of some sort (contract, code, protocol or guideline) ▪ with regulatory support (e.g. a statutory provision, regulation or rule requiring someone to develop the instrument; or requiring designated people to enter/ comply with the instrument)

Section 11.5.1 considers the range of high level options; section 11.5.2 considers the factors that may influence the decision on which option is preferable in the New Zealand context; and section 11.6 offers comments on the way forward.

11.5.1 High level options for instruments that set out compliance requirements

Box 13 sets out high level feasible options based on first principles and international experience: we have not considered the specific nuances of existing New Zealand laws and regulatory trends.

In particular, there will be important debates and legal analysis around the interaction between gas and trade practices laws that should be considered when decisions have been made on the preferred pricing option(s). Notably, legal advice should be sought on any Commerce Act considerations and implications.

Box 13

High level options for instruments that set out compliance requirements

Instrument	Developed by	Enforced by	Description	Precedent
Unregulated contract	System operator (NGC)	Contract with system operator	Compliance is a contractual condition of connection to/ use of the transmission system Arrangements can be set out in the contract, or in a separate instrument or protocol (such as the NGOCP) referred to in the contract.	Not found
Contract plus "threat of regulation"	System operator	Contract with system operator	As above, but with a clear, credible threat of regulation if no agreement within an agreed time frame	Former NZ electricity self-governance arrangement
Contract, arrangements or industry code with	System operator	Contract with system operator	Regulatory framework enables system operator to consult and develop arrangements that are binding on system users	None found

Instrument	Developed by	Enforced by	Description	Precedent
regulatory support	System operator, industry committee, regulator, fall back arbiter	Contract with system operator	Regulation compels a designated person or industry body to consult and develop arrangements that are then binding on system users. Needs to stipulate: • who leads development (e.g. NGC, Gas Industry Co, regulator) • fall-back decision maker if agreement is not reached within an agreed time frame. May involve regulator approval, or simply a 'fall back' role.	Some aspects of Victorian, WA and SA gas schemes
Regulation	System operator, Gas Industry Co, regulator, fall back arbiter	Regulatory instrument (rules, regulation, statute)	As above *(in that arrangements are developed through a defined consultative process),* but with resulting arrangements enforced through a regulatory instrument	Some aspects of WA scheme
Statutory rules, regulations, legislation	Government	Statute	Arrangements are determined by government (or a delegated person) and set in binding statutory instruments	Initial Victorian MSOR

11.5.2 Factors affecting choice of 'mandatory' model

A market contract approach may be possible where all of the following apply:

- System safety is not compromised and government is satisfied that related gas safety issues will be managed effectively by the industry.
- Parties have reasonably equal bargaining powers.
- A fair, efficient solution is considered achievable within a reasonable time frame.
- There is no need to override existing contracts.
- There is no sovereign risk issue (that is, no change in government entity obligations, or change in the regulatory framework that alters existing rights and obligations without adequate compensation).
- Parties other than the contract parties are not affected by the contract terms.
- The parties have appropriate enforcement incentives (that is; incentives that align with the broader public interest in a efficient system.

Conversely, more "heavy-handed" regulation might be justified where one or more of the following apply:

- Parties have *unequal* bargaining powers (with the consequent need for some neutral decision-maker)
- A fair, efficient solution is *not considered achievable* within a reasonable time frame
- Existing contracts will be affected
- There is a perceived sovereign risk issue to be addressed
- Parties other than the contract parties may be affected by the contract terms
- The parties' enforcement incentives are not aligned with the broader public interest in an efficient system.
- The government desires independent regulatory oversight of related gas safety issues

11.6 Way forward

The model selected will depend on the pricing solution that is adopted, and possibly broader regulatory trends and preferences.

The more complex or controversial the solution is, the lower the likelihood of achieving negotiated, industry-led implementation.

Our recommendation - that in the medium term pricing arrangements should be determined through a wholesale market - is relatively complex to develop and implement.

Nevertheless, there are examples (e.g. South Australia) where binding aspects of the wholesale market arrangements (e.g. pricing for swing balancing for the retail market) have been developed through a cooperative industry process.

If there is broad industry agreement in principle to a short term option for the ex-post fair pricing option, then the detailed implementation should be relatively straight forward and not controversial. Hence, it is more likely to lend itself to a contractual or code approach. Generally, there is a long lead time for developing and implementing statutory provisions, rules and/or regulations, given the associated regulatory impact analysis and processes. This timing consideration implies that a contractual approach may be more practical and efficient as an interim solution. However, anecdotal evidence suggests that consensus has been difficult to achieve in the New Zealand gas industry the past. If this is correct, then the preferred model would involve some form of regulation that:

- compels a designated person or industry body (such as the GIC) to consult and develop arrangements; and
- system users to sign up to and be bound by those arrangements as a condition of using the system.

12. Implementation arrangements for ex post determination option

The terms of reference called for comment on changes to current arrangements to give effect to the recommended solution. This section outlines the possible form and content of the legal framework to implement an ex post fair price determination.

As set out in section 5.4.4 above, this solution entails:

Ex post fair price determination

An "emergency gas price(s)" or "compensation amount(s)" would be determined "ex post" based on a defined set of principles.

The price/compensation amounts would be determined either by the system operator, an appointed expert or by an arbitrator.

The process for determining the compensation amounts may involve:

- An emergency gas price / compensation amount paid for each balancing period during the emergency event by shippers in negative imbalance to shippers in positive imbalance.
- Shippers in positive imbalance putting forward a claim for determination of the emergency gas price together with supporting evidence.
- The approach would be based on the insurance principle of indemnification.

12.1 Implementation model summary

This is an interim solution, the preferred long term solution being the establishment of an effective gas market. It is possible that emergencies will not arise and the solution will not be required ahead of market development. As such, it is important that implementation be kept as simple as possible to minimise costs, complexity and resources. This means providing a process outline, high level powers and principles for the decision maker, and enforceable obligations (i.e. to provide information, and make compensation payments in accordance with the final decision).

In summary, we recommend that changes be implemented through multilateral obligations (*Emergency Imbalance Arrangements*), that are mandatory for all entities that may have positive or negative imbalances.

If it is considered that agreement on arrangements cannot be reached in a timely manner, then regulatory support will be required, the simplest form of which is to make entering and compliance with *Emergency Imbalance Arrangements* developed by an industry body such as the GIC a condition of use of the transmission system.

The compensation scheme itself should be subject to triggers or financial caps: an upper cap to prevent unmanageable financial risks; and a lower threshold level of financial harm that must be incurred before a compensation determination is triggered. This lower threshold could be defined financially and/ or physically[25]. The threshold is to avoid process costs outweighing benefits. Parties would be required to mitigate their losses (by drawing on all existing contractual and insurance remedies available to them). To the extent practicable, the compensation scheme

[25] For example, defined non material events (such as outages of small gas fields) could be excluded.

would be funded by those in negative imbalance; not through an insurance pool established in advance.

12.2 Rationale

12.2.1 Application of option - qualification

This model deals only with failure of gas supplies at the injection point, and the resulting positive and negative imbalances of shippers.

If supplies were interrupted due to a failure in the transmission system, the resulting risk allocation would be determined in accordance with relevant transmission contracts (e.g. through a breach of technical obligations, or force majeure provisions). If however those transmission contracts resulted in perceived inefficient or inequitable risk allocation (for example, through the exercise of market power), then conceivably, there may be a case for exploring regulatory intervention in relation to transmission contract terms and conditions.

12.2.2 Enforcement characteristics

The model requires a binding multilateral obligation between all shippers and the transmission companies. It must compel their co-operation in the ex post determination process, and compliance with decisions made. It also requires a direct relationship that allows individual parties to enforce payment obligations against others. The arrangement would need to be binding on all entities which can have positive or negative imbalances.

12.2.3 Which instrument?

The instrument that supports these arrangements must create unambiguous binding obligations on all potential *payers* and *payees*, and on each entity that may be required to supply information in support of the determination.

Such an arrangement differs from a 'reasonable endeavours' protocol such as the current NGOCP.

As set out in section 11. above, the starting point should be to seek industry agreement, and reflect that agreement in a binding multilateral contract, code or other arrangement. For this option, regulatory support (ranging from the threat of regulation, to statutes, as set out in Box 13 may be justified where one or more of the following apply:

- Parties have unequal bargaining powers (with the consequent need for some neutral decision-maker).
- A fair, efficient solution is **not** considered achievable within a reasonable time frame.
- Existing contracts will be affected, notably the interaction between confidentiality provisions and the new requirement to disclose information to the decision maker.
- Parties other than the contract parties may be affected by the contract terms.

To the extent possible, regulatory support should be in the form of less prescriptive, enabling provisions. For example, some form of regulatory instrument could:

- compel a designated person or industry body (such as the GIC) to consult and develop *Emergency Imbalance Arrangements*; and
- require system users to sign up to and be bound by those arrangements as a condition of using the transmission system.

12.2.4 Triggers

Any party or signatory to *Emergency Imbalance Arrangements* that suffers direct financial loss as a result of emergency directions and which exceeds the minimum financial cap could notify the Gas Industry Co that it requests a compensation determination. The request should be made in writing, together with an outline of the losses suffered and steps taken to mitigate those losses, within 2 months of the restoration of normal gas flows following the emergency.

Once triggered, the Gas Industry Co should offer all parties a further 1 month in which to provide information on any direct financial loss suffered as a result of the relevant emergency directions.

12.2.5 Process

In a procedural sense, we suggest drawing on a widely accepted precedent, such as a dispute resolution model that is currently viewed as working effectively in the New Zealand gas or electricity industries.

The model should address matters including the form and content of an application, time periods for responses, and allocation of costs.

As noted above, for an interim solution, the challenge is to achieve a balance between a pragmatic, timely, simple and effective solution; and the level of detail to give confidence in the workability of the solution.

12.2.6 Decision maker

Clearly, the appointed decision maker must be independent, competent and adequately resourced. There are various options available, including:

- agreeing the decision maker at the outset, and stipulating that person in the Emergency Imbalance Agreement
- providing in the Emergency Imbalance Agreement for the parties to agree who the decision maker is, or if agreement cannot be reached, allowing the Gas Industry Co to nominate the decision maker
- providing in the Emergency Imbalance Agreement for a person (such as the head of a lawyers' or arbitrators' industry body, or a Minister) to nominate the decision maker.

As a starting point, we suggest the second option above, with strict time limits for industry agreement to be reached, and for appointment by the Gas Industry Co under the fallback option.

12.2.7 Provision of information, confidentiality

Parties or signatories to *Emergency Imbalance Arrangements* must be bound to supply in a timely manner such detailed information as the decision maker may require in order to assess a compensation claim.

The process should allow for appropriate handling of confidential information. Some assessment is required as to whether current confidentiality restrictions in existing contracts (including insurance contracts, and contracts with end use customers) would impede this disclosure obligation. If so, regulatory support may be required to compel disclosure of information and provide protections for confidential information.

12.2.8 Duty to mitigate losses

It is important that the compensation scheme does not become a substitute for reasonable and prudent commercial arrangements. As such, parties should be required to mitigate their losses, and any compensation otherwise payable should be reduced to the extent that the decision maker (at its discretion) considers that the affected party has not taken reasonable steps in mitigation.

12.2.9 Financial caps

Minimum financial loss

We suggest that there is a minimum dollar threshold level of financial harm that must be indicated before a compensation claim is triggered. That level should be sufficiently high to deter frivolous claims, or claims where the transaction costs would clearly outweigh the potential benefits of the scheme.

As an additional safeguard, there should be a discretion with the decision maker *not* to proceed if he or she reasonably believes that the transaction costs would outweigh the benefits.

Cap on compensation

It will also be important to ensure that the maximum possible payment will not undermine industry stability and continuing viability. Detailed actuarial and insurance advice should be used to determine an appropriate cap.

12.2.10 Possible provision for cost smearing

As noted above, this scheme would not be funded through an insurance pool, but rather by parties with negative imbalances.

Notwithstanding the financial caps, there may be a case for allowing broader smearing of costs across the industry to the extent that it is not possible to attribute cause. We suggest further financial modelling and analysis of experience and incidents to date would guide a decision on whether the scheme should provide for some costs smearing.

12.3 Summary

Changes should be implemented through multilateral obligations (*Emergency Imbalance Arrangements*), that are mandatory for all entities that may have positive or negative imbalances. If it is considered that

agreement cannot be reached in a timely manner, then regulatory support for the arrangements will be required. That support should be as flexible as possible, using enabling rather than prescriptive regulation.

The compensation scheme itself should be subject to financial caps: an upper cap to prevent unmanageable financial risks; and a lower threshold level of financial harm that must be incurred before a compensation determination is triggered.

To the extent practicable, the compensation scheme would be funded by those in negative imbalance through the duration of the emergency event; not through an insurance pool established in advance.

This model deals only with failure of gas supplies at the injection point, and the resulting positive and negative imbalances of shippers. If supplies were interrupted due to a failure in the transmission system, the resulting risk allocation would be determined in accordance with relevant transmission contracts (e.g. through a breach of technical obligations, or force majeure provisions).

The model requires a binding multilateral obligation between all shippers and the transmission companies. It must compel their co-operation in the ex post determination process, and compliance with decisions made. It also requires a direct relationship that allows individual parties to enforce payment obligations against others. The arrangement would need to be binding on all entities which can have positive or negative imbalances.

Any party or signatory to Emergency Imbalance Arrangements that suffers direct financial loss as a result of emergency directions and which exceeds the minimum financial cap could notify the Gas Industry Co that it requests a compensation determination. The request should be made in writing, together with an outline of the losses suffered and steps taken to mitigate those losses, within 2 months of the restoration of normal gas flows following the emergency.

One triggered, the Gas Industry Co should offer all parties a further 1 month in which to provide information on any direct financial loss suffered as a result of the relevant emergency directions.

The process should draw on widely accepted precedent, such as a dispute resolution model that is currently viewed as working effectively in the New Zealand gas or electricity industries.

The model should address matters including the form and content of an application, time periods for responses, and allocation of costs.

The appointed decision maker must independent, competent, and adequately resourced. There are various options available for choice of decision-maker As a starting point as suggest an approach whereby parties to the in the Emergency Imbalance Agreement agree who the decision maker is, or if agreement cannot be reached, allowing the Gas Industry Co to nominate the decision maker.

Parties to the Emergency Imbalance Agreement must be bound to supply in a timely manner such detailed information as the decision maker may require in order to assess a compensation claim.

The process should allow for appropriate handling of confidential information.

Parties should have a duty to mitigate their losses, and any compensation otherwise payable should be reduced to the extent that the decision maker (at its discretion) considers that the affected party has not taken reasonable steps in mitigation

Notwithstanding the financial caps, there may be a case for allowing broader smearing of costs across the industry to the extent that it is not possible to attribute cause. We suggest further financial modelling and analysis of experience and incidents to date would guide a decision on whether the scheme should provide for some costs smearing.

Farrier Swier
Consulting

Level 24
500 Collins Street
Melbourne
Victoria Australia 3000

Tel 613 9612 1900
Fax 613 9612 1999
www.farrierswier.com.au

Emergency Management and Gas Outages: Economic Issues

Report Prepared for the Gas Industry Company Limited

Report Annexes

Draft for Discussion

16 February 2006

Farrier Swier Consulting

in association with Johnson Winter & Slattery

J W S

Table of contents

1. Annex 1: Terms of Reference

The overall objective of this work is to develop soundly- based policy for pricing under outage and contingency situations. The request for proposals anticipated that the report would cover the following areas:

a) Review of comparable arrangements overseas, including:

- Voluntary vs mandatory arrangements
- Types of compensation regimes
- Form and basis of compensation
- Information and notification systems

b) Legal issues

- Distinguish contingencies that may give rise to compensation claims from those that would be covered by existing contracts
- Implications of existing contracts for design of compensation scheme

c) How to quantify the extent of harm:

- GPS uses the term “fair” – how to define this in practice?
- Consider options for measuring dis-benefit to large users being interrupted compared with those who continue to be supplied

d) Options for deriving compensation values, including:

- Replacement gas at a later time
- Posted prices
- Market prices at time of interruption (presupposes existence of spot gas market)
- Imputed prices from opportunities foregone in other markets (e.g. electricity)

e) Evaluate options for funding compensation, e.g.:

- Causer pays
- Pool insurance scheme

f) Evaluate implications for Wholesale Markets design:

- Identify any features of a wholesale market that may be required for particular compensation schemes

g) Identify changes required to existing NGOCP to incorporate compensation regime including:

- Advantages and disadvantages of mandatory and voluntary schemes
- Issues with respect to subsequent changes to NGOCP (e.g. regulated scheme requires design of change management process)

h) Recommendations

The Consultant should advise on the feasibility and desirability of a stand-alone compensation scheme as part of the NGOCP, given the overall objective, and whether it would be better to rely on a wholesale market.

2. Annex 2: NGC's Transmission Services Agreement Balancing Gas arrangement

This Annex summarises NGC's Transmission Services Agreement

2.1 Balancing arrangements

2.1.1 Physical Balancing

Each Shipper is responsible for matching its aggregate Receipt and Delivery Quantities on a pipeline in the course of each Day. NGC manages instantaneous imbalances using the diversity amongst the various offtakers from any pipeline together with careful management of Line pack to manage deviations between nominated and actual quantities. For each Pipeline the NGC System operator establishes an Upper Line Pack Limit and a Lower Line Pack Limit based on engineering and safety considerations. The Upper Line Pack Limit does not change much over time. NGC will determine the pressure profile in a pipeline for each day. The required pressure profile will be used to determine the Lower Line pack Limit for a day. As loads may vary significantly from day to day, NGC will review the Lower Line Pack limit form time to time.

2.1.2 Mismatches

For a Shipper, Mismatch is defined as the Shippers aggregate receipts on a pipeline minus its aggregate deliveries on that pipeline over a day. Mismatches may be positive or negative. NGC does not have real time knowledge of mismatches. Mismatches are not known until the Allocation Agent has completed the end of month reconciliation process. NGC does know the aggregate of all Shippers Mismatches since this is reflected in changes in linepack.

2.1.3 Balancing Gas - Current Situation

Balancing Gas includes any gas NGC users to manage the line pack in a pipeline or in the case of a Welded Point, the Operational Imbalance between the pipeline and the Maui pipeline. In order to ensure linepack does not go outside acceptable operational limits, NGC will seek to obtain (or sell) Balancing Gas to address aggregate Mismatch that is negative (or positive).

NGC may also need to deliver or pay for Balancing Gas or take (or sell) Balancing Gas to settle Operational Imbalances with the Maui pipeline.

NGC obtains Balancing Gas from either the

- Operational Imbalance available at a Welded Point
- Gas purchase or sold under a short term tender
- Gas purchase of sold under a long term (ie back up contract)
- Linepack within a pipeline

2.1.4 Process for Buying or Selling Balancing Gas

NGC states that it aims to minimise the cost of balancing each Pipeline. A process for buying and selling Balancing Gas is set out in the standard transmission services agreement. NGC uses

a tender process that seeks to minimise the cost of Balancing Gas. NGC endeavours to have a back up Balancing Gas contract available at all times.

2.1.5 Balancing and Peaking Pool

NGCs position is that Shippers using a Pipeline are ultimately responsible for balancing that Pipeline. NGC passes on balancing costs (or credits) to the relevant shippers via the Balancing and Peaking Pool for the pipeline

NGC apportions balancing costs as follows

- Costs that are related to events that occur "on the day" are allocated to the Shippers who are in Negative Mismatch on that day in the proportion to the total of all Shippers Negative Mismatches on the Pipeline on that Day.
- Costs that are driven by an accumulation of Mismatches over time (Running Mismatch) are allocated to Shipper Running Mismatch in proportion to the total of all Shipper Running Mismatches on that pipeline that day

NGC also recovers administration costs on a pro rata basis based on Shippers throughput.

2.1.6 Information

NGC aims to provide Shippers with information to facilitate Shippers management of their mismatch positions. This information is provided by OATIS

2.2 Analysis

Shippers face market related costs or credits for mismatches and are encouraged to manage minimise exposure to the balancing and peaking pool costs be either bilaterally managing withdrawals and injections so they remain in balance; and potentially through trading of unders and overs with other parties.

Our understanding is that deficiencies in an emergency situation where there is a significant lost of supply:

- While NGC can call on contracted balancing gas there is no equivalent basis on which NGC can call on commercially contracted curtailment
- There is no certainty that parties will comply with the voluntary nature of the NGOCP
- Suppliers to the mass market face no incentive to arrange back up supplies. If gas fired generators are curtailed then mass market can consumer valuable gas during an emergency and only need to repay it later on a like for like basis.

It should also be noted that while NGC can call on balancing gas to increase injections in an emergency, in practice there are limited supplies of balancing gas available.[1]

[1] Advice form Murray Jackson, Shell New Zealand

3. Annex 3 – Demand Bidding Model

The possibility of a demand response bidding model was identified as a possible option but, as discussed in the report, is not recommended for further consideration. This Annex sets out an outline of how such a model might be operate.

3.1 Assumptions

This proposal is based on the following assumptions:

- That the existing balancing arrangements remain in place until such time as some more developed wholesale market arrangement is implemented
- That an emergency management compensation scheme should be established in the NGOCP that as far as possible neatly dovetails with the existing balancing arrangements in the NGC Transmission Service Agreement and Maui Pipeline Operating Code. That is the emergency management compensation scheme is "bolted on" as a new feature to the existing arrangements, and major changes are minimised
- That the emergency management compensation scheme would be superseded by the more developed wholesale market arrangement
- That the compensation scheme should be market oriented and as far as possible encourage voluntary commercial responses that solves the emergency problem with as little loss to efficiency as possible. In particular
    - Shippers and Major plant would be provided with information and commercial incentives so that in cooperation with the system operator they take voluntary actions to reduce demand in a way that minimises economic loss to the energy market and wider economy.
    - Suppliers to the mass market would face incentives that would encourage arranging back up supplies to mitigate risk.
- The need for directions by NGC to manage an emergency situation should be minimised, but where direction are given that compensation be on commercial market oriented basis;
- That consistent with the current arrangements and gas markets internationally, the emergency management compensation scheme does need any information from Gas Supply Agreements or other markets such as the electricity markets – but rather participants make there own assessments of relevant commercial factors.

3.2 Overview of Demand Bidding model

The emergency management compensation scheme (EMCS) would be based around a market determined "demand decrement schedule" that would complement the existing balancing gas arrangement. The main elements are as follows:

3.2.1 Establishment

1 An EMCS agent would be appointed. This could be NGC Transmission, or perhaps another external party. EMCS rules would be established.

2 The ECMS rules would enable the ECMS agent to invite[2] shippers to offer fixed decrements of demand reduction from normal scheduled quantities at a particular price. Each shipper would be able offer a number bands of demand reduction at nominated Welded Points at a various different prices. Shippers for all major loads and the higher end load shedding categories in Appendix A of the Gas Contingency plan would be invited to participate

3 The ECMS agent would then process the offers and publish a *Emergency Demand Decrement Schedule*. This would show the demand decrements in price order from lowest to highest. In other words, this would be a demand curve. The schedule would set out which shipper is associated with each offer and the Welded point to which the offers apply. The schedule enables the calculation of an *emergency gas price* according to the process outlined below.

4 Demand decrement offer prices for major plant would be market based. This enables the Major Plant to determine the most appropriate prices based on their gas supply contracts, an assessment of the risk of non supply; and commercial factors such as their electricity market contract position

5 An issue of detail is how best to set demand decrement offer prices associated with load shedding categories A to E in Appendix A. One option may be an administered or agreed "fair prices" based on studies of unserved energy for each category of customer. Details of this would need to be worked out.

6 A further issue of detail is how best to set demand decrement prices associated with load shedding categories F and G in Appendix A, or whether at this stage any market pricing should be suspended. Details of this would need to be worked out.

7 The published schedule would be subject to review and checking by the National Gas Outage Planning Group and other relevant parties. For example checks would be done to ensure that bands of electricity generation output that would be required for frequency control were very high up the schedule.

8 There may be a need for some rebids and adjustments to allow the schedule to be refined so that it "makes sense" from all perspectives.

[2] Alternatively participation could be made mandatory.

9 Decisions would need to be made about how often the *Emergency Demand Decrement schedule* need to be amended to allow for changes in the market. It would be expected that once *Emergency Demand Decrement Schedule* has been settled that in normal situations the schedule would not need to be amended very often. Thus in order to minimise administrative costs, the rules could enable each shipper to change their decrement offers at defined intervals, (say one a month) and if changes are lodged, the ECMS agent would reprocess the information and republish the schedule. Arrangements could be made to enable more frequent revision of the schedule if there were unusual situations eg looming dry year in the electricity market, or problems emerging in gas supply / demand balance.

3.2.2 Phase 1 of an Emergency – Initiation

10 As now, this phase would start when a change in gas flow into or through he transmission system occurs that could cause a significant reduction in line pack or deliverability. As now, NGC Transmission would advise Major WP Controllers that a phase 1 National Contingency has occurred. As now, NGC to the extent possible provides Balancing Gas to restore the line pack.

11 The new element is that NGC would to the extent possible publish what ever information is known about the nature of the emergency and the size or likelihood of the projected shortfall. If there is uncertainty about this there could be range published, or scenarios published.

12 Optionally, the ECMS agent could then take this information and publish a forecast or a range of forecasts of the *emergency gas price* based on scenarios published by NGC Transmission; a scheduled list of decrements, and the shipper and the Welded point associated with each decrement. (Note this is not strictly necessary as the emergency decrement schedule would already have been published, so in principle NGC Transmission each shipper could make their own estimate of the price and the schedule based on the information provided by NGC Transmission.)

13 This information would provide a clearer basis on which WP Controllers / Shippers can prepare Major Plant to reduce load; and provide greater certainty to Major Plant as to whether or not they may be asked to reduce; and when that request might take place.

3.2.3 Phase 2 – Linepack preservation

14 As now, this phase would involve

i. implementing initial load shedding by Major Plant to preserve linepack;

ii. alert wholesalers, Major WP Controllers, Gas Retailers, Network Operators and GMS Owners to prepare for load shedding of Reticulated Sector Consumers and Direct Supply Customers and

iii. establish the CCT.

15 As now, Phase 2 commences when a significant reduction in gas flow into or through the transmission system occurs and line pack in any part for the Maui Transmission System drops, or is expected to drop below the Emergency Linepack Limit.

16 As now, NGC Transmission will act to maintain appropriate levels of linepack by advising Wholesalers as necessary that a National Contingency has occurred.

17 Currently NGC Transmission requests Major WP Controllers to reduce load to preserve line pack. Under the new arrangement, NGC Transmission would direct Major WP Controllers to reduce load using the cheapest demand decrements and progressing up the demand decrement schedule as far as is necessary (but not as far as the Appendix A Load shedding categories) to ensure the system is balanced. Note that the directions would be consistent with the offer prices already submitted.

3.2.4 Phase 3 – Stabilisation

18 As now, the objective of this phase is to stabilise all parts of the transmission system by ensuing inputs and outputs are balances and preserve linepack for safety purposes. As now, Phase 3 commences when loss of gas supply into the Transmission System results in or is expected to result in a Maui Transmission system pressure of < 32 bar. As now NGC Transmission endeavours to expedite and transport delivery of alternative gas supplies according to arrangements made in advance with suppliers and requests by owners of gas

19 Currently Major WP Controllers are responsible for requesting operators of Major Plant to response as reasonable and prudent operators and take “appropriate action” to assist in stabilisation of the transmission systems. Under the new arrangement NGC Transmission would continue to direct Major WP Controllers to reduce load using the cheapest available demand decrements and progressing up the demand decrement schedule as far as is necessary to ensure the system is balanced.

20 Once all the offers from Major Plant had been exhausted (other then perhaps electricity generators providing frequency control). Load Shedding commences for the Reticulated Sector. All gas consumers, other than those defined as Major Plant, are provided with a load shedding Categories defined in Schedule A This includes all Consumers in the Reticulated Sector and Direct Supply Consumers. The intent of the categories is to group consumers so that when it is necessary to reduce gas demand the load can be progressively reduced by category until a balance is obtained between demand and deliverability. As now, it is unlikely that Consumers in categories F and G would be shut down other than in the event of total loss of deliverability.

21 In relation to the Reticulated Sector the only difference to the current arrangements is that there would be a pre established price associated with each load shedding category.

3.2.5 Subsequent Phases

22 Phase 4, (post stabilisation) commences when NGC Transmission confirms that all parts of the transmission system have been stabilised and gas demands have been reduced to agreed levels.

23 Phase 5 (Recovery) aims to accommodate the orderly restoration of off take of gas by all customers. The phase terminates when all gas supplies come back to normal and NGC Transmission and Network operates have removed any limitations to stabilise systems and networks

24 Under the new arrangements, during Phases 4 and 5 NGC continues to direct load to be shed using the cheapest available decrements from the *Emergency Demand decrement schedule* needed to ensure the system is balanced

3.2.6 Settlement

- Emergency Gas Price

25 An *emergency gas price* would be determined by the ECMS Agent for every balancing period based on the marginal demand decrement used by NGC to balance the system during each Phase (Phases 2 to the end of Phase 5).

26 Since NGC might call on several different decrements within a balancing period a procedure will be needed to determine the average price (for example time weighted average price).

- NGC Balancing and Peaking Pool arrangement.

27 NGC would pass on the costs or credits arising from demand reductions in the same general way as for the current Balancing and Peaking Pool except that the *emergency gas price* would be used calculate costs and credits for the balancing and Peaking Pool

28 A new *Emergency Balancing and Peaking Pool* section could be included in the Transmission Services Agreement.

29 Shippers that are in Positive Mismatch would receive the *emergency gas price* for each unit of Mismatch for each Balancing period.

30 The total cost of making payments to shippers in positive mismatch would be recovered from Shippers that are in Negative mismatch in the same way as provided for by the Balancing and Peaking Pool. In other word on each day, parties in negative balance would pay in the proportion to total of all Shippers Negative Mismatches on the day.

31 There is a need to consider settlement interface with Maui Operating Code.

4. Annex 4: International Experience

4.1 Introduction

The Terms of Reference requires a review of comparable arrangements overseas, including:

- Voluntary vs mandatory arrangements
- Types of compensation regimes
- Form and basis of compensation
- Information and notification systems

This Annex sets out details of the review of international experience[3] in Australia (South Australia, Western Australia, Victoria) and the United Kingdom. This Annex is structured as follows

- Overview of gas markets
- Wholesale and retail / market institutional arrangements
- Pricing and settlement arrangements under normal conditions
- Price Caps
- Gas emergency legislation
- Role of market arrangements vs central or government direction in managing emergencies
- Emergency management arrangements
- Pricing arrangements when there is notice of an impending emergency
- Triggers for declaring an emergency
- Pricing arrangements once an emergency is declared
- Curtailment arrangements once an emergency is declared
- Information and Notification systems

4.2 Overview

4.2.1 Australia

Similar to New Zealand, each state in Australia (except for Tasmania) was originally developed based on confidential long term take or pay contracts, a single major processing plant, a single pipeline system connecting the processing plant with the major load centre(s) and a small number of gas fields owned by a single entity (producer joint venture).

[3] As set out in our proposal to the GIC we have not reviewed US or Canadian arrangements. The US and Canadian markets are large, diverse and sophisticated markets that are not comparable to New Zealand. We have also not reviewed Singapore's gas markets. Singapore's gas market has not yet been implemented and the main risk management mechanism is government mandated dual fuel and hot switching for gas fired generators.

As in New Zealand, deregulation, third party access, and the wind down in production from some of the original gas fields (eg the Cooper Basin in South Australia and South east Queensland) has resulted in a transition starting in the mid 1990's to a more complex nationally focused industry characterised by multiple producers and consumers and greater diversity in gas fields and gas processing plants.

The majority of the South Australia and New South Wales demand for natural gas continues to met by gas from the Cooper Basin and South West Queensland. Gas is processed at Moomba and transported through long the distance Moomba to Adelaide pipeline system (MAPS) and Moomba to Sydney pipelines respectively. The majority of demand in Victoria is met by gas fields in Bass Strait which is relatively close to the main load centre of Melbourne.

In recent years new gas supplies have been arranged: from Victoria to South Australia via a new South East Australia (SEA) gas pipeline; to NSW via a new Eastern Gas pipeline; and to Tasmania via a new undersea pipeline. Several new gas fields have started production in Victoria. Coal Seam Methane has emerged as a significant new source of gas in NSW and Queensland.

There is considerable variation between the Australian jurisdictions in terms of gas usage, transmission network topology, market reform, and industry structure.

A difference to New Zealand is that the previously separate state gas pipeline systems in South Eastern Australia have in recent years become interconnected so that the two original major gas fields (Cooper Basin and Bass Strait) and major gas processing facilities (Moomba and Longford) systems can, to an extent, provide back up to each other, as well as the various newly emerging gas fields and processing plants.

Pipeline interconnection has lead to a significant focus on gas emergency management and the scope for improvements in national gas markets arrangements. Jurisdictions have recognised that previous state based emergency management arrangements now need to be national in focus.

Another difference between Australia and New Zealand is that in Australia there are significant known domestic gas reserves available (including in Papua New Guinea). The key strategic issues relate to such factors as development timing to match growth in demand and the relative economics of different gas field developments as against other competing fuels (in particular coal). LNG importation is not an economic option. In contrast, in New Zealand there is significant uncertainty as to the medium term gas reserves position, and LNG importation may be a viable option.

In relation to electricity generation, gas plays a smaller role then in New Zealand although the role of gas is expected to increase. This is due to abundant and competitive reserves of coal.

The various gas fired power stations are connected to different gas processing and transportation systems while being connected to an integrated national electricity grid. This provides a greater measure of diversity for the electricity market against major gas supply disruptions.

4.2.2 United Kingdom

The United Kingdom gas market is much larger then either the New Zealand or Australian gas markets with consumption in 2001 of 4031 PJ. Just below half (42 per cent) of the natural gas is consumed for residential and commercial purposes (mostly heating). Electricity generation accounts for a further 29 per cent of consumption, and industry 20 per cent. There are around 90 shippers currently operating in the United Kingdom.

The United Kingdom pipeline system is grid-like, characterised by multiple transport routes between source and destination points. Natural gas may be delivered from offshore field via seven beach terminals, and from Ireland and mainland Europe via interconnectors.

The regulation and monitoring of the gas market is the responsibility of Ofgem.

An important similarity between New Zealand and the United Kingdom are concerns over the adequacy of domestic gas reserves to meet domestic demand. The UK is increasingly dependent upon gas imports. "Existing and planned infrastructure will link the UK much more directly with European and global energy markets, which are themselves becoming more interrelated and complex. Security of supply will therefore significantly depend upon the commercial arrangements relating to the importation of energy and demand side response."[4] In New Zealand it is unclear whether there will be sufficient domestic gas reserves discovered to meet demand. The possibility of LNG importation has been under study.

Gas Transportation services are provided by a sole, independent owner/operator of the entire transmission network, which is subject to a complex regulatory and legislative regime. National Grid Transco (NGT) has two main responsibilities: first, as the primary transporter, for ensuring there is adequate and reliable network capacity to meet anticipated energy transportation requirements; second, as system operator of the transmission networks, for the residual balancing activity in both gas and electricity.

Of potential relevance to New Zealand is that NGT in recent years has played an increasing role to provide information to the participants in the gas and electricity markets in the UK by publishing an outlook for the winter ahead. (See *A Consultation on Winter 2005/06*, National Gas Transco, May 2005.) The purpose of this is to consult on a range of issues to help inform the industry about the likely impact of the commercial arrangements between market participants and implications for security of supply.

4.3 Wholesale and retail / market institutional arrangements

4.3.1 Overview

Wholesale markets deal with gas injections and withdrawals by large loads directly connected to the transmission pipelines and offtakes by distribution networks. Retail markets deal with smaller loads connected to local distribution networks.

[4] A Consultation on Winter 2005/06, National Gas Transco, May 2005

Wholesale and retail market institutional arrangements establish roles and responsibilities for the development and operation of market based arrangements for balancing the gas system during normal periods, the management of major outages and emergency management.

A number of arrangements are required to support fully competitive wholesale and retail gas markets the principal ones being provision of reconciliation, balancing and metering services; customer transfer arrangements; compliance and rule development / rule change processes. The details of these functions vary as between retail and wholesale markets.

In all jurisdictions, obligations on industry participants to establish the necessary wholesale and retail arrangements are mandatory, although the details of the way these obligations have been created varies. The arrangements can be set out in contracts, rules, codes or guidelines.

There are significant differences in some aspects the arrangements including

- whether wholesale and retail arrangements are in separate instruments (eg South Australia, NSW) or integrated in a single set of arrangements (Victoria);
- whether the governance of the wholesale and retail rule making functions are through cooperative industry arrangements (eg South Australia, NSW) or through a government owned system operator (Victoria); and
- Whether approval of rules and rule changes are subject to independent regulatory oversight (South Australia, Victoria, Western Australia, UK) or oversight by a government department (NSW);
- the level of regulatory involvement in approval of wholesale and retail arrangements.

In Australian states other than Victoria

- Loads directly connected to transmission pipelines are subject to wholesale market arrangements established through each transmission pipeline's Access Arrangements[5] approved by the Australian Competition and Consumer Commission (ACCC) pursuant to National Gas Pipeline Laws; and
- For loads connected to the gas distribution networks, obligations to develop and operate retail market arrangements are set out in state government legislation and are subject to oversight by the independent state regulator or government department. Industry owned and managed retail market management companies operate the retail market arrangements and administer the retail market rules.

In Victoria, all loads connected to he Principal Transmission System are subject to a single set of rules, the Market and System Operations Rules (MSO Rules) which govern the operation of the Principal Transmission System and the wholesale gas market. The independent system operator, VENCorp is a state owned body. The MSO rules are currently authorised by the ACCC pursuant to the Trade Practices Act.

[5] An Access Arrangement establishes the base terms and conditions for pipeline access.

In the United Kingdom, OFGEM is seeking to reform Gas Retail Market Governance through three separate initiatives (the Metering Strategy, Network Codes and Improving Customer Transfers). The initial objective is to develop an industry Supply Point Administration Agreement (SPAA) between gas suppliers, to incorporate voluntary agreements, which may then be mandated. Gas suppliers will be required to become signatories by the introduction of a licence condition. OFGEMs objective is to withdraw from prescriptive regulation of the metering and supply markets.

Jurisdiction	Wholesale and retail / market institutional arrangements
South Australia	Large loads directly connected to transmission pipelines are subject to balancing arrangements established through contracts that are based on each pipeline's approved access terms. Loads connected to the gas distribution networks are subject to retail market rules. The Retail Market Company (REMCo) is licensed through a Retail Market Administrator Licence granted by the state regulator (ESCOSA). ESCOSA oversees REMCO's cost-recovery and ensure pricing remains consistent with ESCOSA's principles.
Western Australia	The arrangements in Western Australia are similar to South Australia A Retailer must be a member of an approved Retail Management Scheme (RMS) if it wishes to sell gas to customers through a gas distribution system and there is at least one other company selling gas through that distribution system. (An RMS is defined a scheme that enables a retail market administrator to manage the gas market). An RMS must cover the process for customer transfers, as well as the balancing, allocation, and reconciliation of the gas market. The Minister for Energy has approved an RMS that covers all of the AlintaGas Networks distribution systems. The retail market administrator for this RMS is REMCO. The Minister for Energy has approved the Western Australian policy regarding compliance with the Retail Market Rules (the Rules). The state regulator, the Energy Regulatory Authority assumed responsibility for oversight of Retail Market Schemes on 31 May 2005.
REMCo (South Australia and Western Australia)	REMCo's objective is "To develop and operate cost efficient and effective retail market arrangements for the gas industry; which are fair and equitable; and to facilitate competition in the gas retail market within a Member Jurisdiction. REMCo is governed by a board comprising 4 Directors nominated by Gas Trading Licence Members; 2 Directors nominated by Network Operators and 2 Independent Directors. Administration services, IT services and FRC Hub services are provided by contracted external service providers.

Jurisdiction	Wholesale and retail / market institutional arrangements
	The four primary business process areas that REMCo administers are: ▪ Delivery Point Management – managing the transfer of responsibility for gas delivery points between retailers; ▪ Balancing, Allocation and Reconciliation Management – managing the daily allocation of gas usage to retailers to enable settlement of gas supply and transmission contracts; ▪ Rule Change Management – managing further development and improvement of the rules governing the operation of the retail gas markets; and ▪ Compliance Management – managing and enforcing compliance with the rules governing the operation of the retail gas market.
New South Wales	In December 2000, the New South Wales and retail gas industry established the Gas Market Company (GMC) to manage on their behalf, the development and operation of the rules and systems necessary to facilitate a competitive gas retail market. The Gas Retail Market Business Rules facilitate the fully contestable retail gas market in New South Wales and the Australian Capital Territory.[6] The members of GMC are holders of either a reticulator's or supplier's authorisation under the Gas Supply Act 1996 (NSW) or a licence to supply or distribute gas under the Utilities Act 2000 (ACT), and under the Constitution of Gas Market Company are bound to comply with the Business Rules. The primary aim of GMC is "to develop and operate cost efficient and effective retail market arrangements, which are fair and equitable, to facilitate competition in the gas retail market." Its vision is to serve the interests of energy industry participants, energy consumers, government, and other stakeholders by enabling a competitive market in a fair and cost effective manner. GMC performs the functions of Rules administrator, registry operator, data estimation entity, forecasting entity and participant imbalance manager under these Business Rules. Administration services, IT services and FRC Hub services are provided by contracted external service providers.
Victoria	VENCorp (the Victorian Energy Networks Corporation) is a statutory body established under the Victorian Gas Industry Act. It is the Independent System Operator of the Principal Transmission System in Victoria. It operates and administers the Victorian wholesale gas market, but does not own pipeline facilities. The Market and System Operations Rules (MSO Rules) govern the operation of

[6] NSW and ACT Gas Retail Market Business Rules Version 34 http://www.deus.nsw.gov.au/gas/index.htm

Jurisdiction	Wholesale and retail / market institutional arrangements
	the Principal Transmission System and the wholesale gas market. These rules are a legal document made under the Victorian Gas Industry Act. The MSO Rules form part of VENCorp's Access Arrangements, approved by the Australian Competition and Consumer Commission (ACCC) under the National Access Code. In addition, the MSO Rules are subject to authorisation by the ACCC under the Trade Practices Act. The purpose of the MSO Rules is to: ▪ provide an efficient, competitive and reliable wholesale market for natural gas; ▪ regulate the operation and administration of the wholesale market; ▪ regulate activities of parties using the principal gas transmission system and wholesale market; ▪ provide for open access to the principal gas transmission system; and ▪ provide for the management of system security and safety. The MSO Rules cover the following areas: ▪ Participation in the wholesale market – i.e. who is involved; ▪ Requirements for participation (e.g. prudential requirements); ▪ Nominations and bidding processes; ▪ Scheduling of gas; ▪ Setting the wholesale spot market price; ▪ Metering; ▪ Settlement of the wholesale market; ▪ Management of System Security; ▪ Dispute Resolution; and ▪ Rule change process.
United Kingdom	The Network Code assigns to National Gas Transmission (NGT) functions to operate gas emergency services, ensuring the network remains in physical balance and to coordinate the gas flows through the transmission network, providing transport services to shippers on a non-discriminatory basis. Currently OFGEM is pursuing reform of Gas Retail Market Governance through three separate initiatives (the Metering Strategy, Network Codes and Improving Customer Transfers). The key industry driver is support for supplier-to-supplier communications,

Jurisdiction	Wholesale and retail / market institutional arrangements
	required by a Review of Gas Metering Arrangements project (part of the Metering Strategy), which are not prescribed by current legislation. The initial objective is to develop an industry Supply Point Administration Agreement (SPAA) between gas suppliers, to incorporate voluntary agreements, which may then be mandated. Gas suppliers will be required to become signatories by the introduction of a licence condition. In future, the objective is to review governance within gas transporter (GT) network codes and migrate Supply Point Administration provisions into SPAA, allowing Ofgem to withdraw from prescriptive regulation of the metering and supply markets. At such time, GTs would be required to become signatories by the introduction of a licence condition.

4.4 Pricing and settlement arrangements under normal conditions

4.4.1 Overview

While the details and terminology varies, each market reviewed (other than NSW) has centrally organised market oriented arrangements for pricing of imbalances in the retail market where pricing for imbalances are based on market determined bids and offers.

Within this broad approach, there are two distinct forms of pricing mechanisms.

The most common is a dual imbalance pricing mechanism where different imbalance prices apply depending on whether the shipper is in negative or positive imbalance. This mechanism encourages shippers to manage their injections and withdrawals to minimise exposure to imbalance charges and if necessary to undertake trading through some other mechanisms (eg bilateral trading):

- The South Australia and Western Australia Retail Market Rules provide for a swing service through the submission of a bids to a "bid stack" administered by REMCo;
- Under normal circumstances, if a shipper is out of balance at the end of the day, any imbalance volume is cashed-out at prices determined by trades on the On-the-day Commodity Market (OCM).

In Victoria the gas spot price is a single clearing price. VENCorp uses the information provided in the nominations and "inc" / "dec" offers to produce schedules for the daily operation of the gas system and a single market clearing. Participants can structure their inc and dec offers consistent with their particular risk management and trading objectives.

4.4.2 Detailed arrangements

Jurisdiction	Balancing / market arrangements under normal conditions
South Australia and Western Australia	**Swing Service** A swing service is a service supplied by a Swing Service Provider (SSP) to reconcile wholesale gas between a Supplier and a User (retailer). REMCo, as the market administrator, calculates the amount of swing service required for each pipeline. A SSP is an entity with a transmission contract in a pipeline who has offered to provide a swing service through the submission of a bid (or bids) to the "bid stack" administered by REMCo. If there are insufficient bids in the bid stack to cover demand, the swing service will be provided by the "swing service provider of last resort" (SSPOLR). Users participating in the RMR appoint REMCo as their agent for entering into agreements with SSPs and SSPOLRs. REMCO states that the need for a swing service arises where there are two or more pipelines which connect to a gas sub-network, as occurs in both South Australia and Western Australia. The gas supplied by each pipeline is mixed in the sub-network and supplied to retail customers. In order to protect the operational integrity of the pipelines and the sub-networks, it is necessary to maintain pressure in each pipeline while seeking to match physical supply and demand with the underlying contractual arrangements. The South Australian system operates through one pipeline operating on pressure control, and the other(s) on Flat Rate Flow Control. Users on any particular day will be allocated a swing service for days on which pipeline injections differ from the users' deemed withdrawals from a particular pipeline. Under Part 5.12 of the Retail Market Rules (RMR), REMCo creates a "bid stack" for each "gas day" by administering the bids received from SSPs for "park swing services" or "loan swing services" at each gate point. SSPOLRs are deemed to have lodged a "standing bid" into the bid stack. Provision of the amount of swing service required is allocated to providers on the basis of their bids to REMCo, with the cheapest providers being used first. REMCo generates a "swing service contract note" for allocations of swing service between SPPs and users. Alternately, users may procure swing services "off-market" in accordance with Part 5.11. Information regarding the service procured is supplied to REMCo by SSPs. When allocating the provision of swing services, REMCo determines whether a

Jurisdiction	Balancing / market arrangements under normal conditions
	user is responsible for the swing because of inaccurate forecasting ("user specific" swing service). REMCo then allocates the remainder of the swing service to all users in the sub-network ("socialised" swing service). The price of the swing service is resolved through the bid stack. REMCo calculates the "marginal clearing price" for the total swing service, the marginal clearing price for the "socialised" swing service and the marginal clearing price for the "user specific" swing service, (pursuant to rules 288-295). Payment is made for the swing service, not the gas which is temporarily loaned or parked in the pipelines. It is expected that the price payable by users for the swing service will be considerably less than the cost of the physical gas. Payment for physical gas remains the subject of separate contractual arrangements between users, producers and shippers and is not regulated by the RMR. The Swing service is caused by the aggregate of the errors between what Users forecast and the actual take of their consumers. REMCo forecasts Basic Meters, and Users forecast the Interval meter load. REMCo also provides intra-day reporting to assist Users in making renomination decisions
NSW	The Moomba to Sydney pipeline has substantial linepack which provides significant flexibility to the market. Shippers are required to stay in balance within tolerances, and subject to imbalance penalties. AGL Networks offers a Gas Swap service to enable. Users of Trunk non tariff Reference Services to have gas delivered at an Alternate Receipt Point on a Day, or transfer gas from one User to another User on a Day, after that gas has been delivered to the Network.
Victoria	**Characteristics of the Victorian gas market** Two main reasons are commonly cited to justify Victoria's unique wholesale market arrangements. The first is the nature of the transmission infrastructure. With five injection points, the transmission system in Victoria is often described as a grid. Other jurisdictions, particularly prior to the completion of the EGP and the SEAGas Pipeline, mostly have point-to-point pipelines that flow gas in a single direction from solitary production facilities to consumption centres. Victoria's system has bi-directional gas flows. In addition Victoria's system has very limited linepack due to the relatively short distance between the processing plant at Longford and the main load center at Melbourne. Victoria's demand is also highly sensitive to weather since residential heating accounts for a significant portion of Victoria's gas consumption. This results in daily gas consumption being difficult to forecast. As a result, Victoria's PTS must be managed relatively closely to maintain

Jurisdiction	Balancing / market arrangements under normal conditions
	system security, with gas injections and withdrawals often rescheduled. **Market and System Operations Rules** The Market and System Operations Rules (MSO Rules) govern the operation of the Principal Transmission System and the wholesale gas market. These rules are a legal document made under the Victorian Gas Industry Act. **Wholesale spot market** A principal objective of the wholesale spot market is to balance supply and demand for gas through a competitive bidding process, with the lowest price bidders having first right of access. The spot market provides a mechanism that enables participants to trade their imbalances automatically, based on their offers. The spot market is settled as a net market, which means that market participants pay for the excess of actual withdrawals over actual injections, or receive payment for the excess of actual injections over actual withdrawals. The price paid or received is determined by the spot market. **Participant in the Wholesale market** The participants are as follows: ▪ Producers undertake the extraction and/or storage and processing of natural gas for injection into the pipeline system. ▪ Retailers sell gas to end-use customers, to and from other market participants or producers and can transport gas through the transmission system. Retailers need to be licensed by the Essential Services Commission ▪ Traders buy and sell gas to other market participants or producers and can also transport gas through the transmission system. Traders may not sell gas directly to end-use customers in Victoria without obtaining a retail license. ▪ Market Customers are customers who choose to participate directly in the wholesale market to purchase and deliver gas for their own use. ▪ Transmission Pipeline Owners own and maintain the gas transmission system facilities used to transport the gas between injection (e.g. production or storage facilities) and withdrawal points (e.g. another transmission pipe or storage facility) as well as to customers or the distribution networks. ▪ Interconnected Pipeline Owners operate other transmission

Jurisdiction	Balancing / market arrangements under normal conditions
	pipelines that connect to the Principal Transmission System. ▪ Storage Providers have facilities that store natural gas. ▪ Transmission Customers are directly supplied with gas from the transmission system, rather than the distribution system. ▪ Distributors own and operate the pipeline infrastructure (the distribution system) that transports the gas from the transmission pipeline to end-use customers. Distributors need to be licensed by the Office of the Regulator General (ORG). **- Current spot price determination** The spot market price is currently a daily price that applies to all of the Principal Transmission System. It is determined after the end of a gas day, a 24 hour period from 9.00 am to 9.00 am. The spot market price is calculated by assuming that there are no physical limitations on the pipeline (constraints) and is determined after the gas day based on actual demand. Participant's offers or nominations are simply stacked in order of price and cleared against the total demand. The spot price is determined as the marginal price necessary to clear demand and supply. **- Ancillary Payments** The spot market price is determined assuming there are no constraints on the pipeline and based on actual gas demand for the gas day as determined after the event. However, during the gas day, VENCorp will re-schedule offers from market participants to inject gas as required to meet the variation in demand for gas. There are times when, to meet local or short-term within day requirements for gas, VENCorp will need to schedule additional injections of gas that have been offered at a price which is higher than the resulting spot market price. In these cases, the market participants who have injected the higher priced gas, in accordance with the instructions of VENCorp, are entitled to be compensated for doing so, so that they are not put at a disadvantage in comparison to the spot market price. Such compensation is provided through "Ancillary Payments". Uplift charges are the mechanism used to recover ancillary payments made to market participants. As far as practicable, uplift charges are allocated to those participants whose actions gave rise to the ancillary payments. This allocation is determined by reference to exceedance by a market participant's customers of their Authorised Maximum Daily Quantity (AMDQ) where relevant. Where

Jurisdiction	Balancing / market arrangements under normal conditions
	ancillary payments are not readily attributable to actions by individual participants then uplift charges are spread across all market participants based on their gas withdrawals on that day. **- Market Operations** Market participants inform VENCorp what quantities they wish to inject and/or withdraw during the gas day. There are two ways used to provide this information: ▪ nomination or ▪ increment/decrement offers, more commonly known as Inc/Dec Offers. A nomination reflects a quantity of gas a market participant intends to inject into, or withdraw from, the Principal Transmission System during that day irrespective of the spot market price. Accordingly, nominations are scheduled by VENCorp before inc/dec offers and independent of market price. Alternatively, a market participant may also submit price-related offers to increase or decrease their injection or withdrawal quantities in response to price signals. These offers are used to increase or decrease the quantity injected or withdrawn at specified connection points. Each Inc/Dec offer may specify several prices and corresponding quantities of injections or withdrawals that the market participant is prepared to implement if the market price reaches the specified value. VENCorp uses the information provided in the nominations and inc/dec offers to produce schedules for the daily operation of the gas system. These schedules also include forecast demand for each day as well as the forecast gas price for each day. **Gas Market Reforms** Significant reforms to the pricing, congestion management and transmission investment arrangements are presently being implemented. [7] The spot price determination will be changed in 2006 from system wide ex post pricing (currently) to system wide ex ante. Participants will provide system wide, daily forecasts with hourly-profiles. Rebidding and re-forecasting by participants within day will be permitted. Provision will be made for within day rescheduling and revised system wide ex ante price at each reschedule. Initially scheduled participant imbalances settled at initial ex ante price, deviations from previous

[7] Victorian Gas Market Pricing and Balancing Review, VENCorp, Recommendations to Government 30 June 2004

Jurisdiction	Balancing / market arrangements under normal conditions
	ex ante schedules at revised ex ante prices. A further reforms are being considered for introduction after 2008. These will involve possible introduction of ex ante hub-based within-day pricing. Four or five hubs are envisaged with , 3 within day periods reflecting peak, shoulder and off peak (based around a 6am start for the gas day). Transmission capacity rights could be bid into and scheduled in the spot market operational and market schedules. Participant bidding and forecasting would be by within day period. Provision would also be made for end-of-period linepack bidding. Changes are also proposed for congestion management and transmission investment. **Prudential Requirements** Market participant, such as a retailer, trader or market customer who will be required to make wholesale market payments, must provide appropriate financial securities in the form of a bank guarantee, to cover potential liabilities to the market.
United Kingdom	Shippers are required to nominate day-ahead natural gas injections to and withdrawals from the NTS to NGT. Upon receiving nominations, NGT schedules gas flows to maintain system reliability and minimise costs. It then operates the system according to this schedule, and monitors for imbalance. There are commercial incentives for shippers to balance their system injections and withdrawals at the end of the gas day within a specified tolerance level. NGT alleviates imbalances by trading gas within-days and by using linepack. It records shipper activity and assigns costs in undertaking these functions and other penalties accordingly. Under normal circumstances, if a shipper is out of balance at the end of the day, any imbalance volume is cashed-out at prices determined by trades on the On-the-day Commodity Market (OCM). Different imbalance prices apply depending on whether the shipper is short gas or long gas. A shipper that is short gas pays the system marginal buy price (SMP Buy) which is the highest price of any trade to which Transco NTS is a party on the OCM, excluding any trades that it takes for locational reasons. A shipper that is long gas is paid the system marginal sell price (SMP Sell) which is the lowest price of any trade to which Transco NTS is a party on the OCM, excluding any trades that it takes for locational reasons. Cash out prices are designed to reflect the costs that Transco NTS incurs in buying and selling gas to balance the system each day.

4.5 Price Caps

4.5.1 Overview

The Victoria gas spot market has incorporated a price cap since its inception in 1999. REMCO is currently in the process of seeking approval for price caps to be incorporated in the Retail Market Rules for South Australia and Western Australia. This initiative has come from Market Participants. The National Electricity Market Rules in Australia also includes a price cap.

4.5.2 Detailed arrangements

Jurisdiction	Price cap arrangements
South Australia	Rules are currently being proposed to introduce Swing Service Price Caps.[8] Originally, the Retail Market Rules in South Australia and Western Australia did not have any limits on the price that swing service providers may bid into the bid stack. REMCO states "this makes it difficult for users to effectively assess their possible exposures and risks which prevent user for being able to manage these risks. The absence of a price cap has also been seen by some participants as creating a possible barrier to entry for new entrants." Proposed rule changes have been developed to introduce a cap on the swing service bid stack price as well as a cap on the provider of last resort price. The proposed price caps take into account that there may be different factors affecting the value of the cap at each gast point and each jurisdiction. The price caps in South Australia vary between \$0.800 and \$1.6 per MJ depending on the gate point
Western Australia	The same price cap rules are proposed as in South Australia (above). The proposed value of the price caps in Western Australia vary between \$0.030 and \$0.40 per KJ depending on the gate point.
Victoria	The MSOR contain price cap provisions[9]. If a pricing schedule under normal price determination process[10] determines that injections and withdrawals of gas imply that curtailment would have occurred (whether or not curtailment actually occurs), the market price for that scheduling period is set at the Value of Lost Load (VoLL). VoLL is set in the MSOR at \$800/GJ[11]. This is approximately 250 times the normal average spot price.

[8] Retail Energy Market Company Ltd Notice of Consultation C43/04R. See the Essential Services Commission of South Australia website. " Receipt of Submission No. 11 from REMCo for Rule Changes to the Gas Retail Market Rules" http://www.saiir.sa.gov.au/site/page.cfm?c=1561

4.6 Gas emergency legislation

4.6.1 Overview

Every jurisdiction reviewed has statutory arrangements that enable a government authority (the Minister or department head) and in some cases, the system operator, to issue directions in the event of a gas emergency relating to the use of available gas.

In some cases the powers are very broad and specific factors for how gas is to be allocated in an emergency are not spelled out. It seems likely that the primary purpose in all cases is ensuring safety and integrity in an emergency event. In the South Australia legislation, a specific factor is the "efficient and appropriate use of the available gas."

Gas emergency legislation does not deal with the pricing and commercial outcomes of gas emergencies.

4.6.2 Details of Gas Emergency Legislation

Jurisdiction	Gas emergency legislation
Australia[12]	
South Australia	***Gas Act 1997***. Section 37 of the allows the Minister to direct distribution and transmission system operators and retailers on the most efficient and appropriate use of the available gas and direct consumers not to draw gas when there is insufficient gas in the distribution/transmission system. Section 53 enables a gas retailer or distributor to cut supply in an emergency where safety is an issue. Should a State Emergency be declared then the ***State Disaster Act 1980*** and other emergency acts give power of direction to gas entities.
NSW	**Energy Administration Act 1987**. Part 6 enables the Governor to proclaim an emergency and make regulations to authorise the Director, Department of Energy, Utilities and Sustainability (DEUS), to control supply and use of energy. **State Emergency Services Act 1989** Establishes and defines powers of State Emergency Service in NSW. S22A (1) enables the Director-General (SES) to authorise the shutting off or disconnection of gas in an emergency

[9] Clause 3.2.4 of the MSOR
[10] Clause 3.2.1 of the MSOR
[11] Clause 3.2.4 (b) of the MSOR
[12] This is drawn from the National Gas Emergency Response Protocol Issues Paper, October 2004. Ministerial Council on Energy. Gas Emergency Protocol Working Group.

Jurisdiction	Gas emergency legislation
	area. **State Emergency & Rescue Management Act 1989**. S33 enables the Premier to declare a state of emergency. Local emergency controllers can take all measures necessary to secure public safety. **Essential Services Act 1988**. Provisions are similar to the Energy Administration Act. Other Acts are the Gas Supply Act 1997 and the Pipelines Act 1967. There are no emergency powers under these Acts.
Western Australia	**Energy Coordination Act 1994.** Schedule 3 establishes Roles and responsibilities of the Coordinator of Energy and system operators in dealing with Gas Supply System Emergencies.
Victoria	**Gas Industry Act 2001**. Under Part 8 of this Act, VENCorp, (the Market and system operator) may direct market participants to do certain things during an emergency. Under Part 9 of this Act the Governor in Council can declare an emergency threatening the supply of gas in the State, thus providing the Minister with broad ranging powers and indemnities to protect the interests of the public. **Gas Safety Act 1997**. Under Part 6 of this Act, the Director of the Office of Gas Safety may direct persons to cease gas supply or gas use or to do anything to make a gas emergency situation safe. **Essential Services Act 1958**. This Act enables the Governor in Council to proclaim that a state of emergency exists in relation to an essential service (gas companies are included within the meaning of the Gas Industry Act 2001). During a state of emergency, the Minister may provide, operate, control, regulate and direct any essential service. ***Emergency Management Act 1986***. The objective of this Act is to ensure emergency management that facilitates prevention of emergencies, response to emergencies and recovery from emergencies. Under Part 5 the Premier may declare a State of Disaster exists when satisfied that the emergency constitutes or is likely to constitute a significant and widespread danger to life or property in Victoria.
United Kingdom	Transco NTS, as Network Emergency Co-ordinator (NEC), is required to specify a Safety Case that is approved by the Health and Safety Executive (HSE). The Safety Case sets out procedures to deal with a gas supply emergency. The NEC Safety Case, in conjunction with the Gas Safety (Management) Regulations (GS(M)R) (1996), details the arrangements for co-ordinating

Jurisdiction	Gas emergency legislation
	the actions to be taken to prevent a supply emergency occurring or continuing. It includes an assessment of network risk and identifies two situations that would result in a Network Gas Supply Emergency (NGSE). The first is where there are insufficient gas supplies available to the NTS to meet demand. The second is where there is a critical transportation constraint in either the NTS or in a distribution network (DN).

4.7 Role of market arrangements in managing emergencies

4.7.1 Overview

In Australia and the United Kingdom there is a recognition of the interrelationship between market arrangements and the likelihood that emergency directions will be required to manage an emergency event. It is recognised that the more effective are the market arrangements the less likely it will be that emergency direction powers will need to be exercised.

There is a clear trend in the Australia and United Kingdom to strengthen the role of market mechanisms to enable gas and electricity markets to manage gas outage events and reduce the likelihood that gas outages need to be deemed as emergency events.

4.7.2 Australia

The stated government policy position is that government direction is to be a last resort and there is a preference for contractual and market based processes to be allowed to the operate to the greatest possible extent. The following summarises a recent statement from Australian governments[13] on gas emergencies and the role of governments in managing these emergencies:

> *"Ideally, Government intervention in the gas market in the event of an incident would occur as a last resort after it has become clear that the market has failed or will fail and would be based on the need for the use of emergency powers to manage the gas incident.*
>
> *"For the purposes of managing gas emergencies, the gas market is considered to be the collection of mechanisms whereby gas supply and demand are co-ordinated on a short-term basis, for example hourly or daily. The mechanisms include the processes for: gas nominations by buyers (retailers or shippers) to producers and pipelines; gas allocation to buyers; voluntary or market-based curtailment; imbalance management; and settlement"*
>
> *"Gas market failure is taken to mean failure of the above mechanisms to balance gas supply and demand within normal system tolerances, thereby threatening the integrity of*

[13] Ministerial Council on Energy Gas Emergency Protocol Working Group, National Gas Emergency Response Protocol, Options Paper, February 2005

> *the delivery system. System management beyond this point requires market intervention, by Government under emergency powers or by system operators under operating rules, to restore tolerances."*

Until recently, emergency management arrangements in each state operated independently even though the gas system has become interconnected across state boundaries.

A major gas disruption in January 2004 at Moomba (see section 6.2 in Annex 6 below) highlighted the need for a national inter-governmental agreement that a national protocol will be applied in the event of major supply interruptions and would consider both cross-border and intra-jurisdictional arrangements. In practice many emergencies may be too localised geographically and temporally for inter-jurisdictional action to be necessary.

Governments have recognised that:

> *there are a number of market mechanisms that could be further developed which would support management of gas supply shortfalls and avoid or delay the use of emergency powers, including: short-term trading and establishment of a short-term wholesale market; demand side responses; and spot supply contracts*[14].

In December 2004, the Ministerial Council of Energy[15] approved principles to guide the future development of the Australian wholesale gas market(s). The principles, which have been developed in close consultation with the industry, aim to encourage transparency, new market entrants, investment in gas infrastructure, and provide a market mechanism to assist in managing supply and demand interruptions. They are:

- information on market and system operations and capabilities at all stages of the gas supply chain (subject to recognition of existing contractual confidentialities) should be publicly available and frequently updated;
- gas market structure to facilitate a competitive market in all sectors;
- gas market participants should be able to freely trade between pipelines, regions and basins;
- there should be regulatory certainty and consistency across all jurisdictions; and;
- market design and institutional requirements responsive to and reflective of the needs of the market and market participants.

The Ministerial Council on Energy (MCE) recently established a "Gas Leaders Group[16]" agreed in April 2004 to "expand the gas market element of the energy market reform program to

[14] Ministerial Council on Energy (MCE) Gas Emergency Protocol Working Group, National Gas Emergency Response Protocol, Options Paper, February 2005

[15] Ministerial Council on Energy, Statement on Principles for Gas Market Development, 2004

[16] Gas Market Leaders Group Terms of Reference, Ministerial Council of Energy http://www.mce.gov.au/index.cfm?event=object.showContent&objectID=542EB02E-CB3C-6C04-2567F800D9BDFA88

accelerate the development of a reliable, competitive and secure natural gas market and to further increase the penetration of natural gas."

4.7.3 United Kingdom

As discussed in detail below, new emergency cash out pricing arrangements were recently approved by OFGEM to strengthen incentives for the market function in the event of emergencies.

4.8 Emergency Management Arrangements

4.8.1 Overview

Gas emergency management arrangements in Australia and the United Kingdom are coordinated either by a government agency (South Australia, New South Wales) or under delegated authority provided to the system operator (Vencorp in Victoria; NGT Transco in the United Kingdom)

In each state, a government body is responsible for coordinating the preparation of emergency procedures, and either providing advice to the Minister in giving emergency direction or (in the case of Victoria) giving emergency direction directly.

There has been much debate in the UK over recent years, as to whether the current emergency arrangements in the gas industry were appropriate[17]. Previously this debate took place in the Gas Industry Emergency Committee (GIEC), a body chaired by NGT Transco and attended by the Department for Trade and Industry (DTI) and gas industry representatives, and which was constituted to consider emergency arrangements for the gas industry.

The GIEC has now been replaced by the Gas and Electricity Industry Emergency Committee (GEIEC) in order to reflect the need to consider the increased interactions between the gas and electricity markets.

Consultation on arrangements for gas emergencies in the UK are undertaken jointly with the electricity industry reflecting the need to consider the increased interactions between the gas and electricity markets.

4.8.2 Details of arrangements

Jurisdiction	Emergency management approach
South Australia	The Natural Gas Authority of South Australia (NGASA) is responsible for the administration of gas sales agreements with the Cooper Basin Producers and two of the State's licensed gas retailers. Its primary role is to ensure that its contractual obligations are met while, at the same time, providing active input to achieve the SA Government's objective of maintaining security of gas supply for

[17] "Network code modification proposal 0635 "Changes in Gas Supply Emergency Arrangements" Ofgem. 1 October 2004.

Jurisdiction	Emergency management approach
	the State at an acceptable level. The Office of the Technical Regulator has produced a manual for coordinating gas emergency procedures. This covers various levels of supply difficulties. The Office also administers NGASA, which is aware of any gas supply difficulties related to Moomba or the Moomba-Adelaide Pipeline because of its role in administering the contracts for supplying Moomba gas to two gas retailers. The Office does not normally become involved until there is a real potential for a gas shortfall, the normal trigger being when a non-interruptible consumer has to be rationed. The retailers may then prefer that the Minister issue a direction at this time so as to avoid any breaches of their contracts. The Office would provide advice to the Minister to assist with the decision regarding the need to issue directions. The gas transmitter/distributor would coordinate directly with the retailers in most circumstances with the Office (Technical Regulator) overseeing the operation. The objective of the procedures is to ensure that the available gas is allocated fairly and equitably among the industry, power generators, essential services and domestic gas consumers to ensure that the gas distribution system remains safe and , where possible, operational. The authority to ration available gas is provided under the Gas Act 1997. The Minister has the authority to intervene and issue Ministerial Directions concerning the quality and quantity of gas taken by the gas consumers in order to maintain the integrity of the gas distribution system. Such directions would only be issued following extensive consultation and agreement amongst the parties, ie Energy Division and the gas industry. Customer load shedding schedules are in place to curtail predicted daily quantities of gas. The appropriate schedule is selected depending upon the estimated level and duration of shortfall.
New South Wales	The Department of Energy Utilities and Sustainability (DEUS) has developed a *NSW Natural Gas Supply Disruption Response Plan* that establishes the roles and responsibilities of DEUS, the Minister for Energy and Utilities and Natural Gas System Operators (NGSOs). DEUS monitors the progress of disruptions and advises the Minister for Energy and Utilities on any need for NSW Government intervention and the nature of the most appropriate intervention. The Minister for Energy and Utilities advises the NSW Governor, Premier and Parliament of the effects of a disruption and the need for intervention. Each NGSO has a detailed emergency plan including both load shedding procedures and priorities. These schedules form the basis of Ministerial directions

Jurisdiction	Emergency management approach
	under emergency legislation should this become necessary. The schedules may also be incorporated into the NGSOs' access arrangements at the next review. Gas market participants are working with DEUS to develop revised gas curtailment principles. These principles will define the basis for the equitable allocation of available gas to NSW consumers during periods of extended gas shortages.
Victoria	A comprehensive legislative framework has been established in Victoria to manage major gas emergencies. Broad ranging direction powers are available to the Director of the Office of Gas Safety and the Minister. For the Principal Transmission System and South West Pipeline and associated distribution systems, the CEO of VENCorp (the market and system operator) has similar emergency powers and VENCorp has in place a protocol to ration the use of gas within this network. Other pipelines and networks in Victoria manage emergencies independently. Lower level emergencies (involving a single distributor or a transmitter / distributor pair) would typically not require the exercise of these powers, but would be managed by the relevant distributor or transmitter in accordance with the terms of its Safety Case approved by the Office of Gas Safety. All network operators and retailers are required under their licenses to have a safety plan.

4.9 Pricing arrangements when there is notice of an impending emergency

4.9.1 Overview

When an unexpected outage event occurs, there may (or may not) be a period of time before it is clear whether it is necessary to declare an emergency. In some cases it will be clear that major event has occurred and an emergency would be declared immediately. In other cases it may not be clear whether the event is serious enough to warrant declaration of an emergency. (There may be uncertainties on the extent or duration of the event and there may be potential for adequate market responses to be forthcoming).

Arrangements in Australia and the UK are aimed at ensuring that the transmission operator is able to conserve / maximise available linepack. In each of the jurisdictions, (other then NSW) when there is a notice of an impending emergency, normal pricing arrangements would continue to apply with the gas shortages causing market determined imbalance gas prices. Incentives are thereby created for additional gas to be made available and for major loads to interrupt (provided the value of interruption is less then the price cap) in order sell swing gas to those who require it.

4.9.2 Details of arrangements

Jurisdiction	Balancing / market arrangements when there is notice of an impending emergency
South Australia, Western Australia	Normal swing pricing arrangements continue. If there are no offers made under the swing price then the swing service would be provided by the swing service of last resort. In the event of a significant outage, swing prices would be capped by the (proposed) price cap.
NSW	Normal pricing arrangements continue. The effectiveness of the arrangements depend on the size of imbalance penalties which. Detailed analysis has not been undertaken of
Victoria	Normal gas spot pricing arrangements continue subject to a price cap set at VoLL.
United Kingdom	Normal cash out arrangements apply during this stage Stage 1 of the ***NEC Safety Case*** is a *notice of impending emergency*. This indicates that there is a potential gas emergency, where the information available to the NEC at Stage 1 indicates that there is sufficient time and sufficient gas available, for the primary system to be rebalanced without recourse to Stage 2. This would include maximising the use of linepack, storage and interruption.

4.10 Arrangements when an emergency is declared

4.10.1 Overview

In the jurisdictions reviewed there is a clear definition of an emergency or force majure event in the retail rules (and in Victoria the MSO rules). When an emergency event is declared then normal gas market operations are suspended.

Practices differ as to how imbalance prices are determined when an emergency is declared:

- In South Australia and Western Australia normal pricing arrangements for Swing Services are suspended and instead pricing is determined "off market" based on contractual rights and obligations. REMCo provides information on imbalance quantities and leaves the pricing of imbalances to be resolved commercially. (As discussed in section 8.1 of the report FSC considers that the application of contract clauses is often unclear and rarely provide an effective mechanism to respond to gas supply interruptions.)
- In Victoria and the UK rules set out how prices are to be determined for imbalances.

- In under abnormal circumstances, specified by the MSO Rules as being "force majeure" events, VENCorp:
  - declares an administered price period which imposes a cap on the market price for the day (currently set at $80/GJ); and
  - there is a 5 stage hierarchy of strategies set out in the rules to determine market price.
- In the UK OFGEM recently approved new emergency cash out pricing arrangements:
  - The cash out price for users with a negative Daily Imbalance will be set to the SMP Buy prevailing on the day the emergency commenced; and the cash out price for users with a positive Daily Imbalance will be set to the SAP prevailing on the day the emergency commenced.
  - A new Emergency Curtailment Quantity (ECQ) title trade and associated 'trade' payment which seeks to assign the quantities of gas associated with emergency curtailment actions undertaken by Transco NTS in a GDE (including a Potential GDE) as a Trade Nomination between Transco NTS and each user.

In Victoria the MSOR also allows participants to claim compensation if they consider they have been financially disadvantaged as a result of a direction by VENCorp to inject gas or by VENCorp's application of an administered price cap. "Compensation payments" are payments made in addition to those payments made at the market price for the gas injected. Compensation does not apply in the case of load curtailment. Compensation is based on the insurance principle of indemnification. Compensation is based on proven direct costs incurred by the Participant in injecting gas to comply with VENCorp's schedule instruction or direction.

Pre determined curtailment tables apply in each jurisdiction. Curtailment tables apply to all loads. There is no evidence that any explicit reference is given to contractual positions in determining curtailment tables.

4.10.2 Details of definitions of an emergency event in the retail / wholesale rules

Jurisdiction	Definitions
South Australia, Western Australia	Changes to the Retail Market Rules[18] for South Australia and Western Australia have been proposed to address the gas emergency situations. The issue was that "pipeline operators may be unable to supply gas in accordance with users shippers nominations and the network operator may be required to curtail customers to ensure the network remains pressurised." There was also the possibility that "emergency regulatory intervention by the

[18] Retail Energy Market Company Ltd - Notice of Consultation C03/05R

Jurisdiction	Definitions
	Government under …requires market participants to act in a manner inconsistent with the requirements in the Retail Market Rules to minimise their contribution to swing service." These changes introduced a definition of a gas emergency into the Retail Rules as follows: *Gas emergency means a disruption to normal gas supply to a sub network that commences when a participants advises REMCO that the office of the Technical Regulator in South Australia has applied the emergency response procedures for at least a Level 2 event.* In the event of gas emergencies normal pricing arrangements are suspended.
Western Australia	Similar provisions have been introduced into the Western Australia Retail Rules[19] as in South Australia. These changes introduced a definition of a gas emergency into the Retail Rules as follows: *An emergency is as defined in Schedule 3 – Gas Supply System Emergencies of the Energy Coordination Act 1994 or that an operator has taken action under clause 2 of Schedule 3 of the Energy Coordination Act.* This defines a gas emergency as (a) any event or circumstance in relation to a supply system by reason of which the supply of gas from it is, or in the opinion of the Coordinator may reasonably be expected to be, seriously affected; or (b) any event or circumstance in relation to any act, matter or thing by reason of which the supply of gas from a supply system is, or in the opinion of the Coordinator may reasonably be expected to be, seriously affected, that, in the opinion of the operator of the supply system, requires the immediate exercise of powers given by clause 2 or, in the opinion of the Coordinator, requires the exercise of powers given by clause 3(1) or 4;
NSW	**Suspension** Section 27.11 of the GMC Business Rules enable variation or suspension of nomination process for emergency supply situations. This is defined as follows (1) The network operator may determine that an emergency supply situation has occurred in a network section on a nomination day ("emergency supply situation"). The situations in which the network operator may determine that an

[19] Retail Energy Market Company Ltd - Notice of Consultation C03/05R

Jurisdiction	Definitions
	emergency supply situation has occurred include, but are not limited to, situations in which the network operator or another person has been required to instigate load shedding in order to ensure that supply is maintained in a network section following a failure or constraint in a part or parts of the supply chain. (2) If the network operator determines that an emergency supply situation has occurred on a nomination day then: a) the network operator may vary or suspend the nomination for affected nomination days and the network operator will agree a replacement process for nominations with the relevant pipeline operator(s) for the affected network sections.
Victoria	**Market Suspension**[20] The Gas Industry Act 2001 empowers VENCorp to suspend the gas market in accordance with relevant provisions of the MSO Rules. The power of suspension is intended to be applied to events that significantly threaten the stability of an orderly commercial market for gas. Suspension is not intended as a means to address threats to the physical operation of the gas transmission system itself. VENCorp's powers of "direction" under the Gas Industry Act and MSO Rules allow VENCorp to physically intervene in the operation of the gas transmission system and are designed to ensure the continued physical security and integrity of that system. **Provisions** **Intervention due to system security threat** The MSO Rules[21] provide that If VENCorp believes that insufficient time exists for a threat to system security to subside without intervention, VENCorp must intervene in the market by taking any measures it considers to be reasonable and necessary to overcome the threat to system security. This includes ▪ injecting gas from VENCorp's LNG reserve; ▪ making directions under Part 8, Division 4, of the Gas Industry Act for – curtailment in accordance with the emergency curtailment list (See Annex 3) – increasing withdrawals; – requiring Participants to use reasonable

[20] See: Market Suspension Guidelines: Final Draft for Comment" Vencorp, 18 September 2004
[21] Clause 6.6.4 of the MSOR

Jurisdiction	Definitions
	endeavours to inject gas which is available and to which the Participant has entitlement, but which has not been offered into the market on the relevant gas day or which is non-firm gas, recognising in the case of non-firm gas the uncertainties associated with the supply and injection of that gas; – requiring any Participant to inject off-specification gas into the transmission system; and requiring Participants to do any reasonable act or thing which VENCorp believes necessary in the circumstances.
United Kingdom	***Declaration of emergency*** Stage 3 of the NEC Safety Case is a *Declaration of emergency*. At this stage the On the day Commodity Market is suspended and NGC is instructed to carry out the measures set out in the emergency arrangements.

4.10.3 Details of pricing arrangements under emergency

Jurisdiction	Pricing arrangements when an emergency is declared
South Australia	Normal pricing arrangements for Swing Service are suspended when an emergency is declared and instead pricing is determined off market based on contractual rights and obligations. REMCO continues to provide information to relevant participants on the quantities of swing gas provided and used. Approval for rule changes are currently being sought[22] to address the situation that during gas emergencies "pipeline operators may be unable to supply gas in accordance with shipper nominations and the network operator may be required to curtail customers". There is also the possibility that "regulatory intervention by government may require market participants to act in a manner inconsistent with the requirement in the RMR to minimise their contribution to swing service." "Each of these factors may contribute to large amounts of swing service being created for users if the RMR were to continue to operate normally. Further if swing was allowed to accrue during an extended pipeline disruption the size of

[22] Retail Energy Market Company Ltd Notice of Consultation C43/04R. See the Essential Services Commission of South Australia website. " Receipt of Submission No. 11 from REMCo for Rule Changes to the Gas Retail Market Rules" http://www.saiir.sa.gov.au/site/page.cfm?c=1561

Jurisdiction	Pricing arrangements when an emergency is declared
	the Swing Service Repayment Quantities may lead to the absurd situation that the undisrupted pipeline may need to be shut down following the disruption to allow the swing service to be repaid". The proposed rule changes[23] seek to allow the normal swing service calculations and the procurement of gas to resume as soon as possible after a gas emergency period while leaving the commercial implications to be resolved off market (ie outside of the RMR). The proposed amendments include ▪ amendment to rule 197(1) to introduce the concept of an "alternative settlement period" that applies during a gas emergency; ▪ amendment to rule 296 to provide for REMCO to provide a contract note to the user and the swing service provider setting out the details of the quantities of swing gas provided and used; ▪ amendments to rule 300B to deem the value of all Swing Repayment Quantities to be zero during the alternative settlement period ▪ amendments to rule 296A which suspends rights and obligations for Swing Service payments under the Rules, with these being handled "off market". ▪ amendments to rule 299 and 298 to require REMCO to calculate Swing Service Repayment Quantities; and users to repay this gas on gas day D+2 calculated on gas day D+1
Western Australia	The Western Australian arrangements are the same as for South Australia expect there are also provisions to determine how actual deliveries of gas under "multi shipper allocation agreements" are apportioned between shippers and swing service providers.
Victoria	**Administered Price Cap (APC)** Under abnormal circumstances, specified by the MSO Rules as being "force majeure" events[24], VENCorp is required to declare an administered price period which imposes a cap on the market price for the day (the administered price cap) [25].

[23] Retail Energy Market Company Ltd - Notice of Consultation C03/05R.

[24] See Annex 4 for definitions of System Force Majeure events

[25] Clause Administered 6.7.1 of the MSOR requires that after consulting Market Participants, VENCorp must develop, authorise and publish and may from time to time in accordance with the public consultation procedures vary an administered price cap.

Jurisdiction	Pricing arrangements when an emergency is declared
	MSO Rules[26] requires that market price during a suspension period is the lesser of the price determined reasonably by VENCorp as above and the APC $80/GJ. The APC is currently $80/GJ[27] For example, if an unforeseen plant or equipment failure in the transmission pipeline system, a gas production or storage facility, makes it impossible to supply all customer demand for gas from supplies offered into the market on that day, then the administered price cap would be applied. Under such circumstances, VENCorp may continue to schedule gas and set the market price according to market offers as far as is practical but, on that day, prices for market transactions cannot exceed the administered price cap. **Strategies for determine market price under market suspension** There is a 5 stage hierarchy of strategies to determine market price under the Gas Scheduling Procedures as follows; ▪ Strategy 1: market price determined through the use of normal processes (ex-post market schedule) ▪ Strategy 2: market price determined through manual calculation based on bids, injections and withdrawals for the applicable gas day ▪ Strategy 3: market price as the last forecast of market price issued for the applicable gas day ▪ Strategy 4: market price as an average of the market price for the preceding six months, taking into account the effect of, the seasons, holidays, weekends, week days, historical pricing. ▪ Strategy 5 market price as determined from an estimate of the cost of gas, including LNG. **Compensation Principles** The MSOR[28] allows participants to claim compensation if they consider they have been financially disadvantaged as a result of a direction by VENCorp to inject gas or by VENCorp's application of an administered price cap. "Compensation payments" are payments made in addition to those payments made at the market price for the gas injected. Compensation does not apply in

[26] Clause 3.2.2(c)(2) of the MSOR
[27] "Compensation Determination Guidelines" Version 1, VENCorp, January 2001
[28] Clauses 6.6.5 and 6.7.6 of the MSOR
[29] ibid

Jurisdiction	Pricing arrangements when an emergency is declared
	the case of load curtailment. VENCorp has published guidelines setting out how compensation is determined. The general principles are: ▪ Where, in respect of a particular trading interval, a Participant has injected gas in accordance with a VENCorp schedule instruction or direction, and either (i) no inc/dec offer has been made by that Participant for that source of gas; or VENCorp has notified Participants of the existence of a force majeure event; then compensation is to be based only on proven direct costs incurred by that Participant in injecting gas to comply with VENCorp's schedule instruction or direction. ▪ Where, in respect of a particular trading interval, a Participant has injected gas in accordance with a VENCorp schedule instruction or direction, and (i) an inc/dec offer has been made by that Participant for that source of gas, and (ii) VENCorp has not notified Participants of the existence of a force majeure event in accordance with the MSO Rules clause 6.7.2; then compensation is to be based on that Participant's inc/dec offer. The guidelines state "It is recognised that each compensation claim will have its own unique set of background circumstances that may require divergence from general principles in the interest of fair and equitable outcomes in any given situation. Hence it is accepted that divergence from these principles may be necessary, however, any such divergence must be clearly justified and that justification recorded and made transparent." Trowbridge[29] in its report recommended that compensation be based on the insurance principle of indemnification. "Compensation should place the participants on the same financial footing as it was before the injection, no better of worse off than if the injection had not occurred. This implies that compensation should be payable for direct costs directly incurred to be determined based on contractual costs, and that there be no opportunity cost compensation.
United Kingdom	***Declaration of emergency*** Stage 3 of the NEC Safety Case is a *Declaration of emergency*. At this stage the On the day Commodity Market is suspended and NGC is instructed to carry out the measures set out in the emergency arrangements. After the OCM has been suspended, a new cash out price needs to be established.

Jurisdiction	Pricing arrangements when an emergency is declared
	Previous emergency cash out pricing arrangement Until recently, the dual cash out price was replaced by a single price during Stage 3. This was calculated as the average of the System Average Price (SAP) for the 30 days immediately preceding the suspension of the OCM. Therefore, short shippers pay for any shortfall at 30 day average SAP, while long shippers are paid for any surplus at 30 day average SAP. **New emergency cash out pricing arrangement** OFGEM recently approved new emergency cash out pricing arrangements[30]. The new arrangements ▪ Amend the setting of the emergency cash-out prices from the prevailing single price of the 30 day average SAP to dual prices set at the point of market suspension: – the cash out price for users with a negative Daily Imbalance will be set to the SMP Buy prevailing on the day the GDE commenced; and – the cash out price for users with a positive Daily Imbalance will be set to the SAP prevailing on the day the GDE commenced. ▪ Introduce a new Emergency Curtailment Quantity (ECQ) title trade and associated 'trade' payment. The ECQ title trade seeks to assign the quantities of gas associated with emergency curtailment actions undertaken by Transco NTS in a GDE (including a Potential GDE) as a Trade Nomination between Transco NTS and each user. – the ECQ would be calculated as the aggregate quantity of Emergency Curtailment occurring as a result of a potential or actual GDE at the relevant System Exit Points less any quantity of user commercial “interruption” at the same System Exit Points notified to the relevant Transporters prior to the Emergency Curtailment occurring; and – for those occurrences of Emergency

[30] Uniform Network Code modification proposal 042 “Revision of the Emergency Cash-out price” and Uniform Network Code modification proposal 044 "Revised Emergency Cash-out & Curtailment Arrangements" OFGEM, September 2005.

Jurisdiction	Pricing arrangements when an emergency is declared
	Curtailment in a GDE, users would receive payment based on the ECQ multiplied by a price determined as the 30 day average SAP prevailing at the commencement of the GDE.
United Kingdom	

4.10.4 Details of curtailment arrangements when an emergency is declared

The details of curtailment tables in the different jurisdictions are set out in Annex 7. The gas rationing and recovery procedures for Victoria are also out in detail. Victoria's curtailment tables and gas rationing and recovery procedures are very detailed.

This level of detail reflects a number of factors:

- Until recently, the very high level of reliance on a single gas processing plant (at Longford). This meant that prior to recent increases in alternative gas supply, that the total loss of gas supply from Longford required curtailment of virtually all load n the state
- The relatively high level off domestic gas load
- The experience gained from the total loss of supply for a three week period from the Longford Gas Plant in October 1998. The arrangements reflect the detailed decisions made on rationing extremely limited gas supplies during the event.

4.11 Information and Notification systems

4.11.1 Overview

The terms of reference required a review of information and notification systems.

Information, notification systems, responses by shippers and operator directions are an essential part of any economic and commercial arrangement. Key informational and operational elements for any gas system with multiple gas sources include forecasting, nominations, checking consistency of total nominations with available pipeline capacity, provision of information on imbalances, physical management by shippers of injections and withdrawals; information provided on major events and emergencies, "backstop" operator directions and curtailment, settlement of imbalances, and other ancillary fees and charges (including "out of the market" compensation / funding.)

A key objective of any well designed information and notification systems is to ensure that parties with exposures to imbalance prices and other fees and charges are provided with reliable information so they are a position to manage their risk in "close to real time" through or physical control of gas injections and withdrawals and trading with other parties.

A key structural design issue is whether retail and wholesale information systems are provided by a single body (as in Victoria by VENCorp and in the United Kingdom by xoserve) or whether they are provided separately (as in South Australia, Western Australia and NSW).

Separate provision of information and notification services involves the transmission pipelines companies providing information and notification services to their directly connected parties; and a single retail entity (REMCo, GMC) providing information services to the retail market.

The details and sophistication of the information and nominations systems vary extensively based on a number of factors including the method and frequency with balancing is allocated; the level of linepack; the volatility of demand and the frequency with which nominations must be adjusted. Another factor is the size of the market and the ability of the parties to bear costs.

4.11.2 Details of Information and Notification systems

Jurisdiction	Information and Notification systems
South Australia	**Wholesale information and notification systems** These services are provided by **REMCO Information Systems** The Balancing and Reconciliation BAR comprises three entities: Forecast Profiling Entity; Data Estimation Entity; and Swing Service Processor. Forecast Profiling Entity (FPE) prepares profiled forecasts for each gas day and correctly allocate consumption values across shippers and pipelines. FPE maintains information for all profiles, sub-networks, pipelines, users, shippers. Data Estimation Entity (DEE) runs settlement and reconciliation calculations on a user and sub-network level for all delivery points. DEE determines how much the users withdrawal from each sub-network is and settles any retrospective revisions. DEE maintains DP information which are internally received from DPR. Meter reading data for the whole historical period are also maintained including gate point data, unaccounted for gas, interval meter readings and basic meter readings. The total sub-network withdrawal is provided to FPE for allocation to shippers, swing service providers and to pipeline operators. Swing Service Processor. The main function of SSP is to calculate all swing service amounts and allocate the swing service across the users. SSP maintains the swing service provider register, all off-market trade and bid-stack information. SSPOLR register also maintained inside this entity. SSP is provided all the information required for the swing service calculation internally from FPE and DEE.
Western Australia	Similar to South Australia

Jurisdiction	Information and Notification systems
NSW	Details of the information and notification systems are difficult to obtain as they are confidential to market participants.
Victoria	A significant amount of market information is provided to participants and the public on such things as market forecasts, spot market price, participant offers and market outcomes. Market information such as operating schedules, forecast prices, system wide notices advising of changing conditions / reschedules, settlement statements and relevant supporting data is published electronically on VENCorp's Market Information Bulletin Board (MIBB), which can be accessed by participants. This system provides access to the large volumes of information while ensuring that each participant can only access information to which they are entitled.
United Kingdom	A new entity, xoserve was launched on 1st May 2005, and is an integral part of the restructured gas distribution market in Britain. It delivers transportation transactional services on behalf of all the major gas Network transportation companies.

5. Annex 5 - Rationale for setting Administered Price Cap value in Victoria's MSOR

The setting of the APC at $80/GJ by VENCorp was based on advice from Trowbridge Consulting.[31]

Trowbridge assumed that use of LNG (drawn from the LNG tank at Dandenong) was the marginal supply source that would be used in an emergency situation. It was assumed that controllable loads with dual fuel capability were not likely to bid flexibility into the market at a price that exceeds the typical price of LNG.

This reflected a further assumption that the majority of customers who do install dual fuel capability would do so for business reasons (as an insurance strategy to protect production) and are unlikely to do so based on the possibility of a market offering the potential for financial gains.

It was noted that another report[32] prepared following the Longford event had assessed the marginal costs of interruption for industrial and commercial customers with dual fuel capability as follows:

- Light Oils $12.60 GJ (Small Customers) to $15.20/ GJ (small customers)
- LPG $7.60 GJ (large customers) to $11.40/ GJ (small customers)

A simplified Monte Carlo Simulation model was developed that attempted to simulate the LNG trading profits in a winter from alternative LNG bidding strategies.

The modelling suggests that an APC of $30/GJ to $40/GJ may provide the Gas Retailers with insufficient opportunity to recover the "option value" of their LNG stock.

An APC of $80/GJ appeared to simultaneously

- allow a retailer wishing to derive a trading profit from its LNG stock with a reasonable opportunity to do so; and
- does not lead to super normal LNG trading profits for some (and hence extreme losses for others) following a catastrophic event, in the vast majority of cases.

[31] "Review of the Force Majeure and Administered Price Cap Provision for the Victorian Gas Market" Report by Trowbridge Consulting to VENCorp, 25 November 1998

[32] "Assessment of I/C 100 TJ + Sector Dual Fuel Capability" SRC International Draft Report 23 October

6. Annex 6: Case Studies of Emergency events

6.1 Moomba Incident – January 2004

On 1 January 2004 a fire at the Moomba gas plant reduced its capacity from approximately 700 TJ/day to less than 200 TJ/day for a number of weeks. Summer gas demand in NSW/SA averages 660 TJ/day, of which up to 600 TJ/day had been supplied from Moomba, and the incident therefore presented a major threat to gas supply to NSW/SA.

Additional supply for NSW/SA was sourced from Victoria, for NSW from the Gippsland Basin via the Eastern Gas Pipeline and for SA from underground storage and the Otway and Gippsland Basins via the just completed SEAGas pipeline. Gas demand for power generation in SA was reduced by high electricity import levels and supply was able to be maintained with minimal curtailment of other gas users.

In response to the Moomba gas plant incident, a NSW-VIC-SA-ACT Infrastructure Task Force was formed to undertake various assessments of the gas supply-demand balance, supply constraints and to liaise with gas producers, pipeline operators, gas retailers, gas customers and industry as required.

Subsequently more work has been undertaken by the Ministerial Council of Energy including agreement of a Gas Emergency protocol and steps to develop a Wholesale Gas market

Investigations by the National Electricity Code Administrator (NECA)[33] and ESCOSA[34] into these events concluded that the major issue was the lack of adequate gas market arrangements for managing the rationing of gas supplies. NECA reached a similar conclusion in its investigation of events in November 2000, when there were also gas shortages in Adelaide.

ESCOSA stated “our strong preference is for a market based approach….where short-term price signals drive efficient and secure solutions with trading between wholesale market customers facilitated”.

There has been some debate over the extent to which the incident provided evidence of the industry’s capacity to handle such events with the existing market arrangements.

Some industry participants claimed event provided evidence the current arrangements were robust enough to handle such events. Others pointed to the fortuitous timing of the SEAGas pipeline (the construction of which was underpinned by bilateral contracts) avoided catastrophic gas shortages in South Australia, and parties were able to enter contractual arrangements for gas supplies ex-Longford to supply NSW demand, this only occurred after SA Government intervention and then was only possible because Victorian gas demand in January was in the order of 350-400TJ per day.

Had the incident occurred when Victorian gas demand was significantly greater than this (peak winter demand on the Victorian PTS can be in excess of 1100TJ/day) then the simple existence

[33] Investigation into the events in the electricity market on Saturday 25 January 2003”, NECA, March 2003.

[34] “Inquiry into Generator Bidding and Rebidding 25-28 January 2003”, ESCOSA, March 2003.

of SEAGas and Eastern Gas Pipelines, without clear pricing signals in NSW and SA, would not have provided a basis for a market based solution to balance supply and demand in all three States.

6.2 Victoria, Level 5 Emergency on 22 July 2002

During the early afternoon of Monday, 22July 2002, VENCorp identified a potential threat to system security during Monday afternoon and the evening peak demand period. The forecast hourly gas demand was expected to significantly exceed the rate of supply during that period, and it was likely that, without intervention by VENCorp, minimum operating pressures in the gas transmission system would be breached.

A level 5 Emergency was declared. After issuing the direction to curtail load, VENCorp was advised that two gas-fired generators were converting from gas to oil firing. The use of start up gas for accredited dual fuel sites is provided for under the Gas Load Emergency Curtailment Rules and this had the effect of extending the time required for curtailment of gas usage.

The following factors contributed to this event.

- Monday's weather was much colder than forecast by the Weather Bureau. The Bureau's forecast for Melbourne, issued at 4:30pm on Sunday, was for a mostly sunny day with an expected maximum temperature of 15 C. At 7.30am on Monday the Bureau revised its forecast maximum temperature to 13 C. However, the actual recorded maximum temperature for Melbourne on the day was only 10.8C
- The Bureau's forecast minimum overnight temperature for Sunday/Monday was 6.0 C, whereas the actual recorded minimum overnight temperature was 3.3 C. This resulted in higher than forecast overnight gas usage, consequently reducing the available linepack at the 9:00am start of the Monday gas day.
- There was a much higher consumption of gas early on Monday than indicated by the forecasts provided to VENCorp by gas fired electricity generators. This was due to the colder than expected weather; a reduced electricity import capability because of transmission outages, and; on-line coal fired generation in the Latrobe Valley operating at outputs significantly below their rated capacity.

At the start of the Monday gas day, 260TJ of injection offers had been received by VENCorp for gas from the TXU Underground Gas Storage facility. The first schedule for the gas day required TXU Underground Gas Storage to inject 196TJ of gas. This quantity was rescheduled to 233 TJ at.. However, following this reschedule TXU Underground Gas Storage advised VENCorp that injections of gas would be limited to 202TJ, as injections in excess of this quantity would not meet the gas quality specification.

Despite VENCorp issuing a number of revised schedules after the start of the gas day, the outlook continued to deteriorate and at 3:17pm VENCorp issued a system wide notice to participants in the industry advising that there was a threat to system security due to demand

exceeding supply and that it was likely that Table 1 of Load Curtailment Tables would need to be invoked at some stage.

Conditions continued to deteriorate and at 4:10pm VENCorp issued a direction to Market Participants curtailing gas use by customers as per Table 1 of the Gas Load Emergency Curtailment Rules, effective from 4:30pm.

Table 1 of the Gas Load Emergency Curtailment Rules comprises:

- all unauthorized gas sites and unauthorized gas usage (i.e. that in excess of Authorised MDQ),
- withdrawals into underground gas storage,
- gas fired power generators with MHQs in excess of 2TJ,
- customers with interruptible contracts entered after June 30, 1998, and
- interstate exports.

Due to the continuing depletion of linepack and reducing system pressures, at 5:20pm VENCorp declared a Level 5 Emergency in order to place the industry as a whole on the best footing to respond to the event.

The Office of Gas Safety and Department of Natural Resources and Environment were kept informed of these events by VENCorp as they unfolded.

After issuing the direction to curtail load, VENCorp was advised that two gas-fired generators were converting from gas to oil firing. The use of start up gas for accredited dual fuel sites is provided for under the Gas Load Emergency Curtailment Rules and this had the effect of extending the time required for curtailment of gas usage.

As a result of the actions put in place by VENCorp there were only two pipeline minimum pressure security breaches reported for the day, these being relatively marginal breaches which did not affect gas supplies.

The Level 5 Emergency was lifted at 11.42 pm on Monday, and other notices relating to the threat to system security and curtailments were removed at 5.35am, Tuesday, 23 July, to enable the market to prepare their forecasts and bidding normally for the following gas day.

In a subsequent review, VENCorp considered that the powers and obligations then prescribed under the Gas Industry Act 2001 and MSO Rules were satisfactory for dealing with situations.

Reviews undertaken following the event identified areas where improvements in the implementation of the Rules relevant to system security threats and emergencies could be sought by VENCorp and other industry participants, these being primarily in the area of communications procedures and practices.

The events of the day also illustrated a number of issues related to the long term adequacy of the current single zone, daily price market model in dealing with within day system constraints on the Victorian gas transmission system.

The event led to a major Balancing and Pricing Review which in turn led to decisions to decisions to reform the system of pricing described above.

6.3 United Kingdom: Winter Outlook 2005/06 – Uniform Network Code modifications to Emergency Cash out price – September 2005

In September 2005 OFGEM directed changes to the emergency cash out price and curtailment arrangements.

This followed concerns by the Gas Industry Emergency Committee as to the appropriateness of the previous emergency cash out arrangements. These concerns were:

- the lack of incentive to encourage gas onto the system prior to the declaration of an emergency and
- the potential for perverse incentives not to alleviate or avoid an emergency occurring.

These concerns were against the backdrop a tightening gas supply demand balance forecast for the Winter of 2005/06.

The changes were to

(a) Amend the setting of the emergency cash-out prices from the prevailing single price of the 30 day average SAP to dual prices set at the point of market suspension:

   a. the cash out price for users with a negative Daily Imbalance will be set to the SMP Buy prevailing on the day the GDE commenced; and

   b. the cash out price for users with a positive Daily Imbalance will be set to the SAP prevailing on the day the GDE commenced.

(b) introduce a new Emergency Curtailment Quantity (ECQ) title trade and associated 'trade' payment out price from the prevailing single price

In explaining the basis of its decision on the new emergency cash out price OFGEM commented as follows

> *For shippers who are short gas in the days or hours leading up to an emergency both SAP and SMP Buy are likely to provide stronger incentives than the current 30 day average SAP to procure gas or demand side response from market sources and, therefore, to address their imbalance through the normal market mechanisms. By improving the incentives for shippers to balance their positions in situations where the gas market is close to an emergency, it follows that the likelihood of a stage 2 emergency occurring is reduced, and that any emergency that is called would be expected to be shorter in duration than would have otherwise been the case.*
>
> *Ofgem considers that the market valuation of gas immediately prior to an emergency being called is likely to be higher than an averaged price over a period in the build up*

towards an emergency being declared. Therefore, unless an emergency was declared at the start of the gas day, any method which sets emergency cash out prices to an average level for the day would be likely to undervalue gas at the start and during an emergency. Ofgem therefore considers that the incentives associated with cash out prices set by SMP Buy would be more appropriate, and would encourage shippers to source gas from price sensitive sources including the interconnector and LNG imports in an efficient manner, reflecting the market value of gas in GB.

At present, the emergency arrangements potentially create a perverse incentive in which a shipper that is short of gas may gain financially if the overall system enters stage 2 of an emergency and is, therefore, discouraged, from a financial perspective, from addressing a short gas imbalance.

7. Annex 7 – Curtailment Tables

This section summarises curtailment tables for South Australia, Victoria and the United Kingdom.

7.1 South Australia - AGLGN, Energex, Envestra (South Australia) and AGLGN [35]

7.1.1 Envestra – South Australia

Load Shedding Priority	Description
a	Interruptible Delivery Points
b	Demand Delivery Points with alternative fuel sources
c	Demand Delivery Points with the ability to shut down their plant or operations with minimal disruption
d	Demand Delivery Points which are capable of releasing the greatest capacity to that part or parts of the Network in respect of which load shedding is required
e	Other Demand Delivery Points
f	Commercial Delivery Points
g	Domestic Delivery Points
h	Emergency or essential services (such as hospitals)

7.1.2 AGLN

Load Shedding Priority	Description
1	Interruptible Loads
2	A Delivery Point which serves more than one Customer, and where no arrangement exists between AGLGN and the operator of the facilities beyond the Delivery Point for shedding loads served by those facilities
3	Sites where gas is not used for production
4	Sites where load is transferable to an alternative fuel

[35] Source: Ministerial Council on Energy. Gas Emergency Protocol Working Group. National Gas Emergency Response, Protocol Issues Paper, October 2004

5	Load that may be reduced without damage to product or plant
6	Load that may be halted without damage to product or plant
7	Load where halting will cause product damage
8	Load where halting will cause plant damage
9	Load not transferable to alternative fuel at hospital and essential service sites
10	Tariff sites (Residential, Commercial and Industrial)

7.1.3 Energex

Load Shedding Priority	**Description**
a	Interruptible Delivery Points
b	Demand Delivery Points with alternative fuel sources
c	Demand Delivery Points with the ability to shut down their plant or operations with minimal disruption
d	Demand Delivery Points which are capable of releasing the greatest capacity to that part or parts of the Network in respect of which load shedding is required
e	Other Demand Delivery Points
f	Commercial Delivery Points
g	Domestic Delivery Points
h	Emergency or essential services (such as hospitals)

7.2 Victoria

7.2.1 Curtailment Table

Curtailment Tables are set out in the *Gas Load Curtailment and Gas Rationing and Recovery Guidelines.* [36] If VENCorp is required to, or determines that it is necessary to, implement load curtailment under these Guidelines, then VENCorp must do so, to the extent that it is reasonably practicable in all the circumstances, as follows:

The order in which curtailment is to be implemented should commence with Table 0. (as set out below). Table 1 may be curtailed in whole or in part in the sequence shown commencing with Table 1(a). Within each of Tables 2 to 9 (inclusive) and 11, curtailment should occur in descending order of customer MDQ2. Where a customer is included in Table 9 or 11 as well as another Table, the Table to apply to that customer will be Table 9 or 11, as the case may be.

[36] Gas Load Curtailment and Gas Rationing and Recovery Guidelines, VENCorp, Issue 7.0 March 2003

Where practicable VENCorp should endeavour to confine the curtailment to impacted regions and upstream regions where this can materially reduce the impact of a contingency.

Following implementation of curtailment of customers in Tables 1(a) to 1(d) VENCorp may issue a public appeal for all gas customers to voluntarily reduce gas use.

Following implementation of curtailment of customers in Tables 2 to 5 (inclusive) and prior to proceeding to curtail any customers in Tables 6, 7, 8, 9(a), 9(b), 10(a), 10(b) and 11,where time permits, VENCorp should issue a public appeal for all gas customers to voluntarily reduce gas use.

VENCorp will also have regard to the needs of the electricity supply-demand position and alternate sources of power when curtailment of gas fired power generation is required. Before curtailing gas fired power generators VENCorp will consider the following:

- availability of other power generation;
- whether curtailment will invoke an Level of Reserve notice and if so the type of the LOR;
- the anticipated power demand;
- provision of gas to enable gas fired generators with dual fuel capability to convert to, start-up and run using alternative fuel supplies; and
- advice to Namco and Government of any proposed curtailment.

The following is the classification of customers contained in each of the Curtailment Tables:

Load Shedding Priority	**Description**
Table 0:	In the advent of curtailment to resolve a threat to system security attributable to a gas transmission constraint: (a) Customers with no AMDQ or AMDQ credits who are classified as Tariff D transportation tariff in the VENCorp Meter Installation Register; and b) Customers where usage is in excess of assigned AMDQ and AMDQ credits and who are classified as Tariff D transportation tariff in the VENCorp Meter Installation

	Register are to be limited to the authorised quantity.
Table 1.	(a) Withdrawals into Underground Gas Storage. (b) Gas fired power generation scheduled by NEMMCO[37]. (c) Customers who have entered into contracts with a gas company which allows the interruption of supply of gas to that customer, to the extent that the contract so provides for the interruption of gas to that customer. (d) Exports via interconnections subject to alternative gas supplies being available to export gas customers in the same categories as specified by Curtailment Tables in Victoria that have not been curtailed.
Table 2.	Customers with MDQ equal to or above 5000 GJ/day curtail to 40 % of MDQ.
Table 3.	Customers with MDQ equal to or above 1000 and less than 5000 GJ curtail to 40 % of MDQ.
Table 4.	Customers with MDQ equal to or above 5000 GJ curtail balance of load.
Table 5.	Customers with MDQ equal to or above 1000 and less than 5000GJ curtail balance of load.
Table 6.	Customers with MDQ equal to or above 500 and less than 1000 GJ.
Table 7.	Customers with MDQ equal to or above 250 and less than 500 GJ.
Table 8.	Customers with MDQ less than 250 GJ who are classified as Tariff D transportation tariff in the VENCorp Meter Installation Register.
Table 9.	(a) Customers with uninterruptible continuous processes, to prevent major material damage to furnaces or plant, only as currently approved by VENCorp. (b) Start-Up, Conversion, and Running Gas as approved for accredited Dual Fuel sites available after VENCorp issues the curtailment direction, subject to notice of gas requirements being given to VENCorp and approval by VENCorp in writing.
Table 10.	(a) Gas area heating at all residential dwellings and commercial and industrial customers classified as Tariff V[38]4 transportation tariff, Department of Human Services exemptions excepted. (b) Gas use for other than area heating at all residential dwellings and commercial and industrial customers classified as Tariff V transportation tariff, Department of Human Services exemptions excepted.
Table 11	Essential and Critical Services customers identified by the Department of Human Services: Hospitals, Aged and Infirm Residential Institutions and laundries servicing those hospitals and institutions. Services providing Blood Plasma and related products to hospitals.
Isolation of selected	In the event that curtailment does not reduce demand sufficiently to secure the

[37] Start-up, Conversion or Running gas as approved for dual fuel customers excepted See Table 9(b)

[38] Tariff V customers are comprised of residential and small to medium sized commercial and industrial gas customers normally with annual loads less than 10,000GJ

Networks	transmission system, distribution networks may be selectively isolated to ensure the integrity of the system. In this event customers in Table 11 falling within these networks might have to be curtailed.

7.2.2 United Kingdom

Stage 3 of the NGC Safety Case is “firm load shedding”.

The affected transporter makes direct or indirect contact with firm end-users and instructs them to stop or reduce their offtakes of gas. Firm load shedding is divided into three tranches of increasing severity and effect. The three tranches are:

- Very large end-users (VLDMC) (those taking more than 50 mtpa)
- Large end-users (those taking between 25,000 tpa and 50 mtpa)
- End-users taking less than 25,000 tpa

Firm load shedding is invoked in this order. Flows through the interconnectors can also be curtailed.

8. Annex 8: Definition of System Force majeure events Victorian MSOR

A *system force majeure event* is defined (clause 6.7.2 of the MSOR) as the occurrence of any one or more of the events where

Either

- VENCorp reasonably considers that
  - the event has resulted in a reduction in the normal capacity of part or all of the transmission system and/or the volume of gas which would otherwise normally flow in the transmission system; or
  - the event has resulted in a reduction in the normal capacity of part or all of a Producer's or Storage Provider's plant or facility reducing the volume of gas which would otherwise normally flow into the transmission system; and
- that reduction is likely to materially affect the operation of the market or materially threaten system security.

And/or

- The Governor in Council by proclamation declares that Part 9 of the Gas Industry Act applies, or any like or analogous event;
- The Office of Gas Safety issues a direction under sections 106 or 107 of the Gas Safety Act 1997 (Vic) as the case may be, or any like or analogous event; or
- An event that is a participant force majeure event and which, in the reasonable opinion of VENCorp, satisfies the requirements of 6.7.2(a).

A *participant force majeure event* is defined (clause 3.1.13 dc of the MSOR) as one or more events that is beyond the reasonable control of the Market Participant who is affected by the relevant event; and results in or causes the Market Participant who is affected by the relevant event to fail to comply with scheduling instructions, either in part or in whole.