



# **Natural gas supply and demand report New Brunswick and Nova Scotia 2015-2025**

Prepared for: Atlantica Centre for Energy

Prepared by: Jupia Consultants Inc.

Spring 2015



## Table of Contents

	<u>Page</u>
Executive Summary .....	2
1. Introduction .....	5
2. Natural gas demand in New Brunswick and Nova Scotia .....	6
2.1 Natural gas demand in New Brunswick and Nova Scotia (2005-2013).....	6
2.2 Natural gas supply and demand in New Brunswick and Nova Scotia (2015-2025) .....	9
2.3 Potential big drivers of natural gas demand through 2025 .....	12
3. Sources of natural gas supply to the region .....	14
3.1 Offshore Nova Scotia – Sable Island, Deep Panuke and new fields.....	14
3.2 Frederick Brook Shale/Hiram Brook Sands .....	15
3.3 LNG imports .....	16
3.4 Imported U.S. natural gas .....	17
3.5 Importing natural gas from western Canada.....	17
3.5 Additional onshore shale gas development in New Brunswick.....	18
3.6 Additional onshore shale gas development in Nova Scotia.....	18
4. Potential implications for the regional economy .....	19
4.1 Are we facing a big natural gas price spike? .....	19
4.2 Economic impact from new onshore gas development .....	20
4.3 Mitigating price swings: Natural gas storage.....	21
4.4 Natural Gas and New Investment in the Region.....	22
5. Conclusion.....	22

## Executive Summary

### **Finding #1: Natural gas has become a vital source of energy and economic development in the region.**

Over the past 15 years, natural gas has become an important new source of energy in the Maritimes. Measured in energy use equivalent units (terajoules), natural gas use increased by more than two hundred percent in New Brunswick between 2005 and 2013 and more than 300 percent in Nova Scotia. It is having the largest impact on heavy fuel oil usage of which has declined by 73 percent in New Brunswick and 72 percent in Nova Scotia over the same period. Every other major source of energy in the region is in decline except natural gas. Thousands of institutions, small businesses and households around the region are now using natural gas as a principal source of energy (Section 2.1).

At the same time the local production of natural gas has provided a significant boost to the regional economy. The exploration and production of natural gas along with the construction of pipeline infrastructure has generated billions of dollars worth of economic activity in Nova Scotia and New Brunswick. Nova Scotia in particular has benefitted from royalty revenues. Between 1997 and 2007 alone, the province received \$1.5 billion<sup>1</sup> worth of royalty-related revenues (Section 4.2).

### **Finding #2: Local production of natural gas in the Maritimes is in steep decline.**

According to Statistics Canada, natural gas production from Nova Scotia and New Brunswick fields declined from 167,000 terajoules in 2004 to 78,000 in 2013. A 2013 report prepared for the Nova Scotia government concluded local demand in the Maritimes would outstrip local supply by 2017. Based on the current trend, i.e. without further drilling, it is likely the region's gas production will drop to nearly zero before 2020 even as demand continues to expand. There are times during the year now when demand is greater than supply particularly during winter high use months (Section 2.2).

### **Finding #3: Local demand for natural gas in the Maritimes is expect to rise.**

Demand for natural gas is expected to rise significantly over the next 10-20 years assuming the price for the fuel remains competitive. A report prepared for the Nova Scotia government in 2013 forecasted a mid-level demand growth scenario under which domestic demand in the Maritimes will increase from 189 MMcfd (million cubic feet per day) in 2010 to 500 MMcfd in 2025. Coupling this demand growth with a steep decline in local production would result in local demand being *five times greater* than domestic production by 2025<sup>2</sup> (Section 2.3). The drivers of future natural gas demand in the region will be:

- Electricity production.
- Other industrial uses.
- Expansion of commercial, small business and residential markets.
- The possible export of natural gas via several liquefied natural gas (LNG) export facilities.

---

<sup>1</sup> Throughout this document, dollar figures are shown in Canadian dollars unless otherwise indicated.

<sup>2</sup> The report was developed before Deep Panuke's reserves estimate was cut by 50 percent.

## Executive Summary (cont.)

### **Finding #4: Future local production of natural gas is in jeopardy due to bans put in place on hydraulic fracturing by provincial governments.**

Due to the relatively low cost development of shale gas across North America, there is limited appetite for generally more expensive exploration and production of offshore natural gas. Because of this and the bans on hydraulic fracturing in both New Brunswick and Nova Scotia, it is unclear if or when there will be any new local sources of natural gas production (Section 3). The potential sources of local supply are:

- **Offshore Nova Scotia** – offshore exploration and production for oil and gas continues but the economic viability of natural gas development and production has been negatively impacted by the development of the shale gas industry in the United States and western Canada (Section 3.1).
- **Onshore natural gas** – there are producing fields in the Sussex region in New Brunswick and there is considerable potential for shale gas development in both New Brunswick and Nova Scotia using horizontal drilling and hydraulic fracturing. However, both provinces now have bans in place and it is unclear if and when this situation will change (Section 3.2). Coalbed methane is being developed in Nova Scotia but the scope of this development is unclear.
- **LNG imports through Canaport in Saint John** – however, the price point would be substantially higher than in the past particularly during times of peak demand. In January 2015, the landed LNG price at Canaport was \$16.74/MMBtu<sup>3</sup> (\$US) compared to a price of less than \$4.00/MMBtu (\$US) in the Gulf of Mexico (Section 3.3).
- **Imported U.S. natural gas** - this is the most likely source of large volume natural gas to serve markets in the Maritimes. Based on current estimates, natural gas could be flowing northward from U.S. shale plays by sometime in 2017 (Section 3.4). However, this could lead to a significant increase in the transportation costs associated with natural gas.

### **Finding #5: The future supply options for natural gas could lead to substantial increases in the landed price of natural gas for this region.**

The current approved toll for the gas flowing from offshore Nova Scotia is \$0.67/MMBtu plus fuel retainage of 0.3 percent (note this is the toll before the gas enters local distribution systems). This rate applies to both forward haul and backhaul service. If the pipeline is reversed and gas flows north into New Brunswick, a recent report found the transportation costs will rise to \$3.67/MMBtu – from U.S. shale plays – not including local distribution charges or the price of the commodity (Section 4.1).

---

<sup>3</sup> MMBtu = One Million British Thermal Units, a standard unit used for the price of natural gas.

## Executive Summary (cont.)

### **Finding #6: A higher price for natural gas in the region could harm the economy.**

Most of the region's energy intensive industries have shifted from heavy oil and other sources to natural gas as a primary source of energy. Even those firms not in close proximity to the natural gas pipeline infrastructure are being served using compressed natural gas (CNG) delivered by truck. A significant spike in the delivered cost of natural gas will hurt their overall competitiveness. In addition, a higher price for natural gas could also restrict future investment (Section 4.4).

### **Finding #7: Shifting from local production of natural gas to its importation eliminates potentially substantial economic benefits to the region.**

The exploration and production of natural gas is a major source of economic activity in other areas and could be in New Brunswick and Nova Scotia. A study looking at the economic impact of the Marcellus shale gas industry in Pennsylvania found that its development in the state boosted gross state product (GSP) by more than \$11 billion (\$US) in 2010 while generating nearly \$1.1 billion (\$US) worth of state and local taxes. A 2014 study attempting to quantify the potential of shale gas exploration and production in New Brunswick estimated the industry could generate \$2.2 billion worth of new investment over five years, boost provincial gross domestic product (GDP) by \$1.6 billion and generate over \$425 million worth tax and royalty revenue to all three levels of government (Section 4.2).

### **Finding #8: The natural gas supply/demand challenge is one of the major public policy challenges in the Maritime Provinces.**

The economy in the Maritime Provinces has been among the worst performing regional economies across North America since 2007. Access to a stable supply of competitively priced natural gas is one way to ensure manufacturing and other energy-intensive industries will continue to invest in the region. Finding and exploiting new sources of local natural gas production would not only ensure a more competitive natural gas price environment but also generate substantial economic benefits from its exploration and production.

## 1. Introduction

Since the introduction of natural gas as an energy source in the Maritimes in 1999 it has become an important part of the energy mix in the region. For example, in New Brunswick the demand for natural gas rose from just under 6,400 terajoules in 2005 to over 19,000 terajoules in 2013. The demand for natural gas liquids (NGLs) (e.g. propane, butane, etc.) also rose by more than 300 percent in the same time frame. Industries have been shifting out of heavy and light fuel oil as well as diesel to the cleaner-burning natural gas. The use of heavy fuel oil, once a principal source of industrial energy in the province, has declined by 73 percent between 2005 and 2013. Nova Scotia has also seen rapid expansion in the demand for natural gas in recent years as its use has risen by more than 300 percent between 2005 and 2013. Similar to New Brunswick, heavy fuel oil use as an energy source has dropped dramatically – down 72 percent.

Even on Prince Edward Island, several of the large manufacturing firms are bringing in natural gas in a compressed natural gas (CNG) format to take advantage of the better price and cleaner burning fuel.

The future demand for natural gas in the region is likely to rise significantly again over the coming decade. In New Brunswick, less than ten percent of households and small businesses in the ten communities where natural gas infrastructure exists use the fuel compared to between 50 and 90 percent in provinces with mature natural gas distribution industries. There are potential new industrial markets for natural gas, such as for use in power generation, as well as a proposed new potash mine and fertilizer facilities. Indeed, use of natural gas in Nova Scotia and New Brunswick by small and medium businesses is in its infancy.

Even as demand for natural gas rises in the region, its future supply is coming into serious question. The offshore Sable Island and Deep Panuke fields are winding down. The import of liquefied natural gas (LNG) has become cost prohibitive and is now merely a seasonal supplier, as are the existing on-shore New Brunswick and Deep Panuke off-shore sources. The potential development of onshore natural gas sources (shale gas) have been put on hold in both New Brunswick and Nova Scotia either through a moratorium (New Brunswick) or an outright ban on hydraulic fracturing (Nova Scotia).

This report provides a high level look at the demand for natural gas in the region over the next decade as well as the potential sources of supply to address the demand. In addition, the report assesses how the natural gas market in New Brunswick and Nova Scotia over the next decade could impact the regional economy and its development.

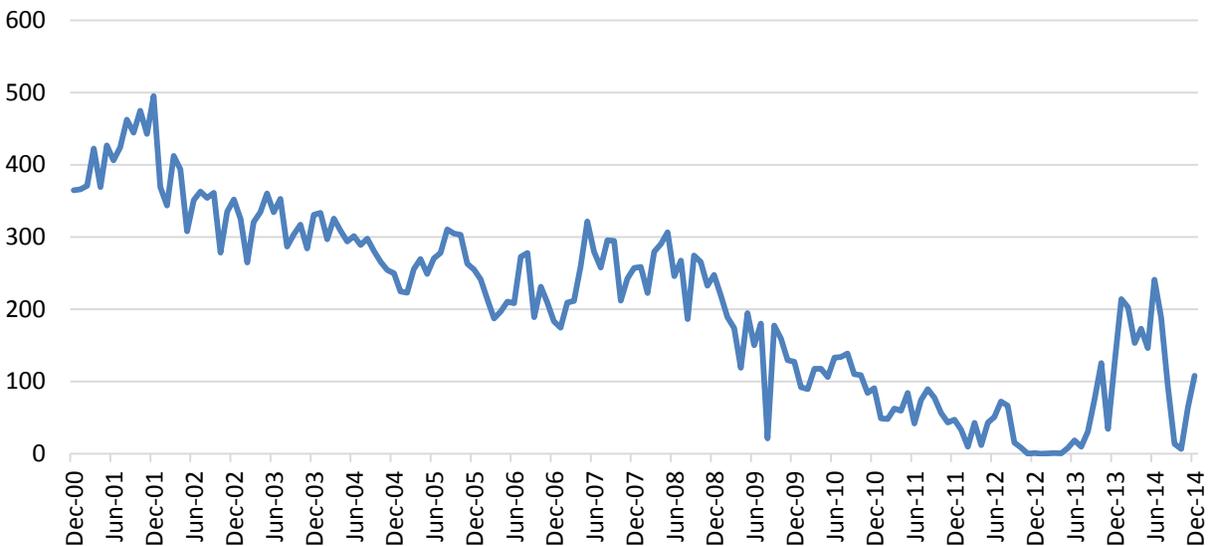
This report highlights the situation in the Maritime Provinces where demand for natural gas is rising, yet domestic supply is dwindling. The primary supply, offshore Nova Scotia, will be economically depleted within the 2020 timeframe. Existing legislation by the Nova Scotia and New Brunswick governments has halted development of onshore resources, leaving importation from outside the region as the only short term option.

## 2. Natural gas demand in New Brunswick and Nova Scotia

### 2.1 Natural gas demand in New Brunswick and Nova Scotia (2005-2013)

The development of the offshore Sable Island natural gas field in the mid-1990s was primarily meant to service natural gas markets in the northeastern United States. However, demand for the gas within the Maritimes has steadily increased. In 2015 less than half of the natural gas crossed the border to the United States, whereas in 2001, nearly 100 percent of Sable Island gas was sent to U.S. markets. In 2012, before Deep Panuke gas started to flow, only 18 percent of all offshore Nova Scotia natural gas production ended up servicing U.S. markets – the rest served the domestic market.

**Figure 1: Natural gas exports from Nova Scotia (2000-2014), million cubic metres**



Source: Statistics Canada. Table 131-0001.

The region's large energy consuming industries have become major users of natural gas. Initially in New Brunswick, a handful of the largest customers for natural gas were given a 'by-pass', meaning they were not required to become customers of the natural gas distribution company in the province and only had to pay the Maritimes & Northeast Pipeline (M&NP) transmission fee. This was done to ensure there was enough base load demand to build the large lateral pipes required to bring gas to local communities in southern New Brunswick. Now most of the large energy consuming industries including the oil refinery, forest products mills and other manufacturers are using natural gas. Even those not close to the pipeline infrastructure are now natural gas users through the truck-based compressed natural gas (CNG) distribution system. The potash mine near Sussex is one of the largest industrial users of natural gas in the region.

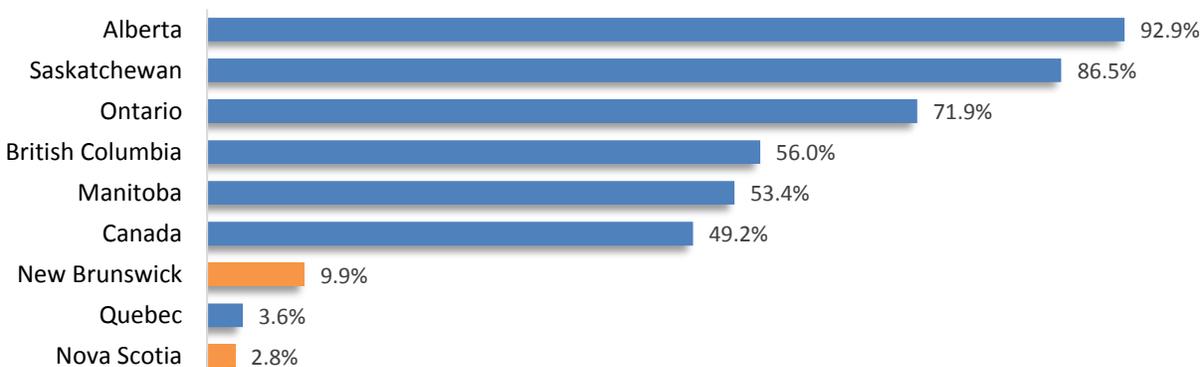
In Nova Scotia there is not as much large industrial demand for natural gas but there has still been wide take-up of the gas in areas where it is available and also through the use of CNG.

Electricity production has also absorbed a considerable amount of the region’s natural gas. The largest single user in the Maritimes is the Tufts Point electrical generation plant near Dartmouth. In fact, between 2009 and 2013 utilities in New Brunswick and Nova Scotia generated more than 10 percent of the national total of utility-generated electricity from natural gas even though the two provinces represent less than five percent of national energy demand.

At the residential level, natural gas is a new fuel to the Maritimes. Households are not overly familiar with its use relative to the rest of Canada. There is strong upside potential as the environmental benefits and heating efficiencies become more main-stream.

Natural gas is also taking a larger share of the household and commercial energy markets in the Maritimes. In New Brunswick, Enbridge Gas NB now has more than 12,000 residential and small business customers or just under 10 percent of the market in the 10 communities in which it has distribution infrastructure (Figure 2). In Nova Scotia, the uptake has been slower but Heritage Gas is now building new local markets in multiple communities.

**Figure 2: Percentage of households using natural gas as principal heating fuel\***



*\*there is no residential use of natural gas on Prince Edward Island.*

Sources: All except New Brunswick and Nova Scotia - Statistics Canada CANSIM table 203-0019. Most recent figures are for 2009. New Brunswick and Nova Scotia – Enbridge NB and Heritage Gas customer figures (2014) as a percentage of total households only in currently serviced areas.

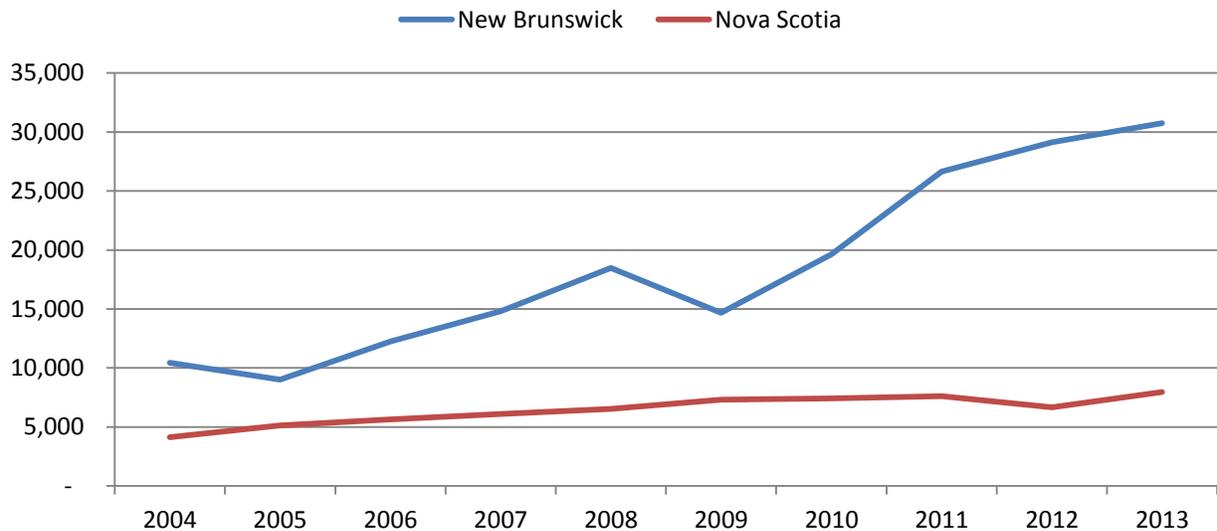
As noted in the chart above, between 90 and 97 percent of Eastern Canadian households are not using natural gas versus 50 to 93 percent using natural gas for the rest of Canada. If there was a consistent supply of natural gas at a consistent price, its use at the residential level would increase in the Maritimes.

The development of industrial, electricity, household and commercial markets has led to a substantial increase in the amount of natural gas used in New Brunswick and Nova Scotia over the past decade. As shown in Figure 3, natural gas and natural gas liquids (NGL) use in New Brunswick has risen from 10,430 terajoules in 2004 to 30,748 terajoules in 2013, a nearly 300 percent increase.

Natural gas and NGLs now make up more than 20 percent of total energy use in New Brunswick. They provide more energy to the province than diesel fuel, heavy fuel oil and aviation fuel combined.

In Nova Scotia, natural gas is the fastest growing source of energy. Natural gas use (not including NGLs) increased by 400 percent between 2004 and 2013. Even with NGLs overall natural gas demand in Nova Scotia is up by nearly 200 percent over the decade.

**Figure 3: Natural gas and NGLs energy use in New Brunswick and Nova Scotia, final demand (terajoules)**



Source: Statistics Canada CANSIM Table 128-0016.

Table 1 shows the change in energy use in New Brunswick between 2005 and 2013. The energy sources are standardized in terajoules rather than natural units to allow for comparison. Energy use in New Brunswick has declined in New Brunswick in recent years mainly as a result of the loss of some industrial activity and the stagnant population. As mentioned above, natural gas use is rising quickly but refined petroleum product use is in fairly large decline – particularly fuel oil. The table shows the same data for Nova Scotia where overall energy use has declined even more steeply than in New Brunswick for similar reasons. Natural gas use – although from a smaller base than in New Brunswick – is also rising quickly and fuel oil use is declining rapidly.

**Table 1: Energy use, final demand (terajoules) - New Brunswick and Nova Scotia**

	NB		NS		% Change	
	<u>2005</u>	<u>2005</u>	<u>2013</u>	<u>2013</u>	<u>2005-2013</u>	
<b>Total primary and secondary energy</b>	<b>170,206</b>	<b>180,372</b>	<b>151,173</b>	<b>147,795</b>	<b>-11%</b>	<b>-18%</b>
Total coal	n/a	1,252	n/a	n/a	n/a	n/a
<b>Natural gas</b>	<b>6,383</b>	<b>1,343</b>	<b>19,238</b>	<b>5,493</b>	<b>+201%</b>	<b>+309%</b>
<b>Gas plant natural gas liquids (NGL's)</b>	<b>2,627</b>	<b>3,796</b>	<b>11,510</b>	<b>2,478</b>	<b>+338%</b>	<b>-35%</b>
Primary electricity, hydro and nuclear	52,704	42,521	45,483	37,559	-14%	-12%
Steam	5,991	1,346	417	144	-93%	-89%
Coke	n/a	n/a	n/a	n/a	n/a	n/a
<b>Total refined petroleum products</b>	<b>101,819</b>	<b>130,114</b>	<b>73,992</b>	<b>101,293</b>	<b>-27%</b>	<b>-22%</b>
Motor gasoline	37,114	43,008	35,283	39,697	-5%	-8%
<i>Diesel fuel oil</i>	<i>34,178</i>	<i>30,662</i>	<i>24,009</i>	<i>26,605</i>	-30%	-13%
<i>Light fuel oil</i>	<i>10,487</i>	<i>28,724</i>	<i>7,159</i>	<i>24,482</i>	-32%	-15%
<b><i>Heavy fuel oil</i></b>	<b><i>17,464</i></b>	<b><i>16,729</i></b>	<b><i>4,637</i></b>	<b><i>4,616</i></b>	<b><i>-73%</i></b>	<b><i>-72%</i></b>

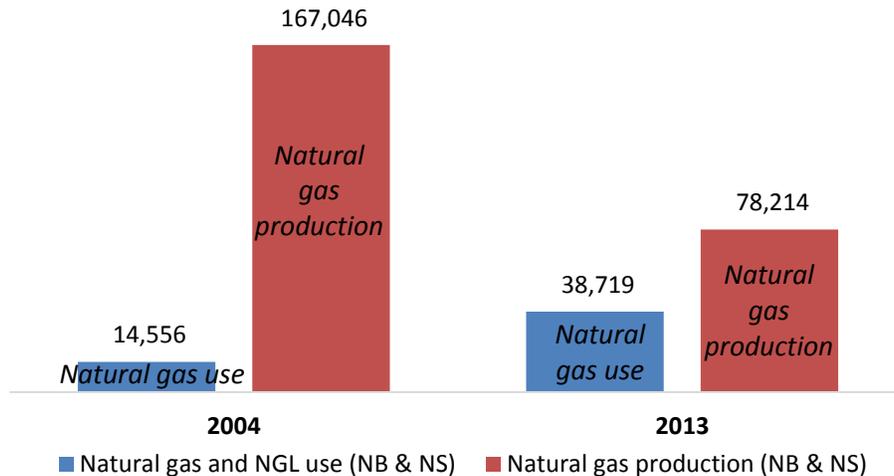
Source: Statistics Canada CANSIM Table 128-0016.

## 2.2 Natural gas supply and demand in New Brunswick and Nova Scotia (2015-2025)

While the demand for natural gas was rising steeply over the past decade there was far more production of natural gas needed to supply local demand. However, with the decline in offshore production, and legislation to prohibit onshore development, the balance between supply and demand in the coming years has come into question.

As shown in Figure 4, in 2004 there was 11.5 times as much production of natural gas in New Brunswick and Nova Scotia as usage in the two provinces. By 2013, there was only twice as much production compared to usage with the two main offshore sources of gas - Sable Island and Deep Panuke - expected to run out within a few years.

**Figure 4: Natural gas and NGLs energy use in New Brunswick and Nova Scotia compared to production in the region (terajoules)\***



*\*At times during the winter, natural gas demand in the Maritimes already outstrips natural gas production.*

Source: Statistics Canada CANSIM Table 128-0016.

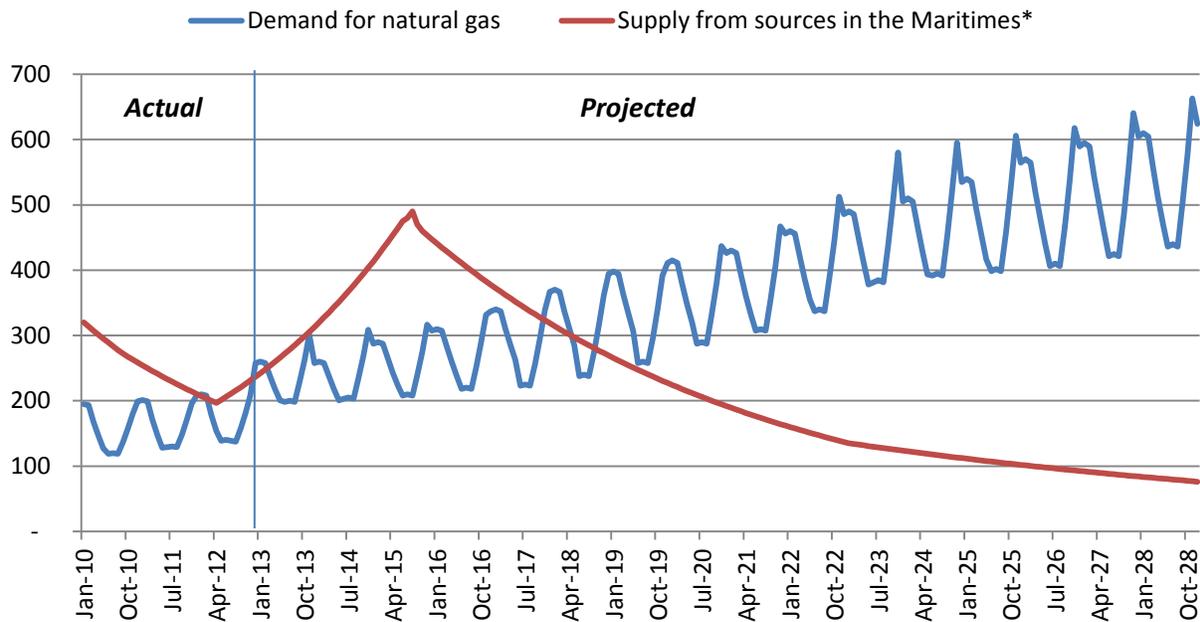
There has been a lot of speculation in recent months about the supply of natural gas within New Brunswick and Nova Scotia. The most recent formal assessment of the issue was prepared by the Toronto-based consulting firm, ICF Consulting Canada, Inc., in 2013. The firm’s report, *The Future of Natural Gas Supply for Nova Scotia*, developed several scenarios for supply and demand and developed the potential implications. Their report was based on input from the Nova Scotia Department of Energy and other sources.

The firm looked at three demand scenarios: 1) low demand growth, 2) mid-level demand growth, and 3) high demand growth. In the mid-level demand growth scenario, the use of natural gas rises at a consistent rate doubling within a decade and tripling by the end of the forecast period, and is considered the scenario that has developed in the two years since the report was released.

In the mid-level demand growth scenario, the firm predicts more use of natural gas in electricity generation in Nova Scotia as well as increased industrial usage. It is based on the actual observed rate of growth in the Maritimes over the five years before the forecast period.

Figure 5 shows the mid-level demand and supply dynamic in the Maritimes through 2028. The in-year deviations are related to peak and trough demand swings.

**Figure 5: Mid-level natural gas demand and steep decline in production scenario, MMcfd Maritime Provinces**



*\*The ICT report was prepared before Encana cut its Deep Panuke reserves estimate by 50 percent. It is likely that natural gas production from sources in the Maritimes is already below total demand for natural gas in the region.*

Source: The Future of Natural Gas Supply for Nova Scotia (2013). ICF Consulting Canada, Inc.

The ICF report also looked at various different domestic natural gas production projections from steep decline to significant expansion. Given the fact that provincial governments in New Brunswick and Nova Scotia have outlawed hydraulic fracturing and the uncertain investment climate for offshore gas development it is likely the steep decline in production scenario is the most realistic.

The steep decline in production scenario is based on the actual trend in New Brunswick and Nova Scotia. In the ICF report, domestic gas from McCully, Sable and Deep Panuke drops to 185 MMcfd in 2020 and less than 50 MMcfd by 2035. It is important to point out this report was published before Encana Corp., announced it was cutting the Deep Panuke’s reserve estimate by 50 percent to 200 billion cubic feet (See Section 3.1). This could mean that offshore Nova Scotia gas could drop to near zero by 2020. In addition, the well owners may shut in prior to full depletion when production drops to an uneconomic level.

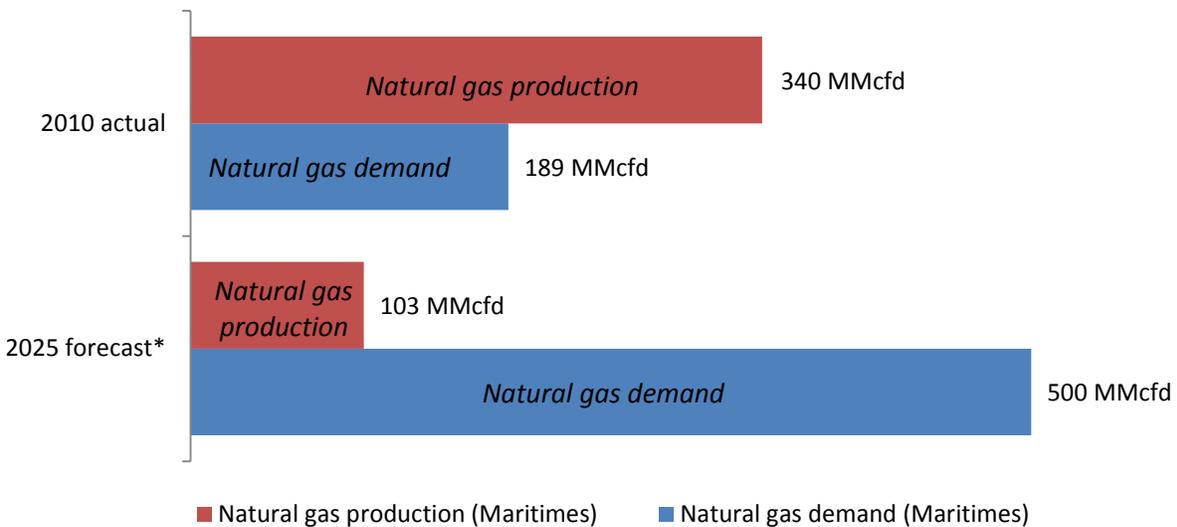
In addition, the ICF report was prepared prior to legislation enacting a moratorium on hydraulic fracturing in New Brunswick. ICF had assumed the McCully field would expand its production moderately during the forecast period. That is now in jeopardy due to the moratorium.

Section 3 discusses the various supply options in more detail.

Figure 6 shows the supply/demand dynamic for the mid-level demand growth and steep decline in production scenario. Mid demand growth with steep decline in production (the current path) shows domestic demand would be *five times* domestic production by 2025 (again this was before the 50 percent cut in Deep Panuke reserves).

In the ICF report there is no scenario in which domestic production continues to decline and demand in the Maritimes is covered. Even under the scenario with slower production decline the mid and high demand growth scenarios would require substantial natural gas imports. Section 4 discusses how the impact of large scale natural gas imports would impact the competitiveness of natural gas as a fuel source in the region.

**Figure 6: Shortfall in natural gas production relative to natural gas demand in the Maritimes by 2025 MMcfd - Using the ICF mid-level demand growth and steep decline in production forecast\***



*\*This projection was developed before the announcement that Deep Panuke gas reserves were 50 percent less than expected.*

Source: The Future of Natural Gas Supply for Nova Scotia (2013). ICF Consulting Canada, Inc.

### 2.3 Potential big drivers of natural gas demand through 2025

The base case in the ICF report assumes no real demand growth. This is unrealistic particularly if natural gas as a fuel source remains competitive. As shown in Figure 2 on page 7, Enbridge Gas NB and Heritage Gas have only begun to tap the residential and commercial markets in the communities in which they have pipeline infrastructure. In addition, there could be continued demand growth among large industrial users.

## **Electricity generation**

In its mid-level demand growth scenario, the ICF report assumes some of Nova Scotia's coal-fired electricity generation will convert to natural gas, as Tufts Cove has done in Nova Scotia. There is a limit to this potential in Nova Scotia given Emera's investment in Labrador hydroelectricity. New Brunswick also has the potential for conversion to natural gas-fired generation particularly with the Coleson Cove generating station in Saint John.

In October 2014, NB Power CEO Gaëtan Thomas stated that "a local source of natural gas would be 20 to 25 per cent cheaper for utilities" compared to oil<sup>4</sup>. Natural-gas fired electricity generation is a low cost source of power and it significantly reduces greenhouse gas emissions compared to both coal and oil-fired electricity generation.

## **LNG Export Facilities**

The largest potential source of demand in the Maritimes is the proposed export of natural gas via LNG terminals. There are at least four projects with some level of traction including the conversion of the Canaport facility in Saint John to an export facility, the Goldboro LNG project, the proposed H-Energy LNG export terminal in Melford Point, and Bear Head which has its permitting process underway. Repsol has filed for an environmental permit related to the potential conversion of the Saint John facility.

If one or more of the LNG export terminals is constructed it will drive substantial new demand for natural gas in the region.

## **Other industrial uses**

There are other large industrial users that could convert to natural gas in the near future assuming it remains a lower cost fuel choice. In Nova Scotia there are a number of large firms that have not converted to natural gas and even in New Brunswick, where many of the largest industrial firms have converted, there are more with potential such as the Brunswick Smelter (lead and silver) in Belledune. Firms not directly on the pipeline infrastructure have been able to access natural gas using the CNG services that are now available in the region.

There has also been speculation related to petrochemical, fertilizer and other large scale projects requiring natural gas. These industries are highly sensitive to the price of energy and would require low cost natural gas to be viable.

---

<sup>4</sup> Canadian Press. October 7, 2014.

### 3. Sources of natural gas supply to the region

It is clear from Section 2 that New Brunswick and Nova Scotia should generate significant demand for additional natural gas over the next decade including new industrial uses for the gas. However, there will be significant shortfalls in regional production of natural gas necessitating new sources to meet demand. This is already the case. Regional demand is in the range of 250 MMcfd. Both Deep Panuke and McCully are shut-in during the summer (to sell the limited supply of gas during peak demand) and therefore total supply is only in the range of 150 MMcfd (from Sable).

This section looks at the potential supply options for natural gas and Section 4 considers the implications of the various options.

#### 3.1 Offshore Nova Scotia – Sable Island, Deep Panuke and new fields

##### Offshore Nova Scotia – Sable Island

Sable Island, the field off Nova Scotia that provided the initial source of natural gas for the region, is nearing the end of its production. While ExxonMobil Canada has not publicly indicated when the field will wind down, it has been on a decline for several years. In 2009, the field produced 3,300 million cubic metres (according to Statistics Canada) and by 2013 it was down to 1,700 million cubic metres. In a 2014 regulatory filing, Nova Scotia Power Inc. forecasted that natural gas would stop flowing from the Sable Offshore Energy Project by October 2016 or about nine years before the expected end of life for the field.

It remains the case that ExxonMobil and its partners - Shell Canada Ltd., Imperial Oil Resources Ltd., Pengrowth Energy Corp. and Mosbacher Operating Ltd. – decided in 2010 that it was uneconomical to proceed with plans to expand Sable production<sup>5</sup>.

##### Offshore Nova Scotia – Deep Panuke

The Deep Panuke field came on-stream in August 2013 with an expected reserve of 400 billion cubic feet, but in February 2015 Encana Corp., the gas field's owner, said it was cutting the field's reserve estimate by 50 percent to 200 billion cubic feet. Since the announcement, Encana has stated it will produce just 80 billion cubic feet of natural gas from the field. Seasonal production will serve the winters of 2015 and 2016. To put that into context, Deep Panuke produced 69 billion cubic feet of gas between August 2013 and December 2014. Encana will not say specifically when production will cease because there are a number of factors that will impact the timing. For example, the firm announced that Deep Panuke would primarily service seasonal demand to meet winter heating needs allowing them to charge higher prices.

---

<sup>5</sup> Source: Cited in Halifax Chronicle Herald. August 21, 2014.

### Offshore Nova Scotia – New production

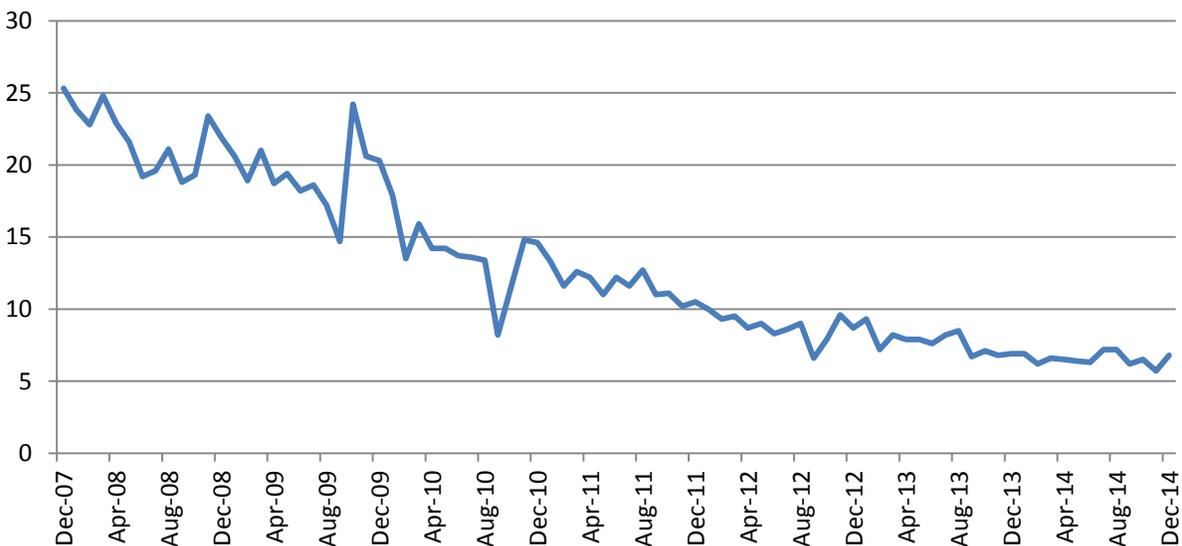
There remains considerable natural gas in place under the waters offshore Nova Scotia. In March 2014, the Nova Scotia Energy Minister stated the government estimates there are “about 120 trillion cubic feet of natural gas and eight billion barrels of oil in the offshore.” While this may be true, there are serious questions about the economic viability of developing offshore given the lower cost of onshore natural gas supply in North America as a result of shale gas development which the provincial government has chosen to prohibit.

However, there is still some limited interest in exploration particularly where there could be gas and oil opportunities. In December 2014, Australia-based Woodside Petroleum announced it would be joining the BP consortium looking to explore offshore Nova Scotia. Woodside Petroleum is a particularly interesting partner as it has 25 years of LNG export experience. BP remains the main operator with a 40 percent interest while Hess has 40 percent and Woodside the remaining 20 percent. According to media reports, BP is not planning to drill its first exploratory well until the second half of 2017 and it is looking for oil. Any associated gas that is found is unlikely to be economical compared to onshore gas coming from areas such as Marcellus Shale.

### 3.2 Frederick Brook Shale/Hiram Brook Sands

The amount of gas being produced from the Hiram Brook sands at the McCully Field in the Sussex region has been slowly declining since the field was connected to the Maritime and Northeast Pipeline in 2007 (based on Statistics Canada published production figures). The declines are to be expected due to a combination of ongoing production and few new wells drilled since 2007. However, the amount of production from McCully is limited relative to the demand for gas in New Brunswick and Nova Scotia. By way of comparison, McCully produced 78 million cubic metres of natural gas in 2014 compared to 3,315 million cubic metres in Nova Scotia’s offshore (Figure 7).

**Figure 7: Monthly natural gas production in New Brunswick, million cubic metres**



Source: Statistics Canada CANSIM Table 131-0001.

The Frederick Brook shale is the source rock for the Hiram Brook sands and extends northeast from the Sussex region. The New Brunswick Department of Energy and Mines suggests there could be 80 Tcf (trillion cubic feet) of gas in place. Further exploration expenditures would be required to determine the amount of gas that is actually recoverable from the shale. If successful, based upon the development of other North American shales, if five to 10 percent of the gas is recoverable, it could provide decades' worth of natural gas to the region.

However, the time frame for onshore development is uncertain. It would take several years of drilling to reach this level of production, and there is currently a moratorium on hydraulic fracturing in New Brunswick.

### 3.3 LNG imports

New Brunswick is already a significant importer of LNG through the Canaport terminal in Saint John. In 2010, more natural gas was supplied via LNG than from Sable Island (388 MMcfd from Canaport compared to 340 MMcfd from Sable in an average winter month in 2010). The supply of natural gas via LNG is not the problem. It is the price. Figure 8 shows the estimated landed price for natural gas at various LNG import terminals around the world in January 2015. Canaport received the highest price for its gas per unit of *any location in the world* as it was used to supply peak New England demand. Even in off peak times, imported LNG can be considerably more expensive than domestic gas, depending on world market pricing.

Figure 8: World LNG estimated January 2015 landed prices (US dollars)\*



\*The highest landed price for LNG in the world was at Saint John, New Brunswick.

Source: Waterborne Energy, Inc. Figures expressed in \$US dollars.

### 3.4 Imported U.S. natural gas

The shortfall in natural gas supply in the Maritimes in the coming years will be filled, at least initially, by natural gas imported from the United States – specifically natural gas sourced from hydraulically fractured Marcellus shale. There is considerable interest in bringing this natural gas to service the New England market and by extension the gas could also be used for demand in Maine and the Maritimes.

Already, several billion dollars' worth of pipeline infrastructure is being built or is in the permitting phase to fix the bottlenecks that are holding back this option.

Spectra Energy, majority owner of the existing Maritimes & Northeast Pipeline, has stated its interest in bringing this gas northward by 2017.

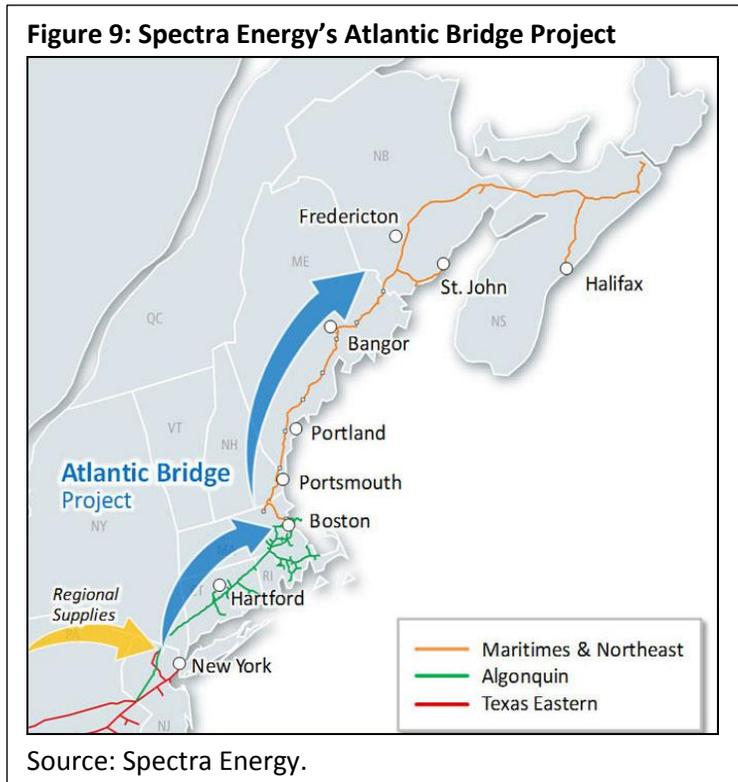
Their Atlantic Bridge Project which is a proposed expansion of the Algonquin Gas Transmission and Maritimes & Northeast Pipeline systems to connect North American natural gas supplies with markets in the New England states and the Maritime Provinces.

According to Spectra Energy, "Algonquin and Maritimes are strategically positioned to answer the region's need for additional pipeline infrastructure as well as much needed reliable, clean-burning natural gas supplies by November 2017." Assuming the project develops as planned and achieves environmental permitting, Marcellus shale gas could be flowing into New Brunswick as early as November 2017. However, there are implications of this option which are discussed in Section 4.

There are other pipeline expansion projects at various stages of development.

### 3.5 Importing natural gas from western Canada

The final option is to import natural gas from western Canada. Some commentators have suggested the Trans Canada Energy East Pipeline corridor be twinned to include a natural gas line, but there is no mention this is part of its plans. The earliest in-service date for the oil pipeline as per its current NEB filing would be 2020.



Western Canadian gas could be imported into the Maritimes via the United States using the Portland Natural Gas Transmission System which currently supplies industrial and electric-power generation markets in Maine, New Hampshire, Vermont and Massachusetts.

The PNGTS is 474 km in length connecting from the Trans-Québec and Maritimes pipeline at the Québec-New Hampshire border and continuing through New Hampshire, Maine and into Massachusetts near Boston. At Westbrook, Maine it connects to the M&NP.

### **3.5 Additional onshore shale gas development in New Brunswick**

Section 3.2 looked at the potential of producing natural gas in the McCully field near Sussex, New Brunswick. The potential for shale gas development extends well beyond McCully. In 2010, Texas-based SWN began an exploration program covering more than 2.5 million net acres in order to test new hydrocarbon basins. Since 2010, the firm has conducted airborne gravity and magnetic surveys, surface geochemistry surveys and completed a broad-based seismic program.

SWN was planning to drill two test wells in 2015 but has postponed this due to the moratorium on hydraulic fracturing in New Brunswick.

The timeframe for future onshore development is uncertain. As there is a moratorium on hydraulic fracturing in New Brunswick, it is unclear if or when this resource will be developed to supply the need in this region.

### **3.6 Additional onshore shale gas development in Nova Scotia**

Nova Scotia's shale gas and coalbed methane plays are smaller but still could be a significant source of natural gas to supply domestic and export markets. A 2009 study indicated there is 69 Tcf worth of gas in place on the Windsor land block in Nova Scotia<sup>6</sup>.

Nova Scotia also has significant reserves of coalbed methane (CBM). According to figures published by the Canadian Gas Potential Committee, Nova Scotia has "probable economically recoverable CBM reserves" of 50 Tcf.

The Nova Scotia Department of Energy reports the province currently has seven conventional oil and gas exploration agreements, one exploration agreement for coal gas, and one production agreement for coal gas.

However, there is currently an outright ban on hydraulic fracturing in Nova Scotia which makes it virtually impossible to develop the province's shale gas resources.

---

<sup>6</sup> A Primer for Understanding Canadian Shale Gas. National Energy Board. 2009.

## 4. Potential implications for the regional economy

### 4.1 Are we facing a big natural gas price spike?

The biggest risk to the economy in New Brunswick and Nova Scotia from the reduction in local natural gas production is the impact on the end price for industrial, commercial and residential users. Natural gas is a commodity and the commodity price is set in open markets. The cost of transportation and distribution of the gas is added to the commodity price from its supply point, reflecting the distance between the commodity and the end user markets.

As discussed earlier, global LNG prices are on average well above the domestic price in North America. Any big shift to LNG as the primary source of natural gas in the Maritimes could drive up the price significantly.

As for the importation of U.S. or western Canadian gas, experts have differing opinions whether the price will rise or fall and in what timeframe. Once Sable and Deep Panuke gas is shut in importing becomes the only option. Even in the short term, the Maritimes will be a captive market by October 2016 going into the winter months, as it will be unable to fulfill its own domestic demand.

The ICF report for the Nova Scotia government provided an estimate of how the importing of natural gas from the United States could impact the final price of natural gas. The current approved toll for M&NP-CA is \$0.67/MMBtu plus fuel retainage of 0.3 percent. This rate applies to both forward haul and backhaul service. If the pipeline is reversed and gas flows north into New Brunswick, ICF projects that transportation costs will rise to \$3.67/MMBtu, plus the local distribution costs and the market rate for the commodity itself (see Table 3).

In addition, customers on the Enbridge and Heritage Gas local distribution systems will add those tolls to their local distribution fees. **Compared to other areas in North America with mature natural gas distribution markets, the Maritimes will have the highest costs of any mainland area.**

Many years in the future, beyond the timeframe of this report, a glut of natural gas may occur and stabilize prices in the region. In the meantime, as soon as Spring 2017, domestic natural gas will be unavailable resulting in higher natural gas prices here relative to other parts of North America.

**Table 3: Estimated Pipeline Costs from Marcellus to New Brunswick and Nova Scotia (\$CDN)\***  
 \$/MMBtu at 80 percent load factor  
 (excluding local distribution charge charges)

	<u>Reservation</u>	<u>Fuel</u>	<u>Total</u>
Marcellus to Dracut via TGP Bullet and Constitution	\$1.81	\$0.10	\$1.91
Dracut to Baileyville via M&NP-US	\$0.69	\$0.05	\$0.74
Baileyville to Maritimes Canada via M&NP-CA	\$1.00	\$0.02	<u>\$1.02</u>
Transportation costs per MMBtu**			\$3.67

\*Note: Fuel assumes \$5.00 gas price in Marcellus.

\*\* The rate is a postage stamp rate, so that the rate does not vary based upon the distance of haul, and applies to deliveries anywhere along the pipeline, including off the laterals.

Source: The Future of Natural Gas Supply for Nova Scotia (2013). ICF Consulting Canada, Inc.

## 4.2 Economic impact from new onshore gas development

In addition to supporting competitive natural gas prices, exploration and production is also a major source of economic activity. A report prepared for the Nova Scotia government in 2010 by Stantec found that between 1996 and 2007, offshore exploration and production supported an average of 3,200 full time equivalent jobs per year in the province and \$1.5 billion worth of royalty-related revenues<sup>7</sup>. These direct economic benefits disappear as local production is curtailed and eventually ended.

The same economics apply to potential new onshore natural gas development. Indeed, one of the main economic benefits from developing onshore shale gas is the new, high value economic activity that occurs from its exploration and production. A study looking at the economic impact of the Marcellus shale gas industry in Pennsylvania found that its development in the state boosted gross state product (GSP) by more than \$11 billion (\$US) in 2010 while generating nearly \$1.1 billion (\$US) worth of state and local taxes. This represents an amount equivalent to 1.7 percent of GSP in Pennsylvania. The report also forecasted the industry would be generating \$20 billion (\$US) worth of GSP and over \$2 billion (\$US) per year in state and local taxes by 2020<sup>8</sup>.

It is difficult to estimate the potential economic impact from the development of shale gas in New Brunswick because of the limited track record of the industry in the province.

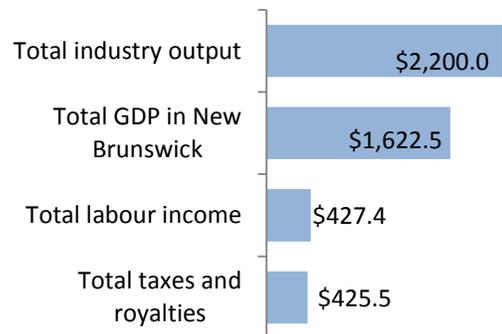
<sup>7</sup> 12-Year Retrospective of Natural Gas Production in Nova Scotia. Stantec. April 2010.

<sup>8</sup> Source: The Pennsylvania Marcellus Natural Gas Industry. Pennsylvania State University College of Earth and Mineral Sciences. July 2011.

A 2014 study<sup>9</sup> attempted to quantify the potential based on existing oil and gas exploration and production in New Brunswick and by using studies on shale gas development in Quebec and British Columbia (Figure 10). In addition, the report used the “per well development cost estimates” developed in a 2013 Deloitte LLP study entitled, *Shale Gas Supply Chain Opportunities in New Brunswick*.

The report is based on a fairly robust estimate of new shale gas wells starting with 15 new wells drilled in Year 1 increasing to 75 new wells by Year 5. Based on these estimates and the economic benefits arising from the construction of a natural gas processing facility, the report estimates the industry could generate \$2.2 billion worth of new investment over the five years, boost provincial gross domestic product (GDP) by \$1.6 billion and support over 1,600 full time equivalent jobs by Year 5. In addition, average employment income would be double the current level for the average worker in New Brunswick.

**Figure 10: Estimated five-year cumulative economic impact from the growth of the shale gas industry in New Brunswick (\$M)**



Source: Potential New Brunswick Energy Infrastructure and Natural Resource Investment Review (2015-2020).

Further, based on these estimates, the industry was expected to generate over \$425 million worth tax and royalty revenue to all three levels of government.

### 4.3 Mitigating price swings: Natural gas storage

One of the ways to mitigate large swings in price between peak and off peak seasons is to develop natural gas storage. Salt caverns are the North American standard and the U.S. government reserves are stored in salt caverns. Other than storage tanks at the Canaport LNG import facility, there is no such capability in the Maritimes. One project is proposed for Nova Scotia.

Alton Natural Gas Storage LP is developing an underground natural gas storage facility and associated pipelines near Alton, Nova Scotia. The Alton Natural Gas Storage facility will initially consist of three salt caverns to store natural gas until it is needed to meet peak demand. According to the firm the 1,000 metres’ deep caverns will take two to three years to complete.

A hold on the project was recently lifted and the \$14 million project is now proceeding.

<sup>9</sup> Source: Potential New Brunswick Energy Infrastructure and Natural Resource Investment Review (2015-2020). Jupia Consultants Inc. June 2014.

#### 4.4 Natural Gas and new investment in the region

The development of shale gas in North America has significantly reduced the cost of natural gas and that has triggered substantial new investment in manufacturing and other sectors. According to the American Chemical Council, lower cost natural gas has enabled \$138 billion (\$US) worth of new investment in the United States alone<sup>10</sup>.

The natural gas supply and demand dynamic in the Maritimes could lead to the region missing out on its share of this large scale investment. As outlined in this document, the development of onshore and offshore natural gas itself drives substantial investment, jobs and tax revenues. At the same time, a stable and competitive price for natural gas would support investment in other sectors of the economy.

### 5. Conclusion

Natural gas has become an important part of the energy mix in the Maritime Provinces. It is the fastest growing fuel in the region (by usage) and there are considerable opportunities for continued expansion in the years ahead. It is also the cleanest burning fossil fuel, and has the highest BTU efficiency, both leading to lower greenhouse gas (GHG) emissions relative to other fossil fuels.

The domestic supply of natural gas from Sable, Deep Panuke and McCully combined is declining and is expected to fall well below regional demand in a few short years. It already does during parts of the year. This will force new sources of supply that are currently not available via existing infrastructure. The most likely source will be the importation of natural gas from the shale plays in the United States through a reversal of the Maritimes and Northeast Pipeline. This expanded capacity will not be available prior to November 2017 at its earliest.

There is debate as to what the price of imported natural gas will be, however, the tolls associated with the various pipelines to reach the Maritimes will add over \$3.50/MMBtu, plus the local distribution charges, to the cost of the gas itself.

For large industry, institutional users, small businesses and residential users, this will put our region at a competitive disadvantage for the landed price of natural gas, the cleanest burning fossil fuel.

From a demand perspective, adoption has been significant since its inception in 1999. Future use of natural gas for residential use could be considerable as currently less than 10 percent of households and businesses use natural gas versus up to 90+ percent in other parts of Canada. Increased use by small and medium businesses as well as large industry looks promising if a stable, competitive supply source(s) can be secured.

---

<sup>10</sup> Shale Gas and New U.S. Chemical Industry Investment. American Chemistry Council. April 2015.



© Copyright 2015