

Quicksilver Resources:Licence Application of the National Energy Board

A Description of the Implications on the ability of
Canadians to meet their natural gas requirements
and an Assessment of whether this gas is surplus to
reasonably foreseeable Canadian requirements

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This report concludes that the quantity of gas applied to be exported by Quicksilver in liquefied form, approximately 27.03 billion cubic metres annually for a term of 25 years does not have unfavourable implications on the ability of Canadians to meet their gas requirements nor does it exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada, having regard to trends in the discovery of gas in Canada

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List of Acronyms and Abbreviations

AECO C	Alberta Energy Company's "C" pipeline and storage hub, commercially a term of art for a leading Canadian price-setting benchmark
BC	British Columbia
Bcf	Billion cubic feet
Bcf/d	Billion cubic feet per day
BCM	Billion cubic metres
Board	National Energy Board
Btu	British Thermal Units
CERI	Canadian Energy Research Institute
Cif	Cost, insurance and freight (of an import quantity)
DOE/FE (U.S.)	Department of Energy, Office of Fossil Energy
EIA (U.S.)	Energy Information Administration
EUR	Estimated Ultimate Recovery (of gas)
FERC	Federal Energy Regulatory Commission
IEA	International Energy Agency
IGCAA	Industrial Gas Consumers Association of Alberta
Journal	Oil and Gas Journal
LF	Load Factor (of thermal generating plant)
LNG Canada	LNG Canada Development Inc.
LNG	Liquefied natural gas
MBP	Market-Based Procedure
Mcf	Thousand cubic feet
MMBtu	Million British thermal units
MTA	Million tonnes per annum (of LNG)
NEB	National Energy Board
RfD	Reasons for Decision (of the NEB)
R/P ratio	Reserves to production ratio
Tcf	Trillion cubic feet
U.S. EIA	Energy Information Administration
U.S.	United States of America
WCSB	Western Canadian Sedimentary Basin
Ziff Energy	Ziff Energy – A Division of Solomon Associates
Ziff Energy Report	<i>Long-term Natural Gas Supply and Demand Forecast to 2050 for Quicksilver Resources Canada Inc.</i>

Summary

The purpose of the Report is to assist the Board in its surplus determination in relation to the proposed Quicksilver gas exports. It is designed to respond to the direction provided in the Board's Filing Manual and other relevant guidance and is further informed by the Board's decisions in other recent gas licence applications. (Section 1, pages 6-7)

The approach is essentially qualitative, recognizes uncertainty in requested quantitative forecasting, cites circumstances where undue reliance on such forecasts could have resulted in mistaken licensing decisions and proposes the usefulness of a qualitative methodology. It assumes that the Board's longstanding market-functioning approach to export licensing will continue and it applies principles of economic analysis to describe in directional terms the implications of Quicksilver's volumes on the ability of Canadians to meet their gas requirements. (Section 2, pages 8-9)

The Report finds that the Board has so far proven correct in terms of the trends it identified in dealing in 2011 with the first of the 21st century gas (LNG) licence applications. Specifically, the Board's confidence in Canadian and North American gas resource has been well placed, production has expanded and Canadians have continued to be able to meet their gas requirements in an entirely satisfactory manner at prevailing market prices. This backwards look covers admittedly a short period in relation to the term of the requested licence, but it builds confidence in the correctness so far of the Board's analysis. (Section 3, pages 10-16)

The Report next considers the Canadian and North American gas sector in relation to the requirement to consider implications of the Quicksilver exports and the Assessment as to whether they are "surplus". It finds that there are no policy or regulatory barriers to the functioning of the market, that almost all the continent's gas resources are physically linked to market hubs where prices are formed and liquidity is created, there is industry cooperation to ensure standardization of international transactions and some corporate activities are organized on a continental basis. The integrated market, the existence of which has long been recognized by the Board, is highly competitive. This leads to the conclusions that the implications on the ability of Canadians to meet their gas requirements are similar for Quicksilver's exports as for exports from the United States to overseas and that surplus determination while focusing on Canadian circumstances must also be informed by the broad background of the integrated North American gas market. (Section 4, pages 17-24)

The likely response of the Canadian and North American gas sector to the exports proposed by Quicksilver is first considered in terms of gas prices, demand, supply, markets and continental gas flows. Next the potential responses are considered in terms of the policy and regulatory framework, gas sector commercial structures and market functioning. The conclusion is that gas markets will adjust responsive to price signals affecting supply and demand, as they have done for decades. The Quicksilver exports if permitted would not have any implications in these areas that negatively affect the ability of Canadians to meet their gas requirements. (Section 5, pages 25-29)

The implications of the proposed exports are examined in the light of the foregoing considerations and in terms of the quantities of available gas, the price effects of the proposed exports and the supply options available to Canadians. It is concluded that the exports proposed by Quicksilver will not significantly affect the ability of Canadians to meet their gas requirements. They will be met from Canadian, United States and possibly overseas import sources, at prices determined in a large, efficient, competitive, flexible, liquid, integrated North American market offering unparalleled price and other commercial transparency. Prices to Canadians may be higher than otherwise, but they will continue to be lower than they would have been without the supply and price revolution caused by the development of unconventional gas resources. Canadians will have multiple alternative supplier options and the Board will continue to monitor energy and gas supply situations to keep the market and itself informed about and alert to the implications of adjustments resulting from the operation of energy markets. (Section 6, pages 30-34)

Certain sensitivities are considered in relation to the description of implications and the surplus Assessment respecting Quicksilver's proposed exports. They include the potential for change in gas market functioning, for enhanced Mexican gas supply potential, for general considerations of gas demand and specific consideration of the effects of an Ontario nuclear power failure. The issue of cumulative exports is considered in the light of the Board's finding that it is not useful to tabulate approved and pending gas export applications in making its surplus determination. The conclusion is that there are no foreseeable plausible sensitivity cases that could invalidate the description of implications presented in Section 6 and the Assessment of surplus in Section 8 in respect of the applied-for Quicksilver exports. (Section 7, pages 35-42)

The Assessment of surplus for the Quicksilver exports is made in the context of a demonstrably dynamic, physically and commercially integrated, price transparent, highly-liquid North American gas commodity marketplace. Its commercial, policy and regulatory underpinnings are not likely to be affected by the Quicksilver exports so the market will continue to be fully functioning and well able to meet Canadians gas requirements in full at market prices. Therefore the Board can confidently find that the gas applied to be exported is surplus to reasonably foreseeable requirement for use in Canada. Further, having regard to the large available gas resource, trends in its discovery, the still-lagging production of gas in relation to that resource's size and the low incremental cost of adding new production, the Board can be confident that trends in the discovery of gas in Canada, and for that matter in North America as a whole, are positive and prospectively will remain so for any foreseeable future. (Section 8, pages 43-46)

It is submitted that the quantity of gas to be exported by Quicksilver does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada having regard to the trends in the discovery of gas in Canada. (Section 9, page 47)

1. Purpose

This Report is designed to assist the National Energy Board (“Board” “NEB”) in determining, pursuant to s.118 of its Act, whether the natural gas proposed to be exported by Quicksilver Resources Canada Inc. (“Quicksilver”) in the form of liquefied natural gas (“LNG”) does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada, having regard to trends in the discovery of gas in Canada. This is termed by the Board the Surplus Criterion.¹

- The term of the applied-for licence is 25 years commencing on the date of first export;
- The maximum term quantity applied-for is 470 million tonnes;
- The maximum annual gaseous quantity, subject to a requested 15% tolerance, is $27.03 \times 10^9 \text{ m}^3$ or approximately 960 Billion cubic feet (“Bcf”) or approximately 2.63 Bcf per day (“Bcf/d”);
- All these quantities are expressed in gaseous form.

The “Implications” and “Surplus Assessment” Components

The Report assists the Board in two ways.

First, by providing the implications of the proposed export volumes on the ability of Canadians to meet their gas requirements (“**the implications component**”) and second by submitting a surplus Assessment (“**the surplus Assessment component**”) based on those implications. The Assessment component takes appropriate account of the description of gas supplies expected to be available to the Canadian market and the expected gas requirements of that market over the requested licence term, as analyzed in the separate report *Long-Term Natural Gas Supply and Demand Forecast to 2050 for Quicksilver Resources Canada Inc.*, prepared by Ziff Energy – A Division of HSB Solomon Associates Canada Ltd., attached to the Application as **Appendix B Supply and Demand Forecast** and hereinafter referred to as “the Ziff Energy Report”. It also provides commentary on the matter of trends in the discovery of gas in Canada.

This Report therefore responds in part to the Board’s Filing Manual, Guide Q – Export and Import Authorizations (Part VI of NEB Act and Part VI Regulations) dated 28 August 2013, Release 2013-3 and to the Filing Requirements stated therein, specifically page 5Q-1, item 4 with reference also to items 2 and 3, and to the Further Guidance provided on pages 5Q-1 and 5Q-2 all of which is referred to as “the Filing Manual”.²

¹ NEB, Letter Decision, Aurora Liquefied Natural Gas Ltd., 1 May 2014, page 2, paragraph 2.

² This Report acknowledges that the Board’s hydrocarbon export licensing procedures are in a transitional stage, as indicated in the Board’s 8 July 2014 letter to Kitsault LNG in the following terms: *The Board recognizes that it is currently in a transition phase with the hydrocarbon export regulatory framework. The National Energy Board Part VI (Oil and Gas) Regulations have not been finalized and the National Energy Board Filing Manual Guide Q Export and Import Authorizations provides only broad direction. Further demonstration of the Board’s information needs and direction have been revealed through previous Board export licence Decision Letters and IRs, as well as other application material from previous applicants.*

This Report has also been informed by the Board's Reasons for Decision respecting the LNG Canada Development Inc. ("LNG Canada") application for a licence to export liquefied natural gas LNG³ to which applicants are directed by Guide Q, and by the Board's Letter Decisions in certain subsequent licence applications such as that of 1 May 2014 in respect of Aurora Liquefied Natural Gas Ltd which state that:

*Our role, under s. 118 of the NEB Act, is to **assess** whether the natural gas proposed 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 to trends in the discovery of gas in Canada.*

The Report does not present significant original analysis: that function is discharged by the Ziff Energy Report. Instead this Report is based on authoritative public and private sector sources and relevant available industry analysis and is as well aligned with the results of the Supply and Demand Report Forecast. It is noted at the outset that the sources used tend to corroborate the views on gas resources, supply, flows, markets, market behaviours, policy and regulatory frameworks as expressed by the Board in its market assessments and licensing decisions.

³ A3F2D6 - LNG Canada Development Inc. Application for a Licence to Export Liquefied Natural Gas - National Energy Board Reasons for Decision

2. Approach

a. Essentially Qualitative

The Filing Manual Guide Q states that the filing requirements can be met in a variety of ways, including quantitatively or qualitatively. The approach of this report to fulfilling item 4 of Guide Q is essentially qualitative, informed by quantitative responses to filing requirements items 1 (the source and volume of gas to be exported—see the Application document) and to items 2 and 3 which are provided by the Ziff Energy Report.

b. Recognizes Uncertainty

There is no need to repeat the available references to uncertainty and its causes which are used to qualify forecasts produced by public and private sector practitioners of this art. It is sufficient to quote only from the Board's Energy Market Assessment title *Canada's Energy Future 2013* as follows:

Over the 23-year projection period, it is likely that developments beyond the realm of normal expectations will occur, such as geopolitical events or technological breakthroughs. Likewise, new information will become available and trends, policies and technology will evolve. Readers of this analysis should consider the projections a baseline for discussing Canada's energy future, not a prediction of what will take place.⁴

While the Board invites and receives energy, oil and gas supply/demand forecasts, it no doubt views them in the light of the above precautionary statement. It is suggested that the qualitative approach embodied in this Report usefully tempers undue reliance on quantitative forecasts and increases confidence in the robustness of surplus Assessments and related licensing decisions.

c. Forecasts were “Wrong”, Licensing Decisions “Right”

To illustrate the point about uncertainties in forecasting: the Board's September 1988 report *Canadian Energy Supply and Demand 1987-2005*, was in retrospect “wrong” in that, reaching out some 17 years, it underestimated Canadian gas production and exports. Gas exports were projected in both high and low cases to rise to 3.9 Bcf/d by 1992 and to continue at that rate through the end of the forecast period in 2005. Actual exports were 5.6 Bcf/d in 1992 and 10.1 Bcf/d in 2005.⁵

Had the Board based its export licensing decisions in the late 1980s and early 1990s on those forecasts—which was never the intention—there would have been, as the Board put it in GHR-1-87, “...the

⁴ NEB, *Canada's Energy Future: ENERGY SUPPLY AND DEMAND PROJECTIONS TO 2035*, November 2013, page 2.

⁵ The forecast is from the NEB report *Canadian Energy Supply and Demand, 1987-2005*, September 1988. The forecasts of gas exports are tabulated in the two tables A6-11 on pages 329-330. Exports in both the high and low gas productive capacity cases were forecast to rise to 1,499 PJ per annum by 1992 and remain at that level through 2005. This is the equivalent of about 1.424 Tcf or 3.9 Bcf/d. Actual annual exports, data from the NEB website, were some 58 billion cubic metres (“BCM”) or 2.04 Tcf or 5.6 Bcf/d in 1992 and 104.5 BCM, 3.69 Tcf or 10.1 Bcf/d in 2005.

possibility of denying exports which it may turn out could have been allowed.”⁶ The Board however relied not on forecasts but on the expectation of continued effective market functioning. As a result, the Board’s export licensing decisions were clearly “right” because the quantities involved proved to be surplus to actual requirements for use in Canada. The same can be categorically affirmed of all the Board’s decisions on the licensing of pipeline exports which were taken pursuant to the Market-Based Procedure from 1986 onwards. Note that by 2014 the export by pipeline of Canadian-origin gas under licence had effectively ceased.

d. Assumes Market-Based Surplus Assessment

While there is obvious value in quantitative assessments of trends in gas supply and requirements such as are provided in the Ziff Energy Report, as concerns a term that reaches out to mid-century, greater confidence should be placed in the effectiveness of continued market functioning than in the eventual accuracy of supply and demand forecasting. The Report, while responding to the requirements of the Filing Manual, presumes continuance of the Board’s market-based approach to gas export licensing first expressed in its decision in *Review of Natural Gas Surplus Determination Procedures* GHR-1-87 (July 1987) and reiterated in many subsequent licensing decisions. The Board has given no indication of any departure from this approach in its 21st century decisions in LNG licence applications, in its Guidance subsequent to amendments to section 118 of the *National Energy Board Act* (*Interim Memorandum of Guidance* (File: Ad-GA-ActsLeg-Fed-NEBA-Amend 0101 of 11 July 2012), in its Consultation on Oil and Gas Exports and Imports (File Ad-GA-ActsLeg-Fed-NEBA-Amend 0101 20 September 2012) or in its *Proposed changes to the NEB Export and Import Regulatory Framework* published on 30 August 2013.

e. Applying the Analysis

The Report applies established principles of economic analysis to the Canadian and North American gas sector to describe in directional terms the implications of additional demand posed by an increment, which is subject to a requested 15% tolerance, of up to 2.63 Bcf/d in demand for gas in North America by way of the export overseas of that gas by Quicksilver in the form of 20 million tonnes per annum (“MTA”) of LNG, over a period of 25 years. The effects of this increment are considered in relation to a mainly qualitative analysis of political, regulatory, institutional and commercial components of the gas sector in order to arrive at a Description of the implications of the increment on the ability of Canadians to meet their gas requirements. For purposes of this report, “North America” includes Mexico which is integrated with Canada and the U.S. by treaty, legislation, physical and commercial connections (note that this definition of North America is not the same as in the Ziff Energy Report).

⁶ NEB, Reasons for Decision (“RfD”), GHR-1-87, July 1987, Chapter 2, *Continuing Appropriateness of Existing Procedures*, page 18 of 96.

3. A Look in the Rearview Mirror

For perspective on Quicksilver's export licence application, it is useful to review developments in the Canadian and North American gas sector during the three and a half years since the first 21st century⁷ LNG export licence application was filed on December 20, 2010 leading to the proceeding in GH-001-2011.⁸ Three-plus years is a very short time in relation to the Board's surplus assessment for Quicksilver's exports which may be initiated about year 2021 and then be flowing for 25 years. It is however submitted that a degree of reassurance exists if it is found that the Board's expectations underpinning its earliest LNG export decision are being borne out.

a. As to gas supply

The Board's view at PDF page 25 of 50 of its Reasons in GH-1-2011 was that:

*The Board is mindful that shale gas development in northeast BC is in its infancy; however, the Board is cognizant of the large resource potential and the significant investments that companies are undertaking to develop these resources. Drilling efficiency, well performance and safety of operations continue to benefit from ongoing technological progress and are likely to further enhance potential gas supplies. It is likely that shale gas in northeast BC will represent a significant incremental source of natural gas production in the future.*⁹

One notes that BC total gas production is up sharply so far in 2014 over 2010 (plus 40%) and that BC's share of total Canada gas production has increased from 19% to 27% currently. Most of these increases are attributable to the development of shale gas.¹⁰

The first study ever to comprehensively estimate the marketable unconventional petroleum resources in the Montney Formation has been completed by the NEB cooperatively with its counterparts in Alberta and BC.¹¹ Although, to quote the Board, the study's findings for marketable natural gas liquids and oil

⁷ Dome Petroleum Limited applied for a licence for the export of natural gas in liquefied form on 1 April 1982 and licence GL-76 was issued 8 March 1983. This licence was subsequently rescinded at the request of the applicant.

⁸ The applicant was KM LNG Operating General Partnership [KM LNG Operating General Partnership - Application for a licence authorizing the export of liquefied natural gas \(A27596\)](#)

⁹ NEB RfD in [GH-1-2011 KM LNG A2F3D2](#)

¹⁰ NEB, statistical series Marketable Natural Gas Production in Canada <http://www.neb-one.gc.ca/clf-nsi/archives/rnrgynfmrtn/sttstc/mrktblntrlgsprdcn/mrktblntrlgsprdcntrchv-eng.html>

¹¹ NEB, *The Ultimate Potential for Unconventional Petroleum from the Montney Formation of British Columbia and Alberta*—Energy Briefing Note, November 2013. <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmrtn/nrgyrprt/ntrlgs/ltmtptntlmntnyfrmtn2013/ltmtptntlmntnyfrmtn2013-eng.html>

are notable, the estimated quantity of natural gas is extensive. The Board states that at current consumption rates the Montney gas resource would meet Canadian needs for 145 years.¹²

On March 4, 2014 the former NEB Chair spoke to Canadian natural gas production by source in the course of a presentation to the Canadian Energy Research Institute's ("CERI") 2014 natural gas conference. From the relevant slide and related speaking notes, it appears that the great bulk of Canadian gas production in the 2020-2035 period will come from the unconventional gas resources of the Horn River and Montney formations while the outlook is for production of conventional, non-associated, gas in the Western Canadian Sedimentary Basin ("WCSB") to continue its present declining trend.¹³ From this presentation it is clear that the centre of gravity of WCSB gas production is moving into northeastern British Columbia.

b. Concerning gas flows

The Board in 2011 at PDF pages 29 and 30 of 50 of its Reasons in GH-1-2011 was:

...cognizant of changing natural gas flows in North America...In particular, the Board recognizes that the exports out of the WCSB to eastern markets have been declining while imports from the US have risen. The Board notes that this is indicative of ongoing market functionality and expects that US natural gas will continue to supply a portion of Canadian demand.

The data for the first four months of years 2010 and 2014 show Canadian overland exports down by about 14% from 9.4 to 8.1 Bcf/d and imports up by about 30% from 2.1 to 2.7 Bcf/d which is a large volume in relation to the eastern Canadian gas market into which those import volumes mostly flow.¹⁴ Canada's net gas exports (exports minus imports) have therefore fallen by about 26% from 7.3 Bcf/d in 2010 when the Board dealt with its first LNG export licence filing of this century, to 5.4 Bcf/d three years later.

Indicative of further expectable changes in export and import flows is the news that Iroquois Gas Transmission, until recently a major export conduit for WCSB gas is holding an open season for its *south-to-north* (their italics) project.¹⁵ A vice-president of the company states:

¹² In an associated press release of 6 November 2013, the Board states that the Montney formation is one of the largest gas resources of the world. <http://www.neb-one.gc.ca/clf-nsi/rthnb/nws/nwsrls/2013/nwsrls30-eng.html>

¹³ Canadian Energy Futures, presentation by Gaétan Caron, the Chair and CEO of the NEB (now former-chair), see slide 9 and speaking notes at <http://www.neb-one.gc.ca/clf-nsi/rpblctn/spchsndprsnthn/2014/cndnnrgyftsr/cndnnrgyftsr-eng.html>

¹⁴ The annual volumes in metric units, taken from data posted on the Board's website are: Exports: 92 Billion cubic metres ("BCM") in 2010, 81 BCM in 2013; Imports: 21 BCM in 2010, 26 BCM in 2013.

¹⁵ Iroquois Gas Transmission System, news release December 3, 2013 http://www.iroquois.com/project/SoNo/Iroquois_SoNo_OS_PR_12.03.2013.pdf

Traditionally known as a north to south pipeline, we are excited to offer customers the ability to physically transport Marcellus shale gas to the U.S.-Canada border.

Another indication is Spectra Energy Transmission's Nexus Project for about 250 miles of pipeline from Ohio directed towards markets that include Ontario and which are characterized as follows:

Additional pipeline transportation infrastructure is needed in the upper U.S. Midwest and eastern Canadian regions to support growing demand for clean-burning natural gas and to help offset the decline in traditional western Canadian supplies available to serve these markets.¹⁶

Conclusion number 7 of the Ziff Energy Report is that Western Canadian natural gas is facing competition and significant displacement in traditional markets, including eastern Canada, from low-cost Lower-48 gas.

c. Regarding gas markets

The Board stated at PDF page 31 of 50 of its Reasons in GH-1-2011 that:

Since deregulation in 1985, North American gas markets have functioned efficiently and there is no evidence to suggest that they will not continue to do so in the future. Canadian and North American gas markets have continued to function so as to allocate supply and demand by means of price signals.

This expectation of four years ago has been borne out: the Canadian and North American gas market clears every day, year in and year out, regardless of the conditions of supply and demand; Canadians have always been able to meet their gas requirements in full at market prices; and the indications are that basis differentials have tended to narrow across the continental market.

The Ziff Energy Report concludes at no. 9 that despite declining Western Canadian gas production since 2001, Canadian gas markets have been adequately supplied and this trend is forecast to continue.

d. A step-change has occurred in the economics of North American gas supply

This has been the result of the shale and tight gas revolution, which Daniel Yergin has termed "the shale gale".¹⁷ This is reflected in such areas as:

- The generally declining valuations of gas-oriented North American producing companies and their poor performance relative to the performance of the national exchanges, recognizing that

¹⁶ Source: <http://www.spectraenergy.com/Operations/New-Projects-and-Our-Process/New-Projects-in-US/NEXUS-Gas-Transmission/>

¹⁷ Yergin, Daniel. *THE QUEST: Energy, Security, and the Remaking of the Modern World*. Penguin:2012, *THE "SHALE GALE"*, pages 331-334.

there has been an uptick in recent months reflecting both higher gas prices and vigorous efforts by managements to cut costs and concentrate activities on higher-value gas liquids;

- The divestment by gas-oriented companies of valuable assets that are adjudged to be “non-core” to producers’ activities—assets are generally not divested when the outlook is for rising commodity prices;¹⁸
- The decline in LNG imports to the U.S. which peaked on an annual basis in 2007 at about 2.1 Bcf/d, had fallen to 1.2 Bcf/d in 2010, in 2013 were about 20% of that amount and by the first quarter of 2014 were a negligible 167 million cubic feet daily (“MMcf/d”);¹⁹ and
- The large number of LNG export projects, the Federal Energy Regulatory Commission (“FERC”) has a list dated June 20, 2014, which may not be complete, of 23 potential U.S. and Canadian export terminals with a total capacity approaching 39 Bcf/d.²⁰ Of these, seven projects, with an aggregate export capacity of some 10.9 Bcf/d, have received conditional approval of the United States’ (“U.S.”) export regulator, the Department of Energy’s Office of Fossil Energy (DOE/FE), for exports to non-Free Trade Agreement countries.²¹

The Ziff Energy Report concludes at no.3 that there is an abundance of low-cost natural gas resources available in North American and Canadian shale and unconventional gas plays. This is in striking contrast to the situation of a decade ago when industry and government were concerned about the prospective shortage of North American gas and there was a large flow of investments to LNG import schemes.

e. Price signals are working on both the supply and the demand side of the market equation

North American producers are reacting strongly to low gas prices and lowered gas price expectations by sharply reducing investment in dry gas activities. Encana, the largest Canadian-based North American gas producer, states that its aim is on increasing “value” not “volumes” (measured in energy terms) and is therefore focusing strongly on increasing the share of liquids in its total production.²² The results in just two years are striking: Encana’s North American gas production is down 17% in 2013 over 2011 while oil production has been doubled and production of gas liquids more than tripled.²³ Chesapeake

¹⁸ See by way of example, Encana’s June 27, 2014 announcement of the sale for some \$US 1.8 Billion of its Bighorn assets in Alberta which include proven reserves equivalent to about 1.1 Tcf of gas. Source : <https://www.encana.com/news-stories/news-releases/details.html?release=856813>

¹⁹ Source: US Energy Information Administration (“EIA”) http://www.eia.gov/dnav/ng/ng_move_imp_c_s1_a.htm

²⁰ Source: FERC <http://www.ferc.gov/industries/gas/indus-act/lng/lng-export-potential.pdf>

²¹ Source: US EIA <http://energy.gov/sites/prod/files/2014/03/f13/Summary%20of%20LNG%20Export%20Applications.pdf>

²² Source: <http://www.encana.com/pdf/investors/presentations-events/corporate-presentation.pdf>

²³ Source 2013 Annual Report, page 26: <https://www.encana.com/pdf/investors/financial/annual-reports/2013/annual-report-2013.pdf>

Energy, seen by investors as the leading U.S. “pure gas play” with 80% of its Bcf equivalent production being of that commodity, states that it is exercising “capital discipline” by reducing capital expenditures from \$13.1 Billion in 2010 to 6.7 in 2013 and an estimated 5.4 in 2014. Its production of dry shale and conventional gas peaked in 2012-13 and the company now looks for income growth from natural gas liquids, oil and associated natural gas.²⁴

North American gas consumers, despite rather poor economic conditions, responded to low gas prices by increasing their gas use of all kinds between 2010 and 2013. In the U.S., annual consumption grew by about 2 trillion cubic feet (“Tcf”) or about 8%. Demand grew in all major consumption sectors--residential, commercial, industrial and electricity generation—but electricity generation demand was down about 11% in 2013 over 2012 although that sector scored a more than 10% increase 2013 over 2010.²⁵

The Ziff Energy Report concludes at no. 10 that North American gas demand growth will be driven primarily by gas-fired electrical generation, Canadian oil sands gas demand and LNG export liquefaction.

Conclusion no.11 in the Ziff Energy Report is that Canadian gas demand growth is expected to be driven by a switch away from coal-fired power generation, gas for growing oil sands production and gas liquefaction for export.

f. Gas demand and gas markets, not supply considerations, are the focus of industry and policy concern

Consider the following indications from the past two years regarding the gas industry’s conjunctural situation:

- The CERI *Natural Gas Pathways and Forums Project*, Narrative Development Workshop, Calgary October 16-17, 2012 stated that the “key question” is “*Looking out to 2030, in the face of robust supply, how will industry, government and others work together to understand and grow the demand for natural gas and improve the competitiveness of the Canadian Natural Gas Industry?*”;²⁶

²⁴ Source: http://www.chk.com/investors/documents/latest_ir_presentation.pdf

²⁵ Canada through 2012 <http://www5.statcan.gc.ca/cansim/pick-choisir> USA through 2013 http://www.eia.gov/dnav/ng/ng_cons_sum_dcu_nus_a.htm

²⁶ Canadian Energy Research Institute (CERI) *Natural Gas Pathways & Forums Project Narrative Development Workshop Report*, October 16-17, 2012 Calgary AB, page 1 of 27.

- The LDC Gas Forum Southeast, Atlanta, April 14-16 2013 posed the question as follows *“Supply, supply, supply—demand anyone?”*²⁷
- The LDC Gas Forum Northeast, Boston, June 14-16 2014 focused two sessions on the expanding supply of gas: *How Shale Gas Is Transforming the Northeast* and *Marcellus and Utica - Any end in sight? Supply and Demand Growth Outlook*
- CERI’s *Natural Gas Pathways Report* August 2013 stated: *“The North American natural gas market has been transformed by the emergence of unconventional gas developments. With significant natural gas continental supplies the question has become ‘How can industry, government and others work together to grow natural gas demand in the coming decades?’*²⁸
- The national policy emphasis is on the importance of finding and developing new markets for natural gas. This is most recently reflected in the paper *CAPTURING THE OPPORTUNITY Realizing a Shared Vision for Canada’s Energy and Mining Sectors*. This document was prepared by Natural Resources Canada in collaboration with the provincial and territorial governments for the Energy and Mines Ministers’ Conference August 24-27, 2013.²⁹ It notes at page 4 that *“Canada has been capturing a lower price for its oil and gas than is available in global markets.”* And goes on to state that *“...the development of energy infrastructure to meet the needs of the North American market and to deliver oil and gas to tidewater for export to Asian and South American markets is critical.”*³⁰

g. Conclusion

The Board has so far been proven correct in terms of the salient trends it identified in dealing with the first LNG export licence application three and a half years ago. The growth of production from enormous North American shale and tight gas resources has been accommodated largely by displacing existing imports of LNG and expanding use of gas in U.S. electricity generation as well as increased consumption in Canadian oil sands operations. Nevertheless gas commodity prices have remained depressed below “pre-shale” historical levels, with the exception of the period in the winter of 2013-14 when demand spiked responsive to the cold weather associated with the continental “polar vortex”. As a generality, investors have for the moment tended to switch their focus from dry to liquids-rich gas. There is a view

²⁷ That Natural Gas Forums agenda has now been taken off the website. But note that in the corresponding April 2014 Forum there is emphasis on the development of infrastructure, regional gas projects and shale gas supply. <http://www.ldcgasforums.com/se/agenda.html>

²⁸ This study is available at http://www.ceri.ca/index.php?option=com_content&view=article&id=113:ceri-study-138-north-american-natural-gas-pathways

²⁹ Source: http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/pdf/publications/emmc/Capturing_Opportunity_e.pdf

³⁰ This document has now been removed from Natural Resources Canada’s website

among policymakers and in industry that, looking out at least a couple of decades, the issue for the sector is not the adequacy of supply but of markets.

Canadians have continued to be able to meet their gas requirements in an entirely satisfactory manner at prevailing market prices: no concerns have been expressed by consumers, consumer organizations or Canadian governments as to the adequacy and reliability of supply available at current market prices. After 25 years of market operations, there appears to be increasing confidence in the ability of robust gas markets to deal with demand and supply fluctuations. Price clearly has been operating to continuously equilibrate supply and demand. The dynamic behavior of Canadian energy and natural gas markets was again confirmed in the Board's March 2014 publication *Canadian Energy Dynamics 2013*³¹ which opens with the following comment:

The energy sector in Canada is dynamic and continually being shaped by new sources of supply, changing demand, and integrated infrastructure development. The National Energy Board (NEB or Board) believes that well-functioning, competitive markets efficiently balance supply and demand, and lead to innovative, and robust energy systems.

The Board's April 2014 publication *Canadian Pipeline Transportation System* comments that:

*Since 2007, oil and gas markets have changed dramatically...New sources of U.S. natural gas are entering Canada through Ontario, reducing throughput on TransCanada's Mainline from Alberta to markets in the east. Energy markets have been responding to these changes. Some adjustments happen quickly, while other adjustments take time.*³²

This rearview mirror consideration of the Canadian and North American gas sector does not reveal anything that has troubling implications for the ability of Canadians to meet their gas requirements if the licence applied-for by Quicksilver is issued and the proposed LNG exports take place. Indeed the short-term development of gas supplies, flows and requirements has only positive implications for Canadians in relation to the applied-for exports.

³¹ Source: <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgydynmcs/cndnnrgydynmcs2013/cndnnrgydynmcs2013-eng.html>

³² This quotation is taken from the Executive Summary under the heading Structural Changes Unfolding. Source: <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/trnsprtt/2014trnsprttsssmnt/2014trnsprttsssmnt-eng.html#svi>

4. The Canadian and North American Gas Sector in relation to the Implications Component and the Surplus Assessment Component

a. There are no policy or regulatory barriers to the functioning of the continental gas market as it is presently structured

The policy and regulatory underpinnings for the North American gas market have been comprehensively reviewed, with appropriate source citations, in evidence filed with the Board in recent applications for gas export licences.³³ It is unnecessary to repeat this material here, although a supplementary reference is needed regarding the absence of restrictions in international gas trade with Mexico.³⁴ The continental market's unimpeded functioning is confirmed as it clears continuously and as participants signal their confidence in the market's maturity and robustness by focusing almost entirely on short-term transactions to secure their gas markets and gas supplies. There is no reason to expect policy or regulatory change in Canada or the U.S., on the contrary confidence in market functioning is enhanced and is extending to Mexico, especially in terms of enabling international capital and entrepreneurship to be applied to the development of Mexican oil and gas resources (this point is developed further in Section 7 relative to potential sensitivities in relation to the Implications and Surplus Assessment).

In respect of some factors which may have an unfavourable influence on gas supply such as concerns over potable water supplies which have prompted some regulatory review, Ziff Energy Report expresses the belief that workable solutions will be found which balance legislators' concerns with producers' ability to employ technology in a safe and reliable manner (Ziff Energy Report, Section 6.2.1.4 *Government Policies*).

Ziff Energy concludes at no.15 that North American natural gas markets will continue to function during the forecast period (which is to 2050) with natural gas buyers and sellers establishing fair market prices based on supply and demand fundamentals.

It is reasonable to conclude that there is no evidence to suggest that North American gas markets will not continue to function efficiently.

³³ See, for example, *Export Impact Assessment Report*, being Appendix B of the licence application of WCC LNG Ltd., NEB filing A315K6, pages 15-17 of 47, https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90466/94153/552726/963926/977286/963718/A315K6_-_Appendix_B_-_Export_Impact_Assessment_Report_-_Mr_Roland_Priddle.pdf?nodeid=963722&vernum=0

³⁴ A possible omission in earlier referencing is to Mexico. It is sufficient to note the statement that "Natural gas foreign trade is an unregulated activity. Importers and exporters must inform the *Comision Reguladora de Energia* on imports and exports." Source: <http://www.cre.gob.mx/documento/ingles.pdf>

b. Almost all gas sources and markets are physically linked by gathering, transmission and distribution networks

The North American pipeline “grid” covers essentially the whole of the continent. The only large proven gas reserves that are not connected to it are those of the Alaska North Slope and the three major gas fields in the Mackenzie Delta. There were at the end of 2008 about 31 pipeline connections of varying sizes between Canada and the U.S. and 13 between the U.S. and Mexico.^{35 36}

Not only is the physical infrastructure of pipelines and storage facilities large and interconnected, it is also growing. Many new pipeline projects are in the phase of commercial development and regulatory application in Canada and the U.S. Illustratively, they include:

- Expansions of the Alberta System of NOVA Gas Transmission into the British Columbia portion of the WCSB, exemplified by the application for the North Montney pipeline in GH-001-2014;
- Discussion of the potential for Marcellus gas to be moved westwards, which contrasts with the trend in the first decade of the 21st century which was for construction of pipeline connections eastwards such as Trailblazer with the objective to provide outlets for Rocky Mountain gas in the Midwest and East Coast;³⁷
- A project to bring as much as 0.5 Bcf/d of new gas supplies to the New England states and Maritime provinces;³⁸ and
- A further project to transport up to 1.0 Bcf/d of Appalachian gas to Ohio, Michigan and Ontario.³⁹

This information on current and proposed physical linkages of the North American gas market supports the recognition that Canadian natural gas requirements are met within an integrated North American market.

³⁵ Source, which includes a map dated 2008:

http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/impex_map.html

³⁶ There are some indications that gas pipeline connections between the USA and Mexico are insufficient for industry needs and that this is encouraging the import to Mexico of liquefied natural gas (“LNG”) which by North American standards is very expensive. For more information see

<http://www.mcclatchydc.com/2013/09/18/202503/in-sign-of-energy-dilemma-mexico.html>

³⁷ Source: <http://www.tallgrassenergyip.com/Pipelines/Trailblazer/>

³⁸ Spectra Energy’s Atlantic Bridge project: <http://www.spectraenergy.com/Newsroom/News-Archive/Spectra-Energy-to-Expand-Pipeline-Systems-in-New-England/>

³⁹ Spectra Energy’s Nexus project: <http://www.spectraenergy.com/Operations/New-Projects-and-Our-Process/New-Projects-in-US/NEXUS-Gas-Transmission/>

c. Physical connections create market hubs where gas prices are formed and market liquidity is created

The North American pipeline system incorporates pipeline connections and storage facilities which constitute “hubs” where the physical conditions exist for sales and purchases to take place, prices to be formed and reported publicly. Well known examples of such hubs are AECO Hub in Alberta,⁴⁰ Henry Hub in Louisiana⁴¹ and Dawn in Ontario.⁴² There are some two dozen hubs in North America and as many as 90 geographical points where gas prices are formed and reported. Typically, the volume of trading in relation to these hubs is much greater than the physical volumes transacted—in the case of Dawn, for example, trades are more than three times the physicals. Natural Gas Intelligence, a commercial subscription source, in June 2014 published data on the activity of the top 25 North American gas marketers which showed that just that group transacted about 130 Bcf/d on average during the first quarter of 2014 when total production of marketable pipeline gas may have been about 100 Bcf/d for Canada and the USA. This is an indication of a very active, highly liquid market.

The Ziff Energy Report concludes at no.8 that the North American gas market is highly liquid, open and efficient.

It is clear from this summary that the Canadian and North American gas market exhibits the physical requirements to be liquid and well-functioning.

d. Industry cooperates to ensure standardization of international transactions

The pre-eminent institutional example of this cooperation is the North American Energy Standards Board which states its purpose as follows:

“The North American Energy Standards Board (NAESB) serves as an industry forum for the development and promotion of standards which will lead to a seamless marketplace for wholesale and retail natural gas and electricity, as recognized by its customers, business community, participants, and regulatory entities.”⁴³

⁴⁰ Source for general information by the owner-operator: <http://www.niskapartners.com/our-business/natural-gas-storage/aeco-hub/>

⁴¹ Source for price data: <http://www.cmegroup.com/trading/energy/natural-gas/natural-gas.html>

⁴² Source for information about storage, pipeline connections and services: <http://www.uniongas.com/storage-and-transportation/resources/about-dawn>

⁴³ Source: <http://www.naesb.org/aboutus.asp>

e. Some corporate activities are organized on a continental basis:

For example, Natural Gas Exchange Inc., which is owned by the TMX Group and has operated since 1994, states that:

“Natural Gas Exchange Inc. (NGX), headquartered in Calgary, Alberta, Canada, provides electronic trading, central counterparty clearing and data services to the North American natural gas and electricity markets.”⁴⁴

Shell Energy North America has this to say about its activities:

“Shell Energy North America is the primary marketer of Shell’s natural gas production in North America. This ensures access to some of the continent’s most productive reserves, including natural gas fields in the Rockies, South Texas, Haynesville, Marcellus, Gulf of Mexico, and in Canada.”⁴⁵

Both cooperatively and corporately, the gas industry functions on a North American rather than on a national geographical basis.

f. Market Data Corroborate this Integration

Two data sets exemplify this:

First, the step change in the economics of gas supply resulting in changes in gas flows referred to above: a surge in imports of U.S. gas to Canada, a related decline in the flow of WCSB gas to Central Canada; a falling-off in Canadian shipments to the U.S. and the collapse of LNG imports from overseas to both countries.

Second, the vast amount of continent-wide gas price information that is available from sources such as ICE (Intercontinental Exchange, with which NGX (above) is closely affiliated in operational terms).⁴⁶ And within that body of information the observation that gas price differentials are essentially geographically networked and have tended to narrow over time reflecting the effect of arbitrage opportunities.⁴⁷

Market transparency is not of course limited to current and futures pricing. There is a huge amount of information as to market activities, short and long-term, available from commercial sources and much from official sources in terms of regulatory filings with state and federal boards and commissions and

⁴⁴ Source: http://www.ngx.com/?page_id=2

⁴⁵ Source: <http://s03.static-shell.com/content/dam/shell/static/usa/downloads/sena/sena-nat-gas-map.pdf> and <http://www.shell.us/products-services/solutions-for-businesses/trading/gas-power/gas-power-products.html>

⁴⁶ Source: <https://www.theice.com/about.jhtml> and continue within this website to identify “products” available concerning the natural gas sector.

⁴⁷ Duncan, Dr. James, Director Marketing Analysis, ConocoPhillips, presentation to LDC Gas Forum, Mid-Continent, Chicago September 11, 2013.

general governmental information-gathering such as that of the U.S. Energy Information Administration (“U.S. EIA”).⁴⁸

In sum, the North American gas sector presents all the features of an integrated, price-transparent, highly liquid commodity market characterized by a large number of buyers and sellers and service-providers of all kinds, huge numbers of paper and physical transactions, with no evidence of dominant positions and resulting market power being present in its unregulated component.

g. The Integrated Market is Highly Competitive and therefore Efficient

There are large numbers of competing sellers and buyers of gas in the integrated North American market. As a result there is no concern about dominant positions or monopolistic anti-market tendencies. The market is open to competitors of all sorts. Examples include a European state electricity giant (EDF Energy), a Russian gas monopolist (Gazprom) and an Australian bank and trading house (McQuarie Energy). As a result of this competition new products are being created to meet the needs of producers, consumers and intermediaries. There are many available commentaries on the efficiency of the U.S. gas market, which apply equally to the integrated North American gas sector. The International Energy Agency’s (“IEA’s”) 2007 view was as follows and there is no reason to think that it would be otherwise today:

*The United States natural gas market is dynamic and highly competitive, with a very active spot and futures market. Deregulation of gas production prices and restructuring of the natural gas market, a process extending now over several decades, have increased market efficiency by ensuring that price signals are quickly and transparently transmitted between producers and consumers, and regional markets are more integrated, including with Canada and Mexico.*⁴⁹

That view was extended to relate to the whole of North America by way of a comment in the IEA’s 2009 review of Canadian energy policy, in the section considering gas emergency policy:

*Long-term risk is not particularly relevant for North America, as its natural gas market is resource rich and is an open, competitive commodity market with many buyers and sellers. Supply and demand are balanced daily, by storage operations and daily price movements. By definition, natural gas supply will equal natural gas demand over the long term. Available supplies tend to clear the market; price is what fluctuates.*⁵⁰

⁴⁸ Abundant examples can be found in the natural gas portion of the EIA website: <http://www.eia.gov/naturalgas/>

⁴⁹ IEA 2007 Review of U.S. Energy, page 117. Source: <http://www.iea.org/publications/freepublications/publication/us2007.pdf>

⁵⁰ IEA 2009 Review of Canada, page 152. Source: <http://www.iea.org/publications/freepublications/publication/canada2009.pdf>

It is an established economic understanding that competitive markets are efficient and this conclusion can readily be applied to the integrated North American gas commodity market.⁵¹

h. The NEB has long recognized North American Market Integration

As long ago as 1995, the Board concluded that there has been an increasing degree of integration among North American natural gas markets since price deregulation and the introduction of open access.⁵² This recognition was expressed in the Board's May 2014 decision in Aurora LNG in the following terms at PDF page 2 of 7⁵³:

In fulfilling this mandate, we recognize that Canadian natural gas requirements are met within a North American integrated market. Depending on regional characteristics, exports and imports contribute to either gas supply or gas demand. It is in this context that we must consider whether the Surplus Criterion in the NEB Act is satisfied.

The analysis and examples provided above confirm the Board's longstanding view that Canadian natural gas requirements are met in the context of an integrated continental market.

i. U.S. analysts take the same position

Consider for example the following from a report prepared by the Congressional Research Service under the caption *Considerations for Congress*:

The United States and Canada, while independent countries, effectively comprise a single integrated market for petroleum and natural gas. These markets are physically linked by billions of dollars of transportation and refining infrastructure, and are economically linked by direct participation in the same regional and global energy markets.⁵⁴

⁵¹ A useful discussion of the efficiency of competitive markets is in connection with consideration of gas pipeline regulation is found in Mansell, Robert L. and Church, Jeffrey R. *Traditional and Incentive Regulation: Applications to Gas Pipelines in Canada*, Calgary: The Van Horne Institute for International Transportation and Regulatory Affairs, 1995, under the subheading *Efficiency* at pages 34-35.

⁵² NEB. *Price Convergence in North American Natural Gas Markets*. December 1995, *Overview*, pages 1-2.

⁵³ See link in footnote 3 above.

⁵⁴ Parfomak, Paul and Ratner, Michael: *The U.S.-Canada Energy Relationship: Joined at the Well*. CRS Report for Congress, June 17, 2011, at page 12.

A report by NERA Economic Consulting (“NERA Report”) for the DOE/FE⁵⁵ which has been cited in all seven conditionally-approved American authorizations for the export of LNG to non-Free Trade Area countries⁵⁶ has this to say about the integration of the Canadian and U.S. gas markets:

"The analysis assumed that Canada is part of an integrated North American natural gas market. As a consequence, Canadian pricing is linked to U.S. prices, and Canadian prices relate by a basis differential to U.S. prices." (NERA Report, page 81)

"There are proposals for export facilities in the Mid-Atlantic, Pacific Northwest and Canada, all of which could change basis differentials and potentially the location of additional natural gas production, with corresponding implications for regional impacts." (NERA Report, page 210, section D, Regional Economic Impacts)

j. Conclusion

The North American gas sector presents in every way a functioning market, the largest and best-operating in the world.^{57 58} It does not distinguish national from international transactions: national borders are not now commercially important. The effects of fluctuations in supply and demand variables are therefore similar across all participants—suppliers, buyers and intermediaries—in the integrated continental market. This large, growing continental market is highly integrated, transparent, liquid, flexible and price responsive. This is the market from which Canadians are able to meet their gas requirements. As regards the exports proposed by Quicksilver, the significance of this analysis is as follows:

- The implications on the ability of Canadians to meet their gas requirements are not significantly different as between exports by Quicksilver of LNG from Canada to the Pacific Rim or by others to the Atlantic Basin or exports of LNG from the U.S. to overseas markets or the long-term surge

⁵⁵ NERA Economic Consulting, *Macroeconomic Impacts of LNG Exports from the United States*. Source: <http://www.fossil.energy.gov/programs/gasregulation/LNGStudy.html>

⁵⁶ A continuously updated listing of approved and pending applications for export of LNG from the U.S. is maintained at the following site: <http://energy.gov/sites/prod/files/2014/03/f13/Summary%20of%20LNG%20Export%20Applications.pdf>

⁵⁷ The IEA Review of United States Energy published in 2007, op.cit., stated at page 22: *The United States oil markets are fully open to competition, and the country's natural gas market is a regulatory model within the IEA for what liberalization can achieve.* Exactly the same comment could appropriately be applied to Canada.

⁵⁸ The IEA Review of Canadian Energy, op.cit. footnote 43, stated at page 32: *The natural gas market in Canada is resource-rich, efficient, competitive and diversified, and the present structure of the natural gas market provides a high degree of energy security.*

in continental gas demand which is occurring and expected to continue as older coal-fired electric generating plants are retired and partly replaced by new combined cycle gas units; and

- The surplus Assessment required under section 118 of the NEB Act respecting the exports proposed by Quicksilver, while necessarily focusing on foreseeable Canadian gas requirements and trends in the discovery of gas in Canada must be informed also by consideration of the broad background of the integrated North American market.

It is reasonable to conclude that the macro-economic impacts of exports of LNG from Canada would, after allowance for the effects of changed basis differentials, be similar to those of exports from the U.S. Gulf area.

5. The Likely Response of the Canadian and North American Gas Sector to the Exports Proposed by Quicksilver

The following are comments on the likely “directional” responses in the gas sector to the export by Quicksilver of some 2.63 Bcf/d in the form of LNG over the period 2021-2046. Essentially, the proposition of the following paragraphs is that the market will adjust as it has done in the quarter-century of gas commodity deregulation and that no changes will occur in basic market structures or operations.

a. Economic response

Gas Prices

After undergoing a downwards shift as a result of the shale and tight gas revolution, the North American resource cost curve (Canada + U.S.) has a positive, shallow slope. The supply-cost of gas in Canada and North America (including Mexico which is an integral part of the market) will therefore be higher than otherwise. This is dealt with in the Ziff Energy Report’s section 9.1 *Impact of LNG Exports on Gas Price*.

That report’s Conclusion no.14 is that the incremental price impact of the Quicksilver project on AECO natural gas prices over the forecast period through 2050 will average \$US 0.19 per thousand cubic feet (“Mcf”). The text and Figure 30 of the Ziff Energy Report puts that incremental impact in the perspective of Alberta Energy Company (AECO) natural gas prices which averaged \$US 4.82/Mcf in the period 2005-2013.

This view as to the shape of the gas resource cost curve may also be implicit in the work by the EIA for the DOE/FE on *Effect of Increased Natural Gas Exports on Domestic Energy Markets: as requested by the Office of Fossil Energy, January 2012*.⁵⁹ Essentially, the EIA study posits gas prices rising through 2035 at varying rates, depending on the estimated ultimate recovery (“EUR”) of gas from shale resources and the rate of assumed economic growth. In the case of high shale EUR, the price increase through 2035 in the presence of 6 Bcf/d of US LNG exports is minimal.⁶⁰

A study carried out by NERA Economic Consulting for the DOE/FE, entitled *Macroeconomic Impacts of LNG Exports from the United States* and released in December 2012⁶¹ presents resource supply curves for U.S. natural gas. Again in the high EUR case, the NERA curves are similar in slope to those in the

⁵⁹ Source: <http://www.eia.gov/analysis/requests/fe/>

⁶⁰ On May 29, 2014, the DOE/FE requested the EIA to update the January 2012 study to evaluate LNG export scenarios of 12, 15 and 20 Bcf/d phased-in at a rate of 2 Bcf/d per year starting in 2015. Source: <http://energy.gov/fe/doe-lng-exports-announcements-may-29-2014>

⁶¹ Source: http://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf

earlier EIA work. Illustratively, in 2035 an increment of about 3 Tcf is brought forward by a price increase of some \$0.75 in the wellhead price per thousand cubic feet ("Mcf").

This American work is now one and two years old. Meanwhile two things have happened: expectations regarding the abundance of the U.S. shale gas resource have probably heightened and the DOE/FE has granted numerous conditional approvals for LNG exports to non-FTA countries. Probably as a result, the DOE/FE announced on May 29, 2014 that it plans to undertake an economic study in order to gain a better understanding of how potential U.S. LNG exports between 12 and 20 Bcf/d, rather than the 6 and 12 Bcf/d cases currently evaluated, could affect the public interest.⁶²

By contrast, it should be noted that the Ziff Energy Report's analysis and findings to date reflect work that is continuously updated whereas the NERA report is of the "one-off" kind. Nevertheless, both these studies are still routinely referred-to in DOE/FE decisions on LNG export orders.⁶³

The market price of gas at any one time may be above, equal to or below full cycle new gas costs in Western Canada, as is shown for the period 2005-2012 in the Ziff Energy Report, Figure 9 *Full-Cycle New Gas Cost*. Similarly the market price at any one time may be above or below or equal to any particular historical gas prices. The market price of gas is of course the resultant of the myriad of influences playing on the supply and demand sides of the price-formation equation, including the full cycle cost of gas.

The Ziff Energy Report concludes at no.14 that the incremental price impact of the Quicksilver proposed exports on the AECO natural gas prices over the forecast period will average \$US 0.19 per Mcf over the forecast period.

Gas Demand

A higher than otherwise gas price will dampen North American gas demand as gas consumers effect a relative reduction in their gas use by, among other things:

- Investing in new gas consuming technologies e.g. more efficient appliances or industrial processes;
- Investing in conservation e.g. greater than otherwise insulation of buildings;
- Using less gas and more of other energy sources, e.g. renewables for electricity generation;

⁶² Source: <http://energy.gov/articles/proposed-change-energy-departments-lng-export-decision-making-procedures> See under caption *ECONOMIC IMPACT STUDY*

⁶³ The most recent references are in the DOE/FE Order conditionally granting long-term authorization to export LNG from the Jordan Cove LNG terminal in Oregon, DOE/FE Order No. 3413, March 24, 2014. The EIA and NERA studies are extensively cited and discussed in Section VI of the decision at pages 27-35 (EIA study) and 36-46 (NERA study). Source: <http://energy.gov/sites/prod/files/2014/03/f13/ord3413.pdf>

- Switching space heating to other fuels e.g. electricity in low seasonal heat-load areas of the U.S.; and
- “Expatriating” their gas consumption to third country locations e.g. methanol or fertilizer manufacturing (note that the current trend, because of low gas prices on this continent, is to “repatriate” gas consuming operations to North America⁶⁴).

The Ziff Energy Report’s conclusions no. 10 and 11, already cited, address expected North American and Canadian gas demand growth in the presence of Quicksilver’s proposed exports.

Gas Supply

A higher than otherwise gas price will result in a larger than otherwise North American supply by, among other things:

- Creating new flows of capital, innovation and entrepreneurship into the gas producing industry;
- Increasing gas-directed exploration, resulting in the discovery of new gas resources and reserves by subsisting investors;
- Bringing some presently sub-commercial discovered gas resources within the economic threshold;
- Potentially increasing gas imports to North America in the form of LNG through presently underutilized facilities, most likely on a seasonal basis.

Parenthetically on the score of gas supply, it should be noted that the abundant shale and tight gas resources of western Canada and the prospect of their development with a view to supplying new markets, including LNG exports, has already resulted in large capital inflows primarily from countries in East Asia (China National Offshore Oil’s acquisition of Nexen and Petronas’s purchase of Progress Energy are outstanding examples).⁶⁵ Arguably this has already benefited Canadian consumers by sustaining exploration and development activity and increasing upstream competition. Conversely, if trade and investment policies were to work against this kind of development, the availability of capital to develop Canadian gas supply would be adversely affected and with it the interests of Canadian gas consumers.

The Ziff Energy Report includes extensive data on gas resources and gas supply. The Report’s conclusion no.2 is that North American and Western Canadian gas supply is not constrained to meet projected base

⁶⁴ Methanex, the world’s largest producer of methanol is currently dismantling two methanol plants in Chile and rebuilding them in Louisiana. Source:

http://www.methanex.com/newsroom/documents/MX_Global_Methanol_Production_Facilities_2013.pdf

⁶⁵ A summary of Asian investments through 2012 together with comments from a leading Canadian law firm can be found at

http://www.osler.com/uploadedFiles/News_and_Resources/Publications/Guides/Capital_Markets_Review_2012/2012%20Capital%20Markets%20Review%20-%20ch%202.pdf Other foreign interests have invested or are considering investment in Canadian gas industry. They include companies from South Asia.

demand, including NEB approved LNG exports and increased demand from the Quicksilver project over the forecast period through 2050. The Ziff Energy Report's Conclusion no. 6 is that Canadian gas supply is expected to grow to 36 Bcf/d in 2050 from 13 Bcf/d in 2013, as new gas supplies more than offset declines of higher-cost conventional gas.

New gas markets enhance gas supply

The export of LNG by Quicksilver from the west coast of Canada will present a new market for WCSB gas supply and will expand that supply, particularly from presently geographically disadvantaged sources, as a result of market and price factor. The Ziff Energy Report's views on the supply-enhancing effects of the new market outlets resulting from NEB-approved LNG projects and Quicksilver's project volumes are presented under Section 6.4 *Canadian Gas Supply Forecast*.

Gas Flows

To the extent that the expansion of WCSB supply is less than the full volume needed to fulfill that new market, flows of gas out of the WCSB to U.S. and eastern Canadian markets will be reduced and will be replaced in those markets by flows from other sources, particularly U.S. shale gas sources. Ziff Energy's views on current and expected natural gas market dynamics are discussed in the Ziff Energy Report Section 8.2 *North American Natural Gas Market Dynamics*. The impact these have on the interaction between gas supply and demand, and the resulting regional natural gas flows are presented in the Ziff Energy Report, Section 8.6 *North American Supply/Demand Balance* and the related set of four maps.

b. Policy and regulatory response

There are no implications for change in the governmental policy, regulatory or international-treaty framework within which the North American gas industry functions. It is simply not conceivable that the export of LNG by Quicksilver at a rate equivalent to 2.63 Bcf/d for a term of 25 years would result in changes in relevant areas of policy and regulation. As already noted at page 15 above, the Ziff Energy Report expresses the belief that workable solutions will be found in areas of government policies affecting gas supply such as rules and regulations relating to fracking of unconventional gas resources.

c. Gas sector commercial structure response

There are no implications for change in the commercial-institutional framework or for the organization of the gas industry. The industry will continue to be characterized by a large number of competing producers, buyers and service providers, the absence of dominant positions, regulated transmission and distribution with open season open access, provision of storage by regulated and merchant entities, multiple interconnected market hubs, national and international standards for transactions, and commercial and regulatory initiatives that encourage competition.

The Ziff Energy Report expresses an essentially congruent view of the North American market in Section 8.2 *North American Natural Gas Market Dynamics*, where it is stated that:

"The natural gas market is characterized by large numbers of competing sellers, buyers,

intermediaries, and huge trading volumes. It is highly liquid, price transparent, and facilitated by electronic trading platforms, a vigorous futures market, and availability of financial instruments to enable price hedging and related activities.”

d. Gas sector market functioning response

There are no implications from the Quicksilver proposed gas exports for change in the functioning of the North American gas market. Indeed, to the extent that the market will be larger, it will present more opportunities and be characterized by more participants than otherwise, the market’s functioning will be enhanced. Therefore as the Board found in LNG Canada⁶⁶ and again in Aurora LNG⁶⁷ the North American gas market is highly liquid, open, efficient, integrated, and responsive to changes in supply and demand.

The Ziff Energy Report states in Section 2.4 *Supply/Demand Balance* that:

Natural gas markets in North America are expected to continue to function in a rational manner during the forecast period and will continue to provide appropriate market signals for development of resources to meet Canadian domestic and export demand.

e. Conclusion

Put simply, North American gas markets will adjust to Quicksilver’s proposed gas exports: supply will increase; to the extent that gas prices increase as the production required moves up the cost curve, local demand may be dampened; and gas flows will change to accommodate exports of WCSB gas from British Columbia (“BC”). The market has been adjusting continuously for decades and there is no reason to think that the adjustment required by Quicksilver’s proposed gas exports will pose any kind of difficulty for gas suppliers, buyers or intermediaries. Neither is there reason to suppose that these exports will affect the policy, regulatory, commercial or market functioning underpinnings that allow and encourage such adjustments.

The overall conclusion therefore is that the export volumes proposed by Quicksilver do not have implications in the area of the functioning of Canadian and North American gas markets or their underpinnings that will negatively affect the ability of Canadians to meet their gas requirements.

⁶⁶ Source: NEB, Letter Decision in LNG Canada, 4 February 2013 (File OF-EI-Gas-GL-L384-2012-01-01) cited in footnote 2 above, *Views of the Board* at page 4 of 12.

⁶⁷ Source: NEB, Letter Decision in Aurora LNG, 1 May 2014 (File OF-EI-Gas-GL-A777-2013-01 01) *Views of the Board* at page 4.

6. A Description of the Implications of the Proposed Export Volumes on the Ability of Canadians to meet their Gas Requirements

The following Description is made in the light of the foregoing considerations of developments since the Board first dealt with an LNG licence application (Section 3); observations about the continental gas market including the insignificance of national boundaries for purposes of this analysis (Section 4); and the expectation that the proposed export volumes will not result in any change in the various frameworks within which the gas sector operates and the behaviours that it exhibits (Section 5).

a. As to quantities

The Ziff Energy Report conclusion no.12 is that Canadian gas demand is expected to increase at an average of 3.9% per year over the forecast period and will comprise a larger component of North American demand, increasing market share to 28% in 2050 from 11% in 2013. Canadian industrial, commercial, institutional and residential consumers will continue to be able to fully meet their gas requirements quantitatively in the presence of the additional demand represented by Quicksilver's proposed LNG exports. They will be able to do so because their requirements are satisfied by gas supply from Canadian, U.S. and other global sources within a robust, healthy, functioning continental market which will approximate 100 Bcf/d when exports commence and grow to 145 Bcf/d⁶⁸ by the end of the requested 25-year term. That continental market has additional supplies potentially available to it of some 5.3 Bcf/d from Canadian and U.S. arctic sources⁶⁹ and nearly 22.0 Bcf/d from global sources in terms of existing LNG import terminals in Canada, Mexico and the U.S.⁷⁰ Within the continental market there does not seem to be a large potential for new demand elements apart from electricity generation and oil sands development. The proposed export volumes are modest in size and their impact over a time period approximating the second quarter of this century is likely to be lost in the ongoing “churn” of market activity. The quantitative implications of these volumes in the continental market cannot be further assessed with any confidence. Qualitatively, however, based on past experience the addition of those export volumes will stimulate gas resource exploration and development and create additional supply equivalent to a large proportion of the demand increment.

b. As to prices

The foundational premise of the Market-Based Gas Export Procedure, enunciated by the Board in GHR-1-87, is that the marketplace will generally operate in such a way that Canadian requirements for

⁶⁸ These are “supply” numbers read-off the Ziff Energy Report’s Figure 13, *North American Gas Supply to 2050* with a notional addition of 5 Bcf/d of Mexican supply added in each case.

⁶⁹ Ziff Energy Report, Section 4.4 *Northern Gas*

⁷⁰ Of the existing LNG import capacity as of June 20,2014, about 18.5 Bcf/d is in the U.S., 1.0 in Canada and 2.2 in Mexico. Source: <http://ferc.gov/industries/gas/indus-act/lng/lng-existing.pdf>

natural gas will be met at fair market prices. This premise has been abundantly confirmed by the experience of the last 27 years, indeed the effective market functioning has become stronger over time. It is therefore entirely reasonable to expect that Canadian gas users will continue to meet their requirements in full at fair market prices over the term of the export licence applied for by Quicksilver.

The following further comments relate to likely behavior of the prices at which Canadians will meet their gas requirements in the presence of Quicksilver's proposed LNG exports:

- Those prices will derive from the normal functioning of the integrated competitive continental market which, because it is fully “networked”, will continue to obey the “law of one price” characteristic of such markets. Where basis differentials exceed the marginal cost of transportation between hubs, market actions by various participants such as suppliers of pipeline services will tend to bring the differentials back to that cost relationship;⁷¹
- Those prices will therefore not be differentially affected to a significant degree from those in North America as a whole by the fact that the proposed exports take place from Canada. The implications of the proposed export volumes are likely to be similar for Canadian, Mexican and U.S. gas buyers. This is because the market, as demonstrated earlier, is a continental one in which national boundaries are commercially insignificant;
- Gas prices to industrial, commercial, institutional and residential consumers in Canada will continue to be vary geographically essentially by differences in transmission and distribution costs. The price implications for BC gas consumers of the proposed exports taking place from the west coast will not be significantly different than for, say, consumers in Central Canada;
- It is not likely that Canadian gas consumers will experience significant price fluctuations as a result of the inception and continuation of the proposed export because market actors—producers, sellers, buyers and intermediaries—will anticipate the initiation and build-up of exports just as they do for other “programmed” changes in demand and supply variables⁷²;
- It is likely that the high ratio of oil to gas prices on an energy equivalency basis will continue, to the advantage of gas consumers who will enjoy large consumer rents relative to users of other energy forms such as fuel oils,⁷³ and

⁷¹ “Basis differentials” are discussed by *Investopedia* at <http://www.investopedia.com/terms/b/basis-differential.asp>

⁷² This matter is discussed in Appendix E to the Application of LNG Canada, *Export Impact Assessment*, (NEB filing A2V315) at pages 40-42 of 52 under the general heading 6. *Are there safeguards against extraordinary demands being suddenly placed on Canadian supply by this export market?*

⁷³ The expectation of a continued high ratio of oil to gas prices was expressed and discussed in Appendix E to the Application of LNG Canada, *Export Impact Assessment*, at pages PDF 35-36 of 52 which also referred to the Board’s

- It is likely that Canadians, along with all North American gas consumers will continue to enjoy gas prices that compare favourably with those in other industrial countries.

As to recent intercontinental gas price differentials, the 2014 BP Review of World Energy provides the following 2013 price data, expressed in \$US per million Btu⁷⁴:

• Japan: imported LNG cost, insurance and freight (“c.i.f.”):	16.17
• Germany: average import price:	10.72
• United Kingdom: National Balancing Point price:	10.63
• Henry Hub, Louisiana U.S.	3.71
• Canada, Alberta	2.93
• Average crude oil import prices OECD countries	18.25

The large differential existing and expected to continue between North American prices and those in, for example, East Asia taken together with abundant low-cost North American gas resources provides the incentive for investors to plan exports in the form of LNG from Canada and the U.S. to overseas markets. However, accessing those markets will involve significant costs of gas transmission, liquefaction, ocean transportation and re-gasification. Those costs will therefore ensure that substantial intercontinental gas price differentials in favour of Canadian and North American consumers will remain when LNG is exported from Canada and North America by Quicksilver and others. North American natural gas prices will necessarily and inevitably remain substantially below the prices prevailing in world markets supplied by LNG.⁷⁵

own expectations in this respect in *Canada’s Energy Future*, 2011, pages 2-4, Energy Prices, an expectation which the proposed exports will not disturb. The Board’s most recent publication *Canada’s Energy Future 2013: Energy Supply and Demand Projections to 2035*, 2013, projects at page 1, in Figure 1.1 a reference case price for West Texas Intermediate (“WTI”) crude oil of \$US110 and for Henry Hub natural gas prices \$US 6.20 per MMBtu which gives a 3:1 energy equivalent ratio in favour of natural gas.

⁷⁴ Source: <http://www.bp.com/content/dam/bp/pdf/Energy-economics/statistical-review-2014/BP-statistical-review-of-world-energy-2014-full-report.pdf> See page 27, Natural Gas – Prices.

⁷⁵ The *Executive Summary* of the NERA Report for the DOE/FE at page 2 expresses this point in respect of U.S. prices as follows:

U.S. natural gas prices increase when the U.S. exports LNG. But the global market limits how high U.S. natural gas prices can rise under pressure of LNG exports because importers will not purchase U.S. exports if U.S. wellhead price rises above the cost of competing supplies. In particular, the U.S. natural gas price does not become linked to oil prices in any of the cases examined.

C. As to supply options

Most Canadian gas users can choose among suppliers—local distribution companies, agents, brokers and marketers—to meet their gas requirements. These suppliers may offer fixed, market-tracking and indexed prices, variable lengths of term of contract, different methods of payment and other energy management solutions.^{76 77} Canadians will continue to enjoy such supply options in meeting their gas requirements: the presence of options—which are likely to grow rather than diminish in an overall larger industry--will enable Canadians who so wish to protect themselves against some future price uncertainties.

d. Conclusion as to the implications of the proposed export volumes

The export by Quicksilver of 2.63 Bcf/d in the form of LNG over a 25-year period commencing in the early 2020s, in and of itself, will not significantly affect the ability of Canadians to meet their gas requirements. This is because Quicksilver's exports cannot effect any significant change in the resource, technical, commercial, policy and regulatory fundamentals that determine Canadian and North American gas supply, demand and market functioning.

Canadians will continue to be able to fully meet those probably slowly-rising requirements from gas supplies sourced in Canada, the United States and, at the margin, from overseas. Those supplies will be drawn from abundant geological resources subject to progressive technological improvements in discovery, development, processing and production. Canadians' gas requirements will be met at prices determined in a large, efficient, competitive, flexible, liquid, integrated North American market offering comprehensive price discovery to all transactors.

The Ziff Energy Report conclusion no.13 is that the market impact of the proposed Quicksilver Project will be muted by the abundance of low-cost resources available in Western Canada and the Lower-48.

The prices that eventuate may be higher than they would have been without the LNG exports but there is no certainty in this: the course of North American gas prices over the past 20 years, expressed in real terms, could not possibly have been predicated in the mid-1990s and the same probably goes for price behavior over the next 20 years.

What seems almost certain is that prices which eventuate will be lower than they would have been without the technology-inspired shale and tight gas revolution which has spurred the search for new gas markets including overseas markets for LNG.

⁷⁶ The Energy Shop website provides information about the price and other options available from six marketers licensed by the Ontario Energy Board. The options include prices fixed for one, three and five year terms. http://www.energyshop.com/es/prices/on/gason.cfm?ldc_id=4

⁷⁷ Direct Energy offers contract term and price options for businesses as well as for residential consumers in different jurisdictions <http://www.business.directenergy.com/ca-business/energy-products-and-services/find-the-best-products-for-you#selectedProducts>

Multiple alternatives will be available to Canadian gas buyers in terms of the type of supplier and the services available to them. Indeed, in a larger total market resulting from LNG exports, those alternatives may be enhanced compared to today.

The Board's activity in the field of energy and gas market assessment will continue to keep Canadians—including gas buyers, sellers, producers, investors and government authorities—as well as itself, informed about and alert to the implications of adjustments resulting from the operation of energy and gas markets. This activity, which was indicated in GHR-1-87⁷⁸, has of course been ongoing for more than 25 years

The Ziff Energy Report conclusion no.16 considers that the export of gas proposed by Quicksilver will not cause Canadians any difficulty in meeting their natural gas requirements at fair prices over the forecast period.

It is concluded from this Description that the quantity of gas applied to be exported by Quicksilver, namely 27.03 10³m³ annually, which is subject to a requested 15% tolerance, for a term of 25 years, does not have unfavourable implications on the ability of Canadians to meet their gas requirements.

⁷⁸ GHR-1-87 stated at page 47 of 96 under the subhead 1) *Assessment of Canadian Energy Supply and Demand* : “The Board will monitor Canadian energy markets so as to be alert to any difficulties for Canadians in adjusting to changes in natural gas supply and demand.” And on the same page under the subhead 2) *Natural Gas Market Assessment*: “As a second part of its ongoing monitoring, the Board will analyse natural gas supply, demand and prices and will periodically publish reports on its findings.”

7. Consideration of Certain Sensitivities relating to the Description and Assessment

Sensitivity analysis is another form of risk assessment.⁷⁹ In the present Description of the implications of the proposed export volumes on the ability of Canadians to meet their gas requirements and the Assessment of surplus, some sensitivities might be considered as “negative” (example: impairments to market functioning, cumulative LNG export authorizations from Canada and U.S.) and others as “positive” (example: gas supply enhancements, changed expectations as to Mexican gas supply).

a. Gas market functioning

It is reasonable to consider whether there are developments in view which could undermine the critical assumption of fully functioning, adequately-supplied Canadian and North American gas markets. The potential includes, but is not limited to:

- *Geopolitical developments that would impinge on North American gas markets e.g. a Middle East crisis affecting international oil supply or a “Russian crisis” impairing the supply of gas from that source to southern, central and western Europe.* The potential for such developments exists, but it is impossible to predict their timing, intensity or gas market impact.
- *Profound social and political change away from market approach for gas energy.* Given the success of market functioning and the absence for a quarter century of serious rethinking of the market approach from any part of the North American elected political spectrum, this potential development seems unlikely to materialize.⁸⁰
- *Failure for whatever reason of technology for shale and tight gas.* Confidence in technology seems to be increasing; costs appear to be continuing to decrease.⁸¹
- *Fundamental adverse environmental effects of shale and tight gas production and the policy and regulatory response.* No such environmental effects have been demonstrated despite the drilling and completion over the past decade of many thousands of shale

⁷⁹ Fahey, Liam and Randall, Robert M., op.cit., page 359.

⁸⁰ This is not to overlook the representations made by a number of corporations and organizations to the U.S. regulator of gas exports, the DOE/FE, in the context of applications for LNG export authorizations. However, in dealing with those applications, the DOE/FE has uniformly reviewed the evidence in the record and has not found adequate basis to conclude that the export of LNG to non-FTA countries will be inconsistent with the public interest. See, for example, the most recent conditional export approval, that of Dominion Cove Point LNG, Order 3381, September 11, 2013 under heading *F. Conclusion* at page 147 of 161

⁸¹ Source: Chesapeake Energy, September 2013 Investor Presentation
<http://www.chk.com/Investors/Pages/Presentations.aspx>

and tight gas wells in a wide variety of geological and surface settings. Environmental issues seem to be most prominent in jurisdictions which have had least experience of gas production and fracking and seem to be rather minor in leading Canadian jurisdictions having very large shale and tight gas resources, namely Alberta and BC.⁸²

- The market does not appear to hold expectations of developments adverse to gas market functioning or that would reverse the trend to economic exploitation of low-cost shale and tight gas resources. Gas producers' and investors' expectations show absolutely no anticipation of any kind of critically-adverse supply-affecting development. Encana for example is telling investors that, *"Due to abundant, low cost supply, natural gas prices are expected to remain range bound around current levels."* That expectation relates to the period through the early 2020s.⁸³

b. Gas Supply: Mexican gas production potential

Mexico presents a net draw on U.S. gas supply in the amount of about 1.8 Bcf/d in the first quarter of 2014. The Ziff Energy Report in Section 8.4 *Mexican Net Imports* forecasts U.S. exports to Mexico in 2050 at about 3.0 Bcf/d. It states at the end of 2009 Mexico's gas proven gas reserves were some 17 Tcf and her total gas resources 61 Tcf.

In August 2013, the Government of Mexico announced, subject to legislative approval, a program of energy reform. Under the heading *Objectives of Hydrocarbons Policy*, the executive summary of the program states as follows:

*"In the case of natural gas, production would rise from 5.7 Bcf/d currently to 8.0 Bcf/d in 2018 and 10.4 Bcf/d in 2025."*⁸⁴

⁸² The Ziff Energy Report states at page 23 under the sub-head *Government Policies*:

"Factors that may have an unfavourable influence on gas supply include concerns over potable water supplies which have prompted regulatory review and investigation in some jurisdictions. Ziff Energy believes workable solutions will be found which balance legislators' concerns for constituents' safety and well-being with producers' ability to employ hydraulic fracturing technology in a safe and reliable manner."

⁸³ Encana, corporate presentation, November 5, 2013, *Commodity Outlook—Natural Gas*, page 11. Source: http://business.financialpost.com/2013/10/01/encana-restructures-senior-management-as-old-guard-leaves/?_lsa=8a63-91fb Encana continues to sell gas assets to reduce its exposure to this commodity. Source: <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/encana-to-sell-some-texas-gas-assets-for-530-million/article18319623/#dashboard/follows/>

⁸⁴ Free translation from page 11 of *Reforma Energetica, Resumen Ejecutivo*, page 11 <http://consulmex.sre.gob.mx/littlerock/images/stories/PDF/RE.pdf>

The Mexican Senate approved this program in December 2013. At that time, the Government of Mexico maintained the above expectation regarding natural gas production. It should be noted that before the reforms can take effect, Mexico's legislature must finalize the secondary laws detailing the fiscal regime, including the contract terms for the exploration and production models and local content requirements. It is expected that Mexico will finalize the secondary legislation by early August 2014.⁸⁵

The chief Latin American economist for Goldman Sachs Group Inc. stated in a December 8, 2013 research report that:

The potential impact on Mexico's widely-perceived inefficient and underinvested energy sector could be truly transformational.

The head of commodities research at Citigroup Inc. stated:

*The resource base for natural gas in Mexico is abundant, would be cheap if developed and would enable Mexico to resume a faster pace of industrial development and GDP growth.*⁸⁶

Corroborating this view, the US EIA in April 2014 noted the following in regard to Mexican gas potential:

*Mexico has one of the world's largest shale gas resource bases, which could support increased natural gas reserves and production. Mexico has an estimated 545 Tcf of technically recoverable shale gas resources—the sixth largest of any country examined in the study.*⁸⁷

One notes that the first official public presentation of Mexico's energy reform intentions to be made outside Mexico was given in Calgary on June 2, 2014 when Mexican officials invited Canadian participation in their industry.

A somewhat contrary view was recorded by the US EIA in a May 29, 2014 article *Mexico's Energy Ministry projects rapid near-term growth in natural gas imports from the U.S.* The expected growth was

⁸⁵ Source: US EIA May 27, 2014 <http://www.eia.gov/todayinenergy/detail.cfm?id=16431>

⁸⁶ Source of quotes from Goldman Sachs and Citigroup is a Bloomberg report Mexico Senate Approves Energy Bill Aimed at Production Boom, dated December 11, 2013 and available at <http://www.bloomberg.com/news/print/2013-12-11/mexican-senate-approves-energy-overhaul-aimed-at-production-boom.html>

⁸⁷ Source: <http://www.eia.gov/countries/cab.cfm?fips=mx> The full assessment on which this comment is based can be found at <http://www.eia.gov/analysis/studies/worldshalegas/pdf/fullreport.pdf>

attributed to surging US gas production and rising demand in Mexico particularly for power generation.⁸⁸

On balance, the possibility of Mexican energy reform cannot be excluded as a sensitivity factor on the supply side of the continental energy equation. If Mexican ambitions in respect of natural gas production were to be fulfilled, it would result in nearly 5 Bcf/d of additional supply from this source soon after the intended coming on stream of Quicksilver's project.

The Ziff Energy Report's view however is that in spite of new constitutional and regulatory amendments, and promising resource potential, gas production in Mexico will continue to be uncertain going forward.

c. Gas Demand: General Considerations

The impact of a sensitivity assumption that Canadian demand will increase at an average annual rate approximately 20% above the level in the relevant Natural Gas Supply and Demand Forecasts filed in support of the current licence applications by Pacific NorthWest LNG, Prince Rupert LNG, WCC LNG and Woodfibre LNG Export was discussed by these applicants responsive to information requests of the NEB.⁸⁹

In each case, the response was to the effect that the assumed additional Canadian demand does not impact the conclusions of Ziff Energy Report's Supply/Demand analysis and the Export Impact Assessment and Surplus Assessment respectively and that the proposed gas export will not cause Canadians any difficulty in meeting their natural gas requirements over the forecast period.⁹⁰

The Ziff Energy Report Section 9.2 *Canadian Demand Sensitivity Increased 20%* discusses this issue in relation to the term and volumes of the proposed Quicksilver exports. The Ziff Energy Report's finding is that a 20% (increase in) Canadian Demand Sensitivity produces an average price impact of \$US 0.26/Mcf and does not change the overall conclusions of its Report. It is reasonable to conclude in the light of all of the foregoing qualitative analysis, that the assessed price impact stemming from this demand

⁸⁸ Source: <http://www.eia.gov/todayinenergy/detail.cfm?id=16471#>

⁸⁹ The NEB Information Requests were contained in the following documents:
Pacific NorthWest LNG: A3K6U4 - Letter and Information Request No. 1 - Pacific NorthWest LNG Ltd. - Application for a Licence to Export LNG; Prince Rupert LNG: A3K6U2 - Letter and Information Request No. 1 - Prince Rupert LNG Exports Limited - Application for a Licence to Export LNG ;WCC LNG: A3K6U9 - Letter and Information Request No. 1 - WCC LNG Ltd. - Application for a Licence to Export LNG ; and Woodfibre LNG Export: A3K8L4 - Letter and Information Request No. 1 - Woodfibre LNG Export Pte. Ltd. LNG Application .

⁹⁰ The Responses to the Board's Information Requests were provided in the following documents:
Pacific NorthWest LNG: A3L3J6 - PNW_LNG_Response_to_NEB_IR_No__1 ; Prince Rupert LNG in A3L3E8 - Response to NEB IR No 1 ; WCC LNG A3L3I9 - WCC LNG Ltd. Cover Letter and IR 1Responses ; and Woodfibre LNG Export: A3L5L6 - Woodfibre LNG Response to NEB IR No. 1, September 27, 2013 .

sensitivity would not have any significant implications on the ability of Canadians to meet their gas requirements.

d. Gas Demand: The Failure of Ontario Nuclear Power

The most striking regional change in global gas demand to have occurred in recent years is the increase in natural gas requirements, essentially LNG, resulting from the complete shut-down of the Japanese nuclear power production because of the failures, and concerns for the safety of the whole system, that followed the March 2011 Fukushima disaster which destroyed three of the six reactors at that nuclear power plant.

The U.S. Energy Information Administration summarized the situation as follows:

In March 2011, a 9.0 magnitude earthquake struck off the coast of Sendai, Japan, triggering a large tsunami. The damage to Japan's nuclear industry resulted in an immediate shutdown of about 10 GW of nuclear electric generating capacity. Between the 2011 Fukushima disaster and May 2012, Japan lost all of its nuclear capacity as a result of scheduled maintenance and lack of government approvals to return to operation. Two nuclear reactors were re-commissioned in July 2012 and represented the only source of nuclear power in the country for more than one year. However, these two reactors were removed from service again in September 2013, eliminating the country's nuclear capacity for a second time in more than 40 years.⁹¹

The lost power output was replaced by generation from conventional sources including by natural gas, coal, heavy fuel oil and by some crude oil burning. Natural gas derived from imported LNG was the major generation contributor.

The province of Ontario obtains more than 40% of its power needs from nuclear sources. The CANDU nuclear system has proven highly reliable as a source of very low fuel cost base-load generation. However the possibility that these reactors would be shut down for an extended period as a result of, say, some systemic technical fault affecting all these plants presents a conceivable Canadian gas demand sensitivity.

The effect on gas demand of such a development can be assessed under the assumption that all the province's gas generating plants, which are normally used for peak supply, are operated on base load to partially replace the lost nuclear generation (other potential sources of supply include a limited amount of oil-thermal generation and electricity imports from Quebec and neighbouring U.S. states, including a proportion of gas generation, for example by the presently underutilized 411 MW combined cycle generating plant of TransCanada PipeLines at Bécancour Québec contracted to Hydro-Québec).

⁹¹ Source: <http://www.eia.gov/countries/cab.cfm?fips=ja>

In recent years, Ontario's gas generating plants, which have an aggregate capacity of about 10 GW with no major additions planned⁹² for an extended period, have operated at a load factor ("LF") of about 20%.⁹³ Assume that it would be technically possible to operate them continuously at a very high 90% LF, this would imply an increase of 4.5 times in the 2012/2013 consumption of gas for Ontario public electricity generation which was of the order of 185 Bcf.⁹⁴ The resulting annual consumption of about 840 Bcf represents an increase of 655 Bcf, which is approximately 1.8 Bcf/d providing 60 additional of the foregone 91 TWh.

An increase in North American gas demand of this magnitude should be manageable through the normal operation of dynamic market forces by a sector in which global supply approximates 100 Bcf/d and which routinely copes with much larger seasonal fluctuations.

e. Gas Demand—the Issue of Cumulative LNG Exports

In dealing with some gas export licence applications previous to that of Quicksilver, the Board has received expressions of concern that the aggregate impact of multiple LNG export licence applications before the Board was not being considered. In its relevant Decision Letters, the Board stated that its mandate is limited to the Surplus Criterion as stated in section 118 of the NEB Act and that it has discretion in how to assess that criterion. The Board said that it is satisfied that the gas resource base in Canada, as well as North America, is large and can accommodate reasonably foreseeable Canadian demand, proposed LNG exports, and plausible potential increases in demand. The Board went on to state that, in the context of a dynamic natural gas market, it did not find a table of approved and proposed LNG exports to be useful in making its surplus determination.

The Board's position is determinative of this issue. It is explicitly informed by its understanding of and expectations for North American gas market behaviour which is consistent with the analysis of this Report. The Board also received views from export licence applicants to the effect that the cumulative amount of LNG exports cannot be predetermined, neither can the cumulative or aggregate impact of LNG exports and that any approach that involved consideration of aggregate or cumulative impacts of

⁹² See *Ontario's Energy Plan* which states at page 33 that "The 2007 Plan projected that some 12,000 MW of natural gas would be needed by 2015. Since then, changes in demand and supply — including about 8,400 MW of new, cleaner power across the system and successful conservation efforts — means that less capacity will be required." Source : http://www.energy.gov.on.ca/docs/en/MEI_LTEP_en.pdf

⁹³ Ontario 2013 gas plant capacity 9920 MW and generation about 17.1 TWh which is 19.68% LF. Source: Ontario Independent System Operator, supply overview. <http://ieso-public.sharepoint.com/Pages/Power-Data/supply.aspx>

⁹⁴ Source: Statistics Canada, Table 127-0004 *Fuel consumed for electric power generation, by electric utility thermal plants*. The 2012 number for Ontario was some 5.266 Billion cubic metres.

LNG exports would risk denying exports which it may turn out could have been allowed and it is contrary to the principle of reliance on market forces.⁹⁵

f. Other uncertainties

The Canadian Energy Research Institute (CERI) Natural Gas Pathways work, already referred-to, considered that as demand grows there may be significant structural changes that influence the use and pricing of natural gas in relation to competing fuels.⁹⁶

The Pathways work however considered that the two critical demand uncertainties are:

1. *LNG Exports from North America*: There is a wide range of uncertainty over whether LNG export from North America will be low or high in the future.
2. *Power Generation Demand*: There is a wide range of uncertainty over whether there will be low or high growth in power generation demand in North America.

In developing the Pathways approach, a number of discussants considered that a third critical uncertainty is the direction of the North American economy which would come third in the above ranking. It is not considered likely that any of these three potential uncertainties/sensitivities would undermine the conclusions of the Description in Section 6 or the submission in Section 9.

g. Conclusion

It would not be sensible to try and explore all the sensitivities and uncertainties potentially affecting the Description provided in Section 7. But having regard to those examined above and referring to the work carried out for CERI Natural Gas Pathways, it is reasonable to conclude that there are no foreseeable

⁹⁵ This summary of the issue of cumulative LNG exports and the Board's position on it is taken from its 16 December 2013 Letter Decision in Pacific Northwest LNG Ltd at pages 4 and 5. https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90466/94153/552726/971020/971021/2385392/Letter_Decision_Pacific_NorthWest_LN_G_Ltd._-A3S0X9.pdf?nodeid=2385393&vernum=-2

⁹⁶ CERI, *North American Natural Gas Pathways*, Study No.138, August 2013, op.cit., *Introduction*, page 1:

- a) Feasibility of substantial liquefied natural gas (LNG) exports
- b) National energy security policies
- c) Supply flexibility
- d) Infrastructure and capital requirements
- e) Uncertainty in environmental regulations
- f) Volatility in international oil markets
- g) Geopolitical stability
- h) Unconventional natural gas developments abroad
- i) Domestic end-user consumption
- j) Moratoriums on future development in key fields
- k) Economic stability and ability to attract capital

The complete document referred to is available at http://images/stories/2013-09-05_CERI_Study_No_138_-_North_American_Natural_Gas_Pathways.pdf

plausible sensitivity cases that could invalidate the findings in regard to the Description in Section 6 or the Assessment in Section 8.

8. Surplus Assessment

The context of the Assessment is the very large, demonstrably dynamic, physically and commercially integrated, price-transparent, highly-liquid, price-responsive North American gas commodity marketplace, which includes Mexico, and is discussed above in Section 4.

It is reasonable to believe that the policy, regulatory and commercial underpinnings of this market will be undisturbed by the proposed exports as discussed in Section 6 and indeed will remain intact for the foreseeable future, as they have done for the past quarter-century.

The Ziff Energy Report Section 6.2.1.4 *Government Policies*, considers that some policies, such as putting a price on carbon emissions, will tend to increase gas demand others will tend to reduce gas supply, but with balanced, workable solutions being found

The North American gas sector will therefore continue to present a fully-functioning market in which international gas flows form part of each country's supply and which continuously adjusts in terms of gas supply, demand and flows to price signals, as discussed above in Section 4.

The Ziff Energy Report Section 2.4 *Supply/Demand Balance*, states that natural gas markets in North America are expected to continue to function in a rational manner during the forecast period and will continue to provide appropriate market signals for development of resources to meet Canadian domestic and export demand.

The Ziff Energy Report in Section 9.1 *Impact of LNG Exports on Gas Price* states that:

"The North American and Canadian natural gas markets are highly integrated and liquid providing gas purchasers and sellers multiple options to ensure that the most economic natural gas is developed, transported, and sold into the market at any given time."

All of the above aligns with the Board's own market monitoring as publicly set out in what is literally "the bottom line" of the Board's most recent comprehensive energy supply/demand report, where it is stated that:

*"Finally, the projections suggest Canadians can expect energy markets to continue to function well. Supplies of oil, natural gas and electricity remain in excess of Canadian requirements for the foreseeable future."*⁹⁷

⁹⁷ NEB, *Canada's Energy Future: Energy Supply and Demand Projections to 2035, An Energy Market Assessment*, November 2011. *Conclusions*, page 51 of 79. <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmr/nrgyrprt/nrgyfr/2011/nrgsppldmndprictn2035-eng.pdf>

Parenthetically it is noted that the challenge at this point in time and, in the view of the CERI *Natural Gas Pathways* work (page 14 above), looking forward as far as 2030 is to find new markets for abundant supplies, a situation which is considered above under the heading *Gas demand and gas markets, not supply considerations, are the focus of industry and policy concern*. Consistent with this, the Ziff Energy Report conclusion no.7 is that western Canadian natural gas is facing competition and significant displacement in traditional markets, including in eastern Canada, from low-cost U.S. Lower-48 gas.

In view of the foregoing, the Board can confidently find that the gas applied to be exported by Quicksilver is surplus to reasonably foreseeable requirements for use in Canada, as is required by s.118 of its Act.

Turning now to the matter of gas supply, the Canadian and North American resource base can easily accommodate reasonably foreseeable Canadian demand as well as the proposed LNG exports because:

- The gas resource is very large;
- Trends in the discovery of gas have been upwards;
- Trends in the supply of gas still lag the potential of the resource;
- The Board staff take the position that in Canada technology has brought forward new supplies of gas but low prices are preventing its economic exploitation; and
- The incremental cost of new production to supply LNG export demand is low.

The Ziff Energy Report's extensive support for this statement is summarized in its Conclusion no.1 that North American and Western Canadian gas resources are robust and will continue to grow with the development of horizontal drilling and multi-stage fracturing technologies, Conclusion no.4 that Western Canada has potential natural gas potential in excess of projected demand over the forecast period and Conclusion no. 5 that Western Canada has potential natural gas supply in excess of projected demand, including NEB approved LNG exports and incremental demand from the Quicksilver project over the forecast period.

In releasing the report, referred-to on pages 11-12 above, on the ultimate potential for unconventional petroleum of the Montney formation in BC and Alberta, jointly authored with collaborators in BC and Alberta, the NEB stated "*The report clearly shows that Canadian energy markets will be well supplied with natural gas far into the future.*"⁹⁸

⁹⁸ NEB, News Release, 6 November 2013, *Montney Formation one of the Largest Gas Resources in the World, report shows*. <https://www.neb-one.gc.ca/clf-nsi/rthnb/nws/nwsrls/2013/nwsrls30-eng.html>

It should be noted in this connection that the Board has from the start of its gas export licensing activity considered the term “trends in the discovery of gas” to relate to expectations regarding the growth of reserves.⁹⁹ The findings of recent years regarding the extent of the gas resource in Canada, exemplified by the report on the Montney formation, combined with growing industry development activity focussed on this unconventional gas, will result in resources being converted into reserves and production. This process is indeed now occurring as noted by the Board in its report on Canadian energy dynamics in 2013:

*The Montney Formation in Alberta and B.C. has been explored since the 1950s. Only recently have advances in technology made it possible to economically produce gas from this unconventional formation. Production began in 2005, and grew to over 2.5 Bcf/d in 2013. Growing Montney production is offsetting declining production from conventional sources in the WCSB.*¹⁰⁰

The Ziff Energy Report is independently consistent with this Assessment. In particular attention is drawn to elements of its Conclusions, and especially to those relating to supply-adequacy (Conclusions 1. through 6.), modest demand growth (Conclusions 10. through 12.), the price impact of the Quicksilver exports (Conclusion 14.) and Ziff Energy’s consideration that the export of gas proposed by Quicksilver will not cause Canadians any difficulty in meeting their natural gas requirements at fair market prices over the forecast period (Conclusion 16.)

It is fitting to conclude with the observation from the Board’s May 2014 Energy Market Assessment *Short-term Canadian Natural Gas Deliverability*

*Natural gas supply in Canada and the U.S., in terms of resources and production, has been robust since techniques to develop shale gas and tight gas formations through horizontal drilling, multi-stage hydraulic fracturing, and multi-well pad drilling have become mainstream. The enormous potential supply from these formations has outpaced growth in natural gas demand in Canada and the U.S.*¹⁰¹

⁹⁹ See by way of example NEB, *Report to the Governor in Council* in GH-1-59 and GH-2-59, March 1960, Sections 3 *Gas Reserves*, 3-6 *Trends in Exploration and Growth* and 3-13 *Finding on Trends in Discovery*. This early work produced finite estimates of trends for a 30-year period through 1989. It was based in part on a volume of sediments approach to estimation of ultimate reserves. Modern methodologies are of course much more sophisticated.

¹⁰⁰ NEB, *Canadian Energy Dynamics 2013*, March 2014, page 6, *Growing Montney Production*

¹⁰¹ NEB, *Short-term Canadian Natural Gas Deliverability*, Chapter 2 *Background*, fourth bullet <http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/ntrlgs/ntrlgsdlvrblty20142016/ntrlgsdlvrblty20142016-eng.html>

In view of these and earlier comments on the matter of gas supply, the Board can have confidence that the “trends in the discovery of gas in Canada”, which by law it must have regard to in making its surplus determination, are positive and will remain so for the foreseeable future.

9. Submission

In view of the foregoing, it is submitted that the annual quantity of gas applied to be exported by Quicksilver Resources Canada Inc., which is subject to a requested annual tolerance of 15%, namely $27.03 \times 10^9 \text{ m}^3$, being the gaseous equivalent of 20 million tonnes of LNG over a term of 25 years commencing in about 2021, for a term quantity of $675.75 \times 10^9 \text{ m}^3$, does not exceed the surplus remaining after due allowance has been made for the reasonably foreseeable requirements for use in Canada having regard to the trends in the discovery of gas in Canada.

R. Priddle
July 2014