LEGISLATIVE ASSEMBLY OF ALBERTA

COMMITTEES
OF THE LEGISLATIVE ASSEMBLY

Standing Committee on Resource Stewardship

Review of the Monetization of Natural Gas in the Province of Alberta

Twenty-Eighth Legislature
Second Session
March 2014

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STANDING COMMITTEE ON RESOURCE STEWARDSHIP

March 2014

To the Honourable Gene Zwozdesky
Speaker of the Legislative Assembly
of the Province of Alberta

I have the honour of submitting, on behalf of the Standing Committee on Resource Stewardship, its final report pursuant to standing order 52.07(2) on the **Review of the Monetization of Natural Gas in the Province of Alberta.**

Sincerely,

[original signed by Chair]

Stephen Khan, MLA
Chair, Standing Committee
on Resource Stewardship

c. Dr. David McNeil
Clerk of the Legislative Assembly

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28th Legislature, Second Session

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1.0 INTRODUCTION

The Standing Committee on Resource Stewardship is one of three legislative policy committees appointed by the Legislative Assembly of Alberta. Standing Order 52.01(1)(c) provides that the Committee's mandate is related to the areas of Environment and Sustainable Resource Development, Transportation, Municipal Affairs, Treasury Board and Finance, Energy, and Aboriginal Relations. Under Standing Order 52.07 the Committee has the ability to initiate a review of any matter of public policy within its mandate. Having initiated any such review, the Committee must conclude the inquiry and issue a substantive report to the Assembly within six months.

On September 10, 2013, the Standing Committee on Resource Stewardship passed the following motion to undertake a study of the public policy tools to be used to incentivize the monetization of natural gas.

> **Moved by** Ms Kubinec that in the interest of encouraging broader and higher value use of natural gas both domestically and abroad, the Committee undertake a study of public policy tools to
>
> - encourage the consumer use of natural gas by eliminating barriers on the use of natural gas for powering personal vehicles, large and small microgenerators, and home appliances: stoves, clothes dryers, et cetera,
> - encourage heavy-duty transport vehicles and off-grid power generation to use compressed natural gas, CNG, and liquefied natural gas, LNG, including in Canada's north,
> - secure market access for Alberta producers to liquefied natural gas terminals which could distribute the resource at world prices, and
> - share information on natural gas use, market experience, and best practices across Canada and abroad.

As part of the review on the monetization of natural gas the Committee held stakeholder presentation meetings on September 10, 2013, October 9, 16, 23, and 28, 2013, November 4 and 18, 2013, and December 2, 2013. Throughout these meetings the Committee heard 17 oral presentations and received one written submission from identified stakeholders (Appendix B) and conducted a site visit to the Williams Energy Facility in Redwater, Alberta, on December 6, 2013.

After completing the information-gathering process and discussing the issues raised throughout the review, the Committee met on December 12, 2013, to give direction to Research Services in the preparation of a draft report. A draft report was prepared and distributed to all Committee members. On February 26, 2014, the Committee met to make additions to the draft final report and to approve the final wording of the existing recommendations. At the conclusion of the meeting, the Committee passed a motion to delegate the finalization of the final report to the Chair in consultation with the working group, which comprises David Dorward (PC), Joe Anglin (W), Laurie Blakeman (AL), and Deron Bilous (ND).

This report contains the recommendations of the Standing Committee on Resource Stewardship following its deliberations on the public policy tools to be used to incentivize the monetization of natural gas. This report is not intended to be a comprehensive record of the Committee's proceedings nor is it a review of individual projects or proposals. For a complete record, reference should be made to the *Alberta Hansard* transcripts of the Committee proceedings, which include the oral presentations made to the Committee, as well as the summary of presentations and research reports that were prepared by the Legislative Assembly Office's Research Services, and other related documents that were submitted to the Committee (see Appendices B and C).

2.0 SUMMARY OF COMMITTEE RECOMMENDATIONS

The Standing Committee on Resource Stewardship makes the following recommendations with respect to the public policy tools to be used to incentivize the monetization of natural gas.

1. The Committee recognizes that Alberta has an abundant supply of natural gas and that the Government of Alberta should encourage greater use of natural gas in the province given its abundant supply and given the environmental benefits, such as decreased greenhouse gas emissions relative to other non-renewable resources. Accordingly, the Committee recommends that the Government conduct additional studies on the costs and environmental impacts associated with the use of natural gas in relation to other non-renewable resources.

2. Natural gas is a cleaner burning fossil fuel, producing reduced greenhouse gas emissions in relation to other non-renewable resources, which makes it a suitable alternative fuel to comply with low-carbon fuel standards proposed internationally. In an effort to explore additional markets for Alberta's natural gas, and given that natural gas is the second most widely used energy source in California, the Committee recommends that the Government conduct a market access study related to the potential for Alberta gas exports to California.

3. In order to export Alberta's natural gas in the form of liquefied natural gas (LNG) to Asia, where there is high demand for the resource, natural gas needs to be transported to the British Columbia coast for liquefaction and shipping. To facilitate this, the Committee recommends that the Government take a proactive approach before the National Energy Board, the Alberta Energy Regulator, and the B.C. Oil and Gas Commission to ensure that Alberta gas is able to flow to west coast LNG facilities should the private sector choose to do so.

4. In the interest of providing transparency on petrochemical feedstock availability and opportunities for domestic utilization, the Committee recommends that the Government request that the National Energy Board and the Alberta Energy Regulator report on natural gas liquids volumes crossing provincial borders and being exported as LNG.

5. In order to provide fair access to markets, the Committee recommends that the Government examine creating a framework for junior natural gas producers to enter into co-operative agreements for the marketing of gas and the formation of export joint ventures with overseas consumers of LNG.

6. The Committee recognizes the potential benefits to Alberta's economy of natural gas projects in the form of increased taxation and royalties to the province and greater employment opportunities. It also considers that there are opportunity costs of exporting Alberta's natural gas, which may result in lost value to the province. As a result, the Committee recommends that the Government prioritize value-added projects, such as petrochemical production and gas-to-liquids projects that use natural gas within the province. Furthermore, the Committee recommends that the Government investigate policy tools, such as sliding royalty scales and cluster development, to encourage the growth of, and facilitate investment in, Alberta's petrochemical industry.

7. The Committee recognizes that a sustained value-added industry in Alberta would allow economic benefits, such as royalties and employment opportunities, to remain within the province. Given these benefits, the Committee recommends that the Government of Alberta support value-added processing of natural gas and ensure the sustainability of the petrochemical industry in Alberta with a view to creating increased employment opportunities within the province, including increased partnerships with Aboriginal communities in Alberta.

8. The Committee recognizes that significant benefits can be derived from using natural gas in petrochemical production in Alberta. Given that the increased value-added production will require supporting infrastructure, such as transportation infrastructure, the Committee recommends that the Government encourage increased efficiencies in natural gas and natural gas liquids processing and shipping infrastructure with a goal of achieving more competitive processing costs and tolls. The

Government can achieve this by encouraging optimal utilization of processing and shipping infrastructure, including consolidation of that infrastructure where volumes warrant.

9. The Committee recognizes that incentive programs such as the Incremental Ethane Extraction Program (IEEP) have been effective in attracting investment to the province and in encouraging the extraction and consumption of natural gas liquids in manufacturing value-added products. Accordingly, the Committee recommends that the Government examine a program similar to the IEEP to encourage further partnerships between manufacturers and the gas sector.

10. The Committee recognizes that with any decision made in regard to how the Government should monetize Alberta's natural gas, a stable regulatory framework needs to be in place in order to attract and maintain investment in the province. Therefore, the Committee recommends that the Government ensure that there is consistency and stability with future regulations surrounding the natural gas industry so that investors have certainty when making long-term investments in Alberta.

11. Technology related to natural gas extraction, production, and the public use of natural gas, such as in heavy-duty transport or personal vehicles, is advancing. The Committee recognizes that regulations regarding natural gas from its extraction to its usage (as CNG or LNG) need to be flexible in order to adapt to advancing technology. As a result, the Committee recommends that the Government periodically review the regulatory framework to ensure that it is current with changing technology in the natural gas industry and to update regulations as needed to encompass technological innovations.

12. In the interest of reducing greenhouse gas emissions from heavy-duty trucks, the Committee recommends that the Government encourage the use of natural gas as a transportation fuel by considering the following policy options.

    - Re-examine the existing weight restrictions on Alberta's roads and bridges with the intention that weight restrictions do not unnecessarily penalize trucks with LNG tanks, which may increase the overall weight of trucks.
    - Raise with the appropriate licensing body the issues associated with imposing weight limits for trucks equipped with LNG tanks in order to encourage the licensing of alternative LNG vehicles.
    - Undertake a study of the feasibility of CNG and LNG vehicle corridors designed to withstand the additional weight of CNG and LNG tanks on trucks and buses, and which would provide a route on which CNG/LNG fuelling stations could be built.
    - The Committee sees value in the Government forging partnerships with other state and provincial governments to encourage CNG and LNG vehicle corridors and in the Government forming technological and regulatory best practice partnerships worldwide with other governments.

13. With the objectives of reducing the Government sector's direct emissions of NO_x, SO_x, and CO_2, and of reducing the lifecycle cost of the Government vehicle fleet, the Committee recommends that the Government examine transitioning its light vehicle fleet and encouraging the transition of light vehicle fleets of agencies, boards, commissions, and municipalities to natural gas fuelling province-wide over the normal time frame of vehicle replacement.

14. The Committee also recommends that the Government examine a requirement that contractors that provide provincially funded services to the Government, agencies, boards, commissions, and municipalities transition to natural gas vehicles where practical and economic.

15. In order to encourage the construction of more LNG/CNG fuelling infrastructure, which will in turn encourage greater use of natural gas as a fuel, the Committee further recommends that the Government find ways to offset the costs associated with building fuelling systems through incentives.

16. In order to increase acceptance and adoption of natural gas as a fuel, the Committee recommends that the Government play a role in educating companies and the general public on the safety, risks, costs, and benefits of natural gas (LNG and CNG).

17. To address the decreasing demand in the market for dry gas as natural gas producers shift drilling activity toward liquids-rich natural gas, the Committee recommends that the Government highlight the value of dry gas to potential LNG customers.

18. Given that the cogeneration of electricity and heat using natural gas is more energy efficient and decreases greenhouse gas emissions, the Committee recommends that the Government examine barriers to the widespread adoption of natural gas and heat cogeneration in multi-family residential, commercial, industrial, neighbourhood, and regional developments.

19. The Committee recognizes that large-scale industrial cogeneration reduces fuel use, reduces greenhouse gas emissions, and provides low-cost electricity to Alberta's grid, and applauds the widespread adoption of large-scale industrial cogeneration in Alberta.

3.0 DEFINITIONS

Compressed natural gas (CNG)	Natural gas that has been compressed to between 3,000 and 3,600 pounds per square inch such that it can be transported in pressurized containers. Compared with gas at normal temperature and pressure, compression reduces the volume by a factor of 300 (or more).
Gas-to-liquid (GTL)	Gas-to-liquid technology is the conversion of natural gas to conventional oil products through a liquefaction process.
Liquefaction	The process of turning natural gas into a liquid by cooling it to -160 degrees Celsius.
Liquefied natural gas (LNG)	Natural gas is liquefied by cooling it to -160 degrees Celsius, and the process reduces the volume of gas by more than 600 times.
Natural gas play	A geographic area which has been targeted for exploration due to favourable geoseismic survey results.
Regasification	Regasification capacity is the ability to turn liquefied natural gas into a vaporous or gaseous state by increasing the temperature and decreasing the pressure.
Shale gas	A form of unconventional gas that is trapped within shale, a sedimentary rock originally deposited as clay or silt, and characterized by extremely low permeability.

4.0 RECOMMENDATIONS

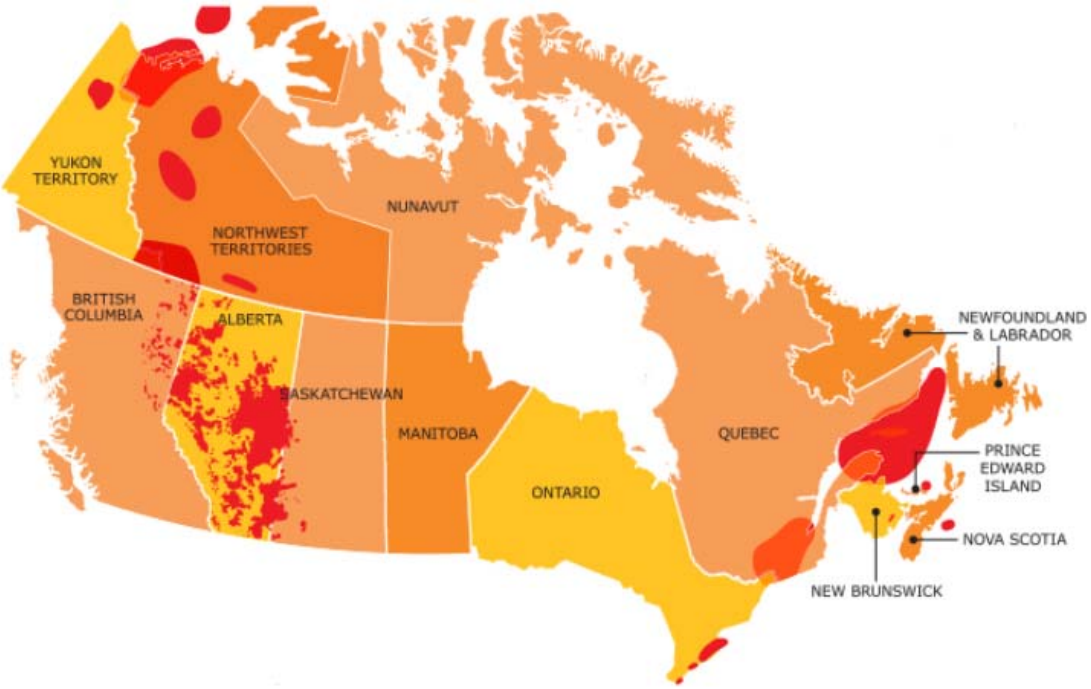
4.1 Natural Gas Supply and Demand

4.1.1 Supply Surplus

In Canada, natural gas has been used as an energy source since the 1800s; however, it did not achieve widespread commercial and residential use outside of Alberta until the late 1950s, with the completion of the TransCanada Pipeline. With the price of crude oil soaring in the late 1970s and with increasing concern about the impact of greenhouse gas emissions on the environment, the demand for natural gas as a cleaner alternative energy source grew dramatically.[*] This increase in the demand for natural gas resulted in a decline in existing conventional natural gas supplies and prompted the exploration of other unconventional sources of natural gas, which has increased coalbed methane, tight gas, and shale gas extraction.

Approximately 70 per cent of the natural gas produced in Canada comes from Alberta. Figure A below shows a map of the distribution of natural gas plays in Canada. As displayed on the map, large reserves of natural gas are located in Alberta. According to Alberta Energy, Alberta's ultimate potential reserve of conventional gas is 223 trillion cubic feet (Tcf), with 34.5 Tcf in remaining established reserves. In 2011, Alberta produced 3.9 Tcf of marketable natural gas, approximately 3.6 Tcf from conventional sources and 0.3 Tcf from unconventional sources such as coalbed methane and shale. Alberta's supply of coalbed methane is estimated to be up to 500 Tcf of natural gas.

Figure A: Canadian Natural Gas Formations



Source: Centre for Energy, "Energy Maps and Statistics, Maps: Canada," (Alberta: 2013) available at http://www.centreforenergy.com/FactsStats/MapsCanada/CA-EnergyMap.asp (accessed August 26, 2013).

As of January 1, 2012, Canada ranks 20th internationally among nations with 61.0 Tcf of natural gas in reserves categorized as "estimated proved plus some probable." According to a report by Natural

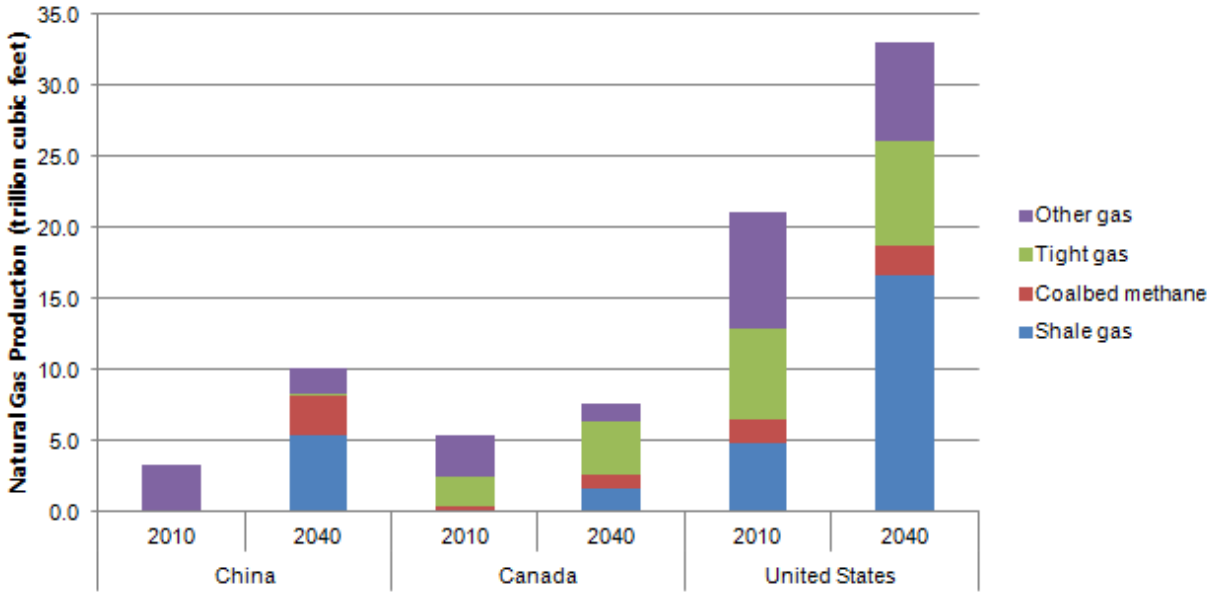
[*] Natural gas is estimated to produce between 25 to 40 per cent fewer greenhouse gas emissions per unit of generated electricity than coal or oil.

Resources Canada (NRCan) entitled Canadian Crude Oil, Natural Gas and Petroleum Products: Review of 2009 and Outlook to 2030, Canada produces natural gas in excess of what is required for domestic consumption. Canada has been exporting natural gas to the United States since 1891, which is currently the only market to which Canada exports.

Recent studies show that the natural gas supply in the United States has increased since 2006 due to increased production of shale gas facilitated by the use of horizontal drilling and hydraulic fracturing technologies, with production projected to grow more than fivefold by 2035. Due to the development of hydraulic fracturing technology, the United States is increasingly able to supply its own natural gas markets with shale gas from the Marcellus formation, found in the eastern United States, at lower costs than importing natural gas from Canada. Furthermore, eastern Canadian customers are potentially able to access eastern United States supplies at a lower cost than western Canadian natural gas, which creates a competitive disadvantage for western Canadian producers. According to an analysis by the Canadian Energy Research Institute (CERI) of the future of natural gas imports and exports, Canada will become a net importer of natural gas as western Canadian gas faces increasing competition in Ontario and Quebec from Marcellus gas. CERI notes that the Marcellus formation will be a source of competition for Canadian natural gas, as it currently produces eight billion cubic feet per day, with the potential to increase production to between 16 billion and 23 billion cubic feet. While current production from shale gas represents only 13 per cent of total North American gas production, shale gas production has grown rapidly, nearly quadrupling between 2006 and 2009.

Figure B displays natural gas production in Canada, the United States, and China (a potential export market) in 2010 and projected production levels by 2040. The significant increase in shale gas production by 2040 in the U.S. is largely attributed to increases in shale gas production from the Marcellus formation.

Figure B: Natural Gas Production in China, Canada, and the United States, 2010 and 2040



Source: U.S. Energy Information Administration, “International Energy Outlook 2013,” available at http://www.eia.gov/forecasts/ieo/nat_gas.cfm (accessed January 10, 2014).

Recommendation

1. **The Committee recognizes that Alberta has an abundant supply of natural gas and that the Government of Alberta should encourage greater use of natural gas in the province given its abundant supply and given the environmental benefits, such as decreased greenhouse gas**

emissions relative to other non-renewable resources. Accordingly, the Committee recommends that the Government conduct additional studies on the costs and environmental impacts associated with the use of natural gas in relation to other non-renewable resources.

4.1.2 Exporting Natural Gas

To address the decreased access to eastern Canada for Alberta's natural gas, the province must look to other markets to export its resource. To transport natural gas outside of Alberta and outside of Canada, the province must rely on the existing pipeline network or pursue the construction of new pipelines (which is further discussed in section 4.2.2). There is an existing pipeline system linking Alberta and California in the form of the TransCanada Foothills system, which carries natural gas from central Alberta to the U.S. border to serve markets in the U.S. midwest, Pacific northwest, California, and Nevada. California is a potential market for Alberta's resource as natural gas is the second most widely used energy source in the state, although consumption varies due to the emergence and availability of renewable resources such as hydroelectricity, solar, and wind generation. According to the California Energy Commission, 40 to 45 per cent of the state's natural gas is used in electricity generation. The demand for natural gas in California was high in 2007 when there appeared to be a shortage of conventional natural gas supply. However, since the discovery of shale gas reserves in the Marcellus and elsewhere, California's demand is being supplied by several major interstate pipelines that deliver natural gas to the state. Presenters to the Committee, such as the In Situ Oil Sands Alliance (IOSA), referred to California's pending low-carbon fuel standards as a regulatory change that may impede market access for any of Alberta's non-renewable resources if Alberta does not address the issue of carbon emissions. Natural gas, as a cleaner burning fossil fuel, can be supplied to California in adherence to proposed low-carbon fuel standards. The Committee recognizes that addressing barriers raised by low-carbon fuel standards is crucial for the marketability of Alberta's resources and that natural gas can be presented as a cleaner alternative.

Recommendation

2. **Natural gas is a cleaner burning fossil fuel, producing reduced greenhouse gas emissions in relation to other non-renewable resources, which makes it a suitable alternative fuel to comply with low-carbon fuel standards proposed internationally. In an effort to explore additional markets for Alberta's natural gas, and given that natural gas is the second most widely used energy source in California, the Committee recommends that the Government conduct a market access study related to the potential for Alberta gas exports to California.**

With the significant increase in shale gas production — the U.S. Energy Information Administration (EIA) projects that U.S. shale production will increase by 113 per cent from 2011 to 2040 — the U.S. market looks to be oversupplied in the long-term future. Therefore, stakeholders who made presentations to the Committee argued that Canada must look elsewhere to deliver its exports, such as California and Asia (discussed in section 4.1.3), in order to benefit from its natural gas production or must, alternatively, find domestic use for natural gas to address this supply surplus (discussed in section 4.3).

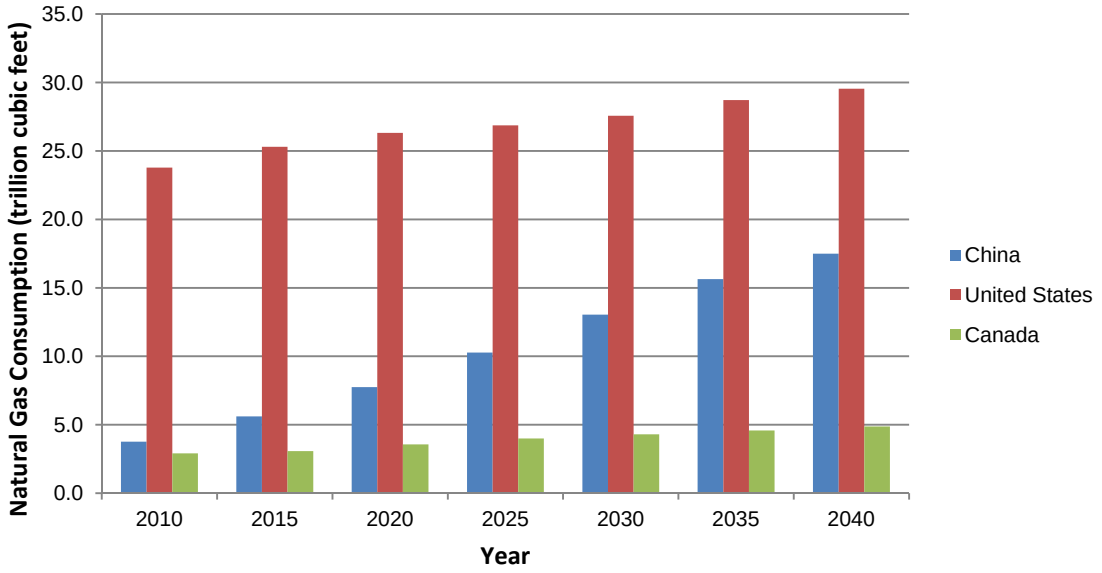
4.1.3 Demand in Asia

The National Energy Board (NEB) projects that Canadian annual natural gas demand will grow by 0.5 billion cubic feet per day (Bcf/d) between 2013 and 2015, with the majority of the increase attributed to increased usage for oil sands development in Alberta. According to Alberta Energy, natural gas produced in Alberta is distributed according to the following approximations: 42 per cent is exported to the United States, 31 per cent is used within Alberta, and 27 per cent is distributed to the rest of Canada. Currently, Canada exports 63 per cent of its total natural gas production, all of which goes to Canada's only international market, the United States.

The EIA projects that global natural gas demand will climb by 44 per cent between 2009 and 2035. The most significant portion of that growth will take place in non-OECD nations, with China accounting for more than 20 per cent of the global increase. Figure C below is a graph of the projected natural gas consumption levels of Canada, China, and the U.S. It illustrates that natural gas consumption in the U.S.

is currently the highest among the three countries, but consumption is projected to grow the most rapidly in China.

Figure C: Natural gas consumption by country, 2010-2040



Source: U.S. Energy Information Administration, "International Energy Outlook 2013," available at http://www.eia.gov/forecasts/ieo/nat_gas.cfm (accessed January 10, 2014).

East Asia currently accounts for less than 10 per cent of world natural gas consumption; however, the region, consisting of China, Japan, and South Korea, is by far the largest market in the world for liquefied natural gas (LNG), accounting for almost two-thirds of global LNG consumption. Japan has limited natural gas resources and relies heavily on imports predominantly from southeast Asian countries such as Malaysia, Indonesia, and Brunei and other countries such as Australia and Russia. Japan is currently the largest importer of LNG and continues to have high demand for natural gas as it shifts away from nuclear power. China, as the largest Asian gas market, is projected to see its demand double over the next five years. However, China itself has significant natural gas reserves, estimated to be approximately 107 Tcf, although the country has yet to efficiently extract the resource.

Several stakeholders discussed the prospects of exporting natural gas from North America to Asia, which would be facilitated by a number of recent developments such as the discovery of large shale deposits in northeastern B.C. and in western and central Alberta, the increasing demand for cleaner alternatives to coal-generated electricity, and the growing concerns over the use of nuclear power in Japan. The following section discusses Alberta's capacity to export LNG.

4.2 LNG Export

With the increase of unconventional resources, particularly in the United States, the natural gas industry is shifting its focus from importing LNG into North America to exporting LNG from North America. This has resulted in a surplus of regasification capacity in Canada and the United States. As of spring 2013, Canada's only operational LNG regasification terminal is Canaport in Saint John, New Brunswick. Canada does not currently have any operational LNG liquefaction facilities; however, according to the Ministry of Natural Resources, as of spring 2013, there are six LNG liquefaction facilities proposed: three

in Kitimat, British Columbia; two in Prince Rupert, British Columbia; and one in Guysborough County, Nova Scotia.[*]

As discussed in section 4.1.1, the production of shale gas in the United States has led to the decreasing competitiveness of Canadian gas in the U.S. market. The International Energy Agency (IEA) estimates that this has led to a significant revenue loss of approximately $49 billion USD for Canada over a five-year period. Canada is therefore searching for alternative markets for its abundant resource.

Stakeholders such as EnCana Corporation (EnCana) indicated that exporting Alberta's natural gas to Asia in the form of LNG is a potential solution to the lack of markets for Alberta's resource. Natural gas that is liquefied is ideal for export as the natural gas is reduced to 1/600th of its original volume through a liquefaction process and therefore allows more of the resource to be transported by ocean tanker. In its gaseous state, natural gas can be transported through pipelines across North America from Alberta westward to B.C. ports. It can also be transported eastward to eastern Canadian markets through the network of pipelines that extend from Alberta east across Canada as well as into the United States. However, as noted above, domestic supply from western Canadian basins face increasing competition in eastern Canada from U.S. natural gas suppliers as U.S. suppliers pay lower shipping costs to transport the resource to market from U.S. plays than do Canadian suppliers transporting natural gas to markets in central Canada.

The proposed LNG facilities in Kitimat and Prince Rupert are intended to serve as liquefaction facilities from which Canadian shale gas can be exported to Asia. According to the University of Alberta's Centre for Applied Business Research in Energy and the Environment (CABREE), with the price of natural gas in Alberta currently between $3 and $4/million British thermal units (MMBtu) and only slightly higher in the United States, the $12 to $16/MMBtu price for gas in China and Japan is an appealing differential to natural gas producers around the world. A number of the stakeholders agreed that there is a small window of opportunity to reach the Asian market (which will be further discussed in section 4.2.1), and all of the stakeholders (with the exception of Ziff Energy[†]) suggested that there is a global race to supply the Asian market, which currently has the greatest demand for LNG.

4.2.1 Time Is of the Essence

TransCanada asserted the urgency of moving forward with LNG projects and described a window of opportunity during which time current long-term and short-term contracts are set to expire (between 2016 and 2019) and foreign firms will be competing to sign new contracts with emerging markets. TransCanada estimated that natural gas prices are likely to remain low in North America during this time; however, competitors such as the United States, Australia, and Russia will be attempting to enter (or increase their presence in) the market in Asia as well. In their presentations to the Committee, CABREE and TransCanada agreed that long-term contracts will determine long-term success in the LNG market in Asia and that the first to sign the contracts will be the first to penetrate the market.

4.2.2 Pipelines

The inland location of Alberta requires that the resource be first transported via pipeline from Alberta to a port in British Columbia before it can be liquefied and transported overseas to Asia. Given that B.C. is currently developing LNG terminals, access to these terminals, and subsequently the Asian market, will be vital should Alberta wish to export its abundant supply of natural gas.

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[*] The construction and operation of LNG terminals generally fall under provincial regulation while the export of LNG is federally regulated. The National Energy Board (NEB) is the federal regulatory body that oversees LNG export from Canada. The NEB reviews export licence applications to ensure that the proposed volume of gas to be exported is surplus to Canada's requirements. As of spring 2013, the NEB had issued long-term export licences to three proponents: Douglas Channel LNG, Kitimat LNG, and LNG Canada. See Natural Resources Canada, "Canadian LNG Projects," available at http://www.nrcan.gc.ca/energy/sources/natural-gas/1156 (accessed on August 1, 2013).

[†] Ziff Energy disagreed with the majority of the presenters and stated that there is no global race to export LNG to Asia because LNG will be in high demand over the long term.

Alberta already has shared infrastructure with B.C., including highways, railways, and pipelines. According to a document produced by the Government of Alberta, Alberta and B.C. share pipelines that allow a small amount of natural gas to flow from Alberta to B.C.; however, the pipelines predominantly ship B.C.'s natural gas through Alberta to be used in Alberta's oil and gas industry. B.C.'s natural gas is also transported through these pipelines for use in central and eastern Canada. Recently, through the construction of the proposed LNG terminals, the B.C. Government is focusing its efforts on exporting its shale gas to Asia. However, export to Asia of Alberta gas is made difficult by the lack of pipelines connecting the shale reserves to the B.C. coast, where there are proposed LNG liquefaction facilities. CERI indicated that pipelines between Alberta and B.C. are not readily available to transport gas from Alberta to B.C. Despite proposed pipeline construction projects and the potential for pipeline reversals, CERI predicts that Alberta's natural gas will not reach LNG liquefaction plants on the B.C. coast within the next 10 years due to the availability of B.C. gas to supply this demand.

Recommendations

3. **In order to export Alberta's natural gas in the form of liquefied natural gas (LNG) to Asia, where there is high demand for the resource, natural gas needs to be transported to the British Columbia coast for liquefaction and shipping. To facilitate this, the Committee recommends that the Government take a proactive approach before the National Energy Board, the Alberta Energy Regulator, and the B.C. Oil and Gas Commission to ensure that Alberta gas is able to flow to west coast LNG facilities should the private sector choose to do so.**

4. **In the interest of providing transparency on petrochemical feedstock availability and opportunities for domestic utilization, the Committee recommends that the Government request that the National Energy Board and the Alberta Energy Regulator report on natural gas liquids volumes crossing provincial borders and being exported as LNG.**

The low availability of and lack of access to west-bound pipelines remain significant barriers to LNG export for Alberta, and places the province's natural gas in competition with natural gas originating from British Columbia. In order to access the NOVA Gas Transmission Ltd. (NGTL) system, which is one of the natural gas transportation networks connected to the Western Canadian Sedimentary Basin, users must pay a pipeline toll. Pipeline tolls represent the cost to a user of adding gas onto the system at one point and removing it at another point. TransCanada stated that ultimately, Alberta consumers will benefit when greater volumes of gas are added to the system, whether the gas originates from B.C. or Alberta, because greater volumes of gas on the system will decrease the unit toll. TransCanada also contended that the NGTL is an open-access pipeline and therefore also allows smaller companies to "come forward and request service under the terms and conditions of the tariff that governs pipeline service." In this manner, the overall grid benefits from additional gas added by smaller natural gas producers which are connected to the pipeline system. Moreover, TransCanada added that it is necessary for natural gas producers of any size to demonstrate that their resource has "staying power." However, smaller natural gas producers may find it more difficult to demonstrate the quality of their reserves in potential sale and purchase agreements.

Recommendation

5. **In order to provide fair access to markets, the Committee recommends that the Government examine creating a framework for junior natural gas producers to enter into co-operative agreements for the marketing of gas and the formation of export joint ventures with overseas consumers of LNG.**

As indicated, the export of natural gas to Asia is made difficult by the lack of pipelines connecting shale reserves in Alberta to the B.C. coast, where proposed LNG liquefaction facilities are to be constructed. CERI indicated that pipeline capacity between Alberta and B.C. is not readily available to transport gas from Alberta to B.C. Despite proposed pipeline construction projects and the potential for pipeline reversals, CERI predicts that Alberta's natural gas will not reach LNG liquefaction plants on the B.C.

coast within the next 10 years due to the availability of B.C. gas to supply this demand. Consequently, several of the presenters to the Committee, including the Alberta Industrial Heartland Association (AIHA), argued for greater domestic use of natural gas given the issues with pipeline availability and the related barriers to exporting LNG. As an example, AIHA stated, "[w]ith a domestic market, the province would not have to worry about pipelines and export permits." Furthermore, AIHA suggested that "there is enough demand at home that a very significant part of the natural gas produced in Alberta could be used here to make value-added products and allow them to be exported all over the world."

4.3 Value-Added Opportunities

While Alberta may choose to export its natural gas in the form of LNG, many stakeholders and Committee members have argued for increased domestic use of natural gas, particularly using natural gas as a transportation fuel and feedstock for the production of petrochemicals. Stakeholders such as Sasol Canada (Sasol) and Williams Energy Canada (Williams Energy) informed the Committee that domestic use could bring economic opportunities to the province through the creation of jobs in the value-added industry and also described the potential for partnerships with Aboriginal communities. Supplying the domestic market would significantly increase Alberta's gross domestic product (GDP), diversify Alberta's economy, and be a significant source of Government revenue (since corporate taxes paid by companies for these domestic projects would generate, according to AIHA, at least $600 million a year in new revenues for the Government). According to the Chemistry Industry Association of Canada (CIAC), the natural gas industry can also produce significant value-added manufacturing opportunities throughout the country and in related service and technology sectors. The CIAC suggested that Alberta should recognize in an energy strategy, framework, or policy discussion for natural gas that cost, availability, and access are keys to a highly competitive and productive economy. Presenters such as AIHA, IOSA, and Williams Energy suggested developing a domestic market for natural gas by promoting natural gas use for oil sands extraction and petrochemical production.

The following sections discuss the petrochemical industry and the gas-to-liquids industry. Although petrochemical production and gas-to-liquids technology involve different processes, the general recommendations made by the Committee can be applied to both industries in an overall effort to expand value-added use of natural gas.

4.3.1 The Petrochemical Industry

Alberta leads Canada in producing petrochemical products, which in 2011 were valued at over $13.5 billion. The province's business currently consists of upgrading ethane to higher value polyethylene. Williams Energy provided a description to the Committee of the process of producing natural gas liquids (NGLs) and olefins from oil sands off-gas. Off-gas can be used as fuel in an upgrader or processed to remove higher value NGLs and olefins. Hydrogen is removed from propane (through a process called dehydrogenation) which produces propylene, which in turn can be used to make plastic. Williams Energy argued that Alberta would receive a greater return for the production and sale of propylene domestically as opposed to exporting propane and suggested that exporting propane to Asia, where there is increasing petrochemical capacity, would allow Asia to build propane dehydrogenation plants to upgrade the propane and reap the higher price for the propylene or polypropylene produced. Williams Energy suggested that the value should remain in Alberta; specifically that Alberta should upgrade propane to propylene and polypropylene, and that these efforts should be aided by incentives, such as an expanded Incremental Ethane Extraction Program (IEEP) and by the construction of supporting infrastructure, such as roads and pipelines. The IEEP allows petrochemical companies to earn credits for the additional extraction and consumption of ethane in the manufacturing of value-added products in Alberta. According to the AIHA, it has resulted in over $1.5 billion in investments in Alberta.

AIHA pointed out that a window of opportunity is currently open in the petrochemical industry, as the industry is seeking investment. For petrochemical products, the AIHA argued that the demand in Canada, North America, and Europe has "plateaued"; however, Asia and India will see increased demand for these products, which the AIHA argues is why the industry is seeking to increase production. Failure to act on policies and directions will result in these investment opportunities going to other parts of the world.

CABREE also recommended that given the issues with interprovincial co-operation and pipeline construction raised by transporting Alberta gas to the B.C. coast, natural gas should instead be used to support the local oil sands and petrochemical industries. CABREE contended that sending rich gas (gas that contains a relatively high proportion of hydrocarbons other than methane) abroad to Asia robs the local petrochemical industry by exporting feedstock for value-added projects elsewhere. It suggested that the Government consider the opportunity costs of exporting natural gas, such as the impact on the local petrochemical industry, when making policy decisions. To ensure the sustainability of the petrochemical market, CABREE recommended examining the potential for expanding the market within the province for the use of Alberta petrochemical products and working with industry to establish a balance between exporting Alberta's gas and supplying the local petrochemical industry.

Stakeholders discussed a number of policy actions that could be taken by the Government to support the petrochemical industry in Alberta. Several stakeholders addressed the need to facilitate natural gas extraction in order to provide a stable supply of feedstock for processing. For example, EnCana stated that Alberta's current royalty structure excels at bringing investment to the province and encouraging natural gas development; however, while the program offers reduced royalties upfront, there is no emphasis on cost-recovery for capital costs within the royalty structure similar to what is offered to oil development projects. For oil sands projects, a sliding royalty rate scale offers lower royalty rates for a project until the capital costs of the project are recovered (pre-payout rate), so that a project can become profitable, at which point the royalty will increase (post-payout rate). According to EnCana, the same royalty structure does not exist for natural gas development.

Other stakeholders emphasized the importance of cluster development, where industries can benefit from the availability of feedstock and transportation infrastructure. An example of such a development is Alberta's Industrial Heartland, which is located northeast of Edmonton and is the largest hydrocarbon processing region in Canada. More than 40 companies (from small companies to multinational firms) are located in the Industrial Heartland and they employ over 6,100 workers and contractors. Investments in this region benefit from a number of efficiencies resulting from cluster development, such as availability of competitive feedstock and materials, availability of infrastructure to both domestic and export markets, and availability of a skilled workforce. Stakeholders such as AIHA and Sasol noted that providing support for cluster development can draw investment to the Industrial Heartland and that, in particular, the Government can encourage investment through streamlining regulatory processes (which will be further discussed in section 4.4) and supporting the construction of necessary infrastructure to transport products throughout the region.

Expanding the local petrochemical industry also has the potential for greater partnerships within the communities that are affected by the projects. In particular, several stakeholders, such as Pacific NorthWest LNG (Pacific NorthWest) and TransCanada, noted that partnerships with Aboriginal communities were being explored as part of consultation efforts for projects such as the construction of LNG facilities and pipeline infrastructure, an effort which the Committee also noted could be extended to petrochemical projects. In particular, the Committee identified the importance of partnerships with Aboriginal communities in the form of consultations and employment agreements, which offer skills training and jobs to Aboriginal partners, in the process of expanding any resource industry.

4.3.2 Gas-to-Liquids

Other value-added opportunities exist, including gas-to-liquids (GTL) technology, which converts natural gas to create synthetic fuels such as GTL naphtha, GTL diesel, and liquefied petroleum gas (LPG). In a presentation to the Committee, Sasol supported these value-added opportunities, such as the use of gas-to-liquids technology to produce synthetic fuels within the province. Sasol argued that GTL produces a "world-class product" because using natural gas as feedstock is both cleaner in terms of carbon emissions produced and cheaper due to the lower cost of natural gas as feedstock. Sasol also submitted that there were several socio-economic effects that a GTL project (such as the one Sasol proposes to build in the Industrial Heartland) would have on Alberta. These effects include the following:

- A contribution of $11.6 billion would be made to Alberta's GDP during construction.

- Onsite workforce would average 1,500 people, increasing to 3,000 by 2019 and 2023.
- A contribution of $550 million annually would be made to Alberta's GDP during operations.
- When fully operational, 890 full-time high-skilled high-paying jobs would be required.
- Sasol would pay $49 million annually in municipal taxes, $5.48 billion in provincial taxes, and $8.23 billion in federal taxes during the life of the project.

Several stakeholders described the employment opportunities that would become available should Alberta expand its petrochemical industry. AIHA stated that the workforce in Alberta is more expensive than in the U.S. Gulf coast, which is the result of labour shortages in the province that drive up the cost of labour and affect productivity; however, AIHA believes that Alberta has a higher quality workforce compared to the U.S. due to skills training and job-matching programs and that Alberta should continue to focus on "getting the right workers into the right jobs and looking, potentially, at what we can do to make sure our young people are going into those areas." According to Sasol, Alberta has a market for GTL products, such as GTL diesel, which Sasol estimated could be entirely absorbed in the western Canadian market. This gives Alberta an advantage over other regions and supports the argument for the development of a local petrochemical industry.

Recommendations

6. **The Committee recognizes the potential benefits to Alberta's economy of natural gas projects in the form of increased taxation and royalties to the province and greater employment opportunities. It also considers that there are opportunity costs of exporting Alberta's natural gas, which may result in lost value to the province. As a result, the Committee recommends that the Government prioritize value-added projects, such as petrochemical production and gas-to-liquids projects that use natural gas within the province. Furthermore, the Committee recommends that the Government investigate policy tools, such as sliding royalty scales and cluster development, to encourage the growth of, and facilitate investment in, Alberta's petrochemical industry.**

7. **The Committee recognizes that a sustained value-added industry in Alberta would allow economic benefits, such as royalties and employment opportunities, to remain within the province. Given these benefits, the Committee recommends that the Government of Alberta support value-added processing of natural gas and ensure the sustainability of the petrochemical industry in Alberta with a view to creating increased employment opportunities within the province, including increased partnerships with Aboriginal communities in Alberta.**

8. **The Committee recognizes that significant benefits can be derived from using natural gas in petrochemical production in Alberta. Given that the increased value-added production will require supporting infrastructure, such as transportation infrastructure, the Committee recommends that the Government encourage increased efficiencies in natural gas and natural gas liquids processing and shipping infrastructure with a goal of achieving more competitive processing costs and tolls. The Government can achieve this by encouraging optimal utilization of processing and shipping infrastructure, including consolidation of that infrastructure where volumes warrant.**

9. **The Committee recognizes that incentive programs such as the Incremental Ethane Extraction Program (IEEP) have been effective in attracting investment to the province and in encouraging the extraction and consumption of natural gas liquids in manufacturing value-added products. Accordingly, the Committee recommends that the Government examine a program similar to the IEEP to encourage further partnerships between manufacturers and the gas sector.**

4.4 Regulatory Considerations

Several stakeholders communicated to the Committee that the Government could provide support to the development of the natural gas industry in Alberta through regulatory measures and policies, specifically by ensuring that there is certainty and simplicity within the regulatory system. AIHA recommended streamlining the regulatory process for natural gas projects in order to give investors confidence that their projects will be reviewed and decided upon in a timely manner. CIAC and Ferus Natural Gas Fuels (Ferus) contended that while there have been good efforts made to address duplicative environmental assessments at the federal and provincial level through the creation of the Alberta Energy Regulator, "regulatory streamlining must be a goal across all sectors of the Canadian economy." In particular, the CIAC believes that regulatory streamlining must be facilitated "where business is seeking to add value to resources."

A number of presenters, such as EnCana and Ziff Energy, submitted that Alberta, in general, was at an advantage having a good regulatory system with a stable royalty structure and a competitive tax regime. Furthermore, foreign firms have become increasingly interested in conducting business in Alberta because of this regulatory system and royalty framework, which are important in early-stage decisions in resource development. These two factors, in conjunction with Alberta's stable political regime, have become crucial in foreign investment decisions and encouraging resource development in Alberta. However, EnCana contended that since current regulations in the province have been designed to manage conventional production and vertical drilling, they do not appropriately regulate unconventional well development with horizontal multi-stage fracturing. According to CABREE, technology is changing so rapidly that regulations cannot keep up. Therefore, CABREE recommended that regulations be robust, yet flexible, in order to allow the market to innovate and to allow regulations to adapt to changing technology.

Updated regulations are also needed to govern the use of natural gas as a transportation fuel. LNG and compressed natural gas (CNG) are relatively new transportation fuels in Alberta, and both Edmonton Transit System (Edmonton Transit) and Calgary Transit noted the lack of safety codes and standards concerning CNG facilities. (Natural gas as a transportation fuel is discussed in section 4.5.) Consequently, when converting fleets to natural gas, fuel facilities must be modified or renovated to be CNG compliant but can only follow existing safety codes for fuels such as propane, which are not necessarily appropriate for CNG. Liquiline North America (Liquiline) suggested that standards for LNG production and use need to be very robust with the objective of creating an equivalent level of safety to that of current fuels, such as propane. However, Liquiline cautioned against over-regulating, particularly in the LNG industry, and recommended that the Government study how other markets and respective regulations have developed before regulating its domestic industry.

Ferus stated that the Government of B.C. has implemented regulations concerning LNG, taken steps to ensure regulatory certainty, and is driving the innovation and adoption of LNG as a transportation fuel. Ferus suggested that Alberta study and learn from the policies implemented by B.C. in terms of regulation of the LNG transportation industry. It recommended taking a strategic vision towards the adoption of natural gas, including looking at current regulations respecting the construction of LNG fuelling stations and determining how those regulations could be streamlined in order to construct more LNG fuelling stations. According to Shell Canada (Shell), consistent codes and standards across the provinces are also important for widespread LNG and CNG adoption. Shell noted, for example, that Alberta and B.C. have different weight allowances for trucks and argued that consistent regulations across jurisdictions would benefit those companies moving toward using LNG and CNG as transportation fuel.

Recommendations

10. **The Committee recognizes that with any decision made in regard to how the Government should monetize Alberta's natural gas, a stable regulatory framework needs to be in place in order to attract and maintain investment in the province. Therefore, the Committee recommends that the Government ensure that there is consistency and stability with future**

regulations surrounding the natural gas industry so that investors have certainty when making long-term investments in Alberta.

11. **Technology related to natural gas extraction, production, and the public use of natural gas, such as in heavy-duty transport or personal vehicles, is advancing. The Committee recognizes that regulations regarding natural gas from its extraction to its usage (as CNG or LNG) need to be flexible in order to adapt to advancing technology. As a result, the Committee recommends that the Government periodically review the regulatory framework to ensure that it is current with changing technology in the natural gas industry and to update regulations as needed to encompass technological innovations.**

4.5 Natural Gas as a Transportation Fuel

Presenters such as Ferus, Bison Transport, Calgary Transit, and Edmonton Transit suggested promoting the use of LNG and CNG as transportation fuels, specifically for heavy-duty trucks (which currently use diesel), city buses, and personal vehicles. Several of the presenters discussed the use of LNG fuel in the transportation industry, and the Committee applauded the ongoing LNG pilot studies by Bison Transport and CN Rail. While heavy diesel trucks account for only four per cent of the vehicles on the road, they produce 30 per cent of the greenhouse gas emissions released from vehicles in Canada. The Canadian Gas Association estimated that the use of natural gas, as a cleaner alternative to diesel, reduces greenhouse gas emissions by 15 to 25 per cent and fuel costs by 15 to 30 per cent. Countries that have adopted the use of natural gas vehicles include Pakistan, Argentina, Brazil, India, Italy, Peru, and the United States. Some of the policies which have been implemented by the aforementioned countries include subsidies for the construction of natural gas refuelling stations, subsidies for taxi and commercial vehicle conversions, the replacement of public buses with buses fuelled by natural gas, and exemption of import duty and sales tax on the import of CNG machinery and equipment.

In a report prepared by the Natural Gas Use in Transportation Roundtable (“the Roundtable”) entitled Natural Gas Use in the Canadian Transportation Sector, the Roundtable found that medium and heavy-duty vehicles had the greatest potential within the transportation sector for widespread deployment due to the availability of mature engine and storage technologies, the growing energy demand for which heavy-duty vehicles account, and the potential for significant fuel savings and a good rate of return for fleet owners. From an environmental perspective, the Roundtable found that natural gas is a cleaner-burning fuel; it produces fewer greenhouse gas emissions, which would significantly reduce total emissions for the heavy-duty transportation sector. According to Ferus, LNG as a fuel is 1/600th the volume of non-liquefied natural gas and emits approximately 30 per cent fewer greenhouse gases and 90 per cent fewer particulates than diesel. In addition, when used as a fuel in heavy-duty transport trucks, Ferus estimates that the use of LNG can result in a cost savings over diesel of 30 to 50 per cent.

Presenters from Calgary Transit and Edmonton Transit also presented on CNG, which is more suitable to vehicles that travel shorter distances, as a fuel for their bus fleets. The presenters noted the significant decreases in nitrous oxide emissions with natural gas use and the potential fuel savings of long-term natural gas contracts. They also suggested that infrastructure, such as refuelling stations, needs to be in place to ensure the reliability of CNG buses and that public education is important if natural gas is to gain acceptance as a widely used fuel. (This will be discussed in section 4.6.) However, presenters such as EnCana noted that converting municipal bus fleets and personal vehicles alone will not significantly increase total natural gas consumption. Instead, EnCana contended that supplying natural gas for petrochemical production would consume a greater portion of the natural gas supply (as discussed in section 4.3).

Another benefit of natural gas vehicles is the fact that natural gas has historically traded at a discount relative to crude oil and diesel. As a consequence of shale gas discoveries in North America and the resulting glut of natural gas on the market, domestic natural gas prices have declined even further. Consequently, there are potential cost savings for companies that make the conversion to natural gas vehicles from diesel. The cost of LNG as a transportation fuel comprises the commodity price, the cost of

liquefaction, the cost of transportation of LNG, and the cost of fuel storage and dispensing. As a result, as Ferus noted, LNG is an appealing fuel alternative because there is room for significant increases in the price of natural gas before LNG is no longer able to compete with the price of diesel.

Despite the generally agreed upon benefits, presenters noted that LNG/CNG has not been widely accepted as a transportation fuel due to several barriers to adoption, including the high capital costs of converting trucks. According to Ferus, the conversion of transport trucks from diesel to natural gas costs approximately $90,000 per truck. Furthermore, companies are reluctant to make the investment because there is no secure source of fuel supply or secure source of savings.

According to Ferus, transport equipment for LNG often costs two to three times more than the cost of comparable diesel equipment. Therefore, while diesel can be produced in a central location and transported over long distances, LNG is often transported within a radius of only approximately 300 to 400 miles from an LNG facility. Ferus contends that this is because it is more economical to build a second LNG plant than to transport the product outside of the 300 to 400 mile radius. According to Ferus, this makes LNG produced for use in transportation a “localized, community-specific” industry, and therefore the construction and operation of an LNG facility can create a significant number of jobs in a local area and have a significant economic impact.

A lack of fuelling infrastructure further restricts transportation routes for LNG trucks and also potentially restricts routes for light-duty vehicles, leading to the slow adoption of natural gas as transportation fuel. According to several stakeholders, the lack of fuelling infrastructure remains one of the most significant barriers to natural gas conversion. However, companies are not motivated to construct natural gas fuelling infrastructure without the assurance that there will be enough natural gas vehicles using the fuel to make a profit. According to a report by the Conference Board of Canada, in order for widespread acceptance of natural gas fuel to occur, a dense and competitive refuelling infrastructure would have to be developed, as it currently does not exist. Stakeholders such as Canada West Foundation, Ferus, and Westport Innovations all recommended developing a LNG/CNG corridor in which LNG and CNG fuelling stations could be built.

Another major issue pertaining to natural gas vehicles is the lower energy density of natural gas compared to diesel (approximately 40 per cent lower), resulting in natural gas trucks and buses having a more limited range for transportation than vehicles powered by diesel or gasoline. The limited range for natural gas vehicles (NGVs) means that NGVs have to be refilled at least twice as often as those powered by gasoline. Between CNG and LNG, CNG is more suited for short-range transports because it is lower in energy density, while LNG is more suitable for long-range transportation. Vehicles can overcome this range issue by carrying fuel in larger tanks; however, this measure comes at the expense of weight. Maximum weight allowances for heavy-duty trucks in Alberta are set by the Ministry of Transportation and, according to stakeholders, are a significant impediment to LNG adoption because LNG trucks are typically 400 to 500 kilograms heavier than an equivalent diesel truck due to the weight of the LNG tanks. The addition of LNG fuel tanks consequently results in a reduced amount of freight that each truck can carry, reducing the payload, which may be another barrier to the adoption of LNG as a transportation fuel.

Recommendations

12. In the interest of reducing greenhouse gas emissions from heavy-duty trucks, the Committee recommends that the Government encourage the use of natural gas as a transportation fuel by considering the following policy options.

- **Re-examine the existing weight restrictions on Alberta’s roads and bridges with the intention that weight restrictions do not unnecessarily penalize trucks with LNG tanks, which may increase the overall weight of trucks.**
- **Raise with the appropriate licensing body the issues associated with imposing weight limits for trucks equipped with LNG tanks in order to encourage the licensing of alternative LNG vehicles.**

- **Undertake a study of the feasibility of CNG and LNG vehicle corridors designed to withstand the additional weight of CNG and LNG tanks on trucks and buses and which would provide a route on which CNG/LNG fuelling stations could be built.**
- **The Committee sees value in the Government forging partnerships with other state and provincial governments to encourage CNG and LNG vehicle corridors and in the Government forming technological and regulatory best practice partnerships worldwide with other governments.**

13. **With the objectives of reducing the Government sector's direct emissions of NO_x, SO_x, and CO_2, and of reducing the lifecycle cost of the Government vehicle fleet, the Committee recommends that the Government examine transitioning its light vehicle fleet and encouraging the transition of light vehicle fleets of agencies, boards, commissions, and municipalities to natural gas fuelling province-wide over the normal time frame of vehicle replacement.**

14. **The Committee also recommends that the Government examine a requirement that contractors that provide provincially funded services to the Government, agencies, boards, commissions, and municipalities transition to natural gas vehicles where practical and economic.**

15. **In order to encourage the construction of more LNG/CNG fuelling infrastructure, which will in turn encourage greater use of natural gas as a fuel, the Committee further recommends that the Government find ways to offset the costs associated with building fuelling systems through incentives.**

4.6 Education

Stakeholders identified education as a crucial step in adopting the use of natural gas. This includes the education of Alberta drivers and the general public about the benefits and uses of natural gas. Ferus noted that the Government of Alberta "has an unmatched ability to reach all Albertans with its communication/message. If it were to use this ability to educate Albertans on the benefits of natural gas for fuelling, it could raise awareness on a scale that could not be matched by individual companies." In the pilot programs for CNG buses, Edmonton Transit and Calgary Transit both found that public perception was a significant barrier to natural gas adoption. According to both transit departments, "there are fallacies around how dangerous natural gas actually is in terms of its explosive capabilities and so on." Edmonton Transit and Calgary Transit both believe that the first step to take is to make people feel comfortable with natural gas as a fuel and to help members of the public and operators understand the science and benefits of CNG. They agreed that this education could be supported by Government policies.

During its deliberations, the Committee discussed the idea that the Government should also educate the public about the risks and costs of natural gas in addition to the safety and benefits in order to provide a complete picture of the issues surrounding the use of natural gas.

Recommendation

16. **In order to increase acceptance and adoption of natural gas as a fuel, the Committee recommends that the Government play a role in educating companies and the general public on the safety, risks, costs, and benefits of natural gas (LNG and CNG).**

4.7 Other Uses of Natural Gas

4.7.1 Dry Gas

Dry gas is natural gas composed almost entirely of methane. Dry gas contains little to no NGLs, which consist of ethane, propane, and butane. According to EnCana, there has been a decrease in demand for dry gas since shale gas reserves have been unlocked across North America. In contrast, liquids-rich gas, or "wet gas," contains NGLs which can be removed and used in petrochemical processes as well as in the oil sands as diluent to transport bitumen.[*] EnCana noted that the decrease in demand for dry gas has resulted in a lower value of dry gas and therefore has compelled companies to shift focus to NGLs. In particular, EnCana indicated that there was significant demand for condensate[†] in Alberta's oil sands. In its report, Short-term Canadian Natural Gas Deliverability 2012-2014 – Energy Market Assessment, the National Energy Board also noted that natural gas producers were shifting drilling activity away from dry natural gas toward liquids-rich natural gas. With the substantial demand for condensate in the oil sands, natural gas producers will need to find a market for the dry gas, which remains after the liquids have been extracted, a product which is seeing decreasing demand.

Recommendation

17. To address the decreasing demand in the market for dry gas as natural gas producers shift drilling activity toward liquids-rich natural gas, the Committee recommends that the Government highlight the value of dry gas to potential LNG customers.

4.7.2 Cogeneration

Cogeneration is the generation of both electricity and heating or cooling in the same facility using one fuel source. Also known as combined heat and power (CHP), cogeneration makes use of an input fuel such as natural gas to simultaneously generate both electricity and heat for industrial processes. Cogeneration is a more efficient way to generate power compared to when heat and electricity are separately generated because it makes use of the thermal energy produced by the electricity generation. According to Alberta Energy, Alberta has approximately 4,000 MW of cogeneration capacity (29 per cent of total installed generation capacity).

According to IOSA, using natural gas to generate two products (heat and electricity) provides "the lowest possible electrical greenhouse gas intensity of any other fossil fuel generated power." IOSA informed the Committee that the facilities at MEG Energy use dry gas in their in situ cogeneration operations. In particular, natural gas is used to generate steam for MEG Energy's steam-assisted gravity drainage (SAGD) process, which injects steam into the ground to heat bitumen and reduce its viscosity, allowing it to flow into the well and to the pipeline. In MEG Energy's operation, "[n]atural gas is used in the gas turbine to create electricity while the hot exhaust is captured in a heat-recovery steam generator and used to generate steam. The result is the efficient generation of steam for oil production and power for site operations as well as Alberta grid supply." Therefore, replacing separate power and heat generation with cogeneration reduces fuel use, reduces greenhouse gas emissions, and provides low-cost electricity for Alberta's grid. Furthermore, MEG Energy purchases gas off the pipeline as dry gas, without the need to extract the liquids, and suggested that a system in which the liquids are stripped prior to purchase by in situ producers is beneficial to operations which do not or cannot separate liquids on their own.

[*] Diluent is added to bitumen to decrease its viscosity so that it can flow through pipelines.

[†] Condensate is the liquid recovered during the production of natural gas, a light oil that is liquid at normal temperatures and pressures.

Recommendations

18. **Given that the cogeneration of electricity and heat using natural gas is more energy efficient and decreases greenhouse gas emissions, the Committee recommends that the Government examine barriers to the widespread adoption of natural gas and heat cogeneration in multi-family residential, commercial, industrial, neighbourhood, and regional developments.**

19. **The Committee recognizes that large-scale industrial cogeneration reduces fuel use, reduces greenhouse gas emissions, and provides low-cost electricity to Alberta's grid, and applauds the widespread adoption of large-scale industrial cogeneration in Alberta.**

5.0 ACKNOWLEDGEMENTS

The Committee wishes to acknowledge the valuable contribution of those who appeared before the Committee and made written submissions to provide Committee members with information about monetizing natural gas.

The Committee also wishes to acknowledge the assistance of Legislative Assembly Office support staff:

Ms Shannon Dean
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Mr. Duncan Leung
Dr. Philip Massolin
Ms Nancy Robert
Mr. Chris Tyrell
Ms Nancy Zhang
Hansard staff
Security staff

6.0 STAKEHOLDER PRESENTATIONS AND SUBMISSIONS

As part of the review of public policy tools to incentivize the monetization of natural gas, the Standing Committee on Resource Stewardship identified stakeholders on the issue and invited these individuals and organizations to make presentations to the Committee as part of the review process. A total of 17 presentations on natural gas were made to the Committee. A list of presenters is provided in Appendix B of this report.

A number of issues were raised in the presentations to the Committee with respect to the monetization of natural gas, including

- access to international and domestic markets;
- regulatory certainty and changes;
- incentives to encourage greater use of natural gas;
- lack of infrastructure; and
- education of the industry and general public.

APPENDICES

APPENDIX A: MINORITY REPORT – DERON BILOUS, MLA

Introduction

I recognize the substantial effort that has gone into this report in terms of developing a comprehensive business case for the development of natural gas. I believe that the stakeholder presentations that were made have built a strong case for one side of the economic argument in favour of encouraging natural gas development and I thank them for their contribution. However, I submit this minority report in the interest of expressing what is missing from the analysis and in the hope that the recommendations be read in an appropriate context given the limitations of the report.

Exclusion of Renewable Resources

The first recommendation of the minority report reads as follows:

> **The Committee recognizes that Alberta has an abundant supply of natural gas and that the Government of Alberta should encourage greater use of natural gas in the province given its abundant supply and given the environmental benefits, such as decreased greenhouse gas emissions, relative to other non-renewable resources. Accordingly, the Committee recommends that the Government conduct additional studies on the costs and environmental impacts associated with the use of natural gas in relation to other non-renewable resources.**

Respectfully, I submit that this recommendation unnecessarily limits the energy development options within the province. While natural gas may produce reduced greenhouse gases compared to other non-renewable resources, this recommendation frames the environmental debate as one centred around more emissions or even more emissions. This has to be recognized as a temporary measure, using natural gas simply as a bridging fuel through a transition to the use of renewable energy sources, rather than a crutch that delays the implementation of renewable sources.

Additionally, the recommendation provides only one example of an environmental benefit without considering the potential risks associated with increased natural gas extraction, namely through the overwhelming water requirements attached to hydraulic fracturing and risk of seismic events. Although

the recommendation acknowledges the need to conduct further studies, having already recommended the Government of Alberta encourage greater use of natural gas it ultimately exhibits an act first, ask questions later mentality that puts our environment at risk.

Inadequate Consultation Given the Recommendations

A further recommendation states:

> **...Committee recommends that the Government should ensure that there is consistency and stability with the future of regulations surrounding the natural gas industry so that investors have certainty when making long-term investments in Alberta.**

Encouraging stable regulations regarding natural gas in favour of investors without having first conducted a thorough environmental analysis and consulting with a broader group of stakeholders places the emphasis on ensuring investor priorities over the priorities of Albertans as collective. In examining the list of stakeholders that contributed to the Committee's understanding, many notable groups are absent. Namely, stakeholders from Indigenous communities, environmental groups, landowners and labour organizations did not contribute submissions. With reference to Indigenous communities, well-established duties of consultation exist that have not been engaged by this report. By increasing our reliance on natural gas we necessarily increase the use of hydraulic fracturing which will have significant impacts on the land and water rights of Indigenous communities. Encouraging natural gas extraction without performing meaningful consultation is not only disrespectful to the wide array of stakeholders excluded from the discussion, it shows ignorance of our legal obligations.

In the ill-advised move that the Government of Alberta moves ahead prior to further environmental study and consultation, putting stability for investors ahead of flexibility that reflects what we hear and what we learn clearly illustrates out of touch priorities. Alberta's resources are part of a wealth belonging to every citizen in the province and they must be developed in the interest of Albertans as whole, rather than simply those of industry or investors. While there is a great deal of value in this

report, applying overly broad recommendations damages its credibility and encourages policy decisions made on incomplete information.

APPENDIX B: SUBMISSIONS TO THE COMMITTEE

Oral Presentations

ORGANIZATION	PRESENTER(S)	DATE OF PRESENTATION
Canadian Energy Research Institute (CERI)	Mr. Peter Howard	September 10, 2013
Ziff Energy	Mr. Bill Gwozd Mr. Mike Hileman	October 9, 2013
Centre for Applied Business Research in Energy and the Environment (CABREE), University of Alberta School of Business	Mr. Richard Dixon	October 9, 2013
Canada West Foundation (CWF)	Mr. James K. Gray	October 16, 2013
Ferus Natural Gas Fuels (Ferus)	Mr. Sean Lalani	October 16, 2013
Bison Transport	Mr. Trevor Fridfinnson	October 16, 2013
Westport Innovations	Mr. Scott Winton	October 16, 2013
Shell Canada (Shell)	Mr. Bob Taylor	October 16, 2013
TransCanada Corporation (TransCanada)	Mr. Patrick Keys Mr. Dan Ronsky	October 23, 2013
Pacific North West LNG	Mr. Greg Kist Mr. Wilf Barke	October 23, 2013
EnCana Corporation (EnCana)	Mr. Kellen Foreman Ms Sarah Koskie	October 28, 2013
In Situ Oil Sands Alliance (IOSA)	Mr. Richard Sendall Mr. Fred Walter	October 28, 2013
Alberta's Industrial Heartland Association (AIHA)	Mr. Ed Gibbons Mr. Neil Shelly Mr. Wayne Woldanski	November 4, 2013
Sasol Canada (Sasol)	Ms Debbie Pietrusik	November 4, 2013
Calgary Transit	Mr. Russell Davies	November 18, 2013
Edmonton Transit System (Edmonton Transit)	Mr. Holmann Wong	November 18, 2013
Liquiline North America	Mr. Calum McClure	December 2, 2013
Williams Energy Canada*	Mr. David Chappell Ms Lorraine Royer	December 6, 2013

Written Submission

ORGANIZATION	PRESENTER(S)	DATE OF SUBMISSION
Chemistry Industry Association of Canada	Mr. Dan Hall	November 27, 2013

* This presentation was made to Committee members during a tour of the Williams Energy facility in Redwater, Alberta.

APPENDIX C: ANNOTATED BIBLIOGRAPHY

British Columbia. Ministry of Energy and Mines. *British Columbia Natural Gas Strategy: Fuelling B.C.'s Economy for the Next Decade and Beyond.* Victoria, British Columbia: Energy and Mines, 2012. http://www.gov.bc.ca/ener/popt/down/natural_gas_strategy.pdf

Published by the British Columbia's Ministry of Energy and Mines in 2012, this document outlines the government's natural gas strategy, including its vision to maintain current and develop new markets, ensure a reliable and abundant supply of natural gas, maintain competitiveness in the marketplace, maximize the benefits of natural gas development, ensure environmentally responsible development, and build partnerships to promote development.

British Columbia. Ministry of Energy, Mines and Natural Gas. *British Columbia's Liquefied Natural Gas Strategy: One Year Update.* Victoria, British Columbia: Energy, Mines and Natural Gas, 2013. http://www.gov.bc.ca/com/attachments/LNGreport_update2013_web130207.pdf

This document was produced by the British Columbia Ministry of Energy, Mines and Natural Gas to provide an update on the status of the province's natural gas strategy one year after the strategy was implemented.

Canada West Foundation. *Seismic Shifts.* Calgary, Alberta: Canada West Foundation, 2011. http://cwf.ca/pdf-docs/publications/Seismic_Shifts_July_2011.pdf

This report provides information on the historical benefits of natural gas to Canada over the past 50 years and examines the future of natural gas from the perspective of both consumers and producers. The paper outlines several policy directions that need to be discussed when outlining future policies that deal with natural gas and the emergence of shale gas. The position of this paper is that while this resource has resulted in economic benefits for Canada over the past 50 years, sound policy decisions are necessary to ensure that natural gas continues to be a cost effective and stable energy alternative as Canada moves toward a carbon-reduced future.

Conference Board of Canada. *Cheap Enough? Making the Switch from Diesel Fuel to Natural Gas*. Ottawa, Ontario: Conference Board, 2012. http://www.conferenceboard.ca/e-library/abstract.aspx?did=4811

This report considers the potential for natural gas as an alternative fuel to diesel for heavy-duty trucks in particular, along with some consideration of its use as a rail and marine transportation fuel. Its primary focus is the potential financial impact on freight carriers. These impacts are also considered in the context of the greenhouse gas reduction potential of the fuel. The report concludes that while carriers willing to convert their fleets to natural gas do face significant capital costs and continuing risks related to relative fuel prices, availability of fuelling infrastructure, and tax policy, they could reap significant net benefits in operating costs while also reducing their environmental impact.

Conference Board of Canada. *The Role of Natural Gas in Powering Canada's Economy.* Ottawa, Ontario: Conference Board, 2012. http://www.conferenceboard.ca/e-library/abstract.aspx?did=5251

This report examines the economic contribution that natural gas exploration, production, transportation, distribution, and consumption will make to Canada's economy between 2012 and 2035. It considers the increased demand for Canadian natural gas, driven by production of liquefied natural gas for Asian export markets and increased use of natural gas within Canada to produce electricity and to produce bitumen in the oil sands.

Fraser Institute. ***Laying the Groundwork for BC LNG Exports to Asia*****. Vancouver, British Columbia: Fraser Institute, 2012. http://www.fraserinstitute.org/uploadedFiles/fraser-ca/Content/research-news/research/publications/laying-the-groundwork-for-BC-LNG-exports-to-asia.pdf**

This report discusses Canada's difficulty in maintaining export volumes to the United States as the U.S. continues to develop shale gas and explores Asia as an emerging market with increased need for liquefied natural gas (LNG) from stable, long-term suppliers. The report discusses the variety of policies that could impede development of the infrastructure that will be required to export LNG to markets in the Asia-Pacific region via British Columbia ports. To assess the economic impacts of exporting LNG to markets in the Asia-Pacific region, the report provides a development scenario compatible with the National Energy Board's most recent long-term forecast of B.C. natural gas production.

Government of Alberta. ***Energizing Investment: A Framework to Improve Alberta's Natural Gas and Conventional Oil Competitiveness*****. Edmonton, Alberta: GOA, 2010.**

This report, produced by the Government of Alberta, outlines Alberta's current business operations in the oil and gas sector and assesses its competitiveness in the marketplace. The report also provides a brief discussion of some of the factors that may impact or impede Alberta's competitive advantages (such as economic volatility, higher costs, and regulatory complexity) and provides recommendations on how to address these factors.

Hilyard, J. ***The Oil and Gas Industry: A Nontechnical Guide*****. Tulsa, Oklahoma: PennWell Corporation, 2012.**

This book provides information on the equipment and processes used in exploring new oil and gas resources, evaluating promising formations, drilling wells, managing oil and gas production, converting oil and gas into products, and transporting oil and gas. It also includes chapters on the evolution of the petroleum industry, oil and gas trading, and challenges that the industry will likely face.

ICF International. ***Life Cycle Greenhouse Gas Emissions of Natural Gas: A Literature Review of Key Studies Comparing Emissions from Natural Gas and Coal.*** **Toronto, Ontario: ICF, 2012.**

This report is a literature review of key studies comparing emissions from natural gas and coal and concludes that life-cycle greenhouse gas emissions from shale gas and conventional gas are significantly lower than that of coal. The study also finds that there is little difference between life-cycle GHG emissions for shale gas produced through hydraulic fracturing and conventional gas production. The most significant factor affecting the life-cycle emissions is the mitigation of completion emissions from hydraulic fracturing.

Inkpen, A. and M.H. Moffett. ***The Global Oil and Gas Industry: Management, Strategy and Finance*****. Tulsa, Oklahoma: PennWell Corporation, 2011.**

This book examines the strategic, financial, and managerial aspects of the oil and gas industry, addressing financial tools, factors that affect crude oil and natural gas price volatility, and upstream and downstream markets, providing examples and business principles throughout.

International Energy Agency. ***The Contribution of Natural Gas Vehicles to Sustainable Transport*****. Paris, France: IEA, 2010. http://www.iea.org/publications/freepublications/publication/natural_gas_vehicles.pdf**

This working paper evaluates the potential costs and benefits of using natural gas as a vehicle fuel for road transportation and the policy related to its market development.

International Energy Agency. *Gas Medium-Term Market Report 2013.* Paris, France: IEA, 2013. http://www.iea.org/Textbase/npsum/MTGMR2013SUM.pdf

This report provides a detailed analysis of demand, upstream investment, and trade developments through 2018 that will shape the gas industry and the role of gas in the global energy system. It investigates the economic viability of gas-fired power generation in Europe, the prospects for an LNG trading hub in Asia, and the potentially transformational role of natural gas in transport.

International Energy Agency. *Security of Gas Supply in Open Markets: LNG and Power at a Turning Point.* Paris, France: IEA, 2004.

This book analyzes the most recent developments in security of gas supply and reliability in all IEA regions. It looks at how governments and other stakeholders in IEA countries respond to the need to create a framework that enables the players to deliver secure and reliable gas supply at the border and all the way down to the final customer.

National Energy Board. *Liquefied Natural Gas: A Canadian Perspective*. Calgary, Alberta: NEB, 2009.

This report provides context on the historical global trade of natural gas and LNG and provides an assessment of LNG supply and demand for the period 2008 to 2015. With this analysis, the National Board seeks to provide a high-level perspective on the potential implications of LNG development in North America and on the potential effects that imported LNG may have on Canadian gas markets and energy infrastructure.

Natural Gas Use in Transportation Roundtable. *Natural Gas Use in the Canadian Transportation Sector: Deployment Roadmap.* Ottawa, Ontario: Natural Gas Use in Transportation Roundtable, 2010.

In March 2010, Natural Resources Canada convened a group of senior stakeholders from across the natural gas value chain, end user groups, provinces, academia, and environmental groups, as well as natural gas truck and equipment manufacturers. This Roundtable launched the natural gas for transportation deployment roadmap. The focus of the deployment roadmap is to consider the potential role of natural gas as a transportation fuel and to determine priorities for market development. Through working groups and stakeholder consultations, the goal of the work was to identify priorities for market development and consider needs related to fleet end users, education and outreach, research and development, capacity building (including codes and standards activities), and effective business models to support adoption across a range of potential end uses. This report provides the resulting recommendations.

Pembina Institute and David Suzuki Foundation. *Is Natural Gas a Climate Change Solution for Canada?* Drayton Valley, Alberta and Vancouver, British Columbia: Pembina and David Suzuki Foundation, 2011. http://www.pembina.org/pub/2240

Many people are asking whether natural gas can play a role as a "bridging" fuel that enables near-term reductions in the greenhouse gas emissions responsible for climate change. This report explores the role of Canada's federal and provincial governments in shaping future production and use of natural gas in consideration of both the climate and non-climate environmental impacts and offers recommendations.

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Alberta. Ministry of Energy. *Alberta Oil and Gas Industry: Quarterly Update, Winter 2013*. Edmonton, Alberta: Energy, 2013. http://albertacanada.com/files/albertacanada/OilGas_QuarterlyUpdate_Winter2013.pdf

This document was produced by Alberta's Ministry of Energy and provides information about the status of the oil and gas industry (excluding the oil sands) as of Winter 2013.

Alberta. Ministry of Energy. *Alberta's Energy Industry: An Overview.* Edmonton, Alberta: Energy, 2012. http://www.energy.alberta.ca/Org/pdfs/Alberta_Energy_Overview.pdf.

This document was produced by Alberta's Ministry of Energy and provides an overview of Alberta's energy industry, including information about the province's production of oil, natural gas, petrochemicals, and electricity.

Websites

Canadian Gas Association: http://www.cga.ca

The Canadian Gas Association (CGA) is the voice of Canada's natural gas delivery industry, and its members are distribution companies, transmission companies, equipment manufacturers and other service providers. CGA works with the natural gas industry to build the understanding of natural gas, advance efficiency and innovation in the energy and economy discourse, drive for improved regulatory engagement, ensure continuous improvements in safety and integrity management, and pursue partnerships to better deliver energy services to Canadians.

Centre for Energy: http://www.centreforenergy.com

The Centre for Energy is a not-for-profit organization that provides information about energy in Canada. It works with other organizations to explore energy and environmental issues and to develop energy-related editorial content and educational resources to support and promote Canada's energy system. This website provides information about the various sources of energy in Canada, as well as providing general information, news, and statistics about Canada's energy system.

U.S. Energy Information Administration: http://www.eia.gov/naturalgas

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