



National Energy Board

Reasons for Decision

**Phase 1
The Surplus Determination
Procedures Phase of the
Gas Export Omnibus
Hearing, 1985**

GH-2-85

April 1986

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In the Matter of

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Table of Contents

Recital	(v)
Summary	(vi)
1. Background	1
1.1 Introduction	1
1.2 The Board's Current Surplus Determination Procedures	2
1.2.1 The Reserves Formula	3
1.2.2 The Deliverability Appraisal	3
1.2.3 The Use of the Reserves Formula and the Deliverability Appraisal	3
1.2.4 Protection Provided by the Reserves Formula	4
2. Continuing Appropriateness of Existing Procedures	5
2.1 Continuing Appropriateness of the Reserves Formula	5
2.2 Continuing Appropriateness of the Deliverability Appraisal	8
2.3 Cost and Adequacy of Security of Supply	9
2.3.1 Security of Supply Concerns	9
2.3.2 How to Ensure Security of Supply	12
2.3.3 The Relevance of Economic Considerations to Surplus Determination	12
2.3.4 The Cost of Providing Security of Supply	13
2.4 Implications of the New Gas Pricing Policy	14
2.4.1 Whether Existing Surplus Determination Procedures are Consistent with the New Agreement	14
2.4.2 The Impact of a Mandated Reserves Inventory in a Market-Sensitive Pricing Environment	15
2.4.3 Whether Supply and Demand will Balance with Market-Sensitive Pricing	16
2.5 Determination of Surplus Nationally or By Region	17
2.6 Treatment of Frontier Reserves	18
2.7 Treatment of Reserves Additions	19
2.8 Allowance for Existing Export Authorizations	19
2.8.1 Licences	19
2.8.2 Short-Term Orders	20
2.9 Treatment of Imports	21
2.10 Synthetic Natural Gas	21
3. Alternative Surplus Determination Procedures	22
3.1 Suggested Modifications to Existing Procedures	22
3.1.1 Reserves Formula	22
3.1.2 Deliverability Appraisal	24
3.2 Cost-Benefit Analysis	24
3.3 Contractual Approach	26
3.4 Reserves to Production Ratio Tests	28

4. Decision	31
4.1 Continuing Appropriateness of Existing Procedures	31
4.2 Description of New Procedure	32
4.3 The Selection of a Reserves to Production Ratio	34
4.4 Merits of the New Procedure	35
4.5 Illustration of Surplus Determination Using the Reserves to Production Ratio Procedure	36
4.5.1 The Calculation of the Maximum Potential Surplus	37
4.5.2 Calculation of the Reserves to Production Ratio and the Productive Capacity	37
4.5.3 The Determination of Annual Export Quantities in New Export Licences	38
4.6 Other Matters	50
4.6.1 Ways of Proceeding with Phase 2 - Surplus Determination Phase	50
4.6.2 Guidelines for Submission for Phase 2	50
5. Disposition	52

Appendices

I	Board Letter of 1 August 1985 and Hearing Order GH-2-85	53
II	Appearances	80
III	Abbreviations	83
IV	Reference Publications	86
V	Evolution of the Board's Natural Gas Surplus Determination Procedures	87
VI	Definitions	94
VII	The Legislative Basis for the Board's Gas Export Responsibilities and an Illustration of the Format of the 25A1 Reserves Formula	97
VIII	Description of Calculations in Tables 4-1 to 4-5	98
IX	The Board's Selection of a Reserves to Production Ratio	100

Recital and Appearances

IN THE MATTER OF the *National Energy Board Act* and the Regulations made thereunder; and

IN THE MATTER OF the Gas Export Omnibus Hearing, 1985, Phase 1 - Surplus Determination Procedures Phase: an examination of the National Energy Board natural gas surplus determination procedures held under National Energy Board Order No. GH-2-85.

HEARD in Calgary on: 18,19, 20, 21 November, 1985

and in Ottawa on: 2, 3, 4, 5, 6, 9, 10, 11, 12, 13, 16, 17, 18, 19 December, 1985.

BEFORE:

W.A. Scotland	Presiding Member
W.G. Stewart	Member
A.B. Gilmour	Member

Summary

(Note: This summary is provided solely for the convenience of the reader and does not constitute part of this decision or the reasons for it.)

One of the key responsibilities of the National Energy Board ("the Board") is to ensure that natural gas proposed to be exported is surplus to Canadian requirements. The Board has carried out that responsibility by various means over the years.

In May 1985, in the light of changing circumstances, the Board proposed that it hold a hearing to review the procedures it uses to determine natural gas surplus. Having received the views of interested parties, the Board issued its Hearing Order on 1 August 1985.

Submissions were received from some sixty parties and the hearing took place in November and December, 1985 in Calgary and in Ottawa.

The surplus determination procedures used by the Board since 1982 consisted of:

- (i) a 25A1 Reserves Formula which compared remaining established reserves with 25 times the current year's Canadian demand, plus the maximum quantities exportable under current licences; and
- (ii) a Deliverability Appraisal which compared the Board's best estimates of future natural gas supply and demand on a year-to-year basis.

The majority of parties suggested relaxing existing procedures. Most of these suggested this be accomplished by reducing the multiplier in the Reserves Formula.

Several parties suggested that the Board adopt completely different procedures. One of these was to rely on contracts, with the amounts not covered by contract being deemed to be surplus. The Board did not adopt this suggestion because there appeared to be no acceptable mechanism for making the concept operational and because the Board considered it more appropriate to fulfill its statutory responsibilities by calculating surplus based on its estimation of supply and requirements. Other procedures suggested were based on reserves to production ratios which are well known and used by industry.

The Board determined that its existing procedures were no longer appropriate because the large inventories of natural gas associated with the 25A1 Reserves Formula are not required in a market-sensitive pricing environment. The Board decided that its new procedure should be based on the ratio between reserves and production.

The Board's new surplus determination procedure - the Reserves to Production (R/P) Ratio Procedure - incorporates estimates of annual additions to reserves, and forecasts of both Canadian demand and authorized exports. It also involves an assessment of future annual productive capacity (the Productive Capacity Check) which takes the place of the previous Deliverability Appraisal.

The Board is of the view that a ratio of 15 between reserves and production would ensure that there will be sufficient spare productive capacity to enable Canadian requirements to be met not only during any period of export but also for a number of years thereafter.

As an important feature of its new surplus determination procedure, the Board intends to conduct reviews at appropriate intervals in order to update its projections of Canadian demand, forecast exports, reserves additions, and productive capacity. The publication of the results of these periodic reviews will provide, on the one hand, a forewarning of potential supply problems and time for any necessary adjustments to be made, for example, to the pace of exploration or connection of reserves. On the other hand, such reviews may provide an early indication of continuing or increasing surplus volumes and, hence, possible further exports.

The Board believes its new procedure should encourage a reasonable balance between exploring for new reserves and developing existing reserves.

The calculations prepared by the Board to illustrate its new procedure indicate that a maximum potential surplus of 10 EJ could result from the procedure using a reserves to production ratio of 15. The Board estimated that exporting up to this amount could result in net economic benefits to Canada.

The Board appreciates the potential impacts that would occur if a somewhat different R/P ratio were to be chosen. Therefore, the Board will be seeking input when considering future natural gas export applications on the continuing appropriateness of an R/P ratio of 15.

The new procedure embodies a combination of security of supply and flexibility which the Board considers to be appropriate in the context of market-sensitive pricing and the maturity of the Western Canada Sedimentary Basin. It also lends itself to the inclusion of new gas-producing regions such as the frontiers.

A number of other issues were considered during the hearing; such as, whether surplus should be determined nationally or by region, and the treatment to be accorded to frontier reserves, imports, border markets, and synthetic natural gas. For each of these, the Board has decided that no changes in its existing procedure are needed at this time.

Chapter 1

Background

1.1 Introduction

On 30 May 1985 the Board wrote to holders of natural gas export licences, governments, associations, and other interested parties. The letter requested their views on the timing, format, and content of a proposed hearing to review the procedures the Board uses to determine the quantity of natural gas surplus to reasonably foreseeable Canadian requirements and hence available for export, and to consider expected applications to export gas.

The Board's letter suggested that the hearing might be held in four phases as follows:

- (i) Phase 1, the Surplus Procedures Phase, to review the continuing appropriateness of existing surplus determination procedures and possible changes to these procedures;
- (ii) Phase 2, the Surplus Phase, to determine the amount, if any, of surplus available for export. based upon the procedures set out in the Board's findings pursuant to Phase 1 and on evidence filed on gas supply and demand;
- (iii) Phase 3, the Surplus Allocation Phase, to consider applications for amendments and extensions to existing licences and applications for new licences to export gas, and to allocate any surplus among competing applicants; and
- (iv) Phase 4, the Certificates for Export Facilities Phase, to consider applications for any new pipeline facilities required to transport exports licensed as a result of Phase 3.

A number of factors led the Board to consider initiating a review of its surplus determination procedures in the spring of 1985. These included changes in circumstances since the Board's last Gas Export Omnibus Hearing in 1982. Also, the Board was aware that certain parties were planning to file applications to export gas, some of it located in frontier areas. The Board thought it would be timely to conduct a review of its surplus determination procedures before considering such applications.

In an annex to its letter dated 30 May 1985, the Board outlined a number of issues for the consideration of interested parties. These included:

- (i) the appropriateness of the Board's surplus determination procedures in a market-sensitive domestic pricing regime as contemplated by the Western Accord; and
- (ii) how the Board should assess the cost and adequacy of security of supply in light of changing circumstances and in view of the increasing role for price in balancing supply and demand for natural gas.

Subsequently, under cover of a letter dated 1 August 1985, the Board issued Hearing Order GH-2-85 setting down for hearing a review of the procedures the Board uses to determine the quantity of

natural gas surplus to reasonably foreseeable Canadian requirements. The Hearing Order stated that later phases of the hearing would consider expected applications to export gas.

A detailed list of the specific matters which the Board expected interested parties to address in Phase 1 - the Surplus Determination Procedures Phase - was set out in paragraph 9 of Hearing Order GH-2-85 (see Appendix 1).

Item 9(j) of the hearing order had indicated that one of the matters to be addressed was the appropriateness of the existing limitation on the volume of natural gas which may be authorized for export under short-term orders. As the 31 October 1985 Agreement on Natural Gas Markets and Prices led to the removal of this limitation, the Board announced at the opening of the hearing that item 9(j) had been deleted as an issue in the proceedings. The Board indicated, however, that it was interested in any views on whether an allowance should be made in its procedures for volumes of gas likely to be exported under short-term orders and, if so, how such an allowance should be made. Parties were also invited, throughout the proceedings, to make known their views on the impact of the Agreement of 31 October upon the positions they had taken.

Submissions were received from some 60 interested parties including companies, associations, and provincial governments and government agencies.

Phase 1 of the hearing was held in Calgary from 18 to 21 November and in Ottawa from 2 to 19 December 1985.

Many participants expressed their appreciation for the opportunity which the hearing afforded for the exchange of views, and suggested that the Board continue to periodically hold hearings to review its surplus determination procedures.

The Board would like to thank all parties to Phase 1 for their submissions and for the cooperation they exhibited in assisting the Board to undertake this review.

1.2 The Board's Current Surplus Determination Procedures

In its disposition of an application to export natural gas, the Board can issue a licence, subject to the approval of the Governor in Council, only if it has first satisfied itself that the quantity of gas to be exported is surplus to the reasonably foreseeable requirements for use in Canada, having regard to the trends in the discovery of gas in Canada. (Appendix 7 sets out the legislative basis under which the Board regulates natural gas exports.)

Appendix 5 outlines how the procedures which the Board has adopted to determine the quantities of natural gas surplus to reasonably foreseeable Canadian requirements have evolved over the years.

These procedures were last modified in May 1982. The modifications were set out in the Board's Reasons for Decision on Phase 1 of the Gas Export Omnibus Hearing, 1982. The Board's current surplus determination procedures consist of two parts: the Reserves Formula and the Deliverability Appraisal.

1.2.1 The Reserves Formula

The Reserves Formula compares the quantity of remaining established reserves, with certain adjustments, with the sum of:

- (i) 25 times the current year's Canadian demand (often abbreviated to "25A1"), and
- (ii) the maximum quantity of gas exportable under the terms and conditions of existing licences.

If established reserves, as adjusted, are less than these requirements, no surplus is available. If reserves exceed these requirements, the amount of the excess is the maximum exportable surplus. The Reserves Formula is illustrated in Appendix 7.

1.2.2 The Deliverability Appraisal

The Deliverability Appraisal compares the Board's best estimates of future natural gas supply and demand on a year-to-year basis in order to determine whether projected gas supply will satisfy annual requirements, including proposed new exports.

The annual supply and demand information used in the Deliverability Appraisal includes:

- (i) estimated deliverability from established reserves and from expected future reserves additions in the Western Canada Sedimentary Basin;
- (ii) expected Canadian requirements; and
- (iii) estimated exports under existing licences.

The estimated exports under existing licences (item (iii) above) are the export volumes expected to flow, whereas in the Reserves Formula exports are the maximum quantities that could flow under the terms and conditions of existing licences.

1.2.3 The Use of the Reserves Formula and the Deliverability Appraisal

The Board stated in its May 1982 report that it would rely on the Reserves Formula to determine the maximum exportable surplus, and it would use the Deliverability Appraisal to determine the annual quantities of gas surplus to foreseeable Canadian requirements. The Board did not expect that these procedures would result in the authorization for export of all the surplus calculated using the Reserves Formula.

Thus, the Reserves Formula is used to determine an upper limit on the total surplus. The quantities in the licences issued may be less than the surplus calculated using the Reserves Formula.

The Board uses its judgement in applying the Deliverability Appraisal to determine whether the annual quantities in new export licences under consideration would be surplus to Canadian needs. While the Board might authorize exports that exceeded the forecast deliverability by minor amounts in any one year, it would not authorize exports which exceeded the sum of the annual differences between deliverability and forecast Canadian and existing export requirements over the term of the proposed export.

1.2.4 Protection Provided by the Reserves Formula

The 25A1 Reserves Formula is susceptible to the interpretation that it protects Canadian requirements 25 years into the future, but such is not the case. Because the Reserves Formula does not take into account growth in Canadian requirements, future reserves additions, or the annual rates at which reserves may be produced, it does not provide 25 years or any other definite period of protection of Canadian requirements. It simply sets aside an amount of reserves equal to 25 times this year's Canadian demand plus an allowance for currently authorized exports, and only quantities in excess of this set-aside amount are deemed surplus and available for export.

In its evidence during the hearing, Gaz Métro estimated that a volume of reserves equal to 25 times the requirements for natural gas in Canada in 1984 could meet its forecast of growing Canadian requirements for a period of 19 years, assuming that all of the reserves could actually be produced during this period. TransCanada estimated that because natural gas reserves are normally produced over a period longer than 19 years, with a constant annual amount produced for an initial period (the flat life) followed by a decreasing annual amount (the decline period), the period over which a 25A1 volume of reserves could meet forecast Canadian requirements could be less than 19 years. In its final argument, TCPL suggested that an amount of reserves equal to 25A1 would be able to be produced with a constant annual production at the A1 level for 15 to 16 years, after which annual production would begin to decline.

Chapter 2

Continuing Appropriateness of Existing Procedures

As outlined in the previous chapter, the Board currently determines surplus using the Reserves Formula which compares existing reserves with 25 times the current year's Canadian demand plus exports already authorized. This has become known as the 25A1 Formula (the A1 standing for Canadian requirements in the current year).

The Board also uses a Deliverability Appraisal to determine the annual quantities of gas surplus to foreseeable Canadian requirements.

The Board, in its hearing order, requested that interested parties address the question of the appropriateness of the existing procedures in light of changing circumstances.

Sections 2.1 and 2.2 summarize the positions of parties and the views of the Board regarding the continuing appropriateness of the Reserves Formula and the Deliverability Appraisal, respectively.

Two of the more critical issues at the hearing concerned the cost and adequacy of security of supply and the implications of the new gas pricing agreement for surplus determination procedures. Sections 2.3 and 2.4 deal with these two issues in turn.

The remaining sections of the chapter summarize the evidence and the Board's views on other specific issues relating to existing procedures which were either set out in the Board's hearing order or raised by parties during the hearing.

2.1 Continuing Appropriateness of the Reserves Formula

Consumer and producer interests were divided on the question of the continuing appropriateness of the 25A1 Reserves Formula. The major consuming provinces and the gas distribution companies argued that the Reserves Formula is still appropriate, although some suggested that the multiplier might be reduced from 25 to 20 in light of the new gas pricing agreement and changed circumstances in the gas industry. Producer interests, on the other hand, were almost unanimously of the view that the multiplier should be significantly reduced if the Reserves Formula were to be retained at all.

Parties which favoured no change to the 25A1 Formula included Ontario, Manitoba, CAC, Union Gas and Northern and Central. With the exception of Canada Geothermal, which argued that fifty years of conventional gas supplies should be developed for the domestic market before exports were permitted, other parties suggested that the Reserves Formula multiplier could be relaxed at least somewhat in light of changing conditions in the natural gas industry (see Section 3.1.1).

Consumer interests favoured the retention of a reserves formula with a multiplier in the range of 20A1 to 25A1 for the following main reasons:

- (i) A reserves test similar to the 25A1 Formula has been in existence for almost 25 years and has served the country well.

- (ii) The 25A1 Reserves Formula was subjected to an extensive review in 1982 and found to be appropriate at that time.
- (iii) A reserves formula with a multiplier between 20 and 25 is essential to ensure the continued availability of natural gas at reasonable prices to domestic consumers.
- (iv) There is no urgency to change the Reserves Formula at this time because it is not currently constraining exports. Exports are flowing at much less than the total quantities licensed and, in their estimation, a further 8 EJ or so of gas could be declared surplus under the 25A1 Formula.
- (v) Even if the new market-sensitive gas pricing policy warrants a fundamental review of the Board's procedures, the current review is premature in that we have not had sufficient experience with the new policy. A significant change in the Reserves Formula at this time would only add to the confusion and uncertainty associated with the transition to market-sensitive pricing.

Producer interests generally argued that the 25A1 Reserves Formula is much too stringent for the following main reasons:

- (i) The intent of the new gas pricing agreement is to allow producers freer access to the export market.
- (ii) The 25A1 Reserves Formula results in a mandated surplus which puts artificial downward pressure on domestic prices inappropriate to the new market-sensitive pricing environment towards which Canada is moving.
- (iii) The 25A1 Formula requires producers to carry excessive reserves and, therefore, causes them to incur inventory-carrying charges which might or might not be recovered from domestic consumers in the new market-sensitive pricing environment.
- (iv) The current trend towards shorter-term contracts in the North American gas industry reflects a reduced concern about security of supply on the part of consumers, including Canadian consumers.
- (v) There is now a mature pipeline system, and new pipeline facilities generally can be financed with contracts of 15 years or less. As a result, applications for export licences with terms of 25 or even 20 years are unlikely in the future.
- (vi) Even though export demand is weak at present, a significant relaxation of the Reserves Formula is required now to send a signal to producers. This will allow them to initiate exploration activity to find the gas which will be needed to take advantage of profitable export opportunities in the early 1990s.
- (vii) The 25A1 Formula does not guarantee security of supply. In fact, by representing a disincentive to efficient and orderly resource development, it may actually reduce security of supply in the longer term.

Views of the Board

With respect to the desirability of reviewing and possibly modifying existing procedures at this time, the Board agrees that Canada is moving into a period of considerable uncertainty regarding how gas markets will be affected by the new gas pricing agreement. However, it does not find this to be a compelling reason for not changing these procedures now if other factors indicate that change is appropriate or required. Rather, it sees this uncertainty as one reason for adopting new procedures that are flexible and able to adapt over time to changing market conditions.

The Board concurs with those parties who argued that the existing procedures are not currently constraining exports and are not likely to, for the next few years. However, the Board is also of the view that surplus procedures should be changed when it is appropriate to do so, not when required to do so by force of circumstance.

The Board's views on the cost and adequacy of security of supply and the implications of the new gas pricing agreement are provided in Sections 2.3 and 2.4, respectively.

Clearly, reserves-based tests were appropriate when they were introduced and for years thereafter - new pipelines were being built and industry practice was to contract for very long-term supplies. Such is not now generally true. Thus, the Board is of the view that many of the reasons supporting the use of the 25A1 Reserves Formula have disappeared or have been reduced in importance.

Also, despite its simplicity, the 25A1 Formula is susceptible to being misunderstood. As discussed in Section 1.2.4, it does not protect future domestic requirements for 25 or any other specific number of years. In fact, 25A1 has consistently protected Canadian requirements for significantly less than 25 years.

It is the Board's view that there could in the future be significant costs associated with the 25A1 Reserves Formula. These include: the costs of carrying inventories in excess of the contracting practices of Canadian consumers, before access is permitted to the export market, foregone profitable exports; and possible economic inefficiencies due to the impact of the Formula on market-sensitive prices. It is the Board's view that these costs may more than offset the value of the added security of supply the Formula provides.

While the 25A1 Formula does avoid forecasting, uncertainties about the future cannot be avoided simply by ignoring them. Moreover, because the Reserves Formula does not incorporate forecasts of supply and demand, it gives no guidance with respect to feasible or desirable time profiles for new exports.

The Western Canada Sedimentary Basin is capable of supplying all presently connected gas markets in Canada plus present exports for a significant number of years. However, any system of protecting Canadian requirements must take careful and specific account of the fact that, in the future, the capability of the Basin will peak and then decline. This does not mean that domestic and export markets cannot continue to be served for a long time. It does, however, mean that the capability to do so must be

addressed. The present method of protection using 25A1 does not address this capability, of itself.

2.2 Continuing Appropriateness of the Deliverability Appraisal

As with the Reserves Formula, consumer and producer interests disagreed on the question of whether the Deliverability Appraisal continues to be appropriate. Consumer interests generally argued that the Deliverability Appraisal should be retained in one form or another, while most producer interests maintained that it was no longer necessary or should be used only for the purposes of monitoring or of allocating surplus.

Ontario, Quebec, Manitoba, CAC, Northern and Central, and ICG Utilities all recommended that the Deliverability Appraisal be retained as is.

CPA, IPAC, APMC, Petro-Canada, Dome, NOVA, Alberta and Southern, KannGaz, Westcoast and ProGas all argued that there is no need for a Deliverability Appraisal in current circumstances.

Other parties suggested that the Deliverability Appraisal could still serve a useful purpose, but that either its nature or its role should be modified (see Section 3.1.2).

As discussed in more detail in Section 2.4, producer interests generally argued that supply and demand would tend to balance in a market-sensitive pricing environment. In this context, it was argued that exports should not be constrained by a Deliverability Appraisal which does not recognize the ability of producers to develop additional deliverability in response to higher prices or increased marketing opportunities.

Most consumer representatives, on the other hand, argued that even under the new pricing agreement significant rigidities and market imperfections would remain, thereby preventing, or at least hampering, the balancing of supply and demand. For this reason they generally argued that the Deliverability Appraisal should be retained to ensure the physical availability of gas to Canadian consumers on a year-to-year basis.

Views of the Board

From the Board's perspective, the Deliverability Appraisal has two very desirable attributes. First, it takes explicit account of both expected reserves additions and future domestic requirements. Secondly, forecasts of supply availability and demand are useful in shaping new exports; that is, in determining an appropriate profile in terms of annual quantities and durations of licences.

From a practical point of view, in preparing a Deliverability Appraisal, some assumption has to be made regarding how domestic prices will be determined in the future. For reasons given in Section 2.4, the most reasonable premise would seem to be that prices will fluctuate, over a reasonable time, so as to balance supply and demand rather than remain unresponsive, as implicitly assumed in past Deliverability Appraisals.

The Deliverability Appraisal would, therefore, not be as necessary in shaping exports to protect against possible quantity shortfalls in the domestic market as it has been in the past. It is the Board's view, however, that it should still be used in a modified form in shaping exports so as to predict and protect against possible short-term strains on the deliverability system which might cause undue price fluctuations in the domestic market.

2.3 Cost and Adequacy of Security of Supply

The Board's hearing order asked that parties address the question of the consideration to be given to the cost and adequacy of security of supply, e.g., whether the surplus determination procedures should take into account any tradeoff between protection of domestic requirements and the benefits from exporting gas and, if so, how.

There is a consequential trade-off between security of supply, i.e., the assurance of gas supplies at reasonable prices to meet Canadian requirements, and economic benefits to the extent that profitable natural gas exports are restricted or additional costs are incurred to ensure security of supply for domestic consumers. The question of the appropriate trade-off was a contentious one. Producer and consumer interests disagreed as to the relative weights that should be attached to security of supply and to economic benefits.

This section first summarizes the security of supply concerns raised by various parties and the Board's views on these concerns. Next, the question of the best way of ensuring security of supply is addressed. The issue of whether the trade-off between security of supply and economic benefits should be one criterion in assessing the relative merits of different surplus determination procedures is then considered. Finally, the economic costs of providing security of supply are examined.

2.3.1 Security of Supply Concerns

(i) Physical Exhaustion

Many submitters emphasized that it is necessary to protect future Canadian requirements because natural gas is a finite resource. Their concern might be summarized as follows. Gas is a fixed and depletable natural resource. There will come a day when it is not available and that day is unknown. Economic theory suggests that rising prices will call forth a supply or a substitute, but it is not known if this theory will always work or will work efficiently or in a timely manner.

(ii) Insufficient Adjustment Period

Other parties, while believing that there would be substitutes for conventional gas such as frontier gas or electricity, were nonetheless concerned that if too much gas were exported now there might not be sufficient time to develop these alternative sources. Consequently, the transition from conventional gas to alternative energy sources could be more painful than necessary.

(iii) Higher Prices

The major security of supply concern of consumer interests appeared to be not that Canada would eventually run out of gas, but rather that exporting lower cost conventional gas supplies now would

bring forward the day when higher cost alternative gas supplies would be required to meet Canadian requirements. In a market-sensitive pricing environment, this would mean higher prices for domestic consumers.

With a few exceptions, producers generally conceded that increased exports would result in higher prices to Canadian consumers in the future, that is, that there would be user costs associated with these exports since frontier and other higher cost resources would be required sooner than otherwise. However, in their view, this simply raised the question of the proper level of user costs.

(iv) Accelerated Depreciation of Existing Facilities

Many parties argued that security of supply is required to ensure that transmission and distribution facilities and gas-burning equipment do not have to be depreciated over smaller volumes or over too short a period of time, thus increasing unit costs.

(v) Off-Oil Policy

Past federal government policy has encouraged the replacement of oil with gas and other energy forms in order to reduce Canada's dependence on uncertain world oil supplies. Many consumer interests were concerned that a relaxation of the Board's surplus protection procedures would undermine the objectives of the off-oil policy and be unfair to consumers who have switched from oil to gas because of the government's policy.

(vi) Consumer Perceptions

A major concern of gas distributors and some other parties was that a significant relaxation in surplus procedures tests would undermine consumer confidence in gas as a secure energy source. It was feared that this in turn would adversely affect the marketing of gas in Canada because other energy resources might seem to be more secure.

Views of the Board

(i) Physical Exhaustion

It is true that natural gas is a non-renewable, finite resource. However, it is also true that our gas resource base is unlikely to ever be completely exhausted in a physical sense. Assuming market-responsive gas prices, as our gas resource base is drawn down, incremental supplies would likely over time become more expensive than alternative energy sources and, consequently, gas demand would gradually be reduced. This could occur even though there were remaining unexploited gas reserves.

(ii) Insufficient Adjustment Period

As discussed in Section 2.4, the Board is of the view that market-sensitive prices will go a long way towards ensuring that gas supply and demand balance on an ongoing basis. Nevertheless, the Board is sympathetic to the concerns of certain parties that the Board's surplus determination procedures should provide an adequate period of adjustment.

(iii) Higher Prices

The concern that increasing gas exports will, in time, lead to higher domestic gas prices is certainly legitimate. However, in the Board's view, the more important question is whether the benefits associated with incremental exports would exceed their costs - including higher domestic gas prices at an earlier time.

(iv) Accelerated Depreciation of Existing Facilities

In the Board's view, domestic demand should not be protected simply to extend the useful life of existing facilities. The premise itself that increasing exports will necessarily translate into a shorter useful life for facilities is not certain. Increasing exports now, it could be argued, rather than leading to the exhaustion of our gas reserves before facilities were fully depreciated, would simply advance the day when we move to alternative gas supply sources (i.e., frontier reserves). The availability of frontier gas supplies would allow ample time to depreciate existing facilities.

It is possible, though, that increased exports would be associated with higher domestic prices both in the short term and long term and this could have the effect of reducing domestic sales and facilities utilization. It is the Board's view that higher prices would more likely restrict the construction of new facilities than significantly reduce the use of existing facilities.

Even if increased exports should require that facilities be depreciated faster, this, in itself, is not sufficient reason for restricting exports. The earlier economic obsolescence of transmission and distribution facilities and gas-burning equipment is one of the costs that would have to be deducted from the benefits of increased exports in determining whether or not such exports were economically desirable.

The fact that changing market conditions may require that certain equipment be depreciated faster or over smaller volumes is a competitive risk faced by all companies in all industries. The risk to regulated gas transmission and distribution companies is generally less than to companies whose prices are determined completely by market forces.

(v) Off-Oil Policy

Fairness questions arise if gas customers had made certain investments as a result of government assurances and financial assistance and then were exposed to losses or reduced net gains due to a change in the rules of the game. It is true that increasing

exports could result in higher gas prices than otherwise. Nonetheless, gas could still maintain a price advantage over oil in the long run. Thus, while the savings to customers who have switched to gas from oil could be less if exports were increased, on average consumers may still benefit substantially. It is most likely that conversion pay-out has been quick and robust enough to offset the long-term effect of increasing exports on domestic gas costs, over a wide range of scenarios.

(vi) Consumer Perceptions

The Board recognizes that a relaxation of its surplus tests might affect consumer perceptions of the amount of gas supply available to them and the probable prices of that supply. This, in turn, could have an adverse impact on the marketing of gas in Canada. The Board, however, is not convinced that this effect would be significant or permanent.

2.3.2 How to Ensure Security of Supply

Consumer interests generally maintained that a Reserves Formula is required to provide security of supply to domestic consumers. A number of parties, including TransCanada, CPA and IPAC, questioned this assumption. They argued that the Reserves Formula does not, of itself, ensure future Canadian requirements will be met. In their view, security of supply would be best assured by a healthy industry, which in turn depends on increased access to the export market. Given Canada's natural gas resource base, increased cash flows from increased export sales will produce more drilling, more discoveries and more reserves which will provide the greatest assurance of a future supply of gas for Canadians.

Others pointed out that to the extent such new supplies were dedicated to the export market they would not benefit Canadian consumers. Moreover, long-term security of supply depends on the size of the remaining resource base which will be smaller, the more gas is exported.

Views of the Board

Increased access to profitable export markets would almost certainly provide a stimulus to exploration and development activity and result in a larger producing sector. However, it does not necessarily follow that Canadians would, as a result, enjoy greater long-term security of supply. The security of supply to Canadians is of course influenced by the size of the remaining resource base, including both discovered and undiscovered reserves, as well as the size of the producing sector. New supplies can be dedicated to the export market only to the extent that they are found to be surplus to Canadian requirements.

2.3.3 The Relevance of Economic Considerations to Surplus Determination

The Board's mandate under Section 83(a) of the NEB Act is to ensure that there are sufficient gas supplies available to meet reasonably foreseeable Canadian requirements before it permits any added exports. Given this mandate, several parties, including the Ontario Government, questioned whether economic factors should even be considered during this phase of the hearing.

They argued that the Board should not be persuaded to change its methodology of determining surplus simply because benefits or added benefits result from exports. The Board is required by Section 83(a) to determine surplus with reference to the reasonably foreseeable requirements of Canadians. Economic factors would not in their view override that essential requirement.

Views of the Board

Phase 1 of the Omnibus Hearing was called in order to consider if the method of determining surplus was appropriate and, if not, what method might be put in its place. In the Board's view, when the relative merits of different procedures are being assessed with a view to possibly changing procedures, it is proper to consider the consequences of any changes in the method of determining surplus. The consequences of such change certainly include economic considerations, i.e., the economic costs and benefits resulting from a different method of determining surplus.

2.3.4 The Cost of Providing Security of Supply

According to most producer representatives, surplus determination procedures impose two main costs. First, to the extent that the procedures require producers to maintain a reserves inventory in excess of what they normally would, producers will incur additional inventory-carrying charges. Secondly, to the extent that exports are not permitted by the surplus determination procedures, net benefits from these potential exports are foregone.

While there was general agreement that there is a cost associated with carrying large inventories of gas, there was not a consensus that the current large inventory of gas reserves is attributable to the Reserves Formula. The question of who would pay these inventory-carrying costs was also contentious.

The only quantitative assessment of the possible benefits of increased exports was contained in a Data Resources Incorporated economic impact study submitted by CPA. This study showed that relaxing the current surplus procedures to allow increased exports could have a beneficial impact on macro-economic variables such as employment and gross national product. However, the study did not address the costs of increased exports.

Views of the Board

The Board shares the view of some parties that the current large inventory of established reserves is not wholly attributable to the 25A1 Reserves Formula. For example, a great deal of exploration and development activity in the late 1970s was undertaken on the expectation that prices and demand would be higher than has occurred. However, the Board recognizes that, to the extent a surplus test causes producers to carry inventories in excess of what they would normally carry, it would cause inventory-carrying costs to be higher than they would otherwise be. It also recognizes that unrealistic surplus procedures could unduly restrict profitable exports.

In the Board's view, the fact that the size of the exportable surplus could affect the benefits and costs accruing to the country is sufficient reason to include economic considerations as a factor in the decision regarding the appropriate surplus

determination procedures. It adds little to speculate upon the eventual allocation within Canada of such benefits or costs.

The major factor is that Canada as a whole may be either better or worse off as a result of a change in the level of exports which arises from a change in surplus resulting from a different surplus determination methodology.

2.4 Implications of the New Gas Pricing Policy

The March, 1985 Western Accord outlined the intention to move to a flexible, market-oriented pricing system in the domestic natural gas market. Subsequently, in October, 1985, an agreement was reached between the federal government and the governments of the producing provinces on domestic gas pricing. The main features of the agreement are:

- Effective 1 November 1986, the prices of all natural gas in interprovincial trade will be determined by negotiation between buyers and sellers.
- During the transition year to 1 November 1986, buyers and sellers may voluntarily enter into negotiated pricing agreements, but, failing this, prices will continue to be prescribed by governments.
- From 1 November 1986, in the absence of an agreement between a shipper and distributor, or a producer and a shipper, on the price to be paid on existing contracts, the price shall be determined by arbitration.

During the hearing, attention centred on three main issues of the pricing agreement which could have an impact upon the method of determining surplus gas. These were:

- whether the Board's surplus determination procedures were consistent with the agreement - specifically, the desire to provide greater access to the export market and the move towards market-sensitive pricing;
- whether requiring producers to maintain a mandated inventory of reserves would artificially depress domestic prices in a market-sensitive pricing environment; and
- whether market-sensitive prices would ensure an ongoing balance between supply and demand.

The following three sections address these questions in turn.

2.4.1 Whether Existing Surplus Determination Procedures are Consistent with the New Agreement

Producer interests argued that the new gas pricing agreement necessitates a relaxation of the Board's surplus determination procedures in order to make them more consistent with market-sensitive pricing and with the intent of the agreement to allow producers greater access to the export market.

Consumer interests, on the other hand, argued that even if the Board's present surplus procedures were not entirely consistent with market-sensitive pricing or if they restricted access to export markets, these were not sufficient reasons for abandoning the procedures.

Consumers interests also pointed out that the new agreement did not give the Board authority to ignore its obligations under the NEB Act. Producer interests did not dispute this, although they noted the flexibility the Board has in discharging its responsibilities thereunder.

Views of the Board

The Board recognizes that its procedures may produce results which are different in greater or lesser degree from those which would result from an unfettered market environment. It also recognizes that the more efficiently markets work, the more flexible it can be and the less may be the need for intervention.

However, given its regulatory mandate, the Board must ensure that all exports it licenses are surplus to Canadian requirements, implying attention to supply and demand and the trends in each. How prices are determined or how efficiently they are determined does not relieve the Board of its statutory responsibilities.

2.4.2 The Impact of a Mandated Reserves Inventory in a Market-Sensitive Pricing Environment

APMC, CPA, IPAC, and most producer companies expressed the view that, in an environment where prices were unregulated, requiring producers to hold an inventory of reserves in excess of those that would be held voluntarily would result in artificially depressed domestic prices. Two related reasons were given as to why this might occur. One was that the Reserves Formula would create an excess supply of gas in the domestic market. The other was that an overly protective surplus test would unduly strengthen the bargaining position of domestic purchasers by reducing their need to contract for longer term supplies, thereby allowing them to negotiate lower prices.

Views of the Board

The Board accepts that the discharge of its obligations under the Act may produce results that are different from those which would result from an unfettered market. In particular, it recognizes that the Reserves Formula, or any other surplus test which causes producers to establish a larger inventory of reserves than in an unfettered market before allowing new exports, could cause domestic prices to be lower in a market-sensitive pricing environment than they would otherwise be. However, the Board does not believe that it should fail to do what it is required to do because of this. In the Board's view, it must fulfill its statutory requirements while at the same time attempting to minimize any associated adverse impacts on the emerging market-sensitive pricing environment.

2.4.3 Whether Supply and Demand will Balance with Market-Sensitive Pricing

Producer representatives generally argued that, in a market-sensitive pricing environment, prices would adjust to ensure that gas supply and demand would be in balance on an ongoing basis.

Consumer interests were sceptical that market-sensitive prices would ensure supply and demand would balance. They generally maintained that, while in theory supply and demand would be in balance, in the real world this might not be the case because of remaining constraints on the free market. The latter include:

- long term contracts between producers and transmission and distribution companies;
- restrictions on access to the facilities of TransCanada;
- rate regulation of transmission and distribution companies;
- the fact that the new agreement applies only to interprovincial sales and not to intraprovincial sales; and
- provincial gas removal permits.

Views of the Board

Because the natural gas market in Canada will almost certainly not be perfectly competitive, even after 1 November 1986, the argument that supply and demand may not balance in the future has merit. For the next year or so, price flexibility will clearly be severely limited by provisions in existing contracts. Contractual commitments will also tend to frustrate gas to gas competition as might current restrictions on access to TransCanada's pipeline system. However, once existing long-term contracts between producers, shippers and distributors have been renegotiated with respect to price and possibly volume, and the shorter term contracts between large industrial users and their distributors expire, the market should become more price-responsive. Moreover, the producing provinces have undertaken to review their surplus determination procedures and other restrictions on interprovincial gas trade to ensure that they do not frustrate the move to market-oriented prices.

Although impediments to market-oriented pricing could prove to be relatively intractable and the transition period from regulated to market pricing quite extended, significant moves have already been made to facilitate or to take advantage of the anticipated new pricing regime. Examples are the Ontario Government's support for direct sales and the splitting of TransCanada's transmission and marketing operations. Even though the terms of the new agreement do not apply to intraprovincial sales, a gas brokerage consortium of the major distributors in British Columbia has been formed to facilitate direct sales.

In considering whether imbalances between supply and demand may occur after the transition to market oriented pricing, a distinction should be made between short-term deviations of supply from demand and longer-term systematic divergences between the

two. Short-run deviations could certainly occur because negotiation or renegotiation of sales agreements based on the latest market conditions only takes place at specified intervals.

While short-run imbalances between supply and demand are likely even with market-oriented pricing, long-run systematic divergences between supply and demand should not occur. If any potential future supply shortfall were perceived, it is likely that prices would start to rise, thereby stimulating new supplies from shut-in reserves or from new reserves, initially from the Western Canada Sedimentary Basin and later on from the frontiers. It is hard to imagine a situation where new supplies of gas would be unavailable regardless of how high the price could climb. Even if one were to assume that eventually an absolute physical constraint on gas were reached, a fundamental imbalance between supply and demand could not be sustained. In such a case, the fixed volume of gas remaining would fetch progressively higher prices so long as demand exceeded supply,

In sum, the important question is whether the Canadian gas market in the future will likely have sufficient flexibility to be self-adjusting. There are a number of factors which will constrain to some extent the operation of market forces over the next few years. However, as time passes, the inflexibility arising from existing long-term contracts and other factors should be of diminishing importance. In other words, the gas market in Canada can be expected to become increasingly competitive in the future.

2.5 Determination of Surplus Nationally or By Region

Paragraph 9(d) of the Hearing Order asked parties to provide their views on whether surplus should be determined nationally or by region.

A majority of parties urged the Board to continue to determine surplus on a national basis. A typical view was that Canadian supply or requirements should not be "balkanized" with the result that the gas requirements in some regions of Canada were protected to a greater extent than requirements in other regions.

Saskatchewan expressed concern that a regional surplus determination might preclude exports from Saskatchewan which are required to provide an economic catalyst to stimulate exploration and development activity in that province.

Some parties, such as KannGaz, Northern and Central and Westcoast urged that exceptions from the national determination of surplus be made for initial projects from frontier regions.

However, Inland submitted that surplus be determined by region, with British Columbia and the East Coast each receiving independent review. It cited several reasons why, in its view, there is less long-term natural gas supply security in British Columbia than in the rest of Canada, particularly the relatively small size of the British Columbia reserves, and the fact that a small number of gas fields in British Columbia account for a large share of production.

Views of the Board

The Board agrees with the majority of parties who proposed that surplus continue to be determined nationally rather than by region. In the Board's view, regional surplus determination could distort the pattern of exploration and development activity, and the access of production from different regions to the export market. In the new market-sensitive pricing environment, regional surplus determination could also distort inter-regional prices in Canada. Finally, it could result in Canadian requirements in some regions receiving less protection than in other regions.

2.6 Treatment of Frontier Reserves

Paragraph 9(e) of the Hearing Order asked parties' views on the treatment to be accorded to gas reserves in the frontier areas north of 60° latitude, and off the east coast.

Most of the parties stated that the Board should retain its existing policy of not including frontier reserves in its surplus determination procedures until they are believed to be within economic reach, a certificate has been granted, and the Board was satisfied that the necessary transportation facilities would be constructed. However, Gaz Métro and Consolidated held that the absence of surplus should not preclude the development of an economically viable frontier project. Petro-Canada, Polar Gas, MidWestern and Tennessee argued that the unique character of frontier projects requires that each be reviewed on its own merits. KannGaz stated that new projects initially may require unrestricted access to the export market, but that once the project was on stream any additional gas resulting from an expansion of the project should be subject to the same surplus procedures as gas from conventional areas. Further, some parties, such as Venture Gas and Nova Scotia, suggested that the Board could encourage frontier projects by relying on the flexible application of the surplus determination procedures rather than on a rigid rule.

IPAC and Carlyle supported the NEB's current treatment of frontier reserves but only on the condition that the Reserves Formula be abolished or the multiplier be reduced.

Alberta and Southern argued that if the Board were to adopt any surplus procedure other than the contractual approach, then established frontier reserves should be included in the reserves set aside to meet future Canadian requirements.

Several parties such as Nova Scotia indicated that the Board should clarify that its policy regarding frontier reserves is not meant to prevent the reserves supporting frontier projects from being taken into consideration at the time the Board is considering export and facility applications related to such projects.

Views of the Board

In the Board's view, it is likely that over the next 20 years at least some frontier reserves will be serving domestic and export markets. There remains, however, considerable uncertainty as to which frontier resources will be exploited and which markets will be served therefrom.

The Board sees no reason to change its present treatment of frontier reserves, which is to not include such reserves in the surplus determination procedures until they are believed to be within economic reach, a certificate has been granted, and the Board is satisfied that the necessary transportation facilities will be constructed. Frontier reserves associated with a specific project will be taken into account when deciding on a licence or certificate application associated with that particular frontier project. Specific frontier reserves might be dedicated to that project if found to be essential to its feasibility.

2.7 Treatment of Reserves Additions

Paragraph 9(g) of the Hearing Order asked for parties' views on the consideration to be given to reserves additions.

Several parties supported the Board's current method of considering reserves additions in the Deliverability Appraisal and not in the Reserves Formula. CPA expressed its support only if the Board retained a Reserves Formula.

Alberta and Southern argued that reserves additions are a predictable component of future total reserves and should be included. NOVA and Foothills recommended that the present Reserves Formula should be amended to include, on the supply side, an allowance for reserves appreciation. Pan-Alberta and Northern and Central suggested including some limited amount of reserves additions in the Reserves Formula. B.C. Hydro recommended amending the Reserves Formula to include both firm future Canadian requirements and reserves additions, and TransCanada proposed a new methodology which included both reserves additions and anticipated demand.

Views of the Board

The Board has decided that it will make explicit allowance for reserves additions in its new surplus determination procedure as set out in Chapter 4.

2.8 Allowance for Existing Export Authorizations

Paragraph 9(h) of the Hearing Order requested parties' views as to the allowance to be made in the Board's surplus determination procedures for existing natural gas export licences.

Also, as indicated in Chapter 1 of this report, in light of the new gas pricing agreement, the Board invited parties at the start of the hearing to comment on whether the Board should make an explicit allowance in its surplus procedures for exports which might be authorized under short-term orders.

2.8.1 Licences

With respect to the Reserves Formula, parties were about evenly split between favouring the existing practice of allowing for the maximum quantities exportable under existing licence conditions, and favouring the use of a forecast of volumes likely to be exported. Pan-Alberta suggested that the Board protect all licensed quantities including trapped gas, that is, quantities which cannot be exported under existing licence conditions before the expiry of the licence. Pan-Alberta also suggested the term of the

licence be extended automatically to permit the export of trapped gas. Alberta and Southern held that the procedure should make an allowance for trapped gas, but within the existing term of the licence.

Concerning the allowance for existing licences in the Deliverability Appraisal, a large majority of parties recommended no change to the Board's current practice of using a forecast of export quantities. Inland, however, suggested that the maximum daily amounts specified in licences be considered in addition to annual volumes. Northern and Central recommended that allowance be made for the maximum quantities exportable as is done in the Reserves Formula.

Consumers' Gas proposed that the Board adopt a policy that would effectively treat border accommodation markets as "quasi-Canadian" markets. This proposal was supported by Vermont Gas.

Views of the Board

Under the Board's current procedures the Reserves Formula includes an allowance for the maximum quantities exportable under the conditions in existing licences, while the Deliverability Appraisal makes allowance for a forecast of exports.

The Board recognizes that export markets have undergone significant changes since its 1982 Gas Export Omnibus Hearing, with the result that some licences may not reach authorized levels for several years, while others may not be used at all. In the interest of making the most realistic allowance for exports, the Board has decided to use a forecast of exports under existing licences in its surplus determination procedures.

With respect to the Consumers' Gas proposal, the Board declines to adopt such a policy because, in the Board's view, a given market cannot be considered to be a Canadian market, and hence be protected, and also be served under an export licence or order.

2.8.2 Short-Term Orders

Parties who chose to comment on whether the Board should make an explicit allowance for exports authorized under short-term (up to 24 months) orders generally expressed the view that short-term orders are for the most part opportunity-type sales limited by pipeline capacity and that some of these sales may be displacing rather than supplementing exports under licence. Making full allowance for short-term orders could, therefore, lead to some double-counting.

Northern & Central held the view that all authorized exports, including short-term orders, should be taken into account. TransCanada advised that only firm short-term orders should be included.

With respect to how an allowance should be made for future short-term orders, TransCanada and PetroCanada suggested that the Board set aside some quantity that it felt confident could be exported under short-term orders. Pan-Alberta, on the other hand, recommended that the Board make no deduction from exportable surplus for future short-term orders until some track record had been established as to the volumes likely to move under such orders.

Views of the Board

The Board has decided to include an estimate of exports under orders in existence at the time of making a surplus determination.

2.9 Treatment of Imports

TransCanada submitted that natural gas imports should be subtracted from total Canadian requirements, so that only Canadian requirements expected to be served by Canadian natural gas would be protected.

Views of the Board

Previously, the Board did make allowance for natural gas imports in its surplus determination procedure. The Board agrees to exclude from estimated Canadian requirements a forecast of those requirements expected to be satisfied by then authorized imports.

2.10 Synthetic Natural Gas

Union Gas purchases methane-rich synthetic natural gas (SNG) from Petrosar. It proposed that such synthetic natural gas should continue to be considered separately when determining natural gas available for export.

Views of the Board

The Board agrees with Union Gas and will continue to exclude SNG from its surplus determination procedures.

Chapter 3

Alternative Surplus Determination Procedures

In Hearing Order GH-2-85, the Board requested that interested parties address the question of whether alternative or complementary protection procedures would better serve the Canadian public interest.

This chapter summarizes parties' views and those of the Board on alternative and complementary surplus determination procedures, including:

- (i) proposed modifications to existing procedures (Section 3.1),
- (ii) cost-benefit analysis (Section 3.2),
- (iii) a contractual approach (Section 3.3), and
- (iv) reserves to production ratio tests (Section 3.4).

3.1 Suggested Modifications to Existing Procedures

Many parties were of the view that the Reserves Formula and Deliverability Appraisal are still useful procedures for surplus determination, but that they needed to be modified in the light of the 31 October 1985 agreement and changing circumstances in the gas industry. Suggested modifications to the Reserves Formula and the Deliverability Appraisal are discussed in Sections 3.1.1 and 3.1.2, respectively.

3.1.1 Reserves Formula

Quebec, Gaz Métro, ICG Utilities and Consumers' Gas all suggested that the Reserves Formula multiplier (i.e. the "25" in 25A1) might be reduced, but to no less than 20. B.C. Hydro also suggested that the multiplier could be reduced to 20, but only if an allowance was made for possible future firm domestic requirements not included in the base year demand. Inland also favoured reducing the multiplier to 20, but only if the Deliverability Appraisal included an allowance for peak day requirements.

The major domestic gas transmission companies all favoured some relaxation of the existing procedures. Westcoast argued that the Reserves Formula multiplier should be reduced to 20. NOVA suggested that the multiplier be reduced to 20 if an allowance were made for future reserves appreciation and to 15 if such allowance were not made, TransCanada suggested a new reserves to production procedure to replace the Reserves Formula (see Section 3.4).

Representatives of the two major producing provinces favoured a considerable relaxation of the Reserves Formula. BCPC argued that the multiplier should be reduced to the range of 15 to 20, while APMC maintained that a multiplier of 15 should be adopted, but only as an interim measure until a contractual approach to surplus determination could be implemented.

With the exception of Canada Geothermal which suggested that a fifty-year supply of gas be developed for the domestic market, gas producers and companies in the gas export business favoured a significant reduction in the Reserves Formula multiplier, if the formula were to be retained at all. ProGas argued that a multiplier in the range of 15 to 20 would be appropriate. Consolidated recommended a 15A1 Formula. While Sulpetro suggested that the Board should use its judgement in determining surplus and not rely on a rigid formula, it favoured the adoption of 15A1 if the Board were to decide that it was necessary to retain the Reserves Formula.

Pan-Alberta and KannGaz argued that different degrees of protection, expressed in years, should be provided to different customer classes. With their proposals, the Reserves Formula multiplier would, therefore, represent a weighted average of the protection provided for different requirements.

Pan-Alberta proposed that residential requirements continue to be protected for a period of 25 years, but that commercial and industrial requirements be protected for only 15 and 10 years, respectively. Rather than using current requirements for each sector, it suggested that the Board use an average of the previous three years of requirements for each sector. In its opinion, this would minimize the effect on the surplus determination of extremes in climate or economic activity. Pan-Alberta estimated that its weighted average multiplier would be close to 15.

KannGaz recommended that residential and commercial requirements be protected for a period of 20 years and firm industrial requirements for 10 years. It argued that interruptible industrial requirements should not be protected at all because interruptible customers have the ability to switch to alternative fuels. While KannGaz recommended particular periods of protection for different types of customers, it suggested that the appropriate overall level of protection was very much a judgement call and could lie in the fairly broad range of 12A1 to 18A1.

Many parties objected to the proposal to provide different amounts of protection to different types of requirements. With respect to interruptible customers, a number of gas distributors pointed out that such customers make an important contribution to the economics of gas distribution and transmission by reducing the need for facilities to meet peak requirements. When these customers are interrupted it is usually at the utilities' convenience. Moreover, such customers often have only limited ability to switch to alternative fuels and are actually committed to take gas volumes for most days of the year.

CPA, IPAC, Alberta and Southern, Dome and PetroCanada all recommended that the Board not use a Reserves Formula and adopt instead a contractual approach to surplus determination (see Section 3.3).

The main arguments of those favouring little or no change in the Reserves Formula and those favouring a significant reduction were outlined in Section 2.1.

Views of the Board

As indicated in Section 2.1, the Board is of the view that its surplus determination procedures must be flexible and be capable of adapting to changing market conditions. In the Board's view, the Reserves Formula no longer provides the required flexibility or adaptability.

The Board is also of the view that each unit of gas required to satisfy Canadian demand should receive the same protection. Therefore, the Board does not accept the

proposal that different levels of protection should be provided to different customer classes.

3.1.2 Deliverability Appraisal

A number of parties argued that the nature or the role of the Deliverability Appraisal should be changed. As indicated in Section 3.1.1, Inland suggested that it be modified to include an allowance for peak day requirements. In its view, peak day protection should be provided for the greater of a period of twenty years or the term of the longest authorized export.

B.C. Hydro maintained that the Deliverability Appraisal should be retained, but modified to allow for the carry forward of unused capacity from previous years. Consumers' Gas also suggested that the Deliverability Appraisal be modified to allow for carry-forward, although it recommended that the Appraisal be used for monitoring purposes only.

BCPC, NOVA, TransCanada and Sulpetro all suggested that if the Deliverability Appraisal were to be retained, it should be applied for a period of no more than five years.

While there was disagreement as to whether the Board should continue to employ its Deliverability Appraisal, almost all parties to the hearing agreed that the Board should at least continue to monitor requirements, reserves, and deliverability on a regular basis. The position of Alberta and Southern, for example, was that a deliverability test is no longer required for determining an exportable surplus in a market-sensitive pricing environment. However, for analytical purposes in assessing markets, market development and price sensitivity impacts, a deliverability assessment is useful.

Views of the Board

The Board's Deliverability Appraisal does not include an explicit allowance for peak day requirements, but such requirements may be considered when the Board applies its judgement in deciding whether or not to recommend the issuance of new export licences.

The Board concurs with those who recommended that the Deliverability Appraisal be modified to incorporate the carry-forward of unused capacity from previous years. The inclusion of carry-forward provides a clearer indication of the ability of supply to meet demand.

For reasons given in Section 2.2, the Board is of the view that an assessment of future supply capability and requirements over the period of any applied-for new export is required. Such an assessment will provide a useful guideline in shaping exports to protect against possible short term strains on the supply system which might temporarily result in undue price increases in the domestic market.

3.2 Cost-Benefit Analysis

In the 1979 and 1982 Gas Export Omnibus Hearings, cost-benefit analysis was used by the Board to rank projects competing for a volume of surplus gas as determined by the Reserves Formula. As

indicated above, the Board asked interested parties in this hearing to comment on the use of cost-benefit analysis in both the determination of surplus and its allocation among applicants.

There was a general consensus among parties that cost-benefit analysis was useful as one tool for assisting in the allocation of surplus, but, with the exceptions of Canadian-Montana and Norcen, parties generally opposed its use for the determination of surplus.

The main arguments against using cost-benefit analysis for surplus determination were that:

- (i) it is not easily understood or applied,
- (ii) it relies on too many uncertain assumptions,
- (iii) it does not take into account intangible factors, and
- (iv) it would bias decisions in favor of increased exports because the benefits from exporting would occur in the near term, while the increased costs to Canadians from having exported additional natural gas would occur later, and the weight given to these costs in the cost-benefit analysis would therefore be diminished by their having been more heavily discounted.

While they did not favor the use of cost-benefit analysis to determine surplus, some parties (CPA and Alberta and Southern for example) who favoured the contractual approach to surplus determination (discussed in Section 3.3 below) indicated that cost benefit analysis might be used to ensure that any proposed exports would provide net benefits to Canada. Alberta and Southern, however, would have reversed the onus of proof from the exporter onto the domestic consumer by requiring that any use for gas that competes with exports should demonstrate that such use provides at least an equal net benefit to Canadians.

Even those parties that supported using cost-benefit analysis as an input into the decision on the volume of exports that should be licensed, expressed criticism of the approach.

As noted in Chapter 2, Ontario and others argued that under Section 83 of the NEB Act the Board is obliged to determine surplus taking into account physical rather than economic considerations. They argued that the Board would not have fulfilled its statutory responsibilities if it were to determine that proposed export quantities of gas were surplus based only upon a cost-benefit analysis which determined that the proposed exports would likely yield net economic benefits to the country as a whole.

Views of the Board

The Board recognizes that cost-benefit analysis has limitations because it is impossible to quantify and incorporate all relevant considerations and because the results of such analysis have a significant degree of uncertainty. In these respects, however, it is no different from any other available analytical tool. Considerable judgement is required in the determination of the exportable surplus regardless of the methodology employed.

With respect to discounting, the Board considers this technique necessary in comparing costs and benefits expected to occur at different times. Discounting does give less

weight to costs and benefits which occur later in the future. To give greater weight to an economic event in the near future than to such an event in the far future is simply a reflection of the greater value of funds available at an earlier date.

The Board is also of the view that cost-benefit analysis has some important advantages, such as the requirement to express explicitly assumptions which, in other methods, are frequently made implicitly. It also provides insights into the relative importance of factors cited for and against additional exports.

Strictly speaking, cost-benefit cannot calculate surplus, but it can be used to determine whether to export. This would involve conducting a cost-benefit analysis to determine whether proposed exports would yield net benefits to the country as a whole.

In the Board's view, the effect of adopting this approach would be to convert the Board's surplus determination procedure to a net-benefit determination procedure. Under the cost-benefit analysis method surplus is not calculated - rather the export of surplus is justified on the basis of public interest. For these reasons and because of the characteristics of cost-benefit analysis previously mentioned, the Board is not adopting such a method. Moreover, a surplus determination role for cost-benefit analysis was not generally supported during the hearing.

However, the Board does see a role for cost-benefit analysis in assessing the trade-off between security of supply and benefits from exports. This aspect of cost-benefit analysis is outlined in Chapter 4. The Board also anticipates that it will continue to use cost benefit analysis in deciding on the allocation of surplus amongst applicants.

3.3 Contractual Approach

Alberta and Southern suggested that gas purchase contracts at the distributor level be used to determine surplus, combined with a requirement that, either by agreement or by export licence conditions, exporters all contribute proportionately to a supply of last resort to relieve any shortfall in Canadian contracted gas supply. It also suggested that the price to be paid for such gas to supply a shortfall include a penalty component, such as 1.3 times the average price, to encourage domestic customers to contract for their requirements.

Alberta and Southern argued that if the Board were to accept the contractual basis of protection, domestic customers would contract for their own supply protection and the Board's obligations under Section 83 of the *National Energy Board Act* would therefore be met.

CPA also argued that the Board's existing procedures are no longer appropriate and should be replaced by a contractual basis of protection. Under its proposal, gas which was not under contract would be presumed to be available for contracting by exporters or by the domestic market. In its view, the fact that gas was not contracted for Canadian markets should be considered to be *prima facie* evidence that the gas was surplus to reasonably foreseeable Canadian requirements and therefore available for export.

Under the contractual basis of protection, CPA expected purchasers to develop a portfolio of short, medium and long-term contracts in purchasing the security of supply which they deemed to be

appropriate for their individual circumstances. CPA argued that in this way the costs of maintaining inventories of gas would be properly allocated to those seeking the security of supply provided by the inventories.

IPAC also called for the replacement of the current procedures by a contractual basis of protection. It suggested that the Board monitor all contracts not only at the distributor level but also at the major end-user level. It left the precise procedure to be determined by the Board.

Petro-Canada maintained that the present surplus determination procedures are no longer appropriate. It called for the Board to inform purchasers of gas that their contracting practices must take into consideration the need to ensure their reasonably foreseeable requirements. Petro-Canada also advocated that the Board suspend the application of the Reserves Formula and the Deliverability Appraisal for an indefinite period of time in order to give the mechanism of protection by contracts an opportunity to work. Lastly, it suggested that the Board rely on an assessment of future deliverability and demand to provide an early warning system for the protection of domestic requirements.

Although its proposed methodology is similar to that proposed by CPA and IPAC, Petro-Canada suggested the Board not review all domestic contracts to arrive at its decision on surplus. Instead, it suggested the Board rely essentially on a complaint procedure whereby parties encountering difficulties in securing Canadian supplies would have an opportunity to express their concerns to the Board in the context of export applications and the proposed annual review,

Other parties generally were opposed to the contractual basis of protection. Some, such as the Consumers' Association of Canada, claimed that the Board could not fulfill the statutory requirement imposed on it by Section 83 of the NEB Act by relying on the contractual basis of protection. In their view, the Board would be improperly delegating that responsibility to distributors and large industrial customers if it simply accepted that the gas they contracted was equivalent to Canadian demand.

Other arguments advanced against this method included the view that it would not provide adequate protection of Canadian requirements, because:

- (i) contracts between suppliers and transmission pipelines do not require producers to make expenditures to ensure the availability of the gas contracted when, in the view of producers, such outlays would not be economic;
- (ii) contracts between transmission pipelines and distributors similarly do not provide a guarantee of delivery of gas in the event the transmission pipeline cannot obtain required supplies; and
- (iii) distributors are locked into existing long-term contracts and cannot, therefore, take full advantage of the new deregulated environment by direct contracting with producers.

TransCanada, among others, pointed out that the proponents of the contractual basis of protection did not provide a satisfactory explanation of the mechanics of just how the Board would fulfill Section 83(a) of the Act thereunder.

Views of the Board

The Board agrees with those parties who expressed the view that those advocating the contractual basis of protection had not really provided a mechanism for making the concept operational. For example, the Board could not be certain that all domestic contracts would be provided to it and those advocating the contractual method were not clear as to how the Board could obtain such contracts or even whether it should attempt to do so.

Neither is the Board satisfied that, even if it could add up the annual amounts contracted for domestically, that the totals should necessarily be viewed as the reasonably foreseeable Canadian requirements. Any errors understating the correct total or omissions due to lack of contractual information would tend to inflate the surplus to the detriment of protection of Canadian requirements.

Even were the Board inclined toward the contractual basis of protection, this would not appear to be a propitious time to adopt it, in the midst of widespread contract renegotiations under the provisions of the 31 October 1985 Agreement.

With regard to Petro-Canada's proposal, the Board notes that no time period was specified after which the proposed suspension of current procedures would come to an end. Furthermore, the proposal to move to a complaint basis appears to shift the onus for establishing that export gas is surplus from the Board to the domestic gas user.

The Board considers it to be appropriate to fulfill its responsibilities under Section 83 of the Act by calculating surplus based on its estimation of supply and the reasonably foreseeable Canadian requirements for natural gas.

3.4 Reserves to Production Ratio Tests

Three submitters - TransCanada, Dome and Ontario proposed surplus determination procedures based upon the maintenance of a specified reserves to production (R/P) ratio.

TransCanada proposed a new surplus determination procedure, which it referred to as a Supply-Demand Indicator (SDI). It advocated licensing new exports only if total demand in each year, including the new exports, was less than an annual limit on production.

TransCanada's proposed procedure requires that the Board prepare a forecast of annual production and reserves additions anticipated for each year of the forecast period. Annual production limits would be established by dividing the reserves remaining at the end of each forecast year by 15. The total quantities of gas available for delivery to export markets during each year of the forecast period would be equal to the difference between the annual production limit for the year and the projected Canadian requirements. The quantity available for new exports would be the difference between existing export authorizations and the total available for export.

TransCanada proposed that the Board annually prepare and publish a forecast. This would indicate to all interested parties the Board's evaluation of the Canadian supply and demand picture as it is forecast to evolve, thereby sending signals that would encourage market and/or reserves development.

TransCanada's suggested procedure is based on the principle that reservoir production declines when it is maintained at full capability, but does not decline if it is continued at a level below full capability.

Reservoirs are usually put on initial production at a level below their maximum level of production in order that a constant level of production can be maintained over a number of years. After this period of constant production the reservoir begins to decline. TransCanada estimated that this decline usually begins when the reserves to production ratio has reached a range of 10 to 12.

TransCanada estimated that its present contracted reserves have an aggregate R/P ratio at capacity of between 10 and 12. TransCanada compared this to the aggregate R/P ratio at capacity in the United States which it estimated has recently been in the range of 8.1 to 10.4.

TransCanada submitted that using an R/P ratio of 15 in its procedure would allow Canadian demand to be satisfied for at least three to five years after exports cease. An even longer period of time would be possible if significant reserves additions occurred, either through new discoveries or appreciation of existing reserves, during this period.

TransCanada contended that its procedure would be an improvement over the Board's Reserves Formula in that it would:

- (i) give explicit recognition to reserves additions;
- (ii) would be flexible, adjusting to changing conditions as they are recognized; and
- (iii) would provide stimulation to the industry while continuing to protect reasonably foreseeable Canadian requirements.

As indicated above, Dome advocated the contractual approach to surplus determination. However, Dome stated that if the Board rejected this approach, its second choice was a reserves to production type of surplus procedure. Dome's proposed procedure is similar to TransCanada's in that it takes into account forecasts of annual reserves additions, domestic requirements, and export sales under current authorizations. A domestic reserves life index is then calculated for each future year by dividing the remaining reserves less remaining licensed exports by domestic requirements. Additional exports would be licensed only to the extent that this index maintained a value of 15 or greater.

Ontario proposed that two forms of surplus tests were required, a prospective test which would be used to authorize exports initially and a corrective test which would operate in the future during the term of the export licence to ensure the maintenance of specific minimum protection levels. Ontario considered the current 25A1 Reserves Formula to be an acceptable prospective test but, if the Board were to drop the Deliverability Appraisal, it recommended that a new test termed the Reserves/Production Index Maintenance Test (RPI) replace it as the corrective test.

Ontario stated that the purpose of this test would be to ensure that at any future time there would always be sufficient remaining reserves to support the actual domestic demand at that time for a reasonable number of transition years before supply would be insufficient to meet domestic demand. With RPI, remaining reserves less remaining authorized exports are divided by domestic requirements in each forecast year. New exports would be authorized only if the ratio exceeded 20. The result is

that at the point in time when exports cease, there would still remain sufficient reserves to provide 20 years domestic assurance at the then current level of domestic requirements.

To ensure that the rate of take from established reserves did not become excessive, Ontario also proposed that the Board monitor the ratio of total annual production to the remaining reserves in each year. If this ratio were to fall any significant amount below 15, the Board should consider if any action would be required to adjust export levels to bring the ratio closer to 15.

Views of the Board

While the Board has not adopted any of the specific procedures suggested, it sees merit in a reserves to production ratio as a useful indicator of the status of Canada's natural gas reserves. It has therefore incorporated the essence of this concept into its new procedure.

Chapter 4

Decision

In considering its decision, the Board focussed on two principal issues:

- (i) the continuing appropriateness of the existing surplus determination procedures, and,
- (ii) what other procedures might be more appropriate.

Having regard to all of the evidence presented by parties, the Board has decided that the 25A1 Reserves Formula and the Deliverability Appraisal are no longer appropriate to the changing circumstances and has decided to replace them with a new procedure based upon the ratio of reserves to production (the R/P Ratio Procedure). This procedure incorporates estimates of annual additions to reserves, and forecasts of both Canadian demand and authorized exports. It also involves an assessment of future annual productive capacity (the Productive Capacity Check) which takes the place of the Board's present Deliverability Appraisal.

Section 4.1 summarizes why the Board has decided that its existing procedures are no longer appropriate. Section 4.2 describes the Board's new procedure. Section 4.3 describes the considerations underlying the selection of an appropriate value of the reserves to production ratio to be used in determining surplus. The merits of the new procedure are discussed in Section 4.4 and illustrative applications of the procedure are provided in Section 4.5. The Board's decisions on other related matters are given in Section 4.6.

4.1 Continuing Appropriateness of Existing Procedures

The views of parties and of the Board on the continuing appropriateness of the 25A1 Reserves Formula and the Deliverability Appraisal were detailed in Chapter 2.

The Board has found merit in the positions of those parties who argued that its 25A1 Reserves Formula is no longer appropriate in current circumstances.

The Reserves Formula required the setting aside of reserves equal to 25 times the current year's Canadian requirements plus the maximum quantities exportable under existing export licences before new exports could be licensed. It did not incorporate additions to reserves, although these are almost certain to occur. Neither did it take account of expected future trends in Canadian demand.

The Board is of the view that the large inventories of natural gas associated with the 25A1 Reserves Formula are not required in a market-sensitive pricing environment. Such inventories could result in excessive inventory carrying costs and national economic inefficiency.

The Board believes that the new market-sensitive pricing policy should, increasingly over time, assist in the balancing of supply and demand. The Board expects to be able to place increasing reliance in the future on the responsiveness of supply and demand to price and less reliance on the size of currently established reserves in protecting future Canadian requirements.

With regard to the Deliverability Appraisal, the productive capacity estimated for any specific year assumed that production had occurred at capacity in each previous year, even though that was unlikely. In estimating productive capacity in a future year using its new procedure, the Board will assume that production in prior years has been at levels equal to its best estimate of demand. It will thus allow for the carry-forward of unused productive capacity from previous years.

4.2 Description of New Procedure

As stated above, the Board has decided to adopt a new surplus determination procedure based upon the ratio of reserves to production - the R/P Ratio Procedure. The Board is of the view that the value of the R/P ratio used in this calculation should, at present, be 15, for reasons which are explained in Section 4.3.

The procedure may be described in four steps.

The first step is to calculate the maximum potential surplus. A potential surplus is calculated for each year of a forecast period. In the illustrations in Section 4.5, this is the 20-year period 1986-2005. The potential annual surplus is the amount by which annual supply, as defined below, exceeds the estimated total annual demand. The maximum potential surplus is the sum of these estimated annual quantities. The calculation is made on the assumption that each annual surplus is, in fact, produced.

In the calculation of the potential annual surpluses, the procedure is as follows:

- (i) annual supply is calculated by dividing the forecast reserves at the end of the year by 15;
- (ii) the forecast reserves at the end of each year consist of the reserves available at the beginning of the year, plus forecast reserves additions during the year, less forecast production during the year;
- (iii) the estimated total annual demand comprises the estimate of Canadian demand plus export volumes expected to flow under existing licences and short-term orders; and
- (iv) the potential annual surplus is the difference between the annual supply in (i) above and the annual demand in (iii) above.

The surplus calculated in this first step of the procedure is termed maximum potential because it is likely, especially in the early years, that neither pipeline capacity nor markets could accommodate the amounts of potential annual surplus derived by the calculation. In addition, an allowance must be made, out of the surplus shown, for the fuel and losses and reprocessing shrinkage associated with any new exports.

The next three steps in the procedure involve the determination of the appropriate annual level and duration of exports under new or extended licences.

In the second step the Board uses its judgement to select an array of trial profiles and durations for possible additional exports, taking into account such factors as the exports applied for and the results of the first step. However, the total of each such profile of additional exports will be less than the

maximum potential surplus calculated in step 1. The Board then calculates the reserves to production ratio for each year of each export profile and identifies years in which the R/P ratio drops below 15.

The third step is the Productive Capacity Check which replaces the Board's previous Deliverability Appraisal. In this step, the Board assesses the productive capacity year by year to ensure that forecast total demand can, in fact, be met. This verification is especially important for any years in which the R/P ratio resulting from the contemplated new exports is forecast to fall below 15.

In the fourth step, the Board determines the most appropriate export profile using the information from the first three steps. This assessment of each export profile takes into account a number of factors, some of which are:

- the security of supply for Canadian markets apparent from the extent to which R/P ratios exceed or fall short of 15 and from the relationship between productive capacity and demand, particularly when the R/P ratio is below 15;
- the capacity of the existing infrastructure to produce and transport the new exports; and
- the estimated net benefits to Canada, taking into account the costs of any new infrastructure which would be required.

Illustrative surplus calculations using the first three steps of the Board's new procedure are provided in Section 4.5.

The new procedure embodies a combination of security of supply and flexibility which the Board considers to be appropriate in the context of market-sensitive pricing and the maturity of the Western Canada Sedimentary Basin.

As an important adjunct to its new surplus determination procedure, the Board intends to conduct reviews at appropriate intervals in order to update its projections of Canadian demand, forecast exports, reserves additions, and productive capacity. The publication of the results of these periodic reviews will provide, on the one hand, a forewarning of potential supply problems and time for any necessary adjustments to be made, for example, to the pace of exploration or connection of reserves. On the other hand, such reviews may provide an early indication of continuing or increasing surplus volumes and, hence, possible further exports.

In carrying out these reviews, the Board intends to seek input from interested parties. In accordance with the general nature of views expressed during the hearing, the gathering of information and advice for the periodic reviews will be informal, involving consultation rather than a hearing process, although it may include written submissions. The Board sees such periodic reviews as the establishment of an ongoing consultative mechanism for the benefit of all concerned.

In addition to the informal process described above, there will be public hearings on export applications from time to time which will provide an opportunity for a full and formal examination of all the parameters, including the appropriate R/P ratio, which enter into the determination of surplus. As discussed in Section 4.6.1, such hearings may be held to consider individual export licence applications or may be omnibus proceedings.

4.3 The Selection of a Reserves to Production Ratio

As indicated above, the Board intends, at the present time, to use an R/P ratio of 15 in determining surplus. The choice of this ratio depends on evaluating two factors:

- (i) the Board's estimate of the R/P ratio if Canada's gas supply were called upon to produce steadily at capacity (the productive capacity R/P ratio), and
- (ii) the Board's view of the appropriate relationship to be maintained between productive capacity and actual production. This would be expressed in terms of the desired margin between the productive capacity R/P ratio, referred to in (i) above, and the actual R/P ratio.

This section discusses in general terms how these two factors are evaluated and why the Board has decided that an R/P ratio of 15 provides protection for Canadian requirements during and after the period over which new gas exports might be licensed. The more technical details are provided in Appendix 9.

When reserves are being produced at less than their productive capacity, the R/P ratio will be higher than it would be if the reserves were being produced at their productive capacity. (This is simply because the lower the production, the longer the reserves will last and the higher the reserves to production ratio will be.) Thus, an actual R/P ratio higher than would prevail at productive capacity is indicative of spare capacity.

The R/P ratio for reserves in the Western Canada Sedimentary Basin is expected to be about 22 in 1986. When the R/P ratio in future years has declined to 15, because production from a greater proportion of gas reservoirs will have passed its peak and will be steadily declining, there will still be present a significant amount of spare capacity to produce relative to total demand.

Also explained in Appendix 9 are the reasons why the Board believes that this spare capacity would not disappear until the R/P ratio has declined to at least the 12 to 13 range for the Western Canada Sedimentary Basin.

Therefore, the use of an R/P ratio of 15, in conjunction with the Productive Capacity Check, ensures that production during the period of exports will be lower than capacity. The difference between productive capacity and actual production should ensure that Canadian requirements will be met not only during the period of export but also for a number of years thereafter. This will provide, in the Board's view, time for any necessary corrective actions to occur such as changes in the pace of exploration and in connecting reserves.

The Board's estimate of the R/P ratio when Canada's gas supply is called upon to produce steadily at capacity (the above-mentioned 12 to 13 range) may change as gas reservoirs mature and as reserves are added. This change, should it occur, may affect the Board's perception of the appropriate value of the R/P ratio to be used in determining maximum potential surplus. The appropriate relationship between productive capacity and actual production may also be affected by the efficiency of the market under market-sensitive pricing and by the resulting changes in perception regarding the need for protection. The Board is prepared to receive evidence at future proceedings as to whether 15 remains an appropriate R/P ratio to use in its procedure, but, at the present time, it is of the view that the reasonable range for such an R/P ratio is a relatively narrow one centering on 15.

The Board appreciates the potential impact upon the gas producing industry, gas consumers, regional economies and the overall economy of Canada that would occur if a somewhat different ratio were to be chosen. These impacts would occur because of the resulting changes in exportable surplus volumes. The Board also recognizes that the appropriate relationship between productive capacity and actual production, which is one component in the selection of the R/P ratio, is a matter for judgement, recognizing the trade-off between security of supply and the benefits from exports. In this regard the Board believes that cost-benefit analysis can play a role, along with other means, in assessing the appropriate R/P ratio value.

4.4 Merits of the New Procedure

As discussed in Section 4.3, a key feature of the reserves to production ratio procedure is the level of protection and the security of supply which it will provide to Canadian consumers. The maintenance of a suitable R/P ratio over the period of any new export will ensure both that a reasonable amount of spare productive capacity will exist over total requirements on a year-to-year basis and that Canadian requirements will continue to be met for a reasonable period after exports cease.

As was the case with the 25A1 Reserves Formula, the R/P Ratio Procedure explicitly identifies the relevant inputs to the calculation of surplus and the methodology underlying the calculation. Such an explicit methodology for surplus determination allows potential applicants for new export licences to make their own estimates of surplus before they incur costs to prepare an application. Such was not necessarily the case with some of the other methods proposed during the hearing.

The new procedure takes into account both the reserves and deliverability aspects of supply. In contrast with the Board's former 25A1 Reserves Formula which provided a static picture at one point in time, the R/P Ratio Procedure embodies dynamic estimates of changes in levels of demand and additions to reserves throughout the forecast period. It is affected less by changes in the current year's requirements than the 25A1 Reserves Formula in which even small changes in demand became magnified, as a result of being multiplied by 25, with concomitant large changes in the resultant surplus calculation. The R/P Ratio Procedure specifically addresses the question of the maturity of the Western Canada Sedimentary Basin and its ability to supply both Canadian and export markets during the inevitable decline of productive capacity as that Basin matures.

The procedure should encourage a reasonable balance between the exploration and development phases of the gas industry - exploration being the basic activity for increasing reserves and development being the basic activity for increasing deliverability.

The R/P Ratio Procedure is based upon a consistent treatment of physical and economic factors in an integrated, forward-looking framework. The procedure is also flexible and capable of responding to changing circumstances, in that the value of the R/P ratio can be changed as evidence accumulates on the trend of the R/P ratio estimated to occur when supply is steadily at capacity, on the working of market-sensitive pricing and on the appropriate relationship between productive capacity and actual production. It also lends itself to the inclusion of new gas-producing regions such as the frontiers.

Under the assumptions incorporated in the illustration of the procedure in Table 4-1 of Section 4.5, a maximum potential surplus of some 10 EJ could result from the new procedure using an R/P ratio of 15. Although this is about the same amount of surplus as would result from the application of the Board's former Reserves Formula, modified to a 20A1 coverage of Canadian requirements, instead of

25A1, the Board would caution that the procedures are not directly comparable since the R/P Ratio Procedure is unlike the Reserves Formula, being based on a different concept, and incorporating entirely different parameters.

The Board estimated, using cost-benefit analysis, that, under a variety of assumptions, there could be substantial net benefits to Canada from exporting an additional 10 EJ of natural gas.

The Board is of the view that its surplus determination procedures must be flexible and capable of responding to changing circumstances if they are to be durable. The new market-sensitive pricing policy requires a more responsive and predictive assessment than has been the case in the past. Rigid tests in the emerging new environment could quickly become inappropriate. The Board believes that the new surplus determination procedure set out in this chapter will meet these requirements.

4.5 Illustration of Surplus Determination Using the Reserves to Production Ratio Procedure

This section illustrates the use of the first three steps of the Reserves to Production Ratio Procedure in the determination of surplus. The illustrations are meant to assist in understanding the way in which the procedure works. They do not constitute the Board's current estimate of surplus, which will be the subject of subsequent proceedings, as discussed in Section 4.6.

None of the numbers included in the tables should be taken as an indication of the Board's views as to the appropriateness of the values shown, or of any predisposition on the part of the Board toward any particular decision in respect of any export application.

The illustrations which follow show how the procedure will be applied when the Board considers applications for licences to export natural gas. Table 4-1 illustrates the calculation of the maximum potential surplus. Table 4-2 illustrates the check that the Board will perform to ensure that forecast productive capacity will, in fact, be capable of satisfying forecast total demand. Tables 4-3, 4-4 and 4-5 illustrate how three configurations of possible new exports might be examined under the new procedure.

Although the method is certainly open to such considerations, none of these illustrations attempts to capture the impacts of market-sensitive pricing or the impacts of any new exports on industry activity. The estimates of reserves additions, domestic requirements, and the allowance for exports were made on the assumption that gas prices would maintain a constant relationship to oil prices, as was sometimes the case in the past.

The following illustrations take into account only supply from the Western Canada Sedimentary Basin. Frontier reserves could be incorporated in the procedure by adding them to reserves in the years in which they are expected to become available, as has been done with reserves additions.

The calculations involved in the tables in this section are explained in the footnotes to the tables and in Appendix 8.

4.5.1 The Calculation of the Maximum Potential Surplus

The calculation of the maximum potential surplus is illustrated in Table 4-1. This calculation involves comparing, year by year, the estimated total demand (Canadian plus forecast exports under existing authorizations) with annual supply calculated assuming an end-of-year reserves to production ratio of 15. The potential annual surpluses, so determined, are summed to yield the maximum potential surplus. The calculation assumes that the potential annual surplus is, in fact, produced; this assumption is necessary because the potential surplus calculated for each year depends on the level of remaining reserves at the beginning of the year and this, in turn, depends on the level of production in earlier years.

For the purpose of these illustrative calculations, forecast reserves include all reserves beyond economic reach and all deterred reserves. The treatment to be accorded these reserves will be a subject of review during a subsequent export proceeding. Total demand includes fuel and losses and reprocessing shrinkage for Canadian demand and exports under existing authorizations.

The maximum potential surplus calculated in Table 4-1 is some 10 EJ. However, it would not be possible to authorize that amount for export for various reasons such as the unlikelihood of pipelines or markets being able to accommodate the pattern of annual surpluses generated by the R/P Ratio Procedure. In addition an allowance would have to be made for the fuel and losses and reprocessing shrinkage associated with any new exports.

4.5.2 Calculation of the Reserves to Production Ratio and the Productive Capacity

Table 4-2 illustrates the calculation of annual reserves to production ratios and the Productive Capacity Check.

The reserves to production, ratio in column (9) is calculated as of the end of each year by dividing reserves by total requirements including the new exports which, in Table 4-2, are set equal to the potential annual surpluses calculated in Table 4-1.

The Productive Capacity Check compares the productive capacity with these same total requirements to ensure that demand can, in fact, be supplied.

The estimated productive capacity shown on Table 4-2 is the amount of gas which could be produced at capacity given the production required to meet total requirements for each previous year. This calculation includes estimates of production from connected reserves and assumptions about connection rates and deliverability from unconnected reserves and reserves additions.

Columns (11) and (12) of Table 4-2 show that annual productive capacity exceeds total requirements, including additional exports up to the limit established by use of a reserves to production ratio of 15. Some margin of spare productive capacity is available throughout the export period.

With market-sensitive pricing, changes in natural gas prices would tend to produce a balance between supply and demand. Future assessments will likely increasingly allow for this price impact as experience is gained. The effect of not including market-sensitive pricing impacts over the long run adds a conservative element to the estimates, particularly in the later years.

4.5.3 The Determination of Annual Export Quantities in New Export Licences

It is unlikely that the Board would receive applications for export licences which correspond in profile and in total with the quantities shown in Table 4-1. Facilities could not handle nor markets absorb the surge in potential exports shown in the early years of the illustration. However, the Board would draw upon the type of information in Tables 4-1 and 4-2 for guidance in setting the parameters of annual quantities and duration of new export licences.

Tables 4-3, 4-4 and 4-5 illustrate how the Board will use the R/P ratio procedure to determine annual exports. The three illustrations show trial amounts of new exports designed to maintain constant overall annual levels of exports for the six-year period from 1990 to 1995 of 1.6, 1.8 and 1.9 EJ respectively, each followed by a three-year phase-down in total exports to 75 percent, 50 percent and 25 percent of the constant level. In all three tables, the constant level includes estimates of exports already authorized and new exports, some of which might replace expiring licences and others of which might supply new markets. The total new exports in these three cases are 5.5 EJ, 6.7 EJ and 7.8 EJ, out of the maximum potential surplus of 10.1 EJ shown in Table 4-1, before making allowances for the fuel and losses and reprocessing shrinkage associated with the new export volumes. Again, the detailed calculations are explained in the notes to the tables and in Appendix 8.

Table 4-1
Illustration of Step 1 of the R/P Ratio Surplus Determination Procedure
Calculation of the Maximum Potential Surplus

(EJ)

Supply				Demand		Step 1	
Year	Opening Inventory 1 Jan.	Estimated Reserves Additions During Year	Annual Supply (Assum- ing R/P=15)	Estimate d Canadian Demand	Estimated Author- ized Exports	Estimate d Total Demand	Potential Annual Surplus (Assumin g R/P=15)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1986	76.6	2.8	5.0	2.3	1.1	3.4	1.6
1987	74.4	2.9	4.8	2.4	1.2	3.6	1.2
1988	72.5	3.2	4.7	2.5	1.5	4.0	.7
1989	71.0	3.2	4.6	2.6	1.5	4.1	.5
1990	69.5	3.0	4.5	2.6	1.5	4.1	.4
1991	68.0	2.9	4.4	2.7	1.2	3.9	.5
1992	66.5	2.7	4.3	2.7	1.0	3.7	.6
1993	64.8	2.5	4.2	2.8	.8	3.6	.6
1994	63.1	2.5	4.1	2.8	.7	3.6	.5
1995	61.5	2.2	4.0	2.8	.6	3.4	.6
1996	59.7	2.0	3.9	2.9	.4	3.2	.7
1997	57.9	1.8	3.7	2.9	.2	3.1	.6
1998	56.0	1.6	3.6	2.9	.1	3.0	.6
1999	54.0	1.5	3.5	2.9	-	3.0	.5
2000	52.0	1.3	3.3	3.0		3.0	.3
2001	50.0	1.1	3.2	3.0		3.0	.2
2002	48.0	1.0	3.1	3.1		3.1	
2003	45.8	.9	2.9	3.1		3.1	
2004	43.6	.8	2.8	3.2		3.2	
2005	41.2	.7	2.6	3.2		3.2	
Total	n.a	40.6	n.a.	n.a.	11.7	n.a.	10.1

- Appendix 8 provides a description of the calculations.
- Column (1) includes all reserves beyond economic reach and all deferred reserves.
- Column (2) is the Board's estimate of annual reserves additions from the Board staff September 1984 Report adjusted to reflect lower than expected additions in 1983 and 1984 and a preliminary estimate for 1985. It is now anticipated that the reserves additions for 1986 and 1987 may be lower than those shown.
- Column (3) is the annual supply that would be available assuming a reserves to production ratio of 15.
Column (3) = (column (1) + column (2) - column (3))/15.

- Column (4) is the Board's most recent estimate of Canadian demand including pipeline fuel and losses and reprocessing shrinkage (assuming that gas prices are maintained at 61% of oil parity at Toronto, 71% at Edmonton, and 65% at Vancouver). This estimate is of Canadian demand expected to be satisfied by Canadian supply; i.e., it is net of imports.
- Column (5) is the Board's most recent estimate of exports expected to flow under existing authorizations.
- column (6) is the sum of columns (4) and (5).
- Column (7) is the potential annual surplus available for export in any given year assuming maintenance of a reserves to production ratio of 15.

$$\text{Column (7)} = \text{Column (3)} - \text{column(6)}$$
 The total of column (7) is the maximum potential surplus.
- n.a. = not applicable.
- All numbers on the table have been rounded.

Table 4-2
Illustration of Steps 2 and 3 of the R/P Ratio Surplus Determination Procedure
Assuming New Exports Equal the Potential Annual Surpluses
(EJ Unless Otherwise Specified)

Year	Supply			Demand		Step 2: Calculated R/P Ratio			Step 3: Productive Capacity Check			
	Opening Inventory 1 Jan.	Estimated Reserves Addition During Year	Annual Supply (Assuming R/P=15)	Estimated Canadian Demand	Estimated Authorized Exports	Estimated Total Demand	Trial New Exports	Resulting Total Requirements	Reserves to Production Ratio 31 Dec. (Ratio)	Productive Capacity	Spare Capacity	Spare Capacity (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1986	76.6	2.8	5.0	2.3	1.1	3.4	1.6	5.0	15.0	5.3	.3	7.6
1987	74.4	2.9	4.8	2.4	1.2	3.6	1.2	4.8	15.0	5.4	.6	11.2
1988	72.5	3.2	4.7	2.5	1.5	4.0	.7	4.7	15.0	5.3	.6	13.1
1989	71.0	3.2	4.6	2.6	1.5	4.1	.5	4.6	15.0	5.3	.7	13.9
1990	69.5	3.0	4.5	2.6	1.5	4.1	.4	4.5	15.0	5.2	.7	14.2
1991	68.0	2.9	4.4	2.7	1.2	3.9	.5	4.4	15.0	5.1	.7	14.6
1992	66.5	2.7	4.3	2.7	1.0	3.7	.6	4.3	15.0	4.9	.6	14.5
1993	64.8	2.5	4.2	2.8	.8	3.6	.6	4.2	15.0	4.9	.7	15.3
1994	63.1	2.5	4.1	2.8	.7	3.6	.5	4.1	15.0	4.7	.6	15.0
1995	61.5	2.2	4.0	2.8	.6	3.4	.6	4.0	15.0	4.6	.6	14.9
1996	59.7	2.0	3.9	2.9	.4	3.2	.7	3.9	15.0	4.4	.5	14.0
1997	57.9	1.8	3.7	2.9	.2	3.1	.6	3.7	15.0	4.3	.6	15.1
1998	56.0	1.6	3.6	2.9	.1	3.0	.6	3.6	15.0	4.1	.5	14.5
1999	54.0	1.5	3.5	2.9	-	3.0	.5	3.5	15.0	4.0	.5	14.1
2000	52.0	1.3	3.3	3.0		3.0	.3	3.3	15.0	3.8	.5	13.7
2001	50.0	1.1	3.2	3.0		3.0	.2	3.2	15.0	3.6	.4	13.2
2002	47.9	1.0	3.1	3.1		3.1		3.1	14.9	3.5	.4	12.3
2003	45.8	.9	2.9	3.1		3.1		3.1	13.9	3.3	.2	6.9
2004	43.6	.8	2.8	3.2		3.2		3.2	13.0	3.1	-.1	-1.3
2005	41.2	.7	2.6	3.2		3.2		3.2	12.0	2.9	-.3	-9.7
Total	n.a.	40.6	n.a.	n.a.	11.7	n.a.	10.1	n.a.	n.a.	n.a.	n.a.	n.a.

- Appendix 8 provides a description of the calculations.
- Column (1) to (6) see footnotes to Table 4-1.
- Column (7) is a profile of trial new exports. In this table, exports are assumed to equal the potential annual surpluses in column (7) of Table 4-1 for illustrative purposes only, as it is not expected that new exports would be applied for in these amounts, that pipelines could transport the amounts shown, or that markets could absorb the amounts shown.
- Column (8), resulting total requirements, is the sum of columns (6), estimated total demand, and (7), trial new exports.

- Column (9) is the calculation of the reserves to production ratio at the end of the year. $\text{Column (9)} = (\text{column (1)} + \text{column (8)}) / \text{column (8)}$.
- Column (10) is a forecast of productive capacity adjusted for the carry-forward of spare capacity from years when the expected requirements (and hence production) would be less than productive capacity. This column is not additive because the quantities shown are potential rather than actual production.
- Column (11) is the amount of spare capacity. $\text{Column (11)} = \text{column (10)} - \text{column (8)}$.
- Column (12) is the spare capacity, column (11), expressed as a percentage of the resulting total requirements, column (8).
- Note that the illustration does not include the associated pipeline fuel and losses and reprocessing shrinkage for the assumed additional exports.
- n.a. - not applicable
- All numbers on the table have been rounded.

Table 4-3
Illustration of Steps 2 and 3 of the R/P Ratio Surplus Determination Procedure
Assuming a Constant Level of Total Exports, Existing and New, of 1.6 EJ per Year
From 1990 to 1995 Followed by a 3-Year Phase Down
(EJ Unless Otherwise Specified)

Year	Supply			Demand			Step 2: Calculated R/P Ratio			Step 3: Productive Capacity Check		
	Opening Inventory 1 Jan.	Estimated Reserves Additions During Year	Annual Supply (Assuming R/P=15)	Estimated Canadian Demand	Estimated Authorized Exports	Estimated Total Demand	Trial New Exports	Resulting Total Requirements	Reserves to Production Ratio 31 Dec. (Ratio)	Productive Capacity	Spare Capacity	Spare Capacity (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1986	76.6	2.8	5.0	2.3	1.1	3.4		3.4	22.1	5.3	1.9	54.2
1987	75.9	2.9	4.9	2.4	1.2	3.6		3.6	21.1	5.3	1.7	49.3
1988	75.3	3.2	4.9	2.5	1.5	4.0		4.0	18.6	5.4	1.4	34.6
1989	74.5	3.2	4.9	2.6	1.5	4.1		4.1	17.8	5.3	1.2	29.3
1990	73.5	3.0	4.8	2.6	1.5	4.1	.1	4.2	17.0	5.3	1.1	24.3
1991	72.3	2.9	4.7	2.7	1.2	3.9	.4	4.3	16.6	5.2	.9	20.9
1992	70.9	2.7	4.6	2.7	1.0	3.7	.6	4.3	16.0	5.1	.8	17.0
1993	69.3	2.5	4.5	2.8	.8	3.6	.8	4.4	15.4	4.9	.5	12.8
1994	67.4	2.5	4.4	2.8	.7	3.6	.9	4.4	14.8	4.9	.5	9.5
1995	65.4	2.2	4.2	2.8	.6	3.4	1.0	4.4	14.2	4.7	.3	5.7
1996	63.2	2.0	4.1	2.9	.4	3.2	.8	4.1	15.1	4.6	.5	12.2
1997	61.1	1.8	3.9	2.9	.2	3.1	.6	3.7	16.1	4.4	.7	19.2
1998	59.3	1.6	3.8	2.9	.1	3.0	.3	3.3	17.4	4.3	1.0	29.7
1999	57.6	1.5	3.7	2.9	-	3.0		3.0	18.7	4.2	1.2	38.5
2000	56.1	1.3	3.6	3.0		3.0		3.0	18.2	4.0	1.0	34.3
2001	54.4	1.1	3.5	3.0		3.0		3.0	17.4	3.9	.9	27.5
2002	52.5	1.0	3.3	3.1		3.1		3.1	16.4	3.7	.6	20.1
2003	50.4	.9	3.2	3.1		3.1		3.1	15.4	3.5	.4	13.3
2004	48.2	.8	3.1	3.2		3.2		3.2	14.5	3.4	.2	6.2
2005	45.8	.7	2.9	3.2		3.2		3.2	13.5	3.2	-	.2
Total	n.a.	40.6	n.a.	n.a.	11.7	n.a.	5.5	n.a.	n.a.	n.a.	n.a.	n.a.

- Appendix 8 provides a description of the calculations.
- Column (1) to (6) see footnotes to Table 4-1.

- Column (7) is additional exports required to maintain a constant level of total exports, existing and new, of 1.6 EJ/YR for six years beginning in 1990 followed by a three year phase down to 75%, 50% and 25% of that level.
- For columns (8) to (12) see footnotes to Table 4-2.
- Note that the illustration does not include the associated pipeline fuel and losses and reprocessing shrinkage for the assumed additional exports.
- n.a. - not applicable.
- All numbers on the table have been rounded.

Figure 4-1
Illustration of Trial New Exports
as per Table 4-3

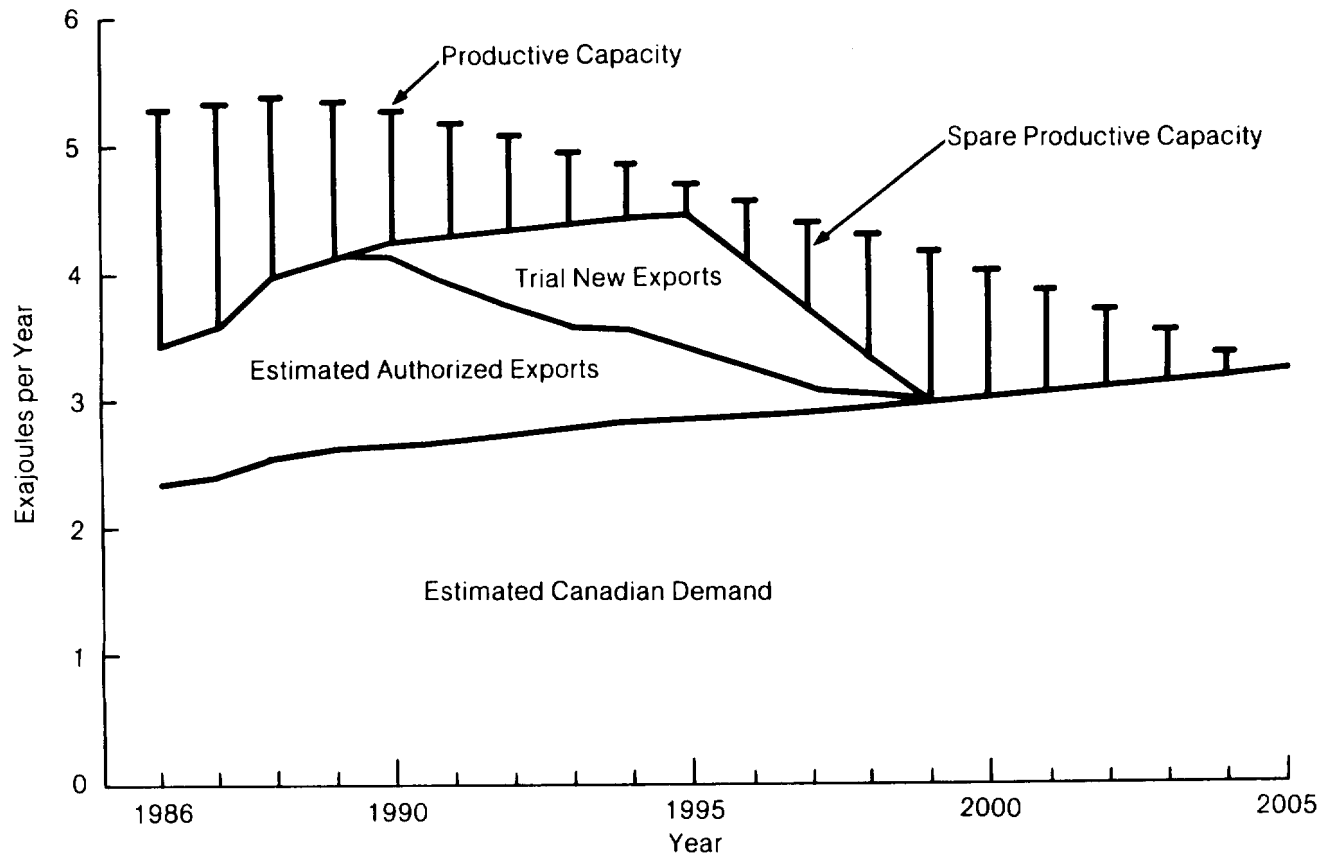


Figure 4-1
Illustration of Trial New Exports
as per Table 4-3

To assist in understanding the results shown in these three tables, Figure 4-1 illustrates the results shown in Table 4-1 illustrates the results shown in Table 4-3 for a trial amount of new exports which would maintain an overall level of exports of 1.6 EJ from 1990 to 1995.

All three examples show that the reserves to production ratio could be less than 15 in some years during the term of new contemplated licences. All three tables illustrate that additional exports could be licensed for the early 1990s. A potential problem is indicated when the R/P ratio (column (9)) is shown as falling below 15.

When the resulting R/P ratio is less than 15, the Board would examine whether sufficient spare productive capacity was available and use its judgement to decide whether the amounts of such indicated spare capacity were adequate to permit authorization of the indicated exports in those years. Column (11) of the tables shows the difference in exajoules between productive capacity (column (10)) and the total requirements, including the new exports (column (8)). Column (12) shows this difference as a percentage of the total requirements.

Table 4-4 shows that, given the export profile used in this case, the reserves to production ratio could be less than 15 for a number of consecutive years, and there could continue to be spare productive capacity. Moreover, the R/P ratio returns to a level above 15 when exports are phased down at the end of the export period.

Table 4-5 illustrates a case where not only does the R/P ratio fall below 15, but in 1995 expected productive capacity is inadequate. Also, Column (11) shows that spare productive capacity is marginal in the years 1993, 1994 and 1996. Given these results, it is doubtful that the Board would unconditionally approve this schedule of exports based solely upon the estimated productive capacity of the Western Canada Sedimentary Basin.

These illustrations do not take into account any price changes which may occur in a market-sensitive pricing environment. The more smoothly markets work, the less need there is to be concerned about the forecast levels of spare supply.

Table 4-4
Illustration of Steps 2 and 3 of the R/P Ratio Surplus Determination Procedure
Assuming a Constant Level of Total Exports, Existing and New, of 1.8 EJ per Year
From 1990 to 1995 Followed by a 3-Year Phase Down
(EJ Unless Otherwise Specified)

Year	Supply			Demand			Step 2: Calculated R/P Ratio			Step 3: Productive Capacity Check		
	Opening Inventory 1 Jan.	Estimated Reserves Addition During Year	Annual Supply (Assuming R/P=15)	Estimated Canadian Demand	Estimated Authorized Exports	Estimated Total Demand	Trial New Exports	Resulting Total Requirements	Reserves to Production Ratio 31 Dec. (Ratio)	Productive Capacity	Spare Capacity	Spare Capacity (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1986	76.6	2.8	5.0	2.3	1.1	3.4		3.4	22.1	5.3	1.9	54.2
1987	75.9	2.9	4.9	2.4	1.2	3.6		3.6	21.1	5.3	1.7	49.3
1988	75.3	3.2	4.9	2.5	1.5	4.0		4.0	18.6	5.4	1.4	34.6
1989	74.5	3.2	4.9	2.6	1.5	4.1		4.1	17.8	5.3	1.2	29.3
1990	73.5	3.0	4.8	2.6	1.5	4.1	.3	4.4	16.4	5.3	.9	20.0
1991	72.2	2.9	4.7	2.7	1.2	3.9	.5	4.4	15.9	5.2	.8	16.7
1992	70.6	2.7	4.6	2.7	1.0	3.7	.8	4.5	15.3	5.1	.6	12.9
1993	68.8	2.5	4.5	2.8	.8	3.6	1.0	4.5	14.7	4.9	.4	8.8
1994	66.8	2.5	4.3	2.8	.7	3.6	1.0	4.6	14.1	4.8	.2	5.3
1995	64.7	2.2	4.2	2.8	.6	3.4	1.2	4.6	13.6	4.6	-	1.1
1996	62.3	2.0	4.0	2.9	.4	3.2	.9	4.2	14.4	4.5	.3	8.5
1997	60.1	1.8	3.9	2.9	.2	3.1	.7	3.8	15.5	4.4	.6	16.1
1998	58.2	1.6	3.7	2.9	.1	3.0	.3	3.4	16.9	4.2	.8	26.7
1999	56.5	1.5	3.6	2.9	-	3.0		3.0	18.3	4.1	1.1	36.7
2000	55.0	1.3	3.5	3.0		3.0		3.0	17.8	4.0	1.0	32.4
2001	53.3	1.1	3.4	3.0		3.0		3.0	17.0	3.8	.8	25.8
2002	51.4	1.0	3.3	3.1		3.1		3.1	16.0	3.6	.5	18.2
2003	49.3	.9	3.1	3.1		3.1		3.1	15.1	3.5	.4	11.3
2004	47.0	.8	3.0	3.2		3.2		3.2	14.1	3.4	.2	6.2
2005	44.7	.7	2.8	3.2		3.2		3.2	13.1	3.1	-.1	-2.2
Total	n.a.	40.6	n.a.	n.a.	11.7	n.a.	6.7	n.a.	n.a.	n.a.	n.a.	n.a.

Appendix 8 provides a description of the calculations.

- Column (1) to (6) see footnotes to Table 4-1.
- Column (7) is the profile of additional exports required to maintain a constant level of total exports, existing and new, of 1.8 EJ/YR for six years beginning in 1990 followed by a three year phase down to 75%, 50% and 25% of that level.
- For columns (8) to (12) see footnotes to Table 4-2.

- Note that the illustration does not include the associated pipeline fuel and losses and reprocessing shrinkage for the assumed additional exports.
- n.a. - not applicable.
- All numbers on the table have been rounded.

Table 4-5

Table 4-5

**Illustration of Steps 2 and 3 of the R/P Ratio Surplus Determination Procedure
Assuming a Constant Level of Total Exports, Existing and New, of 1.9 EJ per Year
From 1990 to 1995 Followed by a 3-Year Phase Down
(EJ Unless Otherwise Specified)**

Year	Supply			Demand			Step 2: Calculated R/P Ratio			Step 3: Productive Capacity Check		
	Opening Inventory 1 Jan.	Estimated Reserves Addition During Year	Annual Supply (Assuming R/P=15)	Estimated Canadian Demand	Estimated Authorized Exports	Estimated Total Demand	Trial New Exports	Resulting Total Requirements	Reserves to Production Ratio 31 Dec. (Ratio)	Productive Capacity	Spare Capacity	Spare Capacity (%)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1986	76.6	2.8	5.0	2.3	1.1	3.4		3.4	22.1	5.3	1.9	54.2
1987	75.9	2.9	4.9	2.4	1.2	3.6		3.6	21.1	5.3	1.7	49.3
1988	75.3	3.2	4.9	2.5	1.5	4.0		4.0	18.6	5.4	1.4	34.6
1989	74.5	3.2	4.9	2.6	1.5	4.1		4.1	17.8	5.3	1.2	29.3
1990	73.5	3.0	4.8	2.6	1.5	4.1	.4	4.5	15.9	5.3	.8	16.0
1991	72.0	2.9	4.7	2.7	1.2	3.9	.7	4.6	15.3	5.2	.6	12.8
1992	70.3	2.7	4.6	2.7	1.0	3.7	.9	4.6	14.7	5.1	.5	9.0
1993	68.4	2.5	4.4	2.8	.8	3.6	1.1	4.7	14.1	4.9	.2	5.0
1994	66.2	2.5	4.3	2.8	.7	3.6	1.2	4.7	13.5	4.8	.1	1.4
1995	63.9	2.2	4.1	2.8	.6	3.4	1.3	4.7	12.9	4.6	-.1	-2.6
1996	61.4	2.0	4.0	2.9	.4	3.2	1.0	4.3	13.8	4.4	.1	3.3
1997	59.1	1.8	3.8	2.9	.2	3.1	.7	3.8	14.9	4.3	.5	13.2
1998	57.1	1.6	3.7	2.9	.1	3.0	.4	3.4	16.1	4.2	.8	23.7
1999	55.3	1.5	3.5	2.9	-	3.0		3.0	17.9	4.0	1.0	35.0
2000	53.8	1.3	3.4	3.0		3.0		3.0	17.4	3.9	.9	30.4
2001	52.1	1.1	3.3	3.0		3.0		3.0	16.6	3.7	.7	23.8
2002	50.2	1.0	3.2	3.1		3.1		3.1	15.6	3.6	.5	16.2
2003	48.1	.9	3.1	3.1		3.1		3.1	14.7	3.4	.3	9.3
2004	45.9	.8	2.9	3.2		3.2		3.2	13.7	3.3	.1	3.7
2005	43.5	.7	2.8	3.2		3.2		3.2	12.8	3.1	-.1	-4.7
Total	n.a.	40.6	n.a.	n.a.	11.7	n.a.	7.8	n.a.	n.a.	n.a.	n.a.	n.a.

- Appendix 8 provides a description of the calculations.
- Column (1) to (6) see footnotes to Table 4-1.
- Column (7) is the profile of additional new exports required to maintain a constant level of total exports, existing and new, of 1.9 EJ/YR for six years beginning in 1990 followed by a three year phase down to 75%, 50% and 25% of that level.

- For columns (8) to (12) see footnotes to Table 4-2.
- Note that the illustration does not include the associated pipeline fuel and losses and reprocessing shrinkage for the assumed additional exports.
- n.a. - not applicable.
- All numbers on the table have been rounded.

4.6 Other Matters

4.6.1 Ways of Proceeding with Phase 2 - Surplus Determination Phase

In paragraph 9 of the Hearing Order, the Board indicated that it would consider the views of interested parties on alternative ways of proceeding with Phase 2 - the Surplus Determination Phase. These alternatives included, in particular:

- (a) a full public hearing;
- (b) written submissions, with opportunity to comment in writing on submissions of others; or
- (c) any other alternative way of proceeding.

The majority of parties supported alternative (b) above on the grounds that it would be the most efficient and effective approach to Phase 2. Those parties who indicated that they favoured some other alternative did not object to proceeding by means of alternative (b); however, one party (Union Gas) indicated that if the Phase 1 decision substantially altered the existing surplus procedures, it would favour a full public hearing. Some other parties expressed their wish to reserve final comment until the results of Phase 1 were known.

Views of the Board

The Board notes that it does not, at this time, have natural gas export licence applications which require disposition in the near future. It is desirable that the determination of surplus take place as closely as possible to the consideration of specific export applications in order that the surplus determined be relevant. The Board therefore cannot decide at this time when it will proceed with other phases of this hearing.

In this regard, the Board notes that several parties suggested that the Board deal with export applications one by one on an as-received basis. The Board intends to continue to deal with applications as required by the public interest. Those applications which warrant individual consideration will be given it; those which would be better dealt with in an omnibus proceeding will be so considered.

The Board has noted the comments of Union Gas and of those parties who expressed a desire to give their views on the format of Phase 2 after they saw the Board's decision in Phase 1. The Board also notes that the views of all parties on Phase 2 were expressed at a time when they were not aware of the Board's decision in Phase 1. Therefore, in light of the changes made to its surplus determination procedures, the Board believes it will be appropriate to afford interested parties an opportunity to provide their views before deciding on the format of Phase 2. However, the Board believes that in dealing with forecasts of supply, reserves additions, and Canadian and export requirements, it would be appropriate to proceed by way of written submissions, with an opportunity to comment on the submissions of others.

4.6.2 Guidelines for Submission for Phase 2

Appendix III of Hearing Order GH-2-85 included guidelines for submissions to Phase 2. At the time it issued the Hearing Order, the Board invited interested parties to submit comments on these guidelines.

Several respondents indicated that they would like to make additional comments after the publication of the Board's report on Phase 1.

In a letter dated 11 October 1985, the Board indicated that it would issue revised guidelines for Phase 2 for comment after the conclusion of Phase 1. These will be issued as necessary.

Chapter 5

Disposition

The foregoing chapters set forth our Reasons for Decision and our Decision in the matter of Phase 1 of the Gas Export Omnibus Hearing, 1985.

W.A. Scotland
Presiding Member

W.G. Stewart
Member

A.B. Gilmour
Member

Ottawa, Ontario
April 1986

Appendix I

Board Letter of 1 August 1985 and Hearing Order GH-2-85

File No. 1539-7

1 August 1985

To: Holders of Gas Export Licences, Governments, Associations, and Other Interested Parties,
listed in Appendix I of Hearing Order GH-2-85

Re: Gas Export Omnibus Hearing, 1985

Dear Sirs:

On 30 May 1985 the Board sent a letter (copy attached as Appendix II to the attached Hearing Order) to holders of gas export licences, governments, associations, and other interested parties. This letter requested views by 30 June 1985 on the timing, format, and content of a proposed hearing to review the procedures the Board uses to determine the quantity of natural gas surplus to reasonably foreseeable Canadian requirements and hence available for export, and to consider expected applications to export gas.

The Board thanks all those who replied. Copies of all the responses have been sent to every submitter with a covering letter dated 15 July 1985.

The Board, having reviewed the responses, has now decided to use a phased approach similar to the omnibus hearing conducted in 1982.

Phase 1 (the Surplus Determination Procedures Phase) of the public hearing will begin Monday 18 November 1985 in the Ballroom, Holiday Inn Downtown, 708-8th Ave S.W., Calgary, Alberta, at 9:30 am. The hearing will continue in the Board's Hearing Room, 473 Albert St., Ottawa, Ontario, on Monday 2 December 1985 at 1:00 p.m.

In Phase 1, the Board will review the procedures it uses for determining the surplus of natural gas available for export. It will examine the continuing appropriateness of existing procedures and possible changes to these procedures. A detailed list of some of the specific issues which the Board expects to address is included in the attached Hearing Order.

Interested parties should note that certain matters will not fall within the ambit of this hearing. These concern principally matters consequent upon the Gas Export Omnibus Hearing, 1982. They include:

- i) exports of liquefied natural gas by Canada LNG Corporation to Japan, for which licence GL-76 was granted in 1983 and on which a hearing is underway on an application for a certificate to construct and operate the related facilities;

- ii) applications for amendments to export licences issued in 1983 which seek an extension of the licences but no change in the total volumes already licensed and for which a separate hearing has been announced to commence on 18 September 1985;
- iii) applications for certificates for facilities to transport Alberta gas to the northeastern United States for which licences to export were granted in 1983 and for which a separate hearing will be held; and
- iv) matters related to so-called "sunset" clauses in several licences issued in 1983. There is a separate procedure for dealing with these matters. These licences will expire on 31 January 1986 if the conditions in the sunset clauses are not fulfilled. Should the licences expire, the gas which has been reserved for them would become part of any surplus available for new licences.

Interested parties should also note that the Board is inclined to consider in a separate proceeding from this Omnibus Hearing, applications for licences to export natural gas from the Sable Island area in connection with the Venture Gas Project. The Board has sent a letter (copy attached as Appendix V of the attached Hearing Order) inquiring whether there are objections to this procedure and will make its decision in this regard at a later date.

The Board will issue a report at the end of Phase 1 setting forth its findings on surplus determination procedures.

The Board will indicate at a later date the content, format and timing of subsequent phases.

In order that interested parties may be able to begin to prepare their submissions on natural gas supply and demand for Phase 2, the Guidelines for Submissions (Appendix III of the attached Hearing Order) include guidelines for Phase 2. These submissions will likely be required in the spring of 1986. The Board will issue further guidelines regarding submissions to Phase 2 after the completion of Phase 1, if necessary. Interested parties are invited to submit comments on the guidelines for Phase 2 by 16 September 1985.

Yours truly,

Original signed by

G. Yorke Slader
Secretary

Attachment: Hearing Order GH-2-85.

**HEARING ORDER GH-2-85
DIRECTIONS ON PROCEDURE**

Gas Export Omnibus Hearing, 1985

The National Energy Board has decided to hold a Gas Export Omnibus Hearing in phases pursuant to the *National Energy Board Act* and the Regulations made thereunder. In the first phase the Board will examine the procedures it uses to determine the surplus of natural gas available for export.

1. The first phase of the hearing will be referred to as Phase 1 - Surplus Determination Procedures Phase.
2. Attached as Appendix II hereto is a copy of the Board's letter dated 30 May 1985 and the Annex thereto, outlining the background to this matter.
3. A copy of all documentation in this matter will be available for viewing in the Board's Library, Room 962, 473 Albert Street, Ottawa, Ontario, and at the Board's Calgary, Alberta office, 4500-16th Avenue, N.W.
4. Submissions from interested parties to Phase 1 are required to be filed with the Secretary by 21 October 1985, and served on all other parties as soon as possible. Guidelines for submissions are attached as Appendix III. Submissions should include a statement of whether the party wishes to be heard:
 - (i) in Calgary or in Ottawa, and
 - (ii) in English or in French.
5. The Secretary will issue a list of interested parties to Phase 1 shortly after 21 October 1985.
6. Written evidence of interested parties who have filed submissions in Phase 1 pursuant to paragraph 4 is required to be filed with the Secretary by 4 November 1985 and served on all other parties as soon as possible.
7. The public hearing in respect to Phase 1 shall commence in the Ballroom, Holiday Inn Downtown, 708-8th Ave S.W., Calgary, Alberta on Monday, 18 November 1985 at 9:30 a.m., and shall continue in the Board's Hearing Room, 473 Albert St., Ottawa, Ontario, on Monday 2 December 1985 at 1:00 p.m.
8. The National Energy Board will publish a notice of public hearing (attached as Appendix IV) in the following publications:

Publications

Cities

"Times Colonist"	Victoria, British Columbia
"Sun", "Vancouver Province", & "Le Soleil de Colombie"	Vancouver, British Columbia
"Herald"	Calgary, Alberta
"Journal" & "Le Franco-Albertain"	Edmonton, Alberta

"Leader-Post" and "Journal l'eau-vive"	Regina, Saskatchewan
"Winnipeg Free Press"	Winnipeg, Manitoba
"La Liberté"	St. Boniface, Manitoba
"The Globe and Mail", "Star", "Financial Times of Canada", & "The Financial Post"	Toronto, Ontario
"The Citizen" & "Le Droit"	Ottawa, Ontario
"The Gazette", "Le Devoir", & "La Presse"	Montreal, Quebec
"Le Soleil" & "Journal de Québec"	Quebec City, Quebec
"The Daily Gleaner"	Fredericton, New Brunswick
"Telegraph Journal"	Saint John, New Brunswick
"Times-Transcript" & "Le Matin"	Moncton, New Brunswick
"The Chronicle Herald" & "Mail Star"	Halifax, Nova Scotia
"Telegram"	St. John's, Newfoundland
"Guardian"	Charlottetown, Prince Edward Island
"Whitehorse Star"	Whitehorse, Yukon Territory
"News/North"	Yellowknife, Northwest Territories
Canada Gazette	Ottawa, Ontario

9. In Phase 1 of the hearing, the interested parties should be guided by the Board's letter of 30 May 1985 and the Annex thereto, and should be prepared to address at least the following matters:
 - a) The appropriateness of the existing procedures - the reserves formula and the deliverability appraisal - in light of changing circumstances;
 - b) Whether alternative or complementary protection procedures, such as using cost/benefit analysis in both the determination of surplus and the allocation of surplus among applicants, or such as having Canadian protection emanate from long term Canadian purchase contracts at the distributor level, would better serve the Canadian public interest;
 - c) The consideration to be given to the cost and adequacy of security of supply; e.g., should the surplus determination procedures take into account any tradeoff between protection of domestic requirements and the benefits from exporting gas and, if so, how;
 - d) Whether surplus should be determined nationally or by region;
 - e) The treatment to be accorded frontier gas reserves;

- (i) in the frontier areas north of 60° latitude,
 - (ii) off the east coast;¹
- f) The consideration to be given to reserves additions;
- g) The allowance to be made in the Board's surplus determination procedures for reasonably foreseeable Canadian requirements, including the role of changes in natural gas prices in matching demand and supply;
- h) The allowance to be made in the Board's surplus determination procedures for existing natural gas export licences;
- i) The effect of any proposed revision to surplus determination procedures on the relative emphasis being placed on exploration for new reserves and development of existing reserves to increase productive capacity;
- j) The appropriateness of the existing limitation on the volume of natural gas which may be authorized for export under short-term orders;
- k) Other Phase 1 matters referred to in Appendix III: Guidelines for Submissions; and
- l) any other relevant matter raised by parties.

During Phase 1 the Board will also consider the views of parties on alternative ways of proceeding with Phase 2. Respondents to the Board's letter of 30 May 1985 suggested the following alternatives:

- i) a full public hearing,
- ii) written submissions, with opportunity to comment in writing on the submissions of others, or
- iii) informal, individual meetings to discuss submissions in addition to (ii) above.

Comments on the guidelines for Phase 2 in Appendix III should be filed with the Secretary by 16 September 1985.

- 10. A public hearing in respect of any later phase(s) shall commence on a date(s) and at a locations to be announced by the Board.
- 11. Where parties are directed by these Directions on Procedure to file or serve documents on other parties, the following shall apply:
 - (i) for documents to be filed with the Board, provide 30 copies; and
 - (ii) for documents to be served on other submitters, provide 1 copy.
- 12. The procedures to be followed in this proceeding shall, unless the Board otherwise directs, be governed by the Draft NEB Rules of Practice and Procedure dated 18 February 1985.

¹ The Board, in a letter dated 29 July 1985 (copy attached as Appendix V), has indicated that it is inclined to consider the Venture Gas Project in a separate proceeding from this Omnibus Hearing, subject to there being no compelling objections.

Original signed by

G. Yorke Slader
Secretary

Appendix I - List of Addressees

Appendix II - Letter from the Board dated 30 May 1985

Appendix III - Guidelines for Submissions

Appendix IV - Notice of Public Hearing

Appendix V - Letter from the Board dated 29 July 1985 re the Venture Gas Project

**Appendix I to Hearing Order GH-2-85
(Gas Export Omnibus Hearing, 1985)**

List of Addressees

Licence Holders

Alberta and Southern Gas Co. Ltd.
Canada LNG Corporation
Canadian-Montana Pipe Line Company
Columbia Gas Development of Canada Ltd.
Consolidated Natural Gas Limited
Dome Petroleum Limited
ICG Utilities (Canada) Ltd.
KannGaz Producers Ltd.
Niagara Gas Transmission Limited
Pan-Alberta Gas Ltd.
ProGas Limited
Sulpetro Limited
TransCanada PipeLines Limited
Transcontinental Gas Pipe Line Corporation
Union Gas Limited
Westcoast Transmission Company Limited

Governments

Province of British Columbia
 Attorney General
 Minister of Energy, Mines and Petroleum Resources
Province of Alberta
 Attorney General
 Alberta Energy and Natural Resources
Alberta Energy Resources Conservation Board
Province of Saskatchewan
 Attorney General
 Minister of Energy and Mines
Province of Manitoba
 Attorney General
 Minister of Energy and Mines
Province of Ontario
 Attorney General
 Ministry of Energy
Province of Quebec
 Procureur général du Québec
 Ministère de l'énergie et des Ressources
Province of New Brunswick
 Attorney General
 Minister of Natural Resources
 Energy Secretariat
Province of Nova Scotia
 Attorney General

Minister of Mines and Energy
Government of Newfoundland and Labrador
Attorney General
Minister of Mines and Energy
Province of Prince Edward Island
Attorney General
Minister of Energy and Forestry
Northwest Territories
Department of Justice and Public Services
Energy, Mines and Resources Secretariat
Yukon Territory
Department of Justice

Associations

Canadian Gas Association
Canadian Petroleum Association
Consumers' Association of Canada
Independent Petroleum Association of Canada
Industrial Gas Users Association

Other Interested Parties

Alberta Petroleum Marketing Commission
Amoco Canada Petroleum Company Limited
Anderson Exploration Ltd.
Bralorne Resources Limited
British Columbia Petroleum Corporation
British Columbia Hydro and Power Authority
B.P. Canada Inc.
B.P. Exploration Canada Limited
Canadian Hunter Exploration Ltd.
Canadian Superior Oil Ltd.
Canadian Western Natural Gas Company Limited
Canterra Energy Ltd.
Chevron Canada Ltd.
Chevron Standard Ltd.
Cigas Products
Cominco
Czar Resources Ltd.
Esso Resources Canada Limited
Foothills Pipe Lines (Yukon) Ltd.
Gaz Inter-Cité Québec Inc.
Gaz Métropolitain, inc.
Gulf Canada Limited
Gulf Canada Resources, Inc.
Home Oil Company Limited
Husky Oil Operations, Limited
Imperial Oil Limited
Inland Natural Gas Co. Ltd.
Inter-City Gas Corporation
Mobil Oil Canada, Ltd.

Murphy Oil Company Ltd.
Norcen Energy Resources Limited
Northridge Petroleum Marketing Inc.
Northern and Central Gas Corporation Limited
Northern Border Pipeline Company
NOVA, AN ALBERTA CORPORATION
Nova Scotia Resources (Ventures) Limited
Ocelot Industries Ltd.
Ontario Mining Association
PacGas Limited
PanArctic Oils Ltd.
PanCanadian Petroleum Limited
Petro-Canada Inc.
PetroGas Processing Ltd.
Petromont Inc.
Petrosar
Polar Gas Project
Sable Gas Systems
Saskatchewan Power Corporation
Shell Canada Limited
Shell Canada Resources Ltd.
Société Québécoise d'initiatives pétrolières (SOQUIP)
Soloway, Wright, Houston, Greenberg, O'Grady, Morin (on behalf of Tennessee Gas
Pipeline Company and MidWestern Gas Transmission Company)
Stone Petroleums Ltd.
Suncor, Incorporated
Texaco Canada Resources Ltd.
The Consumers' Gas Company Ltd.
Turbo Resources Limited
Ultramar Canada, Incorporated
Union Carbide Canada Limited
Vector Energy Systems Ltd.

**Appendix II to Hearing Order GH-2-85
(Gas Export Omnibus Hearing, 1985)**

File No.: 100-3
30 May 1985

To: Holders of Gas Export Licences, Governments, Associations, and Other Interested Parties, as per attached list

Dear Sirs:

Re: Natural Gas Export Licensing Procedures

The National Energy Board last reviewed its natural gas export licensing procedures in 1982 during Phase 1 - The Review Phase of the Gas Export Omnibus Hearing, 1982. The Board's May 1982 report on that review formed the basis for the subsequent determination of surplus and its allocation among applicants. That determination and allocation were set forth in the Board's Reasons for Decision of January 1983.

Circumstances have changed since 1982. Also the Board is aware that certain applications to export gas, some of it located in frontier areas, are likely to be filed in the near future. The Board thinks it would be timely to conduct another review of its surplus determination procedures as a necessary prelude to the consideration of such applications.

The purpose of this letter is to elicit the views of addressees as to how best to undertake the review of surplus procedures and the consideration of the aforementioned applications to export gas.

It appears to the Board that the phased approach followed in the Gas Export Omnibus Hearing of 1982 might lend itself to the upcoming review. The Board would like to have the views of addressees on the following suggested phasing of the subject matter.

Phase Subject Matter

- 1 Surplus Procedures
- 2 Surplus
- 3 Surplus Allocation
- 4 Certificates for Export Facilities

Phase 1 would deal with the procedures the Board uses to determine surplus. It would examine the continuing appropriateness of existing procedures and possible changes to these procedures. On the demand side, it would deal with such issues as the allowance to be made for reasonably foreseeable Canadian requirements and for existing export licences. On the supply side, key issues would be the treatment to be accorded frontier gas reserves and the need for determination of surplus by region. The Board would issue a report at the end of Phase 1 setting forth its findings on surplus procedures.

Phase 2 would determine the amount, if any, of surplus available for export, based upon the procedures set out in the Board's findings pursuant to Phase 1 and on evidence filed on gas supply and demand.

Phase 3 would deal with the allocation of any surplus among competing applicants. Here the Board would expect to consider applications for amendments and extensions to existing licences, and applications for new licences to export gas from conventional producing areas and from frontier areas.

Phase 4 would consider applications for any new pipeline facilities required to effectuate exports licensed as a result of Phase 3.

The Board estimates that in cases where new pipeline capacity is needed, regulatory review of export proposals at the federal and provincial or state level in Canada and the United States and the construction of pipeline facilities would take at least three years. This means that even if the Board commences its consideration of new gas exports this fall, it is unlikely that the first flow of any surplus gas through new pipeline facilities could take place before the end of 1988.

Given this timetable, the Board would appreciate receiving, by 30 June 1985, your views on the approach to the review of gas export licensing procedures and export applications set out in this letter. If you believe another approach has merit, please outline such an approach and set out your rationale. The Board also wishes your views on the feasibility of commencing a Phase 1 hearing to review surplus procedures in the fall of 1985, i.e. September/October, 1985.

An annex to this letter lists issues, concerns and questions which the Board will wish to see addressed at any review of its surplus determination procedures. The Board wishes to receive any views of addressees, as part of their response to this letter, whether these and/or other issues should be considered in the Phase 1 hearing.

As a footnote, for purposes of clarification, the Board wishes to advise addressees that certain matters will not fall within the ambit of the review contemplated above. These concern principally matters consequent upon the Gas Export Omnibus Hearing, 1982. They include:

- i) Canada LNG export to Japan, for which a licence was granted in 1983 and on which a hearing is underway on a certificate for facilities;
- ii) Alberta Gas to the Northeast, for which licences were granted in 1983 and for which applications for certificates for facilities have been received; and
- iii) Sunset clauses in licences issued in 1983. There is a separate procedure for dealing with the sunset clauses which would cause the licences to expire on 31 January 1986 if the conditions have not been fulfilled. Should the licences expire, the gas which has been reserved for them would become part of any surplus available for new licences.

Yours truly,

Original signed by

G. Yorke Slader,
Secretary

Attachments:

Annex
List of Addressees

ANNEX TO THE BOARD'S LETTER DATED 30 MAY 1985 ON NATURAL GAS EXPORT LICENSING PROCEDURES

ISSUES RELATED TO NATURAL GAS SURPLUS PROCEDURES

This Annex outlines a number of issues which interested parties might wish to consider in the natural gas Phase 1 hearing which would assess the method of determining surplus. The list of issues outlined is not intended to be exhaustive nor has the Board determined that the issues outlined here should necessarily be considered. Rather the Board is now seeking views as to the nature of the issues which might be considered in any hearing it might decide to hold.

Section 83 of the *National Energy Board Act* requires the Board to determine the quantity of natural gas surplus to reasonably foreseeable Canadian requirements. In considering issues related to the Board's surplus determination tests it is pertinent to note that in determining exportable surpluses, the Board has, since its early days, used a reserves formula. During the 1970s it became increasingly clear that deliverability considerations were also relevant and these were formally incorporated in the Board's surplus determination procedures in 1979.¹

The surplus tests which currently exist were formulated as a result of Phase 1 of the 1982 Omnibus Gas Hearing. The May 1982 Report states:

"Findings of the Board on Surplus Determination Procedures

Having considered the evidence presented, the Board has decided to modify its surplus determination procedures and in so doing, reiterates its belief that its determination of surplus must continue to take account of both the reserves and deliverability aspects of supply. The modifications are as follows:

The Reserves Formula

The Board will make a modification to its Current Reserves Test, which will be renamed the Reserves Formula. The Board will continue to compare the established reserves base with 25 times the current year's Canadian demand (25A1), but in making allowance for exports under existing licences, the Board will set aside the maximum quantities exportable under existing licence conditions. Previously the remaining term quantities in the licences had been used whether exportable or not. The Reserves Formula will be the means of determining the maximum amount of surplus available for export...

Deliverability Appraisal

The Board will make one evaluation comparing its best estimates of future supply and demand rather than applying the two tests previously used. The supply and demand information to be used in this new Deliverability Appraisal will include the following:

- deliverability from established reserves,
- deliverability from established reserves plus future reserves additions,
- expected Canadian requirements, and
- estimated exports under existing licenses."

¹ Canadian Natural Gas Supply & Demand Requirements, February 1979.

Thus far cost benefit analysis has not been used in the determination of surplus. In the 1979 and 1982 Hearings the Board did, however, assess the potential net benefits to Canada of its export allocation including the impact on Canada of having to use higher cost gas earlier as a result of increased exports. Cost-benefit analysis was also used in the allocation of surplus among competing applications.

The Board has maintained a flexible approach to surplus determination over the years and has modified its procedures to reflect changing conditions in the gas industry.

The Board is aware of the concern which exists about the impact its current tests could have on domestic prices should a more market-oriented domestic pricing policy be put in place. Such a pricing policy is currently being negotiated.

Though the Board at this time has no definitive views on these matters, it seems that there are a number of issues which interested parties might wish to consider:

- (i) In a market-sensitive domestic pricing system, such as is contemplated by the Western Accord, the price of natural gas in Canada may tend to be lower the greater is the protection of Canadian requirements provided by the surplus tests. In view of this relationship between surplus tests and market-sensitive domestic prices are the current surplus tests appropriate?
- (ii) How should allowance be made for reasonably foreseeable Canadian requirements of gas?
- (iii) Is there a continuing need for a reserves test and, if so, what criteria should be used? In assessing the desirability and prospective nature of a reserves test respondents may wish to bear in mind a number of considerations:
 - For many years the Board's reserves test has required that 25 times annual domestic demand plus remaining previously authorized exports be satisfied from established reserves before new exports were allowed. The multiplier of 25 related to the term of export licences issued in the Board's early years, as long licence terms were required to finance new facilities. The intention was to retain for domestic markets a degree of supply security at least equal to that provided to export markets.
 - The current reserves formula takes no account of trends in the discovery of or requirements for gas in Canada.
 - It was considered that both a reserves test and a deliverability appraisal were complementary in order to have an appropriate balance between the finding of new reserves and the development of deliverability.
- (iv) Is there a continuing need for a deliverability appraisal and, if so, how should it be structured?
 - A supply/demand profile has the virtue of showing the amounts of natural gas expected to be physically available to and demanded by Canadians in the absence of further authorized exports and in light of prospective economic and geological conditions.
 - The deliverability appraisal used by the Board suggests that at some future time domestic demand would exceed supply. However, a market-sensitive pricing policy would allow adjustment in supply and demand to occur through the pricing mechanism. Would the establishment of a market-sensitive pricing policy in Canada affect the nature of any deliverability appraisal?

- (v) Should the Board consider frontier reserves in its surplus determination procedures at this time and, if so, should they be incorporated as part of a Canada wide or regional surplus determination?
- (vi) In 1983 it was determined using a cost-benefit approach (reported in the 1983 Omnibus Report) that the gas exports licensed by the Board at that time would yield significant net economic benefits to Canada. This implies that there could have been benefits foregone as a result of export controls.

Larger amounts were not licensed for export due to uncertainty in the outlook. Implicitly these foregone benefits represent the premium Canadians pay to ensure security of supply to Canadian consumers. The Board's existing procedures for determining the surplus for export do not deal explicitly with the trade-off between increased exports and reduced security of supply. In light of changing circumstances and in view of the increasing role for price in balancing supply and demand for natural gas, how should the Board assess the cost and adequacy of security of supply?

The Board recognizes that, predominantly, the physical aspects of surplus have been considered in the past. It is now inquiring whether future prices and costs of supply should be given more explicit consideration in the next hearing.

The Board would appreciate any views of addressees, as part of their response to the Board's letter, as to whether these and/or other issues should be considered in the proposed hearing.

Natural Gas Export Licensing Procedures

Addressees to the Board's Letter Dated 30 May 1985

Licence Holders

Alberta and Southern Gas Co. Ltd.
Canada LNG Corporation
Canadian-Montana Pipe Line Company
Columbia Gas Development of Canada Ltd.
Consolidated Natural Gas Limited
Dome Petroleum Limited
ICG Transmission Holdings Ltd.
KannGaz Producers Ltd.
Niagara Gas Transmission Limited
Pan-Alberta Gas Ltd.
ProGas Limited
Sulpetro Limited
TransCanada PipeLines Limited
Transcontinental Gas Pipe Line Corporation
Union Gas Limited
Westcoast Transmission Company Limited

Governments

Province of British Columbia
Attorney General
Minister of Energy, Mines and Petroleum Resources

Province of Alberta
Attorney General
Alberta Energy and Natural Resources
Alberta Energy Resources Conservation Board

Province of Saskatchewan
Attorney General
Minister of Mineral Resources

Province of Manitoba
Attorney General
Minister of Energy and Mines

Province of Ontario
Attorney General
Ministry of Energy

Province of Quebec
Procureur général du Québec
Ministère de l'énergie et des Ressources

Province of New Brunswick
Attorney General
Minister Responsible for Energy Policy
Energy Secretariat

Province of Nova Scotia
Attorney General
Minister of Mines and Energy

Government of Newfoundland and Labrador
Attorney General
Minister of Mines and Energy

Province of Prince Edward Island
Attorney General
Energy and Mineral Resources

Northwest Territories
Department of Justice and Public Services
Energy, Mines and Resources Secretariat

Yukon Territory
Department of Justice

Associations

Canadian Gas Association
Canadian Petroleum Association
Consumers' Association of Canada
Independent Petroleum Association of Canada
Industrial Gas Users Association

Other Interested Parties

Alberta Petroleum Marketing Commission
Amoco Canada Exploration Limited
Anderson Exploration Ltd.
Bralorne Resources Limited
British Columbia Petroleum Corporation
B.P. Canada Inc.
B.P. Exploration Canada Limited

Canadian Hunter Exploration Ltd.
Canadian Superior Oil Ltd.
Canadian Western Natural Gas Company Limited
Canterra Energy Ltd.
Chevron Canada Ltd.
Chevron Standard Ltd.
Cigas Products
Czar Resources Ltd.
Esso Resources Canada Limited
Foothills Pipe Lines (Yukon) Ltd.
Gaz Inter-Cité Québec Inc.
Gaz Métropolitain, inc.
Gulf Canada Limited
Gulf Canada Resources, Inc.
Home Oil Company Limited
Husky Oil Operations, Limited
Imperial Oil Limited
Inland Natural Gas Co. Ltd.
Inter-City Gas Corporation
Mobil Oil Canada, Ltd.
Murphy Oil Company Ltd.
Norcen Energy Resources Limited
Northridge Petroleum Marketing Inc.
Northern and Central Gas Corporation Limited
NOVA, AN ALBERTA CORPORATION
Ocelot Industries Ltd.
PacGas Limited
PanArctic Oils Ltd.
PanCanadian Petroleum Limited
Petro-Canada Inc.
PetroGas Processing Ltd.
Petromont Inc.
Petrosar
Polar Gas Project
Saskatchewan Power Corporation
Shell Canada Limited
Shell Canada Resources Ltd.
Société Québécoise d'initiatives pétrolières (SOQUIP)
Suncor, Incorporated
Texaco Canada Resources Ltd.
The Consumers' Gas Company Ltd.
Turbo Resources Limited
Ultramar Canada, Incorporated
Union Carbide Canada Limited
Vector Energy Systems Ltd.

Appendix III to Hearing Order GH-2-85 (Gas Export Omnibus Hearing, 1985)

Guidelines for Submissions

The Board requests that parties use, where applicable, the following guidelines in the preparation of submissions. All submissions shall be expressed in SI units.

Submitters may incorporate by reference any submissions or portions of submissions made to the Board

- (i) in connection with the Board staff study:

Canadian Energy Supply and Demand 1983-2005 - Summary Report and Technical Report, September 1984, or

- (ii) in response to the Board's letter of 30 May 1985, or
- (iii) in previous hearings.

All communications, including submissions, should be addressed to the Secretary of the Board at 473 Albert St., Ottawa, Ontario K1A 0E5, (Telex NEB OTT 053-3791). Copies of Board publications or other material can be obtained by writing the Secretary or by telephoning the Board's distribution centre at (613)-998-7204. Inquiries should be directed to the Board's Information Services: (613)-993-6936.

Phase 1 - Surplus Determination Procedures Phase

Submitters should explain the rationale for any proposed changes in the surplus determination procedure, taking into account that a surplus determination procedure should have as many of the following characteristics as possible:

- (1) It should be easily understood and applied.
- (2) It should be flexible to respond to changing circumstances.
- (3) It should provide continuing protection for Canadian requirements throughout any period of export.
- (4) It should take into account gas deliverability and reserves, and trends in the discovery of gas in Canada in the supply considerations.
- (5) It should be compatible with market-sensitive pricing.

Interested parties are asked to illustrate, numerically where possible, the effect of any proposed changes in the surplus determination procedure, compared with a continuation of the existing procedure, on:

- i) surplus
- ii) domestic natural gas prices, supply, and demand, assuming market-sensitive pricing, and
- iii) the adequacy of Canadian security of supply and its cost in terms of potential foregone benefits to Canada.

In developing illustrative examples of the effects of proposed surplus determination procedures submitters may wish to refer to the Board staff study:

Canadian Energy Supply and Demand 1983-2005, September 1984, (Technical Report, pages 55 to 67 and referenced tables).

Phase 2 - Surplus Determination Phase

Submissions to Phase 2 will likely be required in the spring of 1986. The Board is providing a guideline for submissions for Phase 2 at this time in order that parties may begin preparing their submissions on natural gas supply and demand as a basis for the eventual determination of surplus. The Board will, if necessary, issue further guidelines on submissions to Phase 2 after the completion of Phase 1. Interested parties are invited to submit comments on these guidelines to the Board by 16 September 1985.

Submitters are encouraged to provide base case projections of marketable¹ natural gas supply and demand, as detailed below, assuming no change to existing export authorizations, for what they consider the most likely scenario of natural gas prices, and to comment upon the uncertainties or risks associated with their base case. In addition, the Board urges submitters to bracket their base case projections with high and low cases reflecting a plausible range of deviation. Submitters are asked to state all assumptions for each of the base, high, and low cases, including:

- (a) for Canadian markets
 - (i) general economic assumptions,
 - (ii) domestic gas pricing policy,
 - (iii) gas prices and other energy prices,
 - (iv) the social costs² of exploring for and developing natural gas and other energy forms in conventional and frontier areas,
 - (v) levels of drilling, and
 - (vi) rates of connecting reserves to pipelines;
- (b) for United States markets
 - (vii) United States policies regarding natural gas imports,
 - (viii) U.S. natural gas prices,
 - (ix) prices for Canadian natural gas exports,
 - (x) the duration of the U.S. deliverability surplus,
 - (xi) the long term outlook for the demand for gas in the U.S.,
 - (xii) the expected commencement of the new exports to the U.S. northeast licensed as a result of the 1983 Omnibus decision,
 - (xiii) the reliance of the United States on other than domestic or Canadian gas supplies,
 - (xiv) the quantities of Canadian natural gas exports to the United States under existing export authorizations;

¹ Marketable gas is the gas available to the transmission line after any removal of certain hydrocarbon and non-hydrocarbon compounds present in the raw volumes produced from the reservoir, and after allowance has been made for field and plant fuel and losses.

² Social costs include only the incremental real resource costs which will be incurred in undertaking new exploration and development activity. As such, they do not include a return on past investments which are considered as "sunk". Also, they do not include taxes or royalties, which are not costs from the perspective of Canada as a whole, except to the extent these are captured in the social discount rate. Submitters are referred to "Board Staff Notes on the Estimation of the Social Cost of Canadian Natural Gas", Dec. 1984, available on request.

- (c) for Japanese markets
 - (xv) the expected commencement of the LNG exports to Japan licensed as a result of the 1983 decision,
 - (xvi) the quantities of Canadian natural gas exports to Japan under existing export authorizations.

Assumptions underlying supply and demand estimates should of course be consistent.

In the event of a market sensitive domestic pricing regime, domestic gas prices and, therefore, demand may vary depending on the level of new exports. The Board also invites comments on or estimates of how domestic gas prices and demand might be affected, if at all, by new export authorizations. Submitters are also requested to provide their assessment of how gas export prices might vary, if at all, with the level of new exports.

A. SUPPLY OF NATURAL GAS IN CANADA

Submissions should address all aspects of natural gas supply in Canada, including the following:

- Reserves currently available, i.e. established reserves;
- Expected reserves additions and ultimate potential;
- Productive Capacity¹

Estimates should be provided in exajoules for the following:

1. Reserves

(a) From Conventional Sources

For each producing province:

- (i) an estimate of initial and remaining reserves, as at 31 December 1984;
- (ii) a schedule of anticipated additions to reserves in each year from 1985 to 2010;
and
- (iii) an assessment of ultimate potential.

In addition, producing companies are invited to submit estimates of established reserves for pools which they operate or in which they have a major interest. Transmission companies and other gas purchasers with the requisite information are asked to provide estimates of established reserves for pools from which they have contracted gas or expect to do so in future, together with reserves summaries for their respective supply areas and, when possible, by province.

The Board invites comments on the degree to which small non-producing pools in Alberta are connectable to pipeline under current economic conditions, or will prove connectable by 2010. The Board estimates there are approximately 12,500 such pools with total estimated reserves of 18 exajoules, 80 percent of which have been assigned reserves of less than 1 petajoule.

(b) From Non-Conventional Sources

¹ Productive Capacity is defined as the estimated rate, expressed at standard conditions of temperature and pressure, at which natural gas can be produced from a well, pool of defined geographical area, unrestricted by demand, having regard for reservoir characteristics, economic considerations, contractual and regulatory limitations, the availability of gathering, processing and transmission facilities, and incorporating an allowance for downtime.

An estimate of the sources, geographical location, and supply potential of natural gas from non-conventional sources, including synthetic natural gas and natural gas from very low permeability reservoirs, in each year from 1985 to 2010, together with the economic justification for the levels of supply forecast;

(c) From Frontier Areas

An estimate of reserves and expected dates of commencement of production of natural gas discovered in each of the frontier areas, including views regarding the problems and concerns envisaged with respect to such matters as project timing, economic factors affecting rate of development, and market opportunities;

Operators and major interest owners of frontier pools are urged to provide as much information on the subject as possible, including projections of reserves additions, in order that a realistic assessment of future frontier supply can be made.

2. Productive Capacity

Estimates of the annual productive capacity in petajoules for the years 1985 to 2010 of gas reserves by transmission system or province.

The Board would prefer that a pool by pool forecasting technique be used by those submitters who have access to the requisite data base. Submitters should outline the technique used to forecast productive capacity, and state all major assumptions used in the forecast, including connection rates and production profiles for uncommitted reserves and reserves additions, and forecasts for deferred reserves. Wherever possible the Board would appreciate receiving basic data used in the forecasts, especially data for new pools, pools which have had recent development, and pools on which the data have not been previously submitted to the Board.

Submitters are also asked to provide their estimates of the associated aggregate annual by-product (ethane, propanes, butanes, pentanes plus, and sulphur) revenues, or, preferably, the annual stream of individual by-product volumes and revenues.

B. DOMESTIC DEMAND FOR GAS

Submitters are encouraged to present estimates of gas demand in the context of a total energy forecast. Submitters using such an approach are requested to provide a breakdown of Canadian energy demand by energy type including renewable energy. In order to facilitate comparison of the submitted projections, all submitters are requested to make explicit their basic forecast assumptions with respect to such variables as economic growth, population growth, relative prices of various energy types, market shares and expansion of existing transmission systems. Where submitters have assumed the expansion of existing transmission systems or construction of new systems, they are asked to provide explicit detail on penetration of natural gas and displacement of other fuels in the markets served by these new or expanded systems.

All projections of energy demand should be expressed in petajoules.

Details of Natural Gas Demand

For each of the base case and alternatives, submitters are requested to provide projections of domestic requirements for marketable gas by province for each of the years 1985 through 1990, and for 1995, 2000, 2005, and 2010, with actual data for 1984, in the following format:

(a) By Sector for End Use and Primary Demand

End Use Demand

1. Residential;
2. Commercial;
3. Petrochemicals, including fuel and feedstock for basic petrochemicals such as ammonia, methanol and ethylene and fuel for their primary derivatives;
4. Other industrial uses, excluding thermal generation of electricity;
5. Transportation (NGV);
6. Other non-energy use;
7. Total end use demand which is the sum of sectors (1) through (6);

Primary Demand

8. Own use and losses, including transmission and distribution fuel and losses;
9. Natural gas used for generation of electricity and production of steam by utilities and by industry;
10. Gas used as a fuel in gas reprocessing (straddle) plants;
11. Gas shrinkage in gas reprocessing (straddle) plants;
12. Net sales which are the sum of items (7) and (9) above;
13. Primary Demand which is the sum of items (8),(10)and(12)above;
14. Domestic Demand which is the sum of items (11) and (13).

(b) Geographic Regions:

1. Atlantic (by province to the extent practicable)
2. Quebec
3. Ontario
4. Manitoba
5. Saskatchewan
6. Alberta
7. British Columbia, Yukon and N.W.T.
8. Total Canada

(c) By sector and region as indicated in the matrix format attached.

Although submitters are requested to provide forecasts of only natural gas demand, they are asked to include in their submissions details on relative energy prices, total energy demand, and market shares of other energy forms to permit evaluation of natural gas demand in the context of total energy requirements.

C. NATURAL GAS EXPORTS UNDER EXISTING LICENCES

Submitters are requested to provide their estimates, in petajoules, for currently authorized natural gas exports, of the quantities which they expect will be exported in each calendar year by province of origin of the gas.

Licence holders, in addition, are requested to provide a forecast of the quantities which they expect will be exported in each calendar year under each of their own existing licences.

MATRIX FORMAT FOR DEMAND FORECAST

Marketable Natural Gas
(petajoules)

Region

1984 1985 1986 1987 1988 1989 1990 1995 2000 2005 2010
(actual)

Sector Demand

Residential

Commercial

Petrochemicals

Other Industrial

Transportation

Other non-energy

Total End Use

Primary Energy Demand

Own Use

Thermal and Steam
Generation

Reprocessing Fuel

Shrinkage
Reprocessing

Net Sales

Primary Energy
Demand

Domestic Energy
Demand

Appendix IV to Hearing Order GH-2-85

NATIONAL ENERGY BOARD NOTICE OF PUBLIC HEARING GAS EXPORT OMNIBUS HEARING, 1985

The National Energy Board will hold a hearing in phases pursuant to the *National Energy Board Act* and the Regulations made thereunder. The first phase of the hearing, which will be to examine the procedures the Board uses to determine the surplus of natural gas available for export, will start at 9:30 a.m. on Monday, 18 November 1985 in the Ballroom, Holiday Inn Downtown, 708-8th Ave S.W., Calgary, Alberta, and will continue in the Board's Hearing Room, 473 Albert St., Ottawa, Ontario, on Monday 2 December 1985 at 1:00 p.m.

The date(s) and location(s) for later phase(s) will be announced by the Board at a later date.

The hearing will be public and will be held to obtain the evidence and relevant views of interested parties, groups, organizations and companies.

Anyone wishing to participate in the hearing must file a written submission with the Secretary of the Board, and serve a copy on each participant.

The deadline for receipt of written submissions is 21 October 1985. The Secretary will then issue a list of participants.

Information on the procedures for this hearing (Hearing Order GH-2-85) is available in both English and French and may be obtained by writing to the Secretary or telephoning the Board's distribution centre at (613) 998-7204.

Original signed by

G. Yorke Slader
Secretary
473 Albert Street
Ottawa, Ontario
K1A 0E5

1 August 1985

**Appendix V to Hearing Order GH-2-85
(Gas Export Omnibus Hearing, 1985)**

File No.: 1539-7
1550-S-57-1

29 July 1985

TO: All Recipients of and Respondents to the Board's Letter of 30 May 1985, as per the attached list

Dear Sirs:

Re: The Venture Gas Project Applications for Licences to Export Natural Gas

The Board has received applications from Mobil Oil Canada, Ltd., Petro-Canada Inc., Texaco Canada Resources Ltd., and Nova Scotia Resources (Ventures) Ltd. dated 17 July 1985 for licences to export natural gas from the Sable Island area. The Board has also been advised that an additional related application for a natural gas export licence will be filed in the near future by Canterra Energy Ltd. who recently became a participant in the project by virtue of its acquisition of the Scotian Shelf interests previously held by Texas Eastern Exploration of Canada Ltd.

The purpose of this letter is to determine whether there are any objections to a requested separation of a hearing on these applications from the proposed Gas Export Omnibus Hearing. You will recall that in a letter dated 30 May 1985 the Board asked for comments on the timing and format of an Omnibus Hearing to review natural gas export licensing procedures and to consider a number of expected applications for the export of gas. In that letter it was indicated that one of the issues to be considered in Phase 1 of the Omnibus would be the treatment to be accorded frontier gas reserves and the need for determination of surplus by region.

In their responses to the Board's letter of 30 May 1985, the proponents of the Venture Gas Project and the Governments of New Brunswick, Nova Scotia and Prince Edward Island all requested that the Venture Gas Project should be considered in a proceeding separate from the Omnibus. The Board is inclined to accede to this request.

Any objections to the separation of the Venture Gas Project from the Omnibus Hearing, and the reasons for such objections, should be in our hands no later than 12 August 1985.

Yours truly,

Original signed by

G. Yorke Slader
Secretary

Att.

**All Recipients of and Respondents to
the Board's Letter dated 30 May 1985**

Licence Holders

Alberta and Southern Gas Co. Ltd.
Canada LNG Corporation
Canadian-Montana Pipe Line Company
Columbia Gas Development of Canada Ltd.
Consolidated Natural Gas Limited
Dome Petroleum Limited
ICG Utilities (Canada) Ltd.
KannGaz Producers Ltd.
Niagara Gas Transmission Limited
Pan-Alberta Gas Ltd.
ProGas Limited
Sulpetro Limited
TransCanada PipeLines Limited
Transcontinental Gas Pipe Line Corporation
Union Gas Limited
Westcoast Transmission Company Limited

Governments

Province of British Columbia
 Attorney General
 Minister of Energy, Mines and Petroleum Resources
Province of Alberta
 Attorney General
 Alberta Energy and Natural Resources
 Alberta Energy Resources Conservation Board
Province of Saskatchewan
 Attorney General
 Minister of Energy and Mines
Province of Manitoba
 Attorney General
 Minister of Energy and Mines
Province of Ontario
 Attorney General
 Ministry of Energy
Province of Quebec
 Procureur général du Québec
 Ministère de l'énergie et des Ressources
Province of New Brunswick
 Attorney General
 Minister of Natural Resources
 Energy Secretariat
Province of Nova Scotia
 Attorney General
 Minister of Mines and Energy
Government of Newfoundland and Labrador
 Attorney General

Minister of Mines and Energy
Province of Prince Edward Island
Attorney General
Minister of Energy and Forestry
Northwest Territories
Department of Justice and Public Services
Energy, Mines and Resources Secretariat
Yukon Territory
Department of Justice

Associations

Canadian Gas Association
Canadian Petroleum Association
Consumers' Association of Canada
Independent Petroleum Association of Canada
Industrial Gas Users Association

Other Interested Parties

Alberta Petroleum Marketing Commission
Amoco Canada Petroleum Company Limited
Anderson Exploration Ltd.
Bralorne Resources Limited
British Columbia Petroleum Corporation
British Columbia Hydro and Power Authority
B.P. Canada Inc.
B.P. Exploration Canada Limited
Canadian Hunter Exploration Ltd.
Canadian Superior Oil Ltd.
Canadian Western Natural Gas Company Limited
Canterra Energy Ltd.
Chevron Canada Ltd.
Chevron Standard Ltd.
Cigas Products
Cominco
Czar Resources Ltd.
Esso Resources Canada Limited
Foothills Pipe Lines (Yukon) Ltd.
Gaz Inter-Cité Québec Inc.
Gaz Métropolitain, inc.
Gulf Canada Limited
Gulf Canada Resources, Inc.
Home Oil Company Limited
Husky Oil Operations, Limited
Imperial Oil Limited
Inland Natural Gas Co. Ltd.
Inter-City Gas Corporation
Mobil Oil Canada, Ltd.
Murphy Oil Company Ltd.
Norcen Energy Resources Limited
Northridge Petroleum Marketing Inc.

Northern and Central Gas Corporation Limited
Northern Border Pipeline Company
NOVA, AN ALBERTA CORPORATION
Nova Scotia Resources (Ventures) Limited
Ocelot Industries Ltd.
Ontario Mining Association
PacGas Limited
PanArctic Oils Ltd.
PanCanadian Petroleum Limited
Petro-Canada Inc.
PetroGas Processing Ltd.
Petromont Inc.
Petrosar
Polar Gas Project
Sable Gas Systems
Saskatchewan Power Corporation
Shell Canada Limited
Shell Canada Resources Ltd.
Société Québécoise d'initiatives pétrolières (SOQUIP)
Soloway, Wright, Houston, Greenberg, O'Grady,
 Morin (on behalf of Tennessee Gas Pipeline Company
 and MidWestern Gas Transmission Company)
Stone Petroleums Ltd.
Suncor, Incorporated
Texaco Canada Resources Ltd.
The Consumers' Gas Company Ltd.
Turbo Resources Limited
Ultramar Canada, Incorporated
Union Carbide Canada Limited
Vector Energy Systems Ltd.

Appendix II Appearances

J.R. Smith, Q.C.	Alberta and Southern Gas Co. Ltd.
S.C. Lipton	Amoco Canada Petroleum Ltd
D. Hall	BP Resources Canada Limited
D. Austin	British Columbia Hydro and Power Authority
R.E. Wolfe	Canada Geothermal Oil Ltd and Native Canadian Petroleum Association
D. Simmonds	Canadian-Montana Pipe Line Company
S.R. Reid	Carlyle Energy Ltd.
H.M. Kay S.M. McAllister	Consolidated Natural Gas Limited
L.L. Dolecki K.C. Fowlie	Dome Petroleum
J.B. Ballem, Q.C. I. Campbell	Esso Resources Canada Limited
J. Hopwood, Q.C.	Foothills Pipe Lines (Yukon) Ltd.
R. Meunier	Gaz Métropolitain, inc.
E. Bruton	Gulf Canada Limited
W.J. Smart	ICG Resources Ltd.
J.D. Brett P.G. Rogers	ICG Utilities (Manitboa) Ltd. and Greater Winnipeg Gas Company
D.M. Masuhara	Inland Natural Gas Co. Ltd., Columbia Gas Limited and Fort Nelson Gas ltd.
T.M. Hughes	KannGaz Producers Ltd.
D.K. Watkiss	Kern River Gas Supply Corporation & Kern River Gas Transmission Company
H. Soloway, Q.C. N.J. Schultz	Midwestern Gas Transmission Company

E. B. Abbott	
F.M. Saville, Q.C.	Mobil Oil Canada, Ltd.
J.H. Smellie M. Sullivan	Natural Gas Pipeline Company of America
E.R. Elrod	Niagara Interstate Pipeline System
D.G. Davies	Norcen Energy Resources Limited
F. Kelton G. Laidlaw P.F. Scully	Northern and Central Gas Corporation Limited
D.K. Watkiss	Northwest Alaskan Pipeline Company
D.K. Watkiss	Northwest Pipeline Company
M. Veniot	Nova Scotia Resources Limited
J. Hopwood, Q.C.	NOVA, AN ALBERTA CORPORATION
F.R. Foran	Pan-Alberta Gas Ltd.
E. Decter	Petro-Canada Inc.
D. Gibson	Polar Gas Limited
H.R. Ward N. Boutellier	ProGas Limited
S. Carscallen S. Lockwood	Sulpetro Limited
H. Soloway, Q.C. N.J. Schultz E.B. Abbott	Tennessee Gas Pipeline Company, A Division of Tenneco Inc.
W. Muscoby	Texaco Canada Resources Limited
J.E. Weiler	Texas Eastern Transmission Corporation
J.H. Farrell	The Consumers' Gas Company Ltd.
T. Dalgleish M. Brown L. Sloan	TransCanada PipeLines Limited
W.G. Burke-Robertston, Q.C.	Transcontinental Gas Pipe Line Corporation

D. Sulman B. Blackman	Union Gas Limited
D.G. Hart, Q.C.	Venture Gas Project
P.A. Wylie	Vermont Gas Systems, Inc.
J. Lutes S. Taylor	Westcoast Transmission Company Limited
C.K. Yates	Canadian Petroleum Association
K.J. MacDonald C. Baggaley	Consumers' Association of Canada
A.S. Hollingworth	Independent Petroleum Association of Canada
B.A. Carroll	Industrial Gas Users Association
D.C. Edie J. Stein, Q.C.	Alberta Petroleum Marketing Commission
M.M. Moseley	British Columbia Petroleum Corporation
P.G. Jarman H. Eddy	British Columbia, Province of (Ministry of Energy, Mines and Petroleum Resources)
N.D. Shende, Q.C.	Manitoba, Province of (Ministry of Energy and Mines)
D. Keefe	Nova Scotia, Province of (Ministry of Mines and Energy)
J.M. Johnson, Q.C. E.J. Smith C. McCue	Ontario, Province of (Ministry of Energy)
J. Giroux	Québec, Province du (Procureur général)
G. Blue	Saskatchewan, Province of (Ministry of Energy and Mines)
J. Morel H. Soudek	Board Counsel

Appendix III

Abbreviations

Parties

(a) Companies

"Alberta and Southern"	Alberta and Southern Gas Co. Ltd.
"BC Hydro"	British Columbia Hydro and Power Authority
"Canada Geothermal"	Canada Geothermal Oil Ltd. and Native Canadian Petroleum Association
"Canadian-Montana"	Canadian-Montana Pipe Line Company
"Carlyle"	Carlyle Energy Ltd.
"Consolidated"	Consolidated Natural Gas Limited
"Consumers' Gas"	Consumers' Gas Company Ltd.
"Dome"	Dome Petroleum
"Gaz Métro"	Gaz Métropolitain, inc.
"ICG Utilities"	ICG Utilities (Manitoba) Ltd. and Greater Winnipeg Gas Company
"Inland"	Inland Natural Gas Co. Ltd., Columbia Gas Limited and Fort Nelson Gas Ltd.
"KannGaz"	KannGaz Producers Ltd.
"Midwestern"	Midwestern Gas Transmission Company
"Norcen"	Norcen Energy Resources Limited
"Northern and Central"	Northern and Central Gas Corporation Limited
"NOVA"	NOVA, AN ALBERTA CORPORATION and Foothills Pipe Lines (Yukon) Ltd.
"Pan-Alberta"	Pan-Alberta Gas Ltd.
"Petro-Canada"	Petro-Canada Inc.
"Polar Gas"	Polar Gas Limited
"ProGas"	ProGas Limited

"Sulpetro"	Sulpetro Limited
"Tennessee"	Tennessee Gas Pipeline Company, A Division of Tenneco Inc.
"Consumers' Gas"	The Consumers' Gas Company Ltd.
"TransCanada"	TransCanada PipeLines Limited
"Union Gas"	Union Gas Limited
"Venture Gas"	Venture Gas Project
"Vermont Gas"	Vermont Gas Systems, Inc.
"Westcoast"	Westcoast Transmission Company Limited

(b) Associations

"CPA"	Canadian Petroleum Association
"CAC"	Consumers' Association of Canada
"IPAC"	Independent Petroleum Association of Canada

(c) Governments or Government Agencies

"APMC"	Alberta Petroleum Marketing Commission
"BCPC"	British Columbia Petroleum Corporation
"Manitoba"	Manitoba, Province of (Ministry of Energy and Mines)
"NEB" or "the Board"	National Energy Board
"Nova Scotia"	Nova Scotia, Province of (Ministry of Mines and Energy)
"Ontario"	Ontario, Province of (Ministry of Energy)
"Quebec"	Québec, Province du (Procureur général)
"Saskatchewan"	Saskatchewan, Province of (Ministry of Energy and Mines)

Terms

"EJ"	Exajoules (10^{18} joules). One EJ is approximately 0.95 trillion cubic feet.
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"PJ"	Petajoules (10^{15} joules)
"R/P"	Reserves to Production
"RPI"	Reserves/Production Index Maintenance Test proposed by Ontario
"SDI"	Supply/Demand Indicator proposed by TransCanada
"SNG"	Synthetic Natural Gas

Appendix IV

Reference Publications

(i) National Energy Board

December 1985	Reasons for Decision in the Matter of TransCanada PipeLines Limited, KannGaz Producers Limited, Pan-Alberta Gas Limited, ProGas Limited Licence Extensions and Changes to Export Points.
September 1984	Canadian Energy Supply and Demand 1983-2005, Summary Report and Technical Report.
January 1983	Reasons for Decisions in the Matter of Phase II - The Licence Phase, and Phase III - The Surplus Phase of the Gas Export Omnibus Hearing, 1982.
May 1982	Reasons for Decision in the Matter of Phase I - The Review Phase of the Gas Export Omnibus Hearing, 1982.
November 1979	Reasons for Decision in the Matter of Applications under Part VI of the <i>National Energy Board Act</i> of Alberta and Southern Gas Co. Ltd., Canadian-Montana Pipe Line Company, Columbia Gas Development of Canada Limited, Consolidated Natural Gas Limited, Niagara Gas Transmission Limited, Pan-Alberta Gas Limited, ProGas Limited, Sulpetro Limited, Trans-Canada PipeLines Limited, Westcoast Transmission Company Limited.
February 1979	Canadian Natural Gas Supply & Requirements.

(ii) Other

31 October 1985	Agreement among the Governments of Canada, Alberta, British Columbia, and Saskatchewan on Natural Gas Markets and Prices.
28 March 1985	The Western Accord: Agreement between the Governments of Canada, Alberta, Saskatchewan, and British Columbia on Oil and Gas Pricing and Taxation.

Appendix V

Evolution of the Board's Natural Gas Surplus Determination Procedures

This appendix outlines how the Board's surplus determination procedures have evolved over the years. It begins with a few extracts from the report of the 1957 Royal Commission on Energy (Chairman: Mr. Henry Borden) which led to the establishment of the NEB, and some of the discussion relating to the protection of domestic requirements which ensued when the NEB Act was debated in Parliament in 1959.

The Establishment of the NEB

(i) The Borden Report

In October 1957 an Order-in-Council appointed the Borden Commission to "inquire into and make recommendations concerning the policies which will best serve the national interest in relation to the export of energy and sources of energy from Canada". One of the major recommendations of the Borden Commission was that a National Energy Board be established. Other recommendations included the following:

- "that, having regard to the proven reserves of natural gas in Canada and trends in the discovery and growth of reserves, the export from Canada of natural gas, which may from time to time be surplus to the reasonably foreseeable requirements of Canada, be permitted under licence";
- "that an export permit may be granted for a period of not more than 25 years from its date"; and
- "it is clear from the very great differences in market estimates presented to the Commission ... that decisions to export must be based on continuous appraisal of the supply and demand situation as it develops in Canada..."

(ii) Statements: House of Commons

Following the release of the Borden Commission's report, the NEB Act was introduced into Parliament. The following remarks of Mr. Gordon Churchill, then Minister of Trade and Commerce, are indicative of the philosophy of the government of the day regarding the determination of surplus, and how the Board subsequently interpreted its mandate in this regard (House of Commons Debates, Official Report (Hansard), May 22, 1959, p. 3929).

- "The term of export licences is not to exceed 25 years. This upper limit is regarded as the term likely to be required to enable financing of gas export pipelines";
- "Gas and power ... move by fixed channels under long-term contracts at the source and long-term contracts in the area of consumption, so that once committed to a market they cannot be withdrawn without hardship. A gas export service once established must continue for a substantial period to enable the enterprise to attract capital in the first place, and to permit amortization of the necessary investment. Interruption of such export service

is apt to be a source of international friction. Hence there is a clear case for being cautious about permitting exports of any power or gas which we are likely to require ourselves..."

Evolution of NEB Surplus Determination Procedures

(i) Reasons for Decision, March 1960

In March 1960, the Board undertook its first calculations to determine the extent of exportable gas. At that time, two types of surplus were calculated - a Current Surplus and a Future Surplus,

To calculate the Current Surplus the Board first estimated the future requirements for Canadian natural gas by considering:

- (a) future Canadian requirements; estimated by forecasting demand for four years and projecting the fourth year requirement over the remaining years of a 21-year term;
- (b) commitments under then existing export licences; and
- (c) gas required under export applications then being considered by the Board.

The rationale for (a) was as follows:

"The 21 year period 1960 to 1980 has been selected as that for which requirements should be met from presently established reserves. In the case of Alberta, the estimated provincial requirements for the period are met completely from established reserves. This protection for Alberta consumers is a condition of the Government of Alberta before permitting removal of gas from the Province. The requirements elsewhere in Canada have been leveled at the 1963 rate for the balance of the 21 year period. According to evidence filed before the Board, in general it has not been considered practicable for pipe line companies to obtain contracts for the purchase or sale of gas for incremental requirements commencing more than three or four years in the future. Incremental requirements beyond the 1963 level accordingly have been allocated to future discoveries of gas (future reserves). In every case, all requirements accruing after 1980 are assumed to be met from future reserves."

The reserves necessary to satisfy the requirements of the Current Surplus Test were calculated according to a formula which had been developed by Alberta's Oil and Gas Conservation Board (now called the Energy Resources Conservation Board). These were then compared to the Board's estimate of established reserves which were defined to include all proven reserves plus a varying percentage, not exceeding 50 percent, of probable reserves. If this comparison did not indicate a Current Surplus, the export application was rejected. If a Current Surplus did exist, the Board proceeded to determine whether a Future Surplus existed as well.

To calculate the Future Surplus, Canadian requirements were estimated for a 30-year period by forecasting requirements over the full 30-year term rather than assuming annual requirements would not grow beyond the fourth year level. The reserves necessary to satisfy those requirements were estimated in the same manner as for the Current Surplus calculation; however, the Board's estimate of available future gas reserves also included expected additions to reserves. If a comparison of Board estimates of available and required future reserves indicated a surplus, an export application could be approved.

(ii) Reasons for Decision, July 1965

In July 1965 the Board reviewed the surplus procedures which had been articulated in its 1960 report and concluded that its basic approach was still sound. However, the following modifications were made:

- (a) 50 percent of the Alberta and British Columbia reserves then considered to be beyond economic reach were accepted as available to meet Canadian requirements and export commitments;
- (b) reserves not expected to be available for reasons of conservation by the Alberta Oil and Gas Conservation Board were excluded from the calculation of available reserves;
- (c) reserves which had been allocated for the protection of peak-day requirements in the terminal year of an export commitment and which would become available for other use after the termination of the licence were included in the surplus; and
- (d) the Board adopted the practice of the Alberta Board in making allowance for Alberta requirements by setting aside an amount equal to 30 years of requirements less two years growth in reserves to be met from reserves available (established reserves as adjusted by the factors in (a) to (c) above).

(iii) Reasons for Decision, August 1966

The Board's surplus determination procedures were next modified in an August 1966 decision regarding an export application by TransCanada. In that decision, the Board outlined the following principles (which became known as the 25A4 rule) for determining the exportable surplus:

- (a) "Available reserves will include the remaining volumes under existing import Licences, plus contractible reserves. The Board considers contractible reserves to be those established reserves which it believes a purchaser will be able to contract for, with delivery to begin within the next four years."
- (b) "Protection of Canadian gas requirements at an adequate level will be achieved if an amount of reserves equal to 25 times the estimated requirement level for the fourth year is set aside. The multiplier of 25 was selected not only because it appears to the Board to supply adequate protection under presently foreseeable circumstances, but also because it corresponds with the 25-year maximum for export Licences which can be granted by the Board. The fourth-year level was selected because it corresponds with the current policy of the pipe line companies in contracting for the purchase and sale of gas. These contracts provide for a time interval of not more than four years before acceptance and delivery of gas to meet forward requirements."

"In cases where authorization for removal of gas from the province in which it is produced is required by a statute of that province, the amount of protection provided for markets in the province will be the amount set by the province to be its requirement or the amount computed by the above rule, whichever is greater."

- (c) "Canadian market requirements, existing export Licences, and those for which applications are under consideration, will not be given terminal year peak-day protection from established reserves provided that a surplus is indicated by calculating the difference between

- (1) the established reserves plus those indicated by the trends in the growth of reserves, and
- (2) the forecast Canadian requirements over a 30-year period, including terminal year peak-day protection plus export commitments and further, provided that in the opinion of the Board, the trend in the growth of reserves justifies continued confidence."

The application of these principles significantly modified the current surplus calculation. By limiting its consideration to contractible reserves, the Board excluded reserves which were beyond economic reach from its estimate of available reserves. The multiplier in the formula was increased from 21 to 25, and the requirement to meet the peak-day demand in the terminal year was dropped.

The future surplus calculation remained unchanged.

(iv) Reasons for Decision, August 1970

In an August 1970 decision on seven natural gas export applications, the Board liberalized its surplus calculation. Specifically, it allowed 50 percent of reserves beyond economic reach and a part of the reserves deterred for supply conservation by Alberta to be included in its estimate of available reserves which was used to calculate the current surplus. Further, the period of protection provided by the future surplus test was reduced to 20 years from 30.

The Board also concluded that considerations as to future increases in price and lower deliverability suggested a 15-year limit should be placed on "incremental licences to existing export systems". The following reasons were cited:

- "...the Board views with concern the trend to accelerated rate of take, because the shortening of the life index of the remaining available reserves tends to open an increasing gap between that life index and any of the formulae proposed for the protection of Canadian requirements. The corollary of this is that the deliverability showing of the Applicants, in relation to the proposed terms of the export licences they seek, leaves a considerable portion of that term to be provided for out of future discoveries. Strictly on the analysis of gas supply available to the individual Applicants, it appears to the Board that, in respect of companies already in the export business, it is increasingly difficult to justify new licences for periods much in excess of 15 years, and that a shorter period would possibly be more appropriate. A new export system might have to be given a longer initial licence to enable the project to be financed.
- ... if, once the exporting pipe line transmission systems are going concerns, their increments of export throughput were licensed for relatively short terms, United States and Canadian customers would share more equitably in whatever may be the costs of future increments of supply to be committed to Canadian and export markets".
- "An obvious objection to the adoption of approximately 15 years as the normal period for incremental licences for an established exporting company, is that pipe line facilities, gathering facilities and processing facilities, are not normally financible on the basis of sales contracts of less than 20 years... The Board is not convinced that this conventional wisdom is applicable in the case of established pipe line enterprises operating in the current circumstances of the energy market.

- The Board would be prepared to consider further whether licences for periods longer than 15 years are necessary to make feasible the financing of a complete new pipe line system, or a major looping for an existing system".

Some export licences were granted despite the calculation of a small negative "future surplus" and the Board stated it was "essential to emphasize ... the vital importance of an increased rate of discovery if it is to be possible to undertake substantial new exports in the future".

(v) Reasons for Decision, November 1971

In November 1971 in its decision related to additional gas export applications the Board estimated a deficiency of 1.1 Tcf from its current surplus calculation, without taking into account the volumes being considered for export. As a result the export applications were dismissed despite confidence at the time that new discoveries would augment existing reserves beyond the indicated deficiency.

(vi) Canadian Natural Gas - Supply and Requirements, April 1975

Subsequent to the Board's November 1971 decision, there was growing public debate and concern about the outlook for the Canadian natural gas industry and on appropriate policy responses to the industry situation. The Board therefore called a public hearing "to obtain a clearer insight into matters related to Canada's natural gas supply and requirements", and invited submitters to provide an evaluation of the Board's 25A4 gas surplus calculation procedure.

There was virtually unanimous agreement among participants at the hearing that 25A4 no longer adequately protected Canadian requirements and that it appeared "...in light of the changing circumstances now unfolding, that more weight should have been given to deliverability as distinguished from reserves". In considering alternatives to the 25A4 formula, the Board expressed its view that any procedure for determining an exportable surplus should have as many of the following characteristics as possible:

1. It should be easily understood and applied.
2. It should incorporate gas deliverability rather than reserves in the supply considerations.
3. It should be flexible to respond to changing circumstances.
4. It should provide continuing protection for Canadian demand throughout any period of export.
5. It should provide incentive and encouragement to the gas industry.
6. Licensed export commitments should be satisfied to the extent possible.
7. It should reserve for Canadians any benefits from conservation restraints undertaken by Canadians.

At that time, the Board was very concerned about the adequacy of the protection of Canadian requirements given existing export licences and therefore did not anticipate additional export applications in the near future. Given these circumstances the Board decided not to develop a specific surplus determination procedure until it would actually be needed. It did, however, establish the following general principles which could form the basis of a surplus determination procedure in the future:

- "The surplus calculation procedure would be based on gas deliverability and gas demand schedules developed for as far into the future as reasonable forecasting accuracy and data

dependability will permit. The comparison of these two schedules will indicate the feasible volumes, rate and timing of exports".

(vii) Canadian Natural Gas - Supply and Requirements, February 1979

In 1979, following a supply/demand inquiry hearing, the Board defined both a current deliverability test and a future deliverability test in addition to a reserves test.

Under the Current Reserves Test, natural gas could be deemed surplus to the extent that available established reserves were calculated to exceed a quantity equal to 25 times the current year's Canadian demand plus the total authorized exports.

Under the Current Deliverability Test, annual quantities of gas could be deemed to be surplus if forecast annual deliverability from established reserves exceeded expected Canadian demand plus authorized exports for a minimum of five years.

Finally, under the Future Deliverability Test, annual quantities of gas could be deemed to be surplus provided forecast deliverability from established reserves and forecast reserves additions exceeded expected Canadian demand plus authorized exports for some ten years.

The following rationale was given for these tests:

- "The potentially large economic dislocations that could result from unanticipated shortfalls in natural gas deliverability make it imperative that there be a high degree of confidence that deliverability will meet annual Canadian requirements in the immediate future. Such confidence is also necessary to meet the planning requirements of gas distributors. The difficulties that unanticipated reductions in authorized exports would cause export customers make it important to provide similar protection for authorized exports. The Board believes that a test utilizing deliverability from established reserves will provide the requisite high degree of assurance".
- "Tests solely relying on deliverability could lead to excessive industry activity to increase deliverability at the expense of developing new reserves. Therefore the Board believes that a reserves test is necessary to maintain a reasonable relationship between established reserves and deliverability.
- A test utilizing remaining established reserves compared with 25 times projected demand four years in the future introduces the uncertainty of a future projection on the demand side but not on the supply side. A formula based on the current year's demand would be more appropriate and a suitable amount of protection would be afforded by setting aside established reserves to provide coverage of current Canadian demand for a period of 25 years plus authorized exports".
- "The Board believes it is important not only to ensure that requirements be afforded the highly assured protection from established reserves as provided under the Current Deliverability Test but also that a longer period of surplus be foreseen when measuring requirements against forecast deliverability from a combination of established reserves, reserves additions and, when appropriate, new sources of gas such as frontier reserves. It would be necessary, in considering proposed new exports which could meet the Current Deliverability Test and the Current Reserves Test, to ensure that such exports would not result in deficiencies in the longer protection period".

The Future Deliverability Test would be used to

“ensure that any proposed exports, which might otherwise be authorized on the basis of satisfying the first two surplus tests, would not cause a future deliverability shortfall within a 10 year period. Secondly, in any case where the Board finds that it would be in the public interest to grant a licence term in excess of that indicated by deliverability from established reserves, the extended portion of the licence, both with respect to the annual quantities and term would be limited by the projected deliverability from future reserves. All exports under this extended portion of the licence would be subject to reduction, if subsequent deliverability determinations indicated a deficiency within the extended term.”

(viii) Reasons for Decision, May 1982

The most recent changes to the gas surplus test were made following Phase I of the Board's 1982 Gas Export Omnibus Hearing.

Although the procedure of comparing the established reserves base with 25 times the current year's Canadian demand plus licensed exports was continued, the allowance in the Reserves Formula for exports under existing licences was reduced. Rather than continuing to incorporate the remaining term quantities in the licences (whether exportable or not), the new procedure set aside only those quantities considered exportable under existing licence conditions.

Also, the Current and Future Deliverability Tests were combined into a single Deliverability Appraisal which contained features of both the previously employed tests. The Deliverability Appraisal, to be used as a guideline rather than as a test, compared estimates of annual deliverability from both established reserves and future reserves additions, with expected annual Canadian requirements and estimated annual exports under existing licences.

The Board's report stated:

“The Deliverability Appraisal will not contain rigid minimum periods of protection as previously used in the Board's Deliverability Tests. Rather, the Board will use its judgement to determine the annual deliverability profile which may be deemed surplus to Canadian needs. While the Board might authorize exports which exceed the deliverability by minor amounts in any one year, the Board would not expect to exceed the sum of the annual differences between requirements and deliverability over the effective term of the Deliverability Appraisal; that is, in the period to cross-over taking place.

In coming to the above decisions, the Board agrees with submitters that suggested more flexibility is desirable in determining the amount of surplus gas. While the Board will rely on the Reserves Formula to determine the maximum exportable surplus, it will use the Deliverability Appraisal as a guideline rather than as a specific test to determine the annual quantities of gas surplus to foreseeable Canadian requirements. It is not expected that these procedures would result in the authorization for export of all the surplus calculated using the Reserves Formula.”

Appendix VI

Definitions

Conventional Areas	Those areas of Canada which have a long history of hydrocarbon production. Conventional areas are also referred to as non-frontier areas.
Decline Period	The period between the end of the reservoir's flat-life period and abandonment, during which production is decreasing.
Deferred Reserves	Those quantities of established reserves which for a specific reason, usually because of involvement in a recycling or pressure maintenance project, are not yet available for market.
Deliverability	A general term used to refer to an actual or expected rate of natural gas production.
Discounting	The application of a discount rate to obtain the present value of costs and benefits that occur in different years.
Established Reserves	Those reserves recoverable under current technology and present and anticipated economic conditions, specifically proved by drilling, testing or production, plus that judgement portion of contiguous recoverable reserves that are interpreted to exist, from geological, geophysical or similar information, with reasonable certainty.
Flat-Life Period	That period of the producing life of a natural gas reservoir when production is maintained at a constant rate. The flat-life period precedes the onset of production decline.
Frontier Areas	Those areas of Canada which have a potential for, but no history of, natural gas production. These include the Mackenzie Delta - Beaufort Sea area, the Arctic Islands and the east coast offshore areas.
Infill Drilling	The process of drilling additional wells within the defined pool outline of a natural gas or oil pool.
Physical Capability	The maximum rate at which a reservoir can be produced, if restricted only by physical characteristics and well equipment.
Productive Capacity (of natural gas)	The estimated rate at which natural gas can be produced from a well, pool or other entity, unrestricted by demand, having regard to reservoir characteristics, economic considerations, contractual and regulatory limitations, the feasibility of infill drilling and/or addition of compression, the availability of processing facilities and potential losses due to mechanical breakdown.

Rate-of-Take	The average daily rate of production of natural gas related to the volume of established reserves assigned to the reservoir or reservoirs from which the production is obtained. For example, 1:7300 means one unit of production a day for each 7300 units of initial established reserves.
Remaining Established Reserves	Initial established reserves (i.e. established reserves prior to the deduction of any production) less cumulative production.
Reprocessing Shrinkage	The reduction in the quantity of natural gas arising from the removal of natural gas liquids (ethane, propane, butanes, and pentanes plus) at "straddle" or "reprocessing plants located on main gas transmission systems.
Reserves Additions	Incremental changes to established reserves resulting from the discovery of new pools and reserves appreciation.
Reserves Appreciation	Incremental changes to established reserves resulting from extensions to existing pools and/or revisions to previous reserves estimates.
Reserves Beyond Economic Reach	Those established reserves which because of size, geographic location or composition are not considered economically connectable to a pipeline at the present time.
Reserves to Production (R/P) Ratio	Remaining reserves divided by annual production.
Reserves to Production (R/P) Ratio at Productive Capacity.	Remaining reserves divided by annual productive capacity.
User Costs	The cost to Canadians of having to use higher cost gas earlier in the future because of incremental exports.
Western Accord	An agreement between the Governments of Canada, Alberta, Saskatchewan and British Columbia on oil and gas pricing and taxation announced in March 1985.
Western Canada Sedimentary Basin	Generally, those areas of Manitoba, Saskatchewan, Alberta, British Columbia, the Yukon and Northwest Territories underlain by sedimentary rock, between the Precambrian Shield on the east and the mountain ranges of western Canada on the west, and extending from the international boundary north to, but not including, the Mackenzie Delta-Beaufort Sea area.

Appendix VII

The Legislative Basis for the Board's Gas Export Responsibilities and an Illustration of the Format of the 25A1 Reserves Formula

This appendix sets out the legislative basis for the licensing of exports and illustrates the format of the Reserves Formula which was described in Chapter 1.

Part VI of the *National Energy Board Act* and the regulations made under that part provide that no person shall export natural gas without an export licence or order¹ from the Board.

Section 83 of the Act sets out the considerations applicable to the issue of licences. It states in part:

“On an application for a licence, the Board shall have regard to all considerations that appear to it to be relevant and, without limiting the generality of the foregoing, the Board shall

- (a) satisfy itself that the quantity of ... gas ... to be exported does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada having regard, in the case of an application to export ... gas, to the trends in the discovery of...gas in Canada;...”

The format of the Board's previous 25A1 Reserves Formula is provided in Table A7-1.

¹ The regulations provide that orders to export natural gas may be issued:

- (i) for a period not exceeding 24 months, or
- (ii) for a period exceeding 24 months but not exceeding 20 years for a volume of not more than 30 thousand cubic metres per day.

The Board may, under the regulations, make the order subject to the condition that any contract or agreement for the exportation of gas for a period exceeding one month shall contain a clause relieving the exporter of the obligation to export gas to the extent that authorized exports are restricted by the Government of Canada.

To export larger volumes over a period exceeding 24 months requires a licence from the Board.

Table A7-1**Format of 25A 1 Reserves Formula****Calculation of Supply**

Remaining Established Reserves	
Less:	Deferred Reserves
Less:	1/2 of Reserves Beyond Economic Reach
Less:	Reprocessing Shrinkage

Equals: **Net Total Shrinkage**
Calculation of Requirements

Canadian Sales (25A1)	
Plus:	Authorized Export Sales
Equals:	Total Requirements

Calculation of Surplus

Net Total Supply	
Less:	Total Requirements
Equals:	Reserves Surplus

-
- * The regulations provide that orders to export natural gas may be issued:
- (i) for a period not exceeding 24 months, or
 - (ii) for a period exceeding 24 months but not exceeding 20 years for a volume of not more than 30 thousand cubic metres per day

The Board may, under the regulations, make the order subject to the condition that any contract or agreement for the exportation of gas for a period exceeding one month shall contain a clause relieving the exporter of the obligation to export gas to the extent that authorized exports are restricted by the Government of Canada.

To export larger volumes over a period exceeding 24 months requires a licence from the Board.

Appendix VIII

Description of Calculations in Tables 4-1 to 4-5

The Board's new surplus determination procedure is described in Section 4.2, and illustrated in Section 4.5. This appendix presents a sample calculation to assist in the understanding of how the illustrative Tables 4-1 to 4-5, presented in Section 4.5, were calculated. The sample calculation presented here is for the year 1990. These calculations have been rounded.

(i) Table 4-1

This table illustrates Step 1 of the surplus determination procedure, the calculation of maximum potential surplus.

Column (1), contains the opening inventory for 1 January of each year. For 1 January 1990 this is shown as 69.5 EJ (this results from the 1989 opening inventory of 71.0 EJ plus 1989 reserves additions of 3.2 EJ shown in column (2), less 1989 total production of 4.6 EJ which is the sum of 4.1 EJ in column (6) and .5 EJ in column (7) for 1989).

Column (3), the annual supply available, assuming an R/P ratio of 15 at the end of the year, is 4.5 EJ in 1990. This value is calculated by dividing the sum of the 1990 opening inventory (69.5 EJ) and the 1990 reserves additions (shown in column (2) as 3.0 EJ) by 16. This is the same as dividing the reserves remaining at the end of the year (the opening inventory (column (1)) plus reserves additions during the year (column (2)) less supply in 1990 assuming R/P 15 at the end of the year (column (3))) by 15. That can be seen as follows:

$$\frac{69.5 + 3.0}{16} = 4.5 \text{ and } \frac{69.5 + 3.0 - 4.5}{15} = 4.5$$

The estimated total demand (shown as 4.1 EJ in column (6)) is the sum of the estimated Canadian demand (shown as 2.6 EJ in column (4)) and the estimated authorized exports (shown as 1.5 EJ in column (5)).

The potential annual surplus (shown as 0.4 EJ in column (7)) is calculated as the annual supply (4.5 in column (3)) less estimated total demand (4.1 in column (6)). The maximum potential surplus is the sum of the potential annual surpluses calculated for each year.

(ii) Tables 4-2 to 4-5

The calculations involved for columns (1) through (6) on Tables 4-2 through 4-5 are similar to those described above for Table 4-1.

Columns (7), (8) and (9) illustrate Step 2 of the surplus procedure, the calculation of the total requirements and the reserves to production ratio resulting from the trial amount of new exports.

Column (7) contains trial amounts of new exports. For Table 4-2 column (7) was set equal to the potential annual surpluses shown in column (7) of Table 4-1. For Tables 4-3, 4-4 and 4-5, column (7) is the additional exports required to maintain a constant level of total exports, existing and new, of 1.6 EJ/YR, 1.8 EJ/YR and 1.9 EJ/YR respectively for six years beginning in 1990 followed by a three-year phase-down to 75 percent, 50 percent and 25 percent of that level.

The sample calculation presented below is for the year 1990 in Table 4-3.

Column (7) contains the trial new exports. The resulting total requirements (shown as 4.2 EJ in column (8)) are the sum of the estimated total demand (4.1 EJ in column (6)) and the contemplated new exports (.1 in column (7)).

Column (9) illustrates the resulting R/P ratio at the end of the year. The value 17.0 for 1990 is determined by dividing the reserves at the end of 1990 (equal to the opening inventory of 73.5 EJ (column (1)) plus reserves additions of 3.0 EJ (column (2)) less total production (equal to resulting total requirements) of 4.2 EJ (column (8)) by the total production in 1990 of 4.2 EJ (column (8)).

Columns (10) through (12) represent Step 3 of the surplus procedure, the Productive Capacity Check to ensure that productive capacity can, in fact, satisfy total requirements.

Column (10) is the Board's estimate of productive capacity assuming that production in the previous years has been at the levels shown in column (8). For 1990, the productive capacity of 5.3 EJ (column (10)) exceeds the total requirements of 4.2 EJ (column (8)) by 1.1 EJ. This spare capacity is shown in column (11).

Column (12) illustrates the percentage by which productive capacity exceeds total requirements. For 1990 the value of 24.3 is calculated by dividing the spare capacity of 1.1 EJ (column (11)) by total requirements of 4.2 EJ (column (8)) and multiplying by 100.

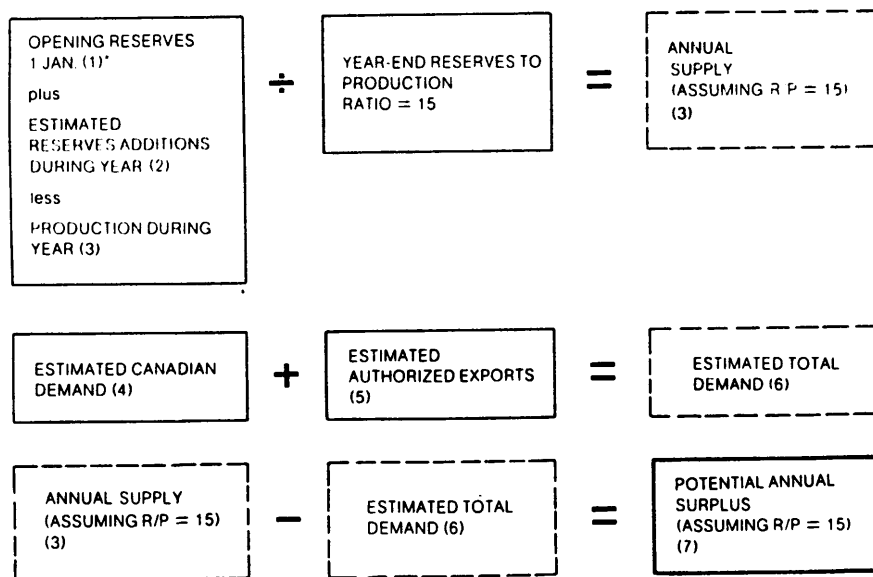
A schematic illustration of the surplus calculation is provided by Figure A8-1.

Figure A8-1
Schematic Illustration of Surplus Calculation

Figure A8-1
SCHEMATIC ILLUSTRATION OF SURPLUS CALCULATION

**STEP 1:
CALCULATION OF MAXIMUM POTENTIAL SURPLUS**

(i) ANNUAL CALCULATION



*Numbers in brackets refer to column numbers on Table 4-1

(ii) SUM OF POTENTIAL ANNUAL SURPLUSES (COLUMN 7) = MAXIMUM POTENTIAL SURPLUS

Figure A8-1 (Cont'd.)
DETERMINATION OF ANNUAL QUANTITIES IN NEW EXPORT LICENCES

STEP 2: CALCULATION OF THE R/P RATIO

Select trial annual quantities of new exports ensuring that the total does not exceed the maximum potential surplus



For each trial export profile, calculate the resulting total requirements for each year



Calculate the R/P ratio for each year to identify years in which the R/P ratio drops below 15

STEP 3: PRODUCTIVE CAPACITY CHECK

Check the productive capacity to ensure that the total requirements resulting from each trial export profile can, in fact, be met for each year (especially important for any year in which the R/P ratio is forecast to fall below 15)

STEP 4: ASSESS ALTERNATIVE TRIAL EXPORT PROFILES AND SELECT MOST APPROPRIATE PROFILE

Assessment takes into account a number of factors, some of which are:

- security of supply for Canadian requirements
- existing infrastructure to produce and transport new exports
- estimated net benefits to Canada

Appendix IX

The Board's Selection of a Reserves to Production Ratio

This appendix sets out the technical rationale for the Board's selection of a reserves to production (R/P) ratio of 15 for use in its new surplus determination procedure.

The maximum rate at which a reservoir can be produced is termed the physical capability. The rate is determined by the physical nature of the reservoir, particularly the pressure and permeability, both of which limit the rate at which gas can move into a wellbore and be produced. The physical capability of a reservoir declines with time as it is produced.

Factors which may limit production to a level below the physical capability of a reservoir are the terms of the contract between the producer and purchaser, and limitations imposed by gathering, processing and transmission facilities. The level to which production is constrained below physical capability by any of these factors is termed the productive capacity.

If a gas reservoir is produced at less than its physical capability, a constant level of production can be maintained over a period of time. This is known as the flat-life period. Throughout this period the R/P ratio of the reservoir will decrease by one each year. This is so because each year the remaining reserves (the numerator in the ratio) are decreased by a constant amount of production (the denominator).

When this constant level of production can no longer be maintained because of the declining physical capability of the reservoir, the production rate will decline. Thereafter, physical capability and productive capacity will be the same.

The energy to produce gas is provided by the pressure exerted by the gas reserves remaining in the reservoir. Because this pressure also bears a direct relationship to the volume of reserves remaining, the decline in physical capability very often exhibits a linear relationship with the remaining reserves. In other words, when the productive capacity becomes equal to the physical capability and production starts to decline, the R/P ratio reaches a minimum and will tend to remain constant thereafter.

The drilling of additional wells into a producing reservoir will have the effect of delaying the commencement of a decline in the production rate, but only temporarily. Once decline is underway, additional wells can stabilize or even increase the production rate, but again, only temporarily.

The R/P ratio will vary with the amount of drilling that has occurred. For example, a reservoir drilled with one well on each 250 hectares might have an R/P ratio of 15 during the decline period. If twice as many wells were drilled so that well spacing became 125 hectares and the same total reservoir production rate were maintained, the reservoir would have a longer flat-life period and would go into decline later at a lower R/P ratio, perhaps 7 or 8. In Canada, provincial agencies regulate well spacing and, therefore, set the maximum number of wells in each reservoir.

For reservoirs in total, the reserves to production ratio is defined as the total end-of-year reserves divided by total production during the year. The reserves to production ratio at productive capacity is defined as the total end-of-year reserves divided by the sum of the individual productive capacities. Unconnected reserves are included in total reserves but are assigned zero productive capacity. Therefore, in estimating future reserves to production ratios at productive capacity, forecasts must be

made of when unconnected reservoirs could be connected and of what their productive capacities would then be.

As long as the actual R/P ratio exceeds the R/P ratio at productive capacity, actual production will be less than productive capacity and can be maintained at a constant level for a period of time before it begins to decline.

Table A9-1 illustrates productive capacity and associated R/P ratios for contracted reserves and for total reserves in the Western Canada Sedimentary Basin. The contracted data (columns (1) and (2)) refer only to reserves under contract as of year-end 1982. These reserves are mostly in producing reservoirs; however, some very small portion is still not connected as of year-end 1986.

The total reserves data (columns (3) and (4)) include reserves uncontracted as of year end 1982, additions to reserves since 1982, and forecast future reserves additions.

Table A9-1**Board Estimates of Productive Capacity and R/P Ratios**

Year	Contracted Reserves		Total Reserves	
	Productive Capacity (EJ)	R/P Ratio	Productive Capacity (EJ)	R/P Ratio
	(1)	(2)	(3)	(4)
1986	4.8	8.7	5.3	14.2
1987	4.5	8.2	5.3	13.7
1988	4.2	7.8	5.2	13.4
1989	3.7	7.8	5.2	13.2
1990	3.4	7.6	5.1	13.1
1991	3.1	7.3	5.0	12.8
1992	2.7	7.2	4.9	12.7
1993	2.4	7.3	4.7	12.7
1994	2.1	7.5	4.5	12.7
1995	1.8	7.5	4.3	12.7
1996	1.6	7.7	4.1	12.7
1997	1.3	8.1	3.9	13.0
1998	1.1	8.7	3.7	13.2
1999	0.9	9.2	3.5	13.3
2000	0.8	9.5	3.3	13.4
2001	0.7	10.0	3.1	13.5
2002	0.6	10.3	2.9	13.6
2003	0.5	10.9	2.8	13.5
2004	0.5	11.2	2.6	13.5
2005	0.4	11.4	2.5	13.6

Notes:

- (i) The estimate of contracted reserves used in column (1) is based upon the Board staff September 1984 report, but was adjusted for actual production for 1983 and 1984. It incorporates contracted reserves as of year-end 1982. The values shown in column (3) are higher than those in column (1) not only because column (3) includes the connection of additional reserves from 1986 on, but also because it includes estimates of reserves connected in the years 1983 through 1985.
- (ii) The R/P ratios shown are based on production having taken place at productive capacity in each previous year.

The productive capacity of contracted reserves, on average, is now on decline. The R/P ratios at productive capacity for contracted reserves, shown in column (2) of the table, fall from 8.7 in 1986 to a low of 7.2 in 1992, as a growing proportion of production is from reservoirs on decline. Beyond 1992, the R/P ratio slowly increases because the higher productivity pools are mostly depleted, and production is being obtained increasingly from poorer quality reservoirs (those with lower productive capacities and hence higher R/P ratios).

The higher numbers in column (3) as compared to column (1) illustrate the growing importance of reserves additions over the forecast period. By the end of the period approximately 80 percent of total productive capacity could come from reserves additions i.e. from reserves which have yet to be discovered.

The R/P ratio at productive capacity for total reserves shown in column (4) remains relatively stable over the forecast period, ranging between 12.7 and 14.2. The stability of the ratios is largely the result of assuming the same connection rate and productive capacity profile for all reserves additions.

It is likely that some increase in productive capacity from total reserves, over that shown in column (3) of Table A9-1, could be accomplished through faster development, given appropriate economic incentives to more rapidly connect reserves, to drill additional wells, or to add compression facilities. This would increase production and result in lower R/P ratios.

However, even if reserves are developed and connected faster than assumed in column (3), the R/P ratios for total reserves are not likely to fall to the levels shown in column (2) of the table for contracted reserves because, throughout the period, there will continue to be some unconnected reserves. Also, during the period, total reserves in column (4) will always include some newly connected reserves producing in their flat-life period, with R/P ratios higher than they would be at physical capability.

Accordingly, the Board judges that it is unlikely that the R/P ratio at productive capacity for total reserves will fall much below a range of 12 to 13. As discussed in section 3.4, TransCanada estimated the R/P ratio at productive capacity for its reserves to be in the range of 10 to 12.

The Board is of the view that it would be prudent to choose an R/P ratio somewhat above the 12 to 13 range for use in its surplus determination procedure. The Board notes that even in the unlikely event that no reserves additions occurred after the end of the period for which new exports had been licensed, an R/P ratio of 15 would provide a minimum period of 2 to 3 years of level production before productive capacity from the Western Canada Sedimentary Basin would commence to decline. This is because, with no reserves additions, the R/P ratio would decline by one each year, and production could be maintained at its previous level until an R/P ratio of 12 to 13 would be reached. If, as is more likely, there were reserves additions ranging from one-quarter to one-half of the production from established reserves in each of the years following the period for which exports had been authorized, and if these reserves additions were connected and produced as required, the R/P ratio would decline by less than one each year and the period of level production could last from 3 to 6 years, during which time adjustments could be made to the pace of exploration or the connecting of reserves.