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Ensuring Canadian Access to Oil Markets in the Asia-Pacific Region

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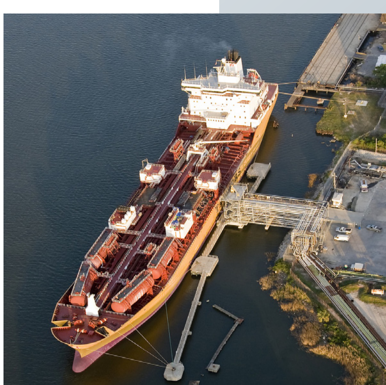


Key findings

- Demand for oil products in countries in the Asia-Pacific region is rapidly increasing and crude oil can be sold in those markets at a premium. If Canadian oil producers had access to the US *and* the Asia-Pacific region, they could secure the best possible return on their investment. This would also reduce the risk that growth in Canadian oil production could be constrained by US opposition inhibiting the construction of new pipelines.

- Construction and operation of pipelines from Alberta to ports in British Columbia could contribute substantially to GDP, and to employment and income in Alberta, British Columbia, and the rest of Canada. Additionally, the possible price premiums on sales to markets in the Asia-Pacific region would benefit the shareholders of the oil production companies, including many public and private pension funds.

- Outdated regulatory processes and procedures, First Nations' opposition, and unwieldy environmental review processes are impeding the timely development of the infrastructure required to transport oil to the west coast and beyond.

- For Canadians to prosper from environmentally responsible development of the oil sands, the Alberta and British Columbia governments must act quickly, using legal and regulatory reforms, to expedite development of the crude-oil transportation infrastructure needed for access to markets in the Asia-Pacific region.

Summary

This report provides a comprehensive overview of the outlook for Alberta crude oil and bitumen production and an assessment of the economic attractiveness and feasibility of exporting oil to countries in the Asia-Pacific region instead of solely to markets in the United States. It also describes the extent of the new oil pipeline infrastructure that would be needed to allow oil exports to Asia-Pacific region under two scenarios: 1. no increase in oil sands bitumen production capacity from a base-case forecast; and 2. bitumen production capacity increased from that in the base case to supply Asian markets after 2026. The likely gross employment and overall economic (GDP) benefits from construction and operation of the required facilities are also discussed.

The report also examines unnecessary regulatory and other barriers that are inhibiting the development of the pipelines and port facilities required to ship crude oil, raw bitumen and synthetic crude oil (i.e., upgraded bitumen) to the west coast and on to oil refineries in Japan, Korea, China, India and other countries in Asia that are increasingly becoming dependent on oil imports.

Finally, we suggest a number of policy reforms that, if implemented, would resolve, or at least help to overcome, the obstacles that stand in the way of infrastructure development and therefore threaten to prevent Canada from taking full advantage of opportunities to develop markets for crude oil in southeast Asia. The overriding objective is to ensure that Alberta's conventional crude oil and oil sands resources are developed expeditiously and efficiently in view of current market conditions, legitimate environmental concerns, and global investment opportunities in order that Canadians may benefit, both directly and indirectly, from the employment and income opportunities that such development will bring.

Contents

Overview

This study will identify the barriers to infrastructure development that impede the export of Alberta crude oil, raw bitumen, and synthetic crude oil (upgraded bitumen) to markets in the Asia-Pacific region through ports in British Columbia. Although Canada has long been a reliable supplier of crude oil to the United States and has the potential to increase shipments to US refineries a great deal, countries in the Asian Pacific present a growth opportunity for Canadian producers of crude oil and bitumen because of the anticipated increase in oil consumption there and the likelihood of greater "netbacks"[1] on sales to the region.

Oil consumption in China, India, and the rest of the non-OECD countries in the Asia-Pacific region is growing because economic growth is increasing the demand for liquid transportation fuels. It is projected that the region will consume about 34 million barrels of crude oil per day by 2035. Among OECD countries of the Asia-Pacific region, Japan and Korea are also heavily dependent on imports of crude oil for transportation and electricity generation: by 2035, Japan is expected to consume 3 million barrels per day, and Korea, 4 million.

With construction of new and expanded pipeline capacity to transport oil to US markets in step with growth of oil-sands bitumen production, the United States could absorb all of the crude oil and bitumen that Canada has available for export in the foreseeable future. However, there is a significant opportunity cost associated with not developing alternative market relationships in Asia because of the higher prices that appear to be available there. In February 2012, for example, West Texas Intermediate (WTI) crude oil, the price marker that is used to determine netbacks to Canadian producers marketing crude oil in Canada and the United States, was trading at a discount of US$15.15 per barrel compared to Brent (North Sea) crude. Moreover, WTI was being discounted to the most commonly used (and therefore most relevant) crude oil benchmarks in Asia, namely Tapis and Dubai, by US$25.73 and US$13.42 per barrel, respectively. Having market opportunities in countries other than the United States would help ensure that Canadian oil producers are in a position to secure the most attractive netbacks available.

Strategically, development of alternative markets for Canadian oil and bitumen also makes sense as a consequence of the possibility of delays in the

1 "Netbacks" are the sales margins secured at the wellhead: that is, the market price that is obtained by the seller, less the cost of transportation from the source of supply to the market destination point.

development of additional capacity to export oil to the United States because of opposition such as that which has plagued TransCanada's Keystone XL project. Access to Chinese and other Asian markets would reduce the risk that is attached to being dependent on a single market—whether the problem is political or economic (e.g., a recession). For these reasons, putting the required oil transportation infrastructure in place is clearly in the national interest and of strategic importance.

In order to assess the economic benefits from exporting Alberta crude oil and bitumen to markets in the Asia-Pacific region, we developed a hypothetical but highly plausible scenario where a portion of the raw bitumen and synthetic crude oil (SCO) produced in Alberta is exported to countries in the Asia-Pacific region commencing in 2018, the date we assumed the Northern Gateway Project would commence operations. In this case, total Alberta oil production could reach up to 5.4 million barrels per day by 2035, with 1.15 million barrels per day exported to the Asia-Pacific region.[2] In an alternative case, annual increments of 20,000 barrels per day in bitumen production for export to markets in the Asia-Pacific region were assumed, commencing in 2026. This allowed total Alberta oil production and exports to the Asia-Pacific region to reach 5.6 million barrels per day, and 1.35 million barrels per day, respectively, in 2035.

It is estimated that construction and operation of the Enbridge Northern Gateway Project would contribute substantially to GDP and employment in Alberta, British Columbia, and the rest of Canada. These economic benefits would be augmented considerably by subsequent expansions of both TransMountain Pipeline and the Northern Gateway oil pipeline to facilitate growth of oil exports to Asia. Further, the 5.7 billion barrels of crude oil assumed to be exported to Asia during the period from 2018 to 2035 would increase oil production revenues by more than $14.25 billion (in 2011 constant dollars) if the incremental netback (that is, compared with exports to the United States) averages $2.50 per barrel. This, of course, would be of considerable benefit to the shareholders of companies producing oil sands bitumen, including public and private pension funds.

Unfortunately, outdated regulatory processes and procedures, opposition from First Nations, and environmental concerns and review processes are inhibiting the development of the transportation infrastructure needed to ship crude oil, raw bitumen, and synthetic crude oil to the west coast, thereby preventing Canada from taking advantage of what amount to nation-building

2 The Northern Gateway Project would consist of a marine terminal in Kitimat, British Columbia, a crude oil pipeline from Edmonton, Alberta to Kitimat, and a pipeline to ship diluent from Kitimat to Edmonton. Diluent is liquid (usually pentanes plus and/or other light hydrocarbons) that is used to lower the viscosity of heavy oil to allow it to be transported by pipeline.

opportunities. If Canadians wish to reap the benefits that would accrue from this development, discussion of policy reforms that could remove or, at least, lower the non-market barriers that are impeding development of the required infrastructure is essential. Review of the policy options will help to ensure that the oil-sands resources can be developed as rapidly as possible in view of current market conditions, legitimate environmental concerns, and global investment opportunities. In turn, this will enable the citizens of Alberta and all Canadians to prosper as much as possible from continued, responsible development of those resources.

Removing barriers also means considering the benefits from updating essential regulatory processes, including those required under the National Energy Board Act, to meet the needs of the 21st century. Applicable legislation and regulations governing energy project regulation may need to be reformed to ensure that, going forward, project applications can be dealt with objectively and within reasonable time periods. Clearly, repetition of the regulatory delays and related costs witnessed in the case of the Mackenzie Gas Project in the Enbridge Northern Gateway Project case that is now before a Joint Panel and in similar cases that will undoubtedly follow needs to be avoided.

In particular, the authors suggest that the federal and provincial governments consider how they can expedite development of the western Canada crude-oil transportation infrastructure needed for access to oil markets in the Asia-Pacific region with legal and regulatory reforms and measures, and new approaches. These might include:

- restricting the scope of the National Energy Board to matters necessary to protect the public interest such as construction and operating standards and efficiency, property rights and claims, and environmental impacts;
- establishing a process for limiting the number of registered interveners that can be heard at a public hearing to prevent special-interest groups from unnecessarily "owning the mike" and prolonging the process;
- placing a limit on the time that the National Energy Board or a Joint Review Panel may take to arrive at its reasons for a decision, depending on project size or complexity;
- having the National Energy Board convene generic hearings if two or more similar project applications are likely to be brought forward during the next 10 to 20 years;
- establishing joint federal-provincial environmental review processes for projects that require approvals from both levels of government;
- encouraging discussions between project proponents and First Nations well before applications are filed with the National Energy Board, a Joint Review Panel or other government agencies;

- involving federal and provincial government, and First Nations organizations in discussions with industry representatives to identify and approve in advance transportation corridors to be used for infrastructure development;
- requiring First Nations' environmental concerns to be addressed under and in accordance with the Canadian Environmental Assessment Act; and
- considering legislation and regulations to provide for mandatory settlement mechanisms to resolve compensation-issue disputes with First Nations groups if and as required.

In addition, we suggest that government authorities and industry associations such as the Canadian Energy Pipeline Association work to reduce the likelihood and severity of oil spills and leaks by:

- encouraging pipeline operators to undertake risk assessments in relation to "high consequence areas" as part of their integrated management plans;
- ensuring that environmental protection monitoring of pipelines is sufficiently frequent and thorough;
- reducing the risk of pipelines being operated at greater than approved pressures;
- informing affected stakeholders more quickly when a pipeline leak does occur;
- requiring the adoption of proactive risk management policies to lower the frequency and severity of oil tanker spills.

Finally, we urge governments and oil producers to engage in a vigorous collaborative effort to determine the feasibility of pipeline-by-rail systems for crude oil transportation to the Canada's west coast.

Introduction

The development of Canadian oil sands projects has resumed following the slowdown during 2008 and 2009 as a consequence of the recession and global financial crisis. However, the long-held view that the United States, being oil deficient, will continue to absorb ever-expanding quantities of bitumen from the oil sands is being questioned for several reasons. American environmentalists and landowners have been offering considerable resistance to plans to expand the capacity to transport bitumen and synthetic crude oil from Alberta to the important market in US Gulf of Mexico region. For example, opposition to TransCanada Corporation's proposed Keystone XL Pipeline that would eventually allow some 800,000 barrels per day of crude oil and raw and upgraded bitumen[1] to be shipped from Alberta to refineries in Texas has caused the government of Nebraska to require that the proposed route be altered to avoid risk to the large underground aquifer system upon which the state relies for most of its water. Others, who would not be directly affected if an oil spill were to occur, oppose increased imports of raw and upgraded bitumen from Alberta by any mode of transportation because they believe that the production of bitumen poses a greater threat to the environment than other sources of energy.

These environmental concerns caused the US Environmental Protection Agency to prolong its investigation of the impacts of construction and operation of the Keystone XL Pipeline. As a consequence, the US State Department indicated in November 2011 that it would not be in a position to decide whether to recommend that the Presidential license required to allow construction of the US portion of the Keystone XL pipeline be granted until early in 2013.

In December 2011, the US Congress voted to give the Obama Administration a 60-day deadline to make a decision on TransCanada's application to construct the Keystone XL Pipeline. But, in January 2012 the President rejected the application on the grounds that the deadline of February 21, 2012 set by Congress would not allow sufficient time for the State Department to make an adequately assessment of the impacts on the project. On May 4, 2012, TransCanada submitted a revised application for

1 Bitumen is the least viscous form of petroleum and, unlike conventional oil, does not flow freely. Most of the hydrocarbons in bitumen are heavier than pentane, and about half are very heavy molecules with a boiling point over 525° C. Synthetic crude oil (SCO) is the output from a bitumen upgrader facility used in connection with oil sands production. The viscosity of SCO is similar to that of conventional crude oil.

a Presidential permit to build the pipeline. The application is to be supplemented by information about an alternative route for the pipeline through Nebraska as soon as possible. TransCanada now expects to begin construction of Keystone XL during the first quarter of 2013, with completion slated for late 2014 or early 2015 (TransCanada, 2012a).

Other pipeline projects will increase the capacity to ship crude oil from Cushing, Oklahoma to the Gulf Coast of the United States. On May 17 2012, Enterprise Products Partners and Enbridge Inc. announced completion of the reversal of the Seaway Crude Oil Pipeline. The initial capacity of 150,000 barrels per day is expected to be increased to more than 400,000 barrels per day in the first quarter of 2013 as the result of various modifications (Enbridge, 2012).

Construction of TransCanada's Gulf Coast Pipeline project is expected to begin in mid-2012 with an anticipated in-service date of mid- to late 2013. That facility will have the initial capacity to ship 700,000 barrels of oil per day, expandable to 830,000 barrels of oil per day, to Gulf Coast refineries from Cushing (TransCanada, 2012b). TransCanada is also developing the Houston Lateral Project to transport oil to refineries in the Houston area from the Gulf Coast Pipeline. Construction is planned to begin in the first quarter of 2013 with operations to commence a year later, 2014 (TransCanada, 2012c). Eventually, the Gulf Coast Pipeline and the Houston Lateral will be part of the Keystone XL oil delivery system.

Another development with implications for the marketing of Canadian oil is the increasing participation in Canadian operations by companies from Asian countries, which will need additional supplies of crude oil to meet their future requirements. For example, KOGAS (the South Korean state-owned gas company), and Sinopec (the Chinese national petroleum company) are involved in joint ventures with Canadian companies with interests in oil-sands operations and have taken direct ownership positions in other Canadian companies. The list of companies headquartered in countries in the Asia-Pacific region that are participating in the development of oil sands projects continues to grow. These companies have no assurance that transportation facilities will be developed that will permit shipments of crude oil from Alberta to their home markets, but the Indians, South Koreans, Chinese, Thais, and Japanese all have an interest in diversifying their sources of crude-oil supply.

Instead of remaining almost entirely focused on US markets for oil exports, as in the past, Canada needs to turn its attention to the market opportunities for these commodities that are emerging overseas. If higher netbacks for our oil-sands resources can be realized in the Asia-Pacific region and if there is the potential to increase overall sales, unnecessary regulatory obstacles and other non-market barriers that stand in the way of development of the required infrastructure must be overcome.

Identifying those barriers, and putting forward essential reforms to remove or at least substantially lower them, is the focus of this paper. The overriding objective is to ensure that Alberta's conventional crude oil and oil-sands resources are developed expeditiously and efficiently in view of current market conditions, legitimate environmental concerns and compensation claims, and global investment opportunities. This will ensure that the citizens of Alberta and Canada as a whole may benefit, both directly and indirectly, from the employment and income opportunities that such development will bring.[2]

2 In this publication we do not examine the merits, or otherwise, of upgrading bitumen or refining synthetic crude oil in Alberta instead of exporting raw bitumen or synthetic crude oil. That is a matter for investors to decide, based on their knowledge of market conditions and available technologies.

Outlook for oil-sands bitumen production and exports

According to the Alberta Energy Resources Conservation Board (ERCB), Alberta has remaining established oil reserves of 170.8 billion barrels (ERCB, 2011). This total comprises 169.3 billion barrels of bitumen reserves in the oil sands and 1.5 billion barrels of conventional crude oil. Including Alberta's bitumen reserves, Canada has 172.8 billion barrels of proved crude-oil reserves (National Energy Board, 2011a). Given Canada's 2010 crude-oil production of 3 million barrels per day, the country has an estimated reserves-to-production ratio of 165 years of supply (National Energy Board, 2011a). As oil sands development is extended to additional formations and areas, including the Grand Rapids formation in northern Alberta and resources in northwest Saskatchewan, and more knowledge becomes available, the potential size of the resource is likely to grow. In any case, the current estimate indicates that there is considerable potential for production growth.

The National Energy Board (NEB) estimates that raw bitumen production from both surface mining and "in situ"[1] operations will increase from 1.6 million barrels per day in 2010 to 5.04 million barrels per day in 2035 (figure 1). A portion of the raw bitumen that is produced is upgraded to synthetic crude oil in Alberta.[2] The ERCB estimates that all of the bitumen produced from surface mining operations and a small portion of the in-situ bitumen production (about 11%) was upgraded in Alberta in 2010, yielding almost 800,000 barrels per day of SCO on average (a yield of about 85%)[3] (ERCB, 2011). The ERCB projects that mined bitumen will continue to be the primary source of the bitumen that is upgraded in the province but that the share of in-situ production that is upgraded will increase from 11% in 2010 to 13% in 2020.

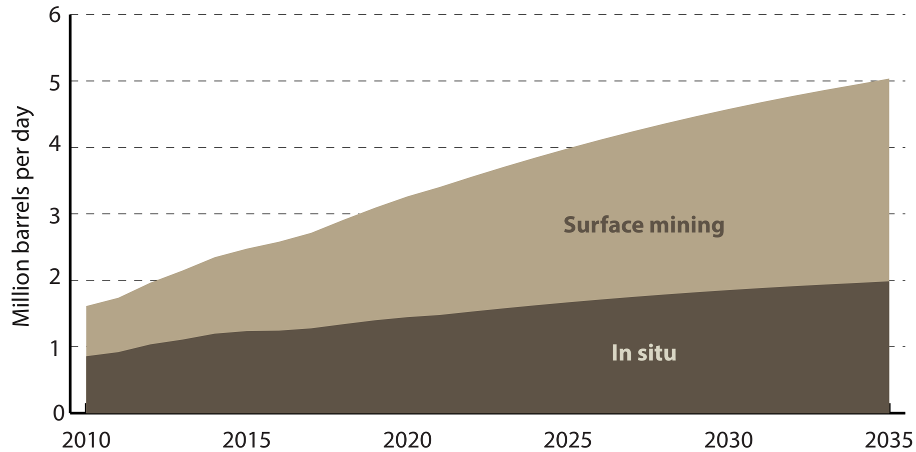
The NEB is anticipating that production of upgraded bitumen (synthetic crude oil) will increase from 791,000 barrels per day in 2010 to 1.9 million barrels per day in 2035 (National Energy Board, 2011a) (figure 2).

1 "In situ" (in place) technology generally involves the injection of steam or other materials into a heavy oil reservoir or bitumen deposit to facilitate the flow of oil to the surface.

2 Raw bitumen is the heavy crude oil that is extracted from the oil sands via either open-pit mining or in-situ recovery methods. It generally needs upgrading to be acceptable for standard oil-refining processes. Upgraded or "refinery-ready" bitumen is referred to as synthetic crude oil (SCO).

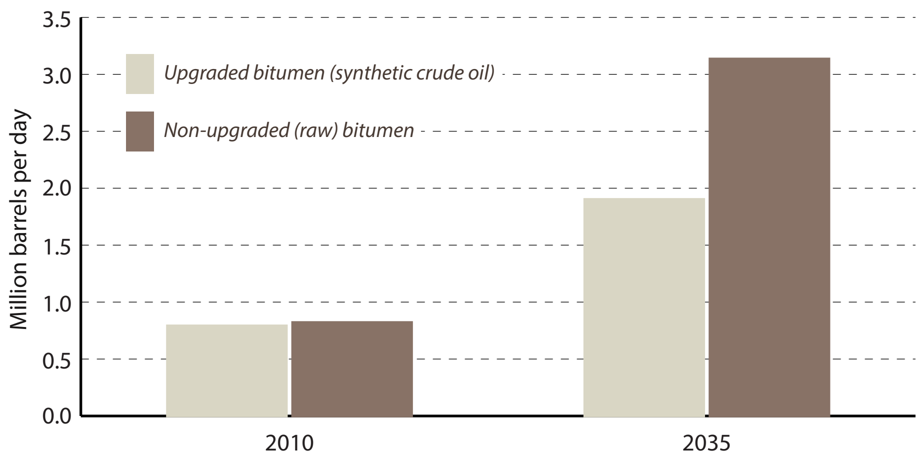
3 Volumetric liquid yields refer to the ratio between SCO produced and bitumen processed.

Figure 1: Crude bitumen supply in Alberta, 2010–2035



Source: National Energy Board, 2011a.

Figure 2: Production of upgraded and raw bitumen in Alberta, 2010 & 2035



Source: National Energy Board, 2011a.

Production of non-upgraded (raw) bitumen production is projected to almost quadruple from 820,000 barrels per day in 2010 to 3.1 million barrels per day in 2035. Production of raw bitumen and SCO combined is projected to more than triple, from 1.6 million barrels per day in 2010 to 5 million barrels per day in 2035.

Canadian crude oil available for export[4] will continue to respond to increases in the supply of oil-sands bitumen as well as changes in supply from

4 Crude oil available for export is oil that is surplus to domestic requirements (net of imports). This will increase more or less directly with production volumes since little change in domestic crude oil requirements is anticipated (National Energy Board, 2011a). If, however, more western Canadian crude oil is shipped to eastern Canada, displacing imported supplies, the volume that is available for export will be reduced.

conventional sources (National Energy Board, 2011a). Canadian production of crude-oil equivalent[5] is estimated to reach 7.8 million barrels per day by 2035 (figure 3), with approximately 6.9 million barrels per day or 88% of the total, being available for export (figure 4) (National Energy Board, 2011a). Production in Alberta of conventional crude, SCO, and non-upgraded bitumen is projected to increase from a total of 2.1 million barrels per day in 2010 to 5.4 million barrels per day in 2035 (table 1) (National Energy Board, 2011a).[6]

The United States' crude-oil requirements averaged 17.55 million barrels per day in 2010, of which 9.5 million barrels per day (on average) were met by imports (US Energy Information Administration, 2012). Of the imported volume, 2 million barrels per day (21%) were from Canada[7] (US Energy Information Administration, 2011a). The second largest supplier to the US market was Saudi Arabia which, at 1.1 million barrels per day, was the source of 11.6% of U.S. crude oil imports (US Energy Information Administration, 2011a).

According to the United States Department of Energy's *Annual Energy Outlook 2012*, US requirements for crude-oil imports are anticipated to decline from 9.5 million barrels per day in 2010 to 7.4 million barrels per day in 2035, largely because of projected increases in the rates of production of domestic crude oil, particularly from US offshore wells and biofuels. Another reason for the projected decline in American oil import requirements is modest growth in transportation-sector fuel requirements compared with the Department's previous outlook because of more aggressive fuel-use efficiency assumptions in *Annual Energy Outlook 2012* (US Energy Information Administration, 2012).[8]

Canada imported an average of 778,000 barrels of crude oil per day in 2010 as feedstock for refineries in Ontario, Quebec, and the Maritimes because it was cost effective to do so. But, not all of the refined petroleum

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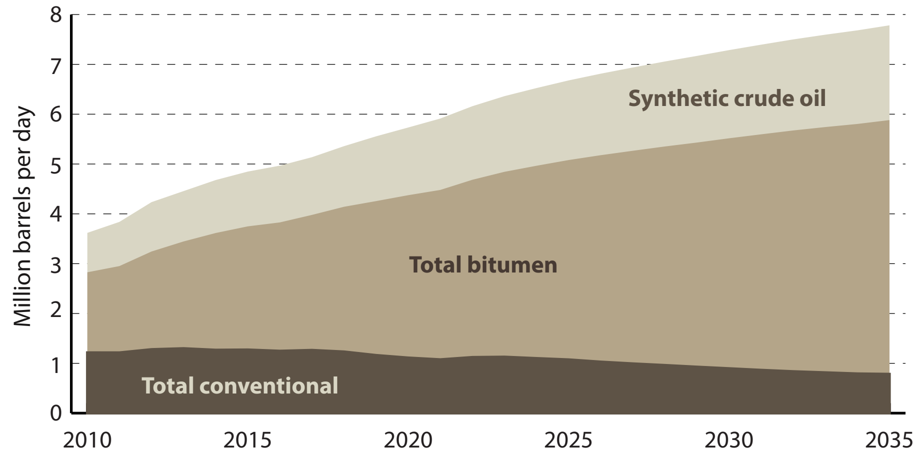
5 The National Energy Board labels combined estimates of conventional crude oil and bitumen that are produced or available for consumption or export as "crude oil equivalent" barrels or cubic metres. A volumetric loss occurs when upgrading raw bitumen to refinery-ready synthetic crude oil. Therefore, one cannot simply add barrels of crude oil and barrels of raw (non-upgraded) bitumen and label to total "crude oil."

6 This compares with a projection by the Canadian Energy Research Institute (CERI) that bitumen and SCO production will reach 4.9 million barrels per day by 2030. In the same CERI "Realistic" scenario, bitumen production reaches to 5.1 million barrels per day by 2042 (Canadian Energy Research Institute, 2011).

7 In 2010, small quantities—an average of 25,400 barrels a day or 1.3% of total Canadian crude oil exports—of Canadian crude oil were exported to destinations other than the United States with (National Energy Board, 2010a).

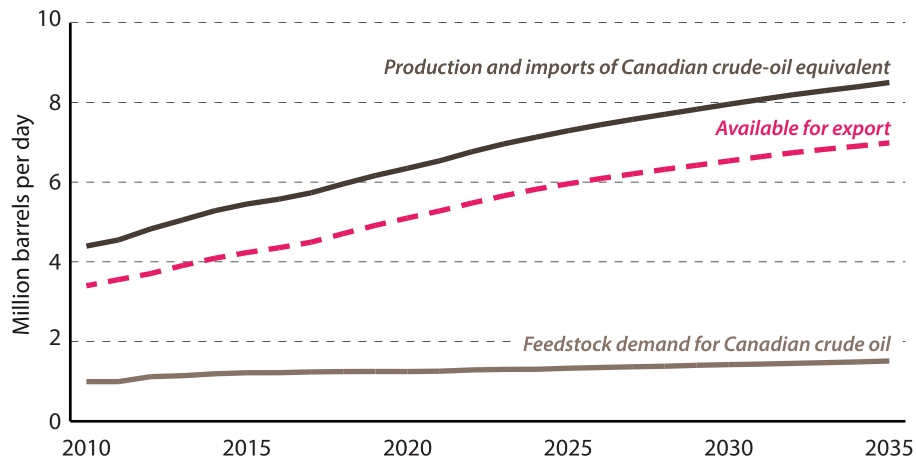
8 Proposed fuel-economy standards with respect to vehicle model years 2017 through 2025 that are not included in the AEO 2012 Reference Case would likely further reduce projected transportation fuel requirements and also the need for oil imports.

Figure 3: Forecast production of Canadian crude-oil equivalent, 2010–2035



Source: National Energy Board, 2011a.

Figure 4: Canadian crude-oil equivalent available for export, 2010–2035



Source: National Energy Board, 2011a.

Table 1: Forecast of crude oil and equivalent production (barrels per day) in Alberta, 2010–2035

	Conventional	Synthetic crude oil (SCO)	Non-upgraded bitumen	TOTAL production
2010	459,400	791,300	820,900	2,071,600
2015	521,000	1,099,500	1,376,700	2,997,200
2020	470,400	1,358,600	1,904,300	3,733,300
2025	422,900	1,598,300	2,387,800	4,409,000
2030	378,100	1,769,700	2,808,700	4,956,500
2035	341,600	1,901,800	3,134,800	5,378,200

Source: National Energy Board, 2011a.

products produced from these imports were consumed domestically; a portion of the production was exported to markets in the United States.[9] Canada's requirements for imported crude oil are not expected to increase much during the forecast horizon. But with increased output off the shore of Newfoundland & Labrador, and the possibility that flows on Enbridge Inc.'s Line 9 crude-oil pipeline from Sarnia to Montreal will be reversed, they could decline.[10]

By 2035, Canadian crude oil and equivalent production is anticipated to reach 7.8 million barrels a day and domestic crude oil requirements, 2.4 million barrels a day (National Energy Board, 2011a). The country will therefore have much more oil available for export than is the case today and be well positioned to increase oil exports to US refineries. However, given competition from oil suppliers in the Middle East and other world regions, the US Energy Information Administration's latest projection of America's oil import requirements suggests that the US market will not absorb all of the oil that Canada will have available.

If it will not be possible to develop expanded access to the US market at a rate sufficient to match the growth in bitumen production, it will be critically important to develop additional markets. Even if expanded access to the US market is not constrained, it will be of strategic importance for Canada to take advantage of market opportunities overseas if viable opportunities arise.[11] Market diversification will reduce the risks associated with having a single customer and allow producers to focus on those markets that promise the highest returns.

9 The imported crude oil came from Algeria, the United Kingdom, Nigeria, Norway, Saudi Iraq, Venezuela, Mexico, and the United States (National Energy Board, 2012).

10 Line 9 was constructed in 1975 to ship western Canadian crude oil from Sarnia to refineries in Montreal. The direction of the flow was reversed 12 years ago to allow foreign crude oil to reach Sarnia. Enbridge Pipelines Inc. is considering reverting to the original scheme so that increased output from the Alberta oil sands can reach the Montreal refinery market. The company has also been exploring the possibility of having the direction of flow on the pipeline between Portland (Maine) and Montreal reversed. That pipeline currently supplies refineries in Montreal and Ontario with crude oil loaded at Portland, Maine.

11 The possible opportunity costs of not doing so are examined below, page 15.

Outlook for oil consumption in the Asia-Pacific region

China and India each have some oil reserves and production but not nearly enough to meet the needs of their rapidly expanding economies. Moreover, consumption of crude oil is growing rapidly in these countries, and is expected to continue to do so, in part because of rapidly expanding use of transportation (US Energy Information Administration, 2011b). As summarized by table 2, crude oil consumption in China reached 9.1 million barrels a day in 2010 but net crude oil imports of 4.7 million barrels a day supplied 52% of the country's requirements (British Petroleum, 2011). China's major foreign sources of crude oil included the Middle East (2.4 million barrels per day), West Africa (0.8 million barrels per day), and Russia (0.6 million barrels per day). India's consumption of crude oil reached 3.3 million barrels a day in 2010. Nearly all of the country's consumption requirements were met by imports; the major foreign sources included the Middle East, West Africa, and Central and South America from which 2.6, 0.4, and 0.1 million barrels per day, respectively, were secured (British Petroleum, 2011).

Japan is also heavily dependent on crude-oil imports. In fact, 3.7 million barrels, or 83% of the country's 2010 crude-oil requirements of 4.5 million barrels per day, were met by imports from other countries. These included 3.6 million barrels per day from the Middle East and 0.3 million barrels per day from Russia (British Petroleum, 2011). Other countries in the Asia-Pacific region that rely heavily on imported crude oil are South Korea, Singapore, and Taiwan. The rest of the countries in the Asia-Pacific region imported

Table 2: Consumption of crude oil in the Asia-Pacific region, 2010

	Consumption (barrels/day)	Net Imports (barrels/day)	Percentage met by imports
China	9,057,000	4,669,500	52%
India	3,319,000	3,254,000	98%
Japan	4,451,000	3,704,500	83%
Other countries	10,411,000	4,490,000	43%
Total	**27,238,000**	**16,118,000**	

Source: BP Statistical Review, 2011.

around 4.5 million barrels a day or 43% of their 2010 crude oil requirements of 10.4 million barrels per day (British Petroleum, 2011). Their major sources of supply were the Middle East and Russia.

Looking ahead, crude oil consumption in non-OECD Asia, where China and India are the largest oil-consuming countries, is projected to grow from 19 million barrels per day in 2010 to 34 million barrels per day in 2035, a compound annual growth rate (CAGR) of 2.3% (US Energy Information Administration, 2011b). Annual crude oil consumption in China, India, and the rest of non-OECD Asia is projected to grow at CAGRs of 2.6%, 4.0%, and 2.1%, respectively.

Consumption of crude oil in South Korea is anticipated to increase from 2 million barrels per day in 2010 to 3 million barrels per day in 2035, implying a CAGR of 1.6%. In Japan, crude-oil consumption is projected to remain fairly steady at about 4 million barrels per day from 2010 to 2035 (US Energy Information Administration, 2011b). The outlook there has changed on account of the tsunami disaster in 2011. In 2010, the EIA was projecting that Japanese oil demand would decrease at a compound annual rate of 0.4% during the period from 2010 to 2035. Their more recent forecast anticipates somewhat greater demand for oil because it is now assumed that some electricity demand that would have been met from nuclear power will be met by oil-fired electricity-generation units.

Opportunity cost of only targeting oil markets in the United States

With construction of new and expanded pipeline capacity to transport oil to US markets in step with growth of oil-sands bitumen production, the United States could absorb all of the crude oil and bitumen that Canada has available for export in the foreseeable future.[1] However, there appears to be a significant opportunity cost associated with not developing alternative market relationships in Asia because of the higher prices that appear to be available there. For example, John Carruthers, President of Enbridge Northern Gateway Pipelines, estimates that Canadian crude-oil deliveries to emerging Asian markets rather than to the United States could represent a price increase of $2 to $3 per barrel of crude oil sold (Vanderklippe, 2011, August 24).

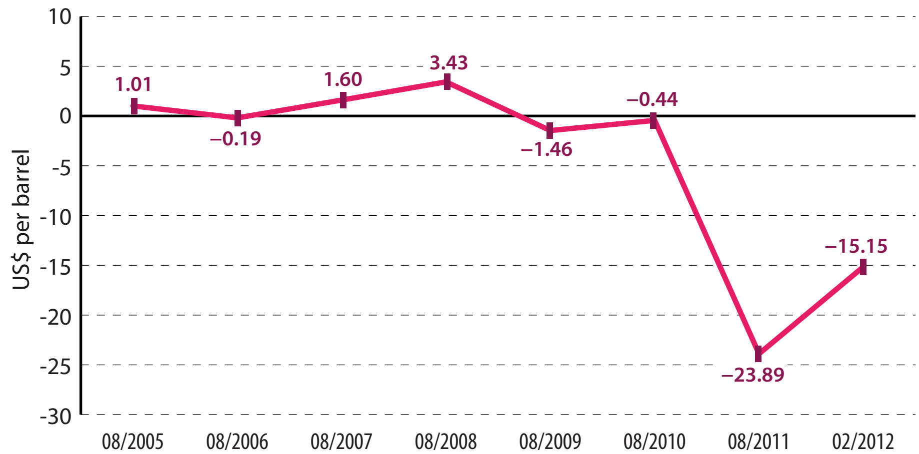
In spite of some oil-supply uncertainties during the "Arab spring" of 2011, the world oil price has been relatively stable during the past two years, for the most part fluctuating in the range between US $90 per barrel to US $100 per barrel. In the long term, some escalation in the price is anticipated because of increasing demand for oil liquids in the emerging countries of Asia and rising production costs. For example, in its 2012 International Energy Outlook, the EIA projects the price of crude oil (as represented by the average annual world price of sweet crude oil in 2010 dollars per barrel) to increase from $79 per barrel in 2010 to $116 per barrel in 2015, and to reach $145 per barrel in 2035 ($230 per barrel in nominal terms) (US Energy Information Administration, 2012).

From 2005 to 2010, the differential between the Western Texas Intermediate (WTI) and Brent[2] (North Sea) crude-oil price markers was for the most part $1 per barrel or less. More recently, however, a considerable spread has developed: WTI was trading at a discount of $15.15 per barrel with respect to Brent at the end of February, 2012, a much greater discount than the average spread of $4.91 per barrel during the five years from 2005 to 2009 (figure 5). The main reason for this is that rising volumes of bitumen

1 This assumes that adjustments are made, as required, to the capacity of US refineries to absorb raw bitumen as, for example, through the addition of coking capacity. As noted earlier (page 10), in 2010 virtually all of Canada's crude oil exports were shipped to refineries in the United States but those volumes represented only about 22% of total US oil import requirements.

2 Brent blend is a light crude oil, though not as light as WTI. Brent crude is sourced from the North Sea.

Figure 5: WTI/Brent price differential (US$/barrel), 2005–2012

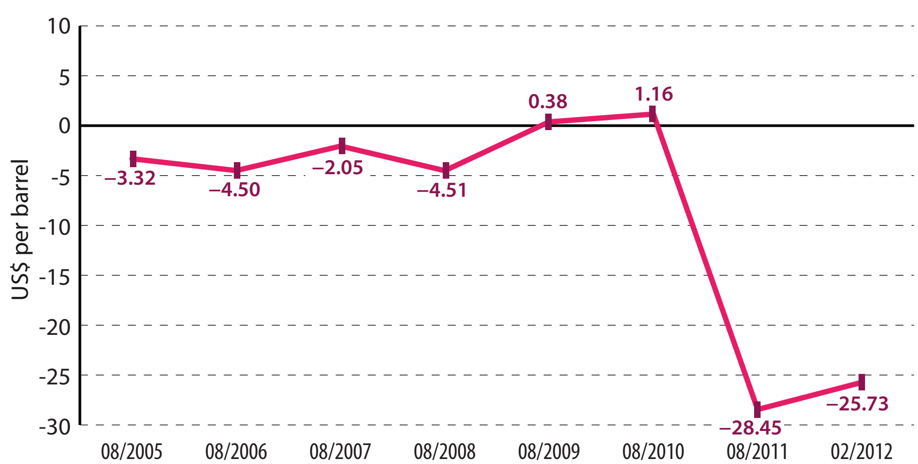


Note: the figure shows the price of WTI crude oil minus the price of Brent crude.
Source: US Energy Information Administration, 2011c.

and synthetic crude oil production from Alberta were swamping inventories in the US mid-continent, lowering the price of WTI at Cushing, Oklahoma (Spicer, 2011, August 3). Also, a decline in Norwegian North Sea production had been pushing up the price of Brent crude (Jegarajah, 2011).

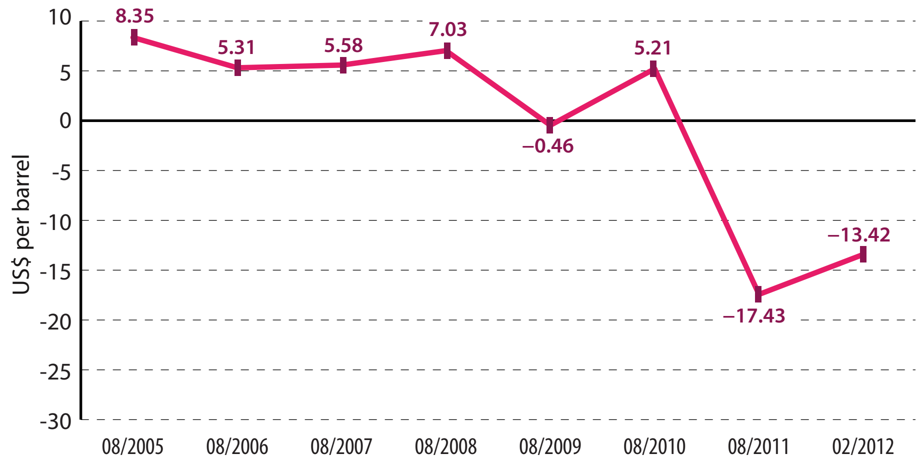
In Asia, the two most commonly used crude-oil benchmarks are Tapis Blend and Dubai Fateh. Tapis is a Malaysian crude oil that is frequently used as an oil price marker in Singapore, whereas the Dubai crude oil price is generally used in relation to Persian Gulf crude-oil exports to Asia. As shown in figures 6 and 7, WTI has been trading at a significant discount with respect to both of these markers. In fact, at the end of February, 2012, WTI was being discounted relative to Tapis and Dubai by $25.73 and $13.42 per barrel, respectively.

Figure 6: WTI/Tapis price differential (US$/barrel), 2005–2012



Sources: US Energy Information Administration, 2011c, 2011d; Bloomberg, 2012a.

Figure 7: WTI/Dubai price differential (US$/barrel), 2005–2012

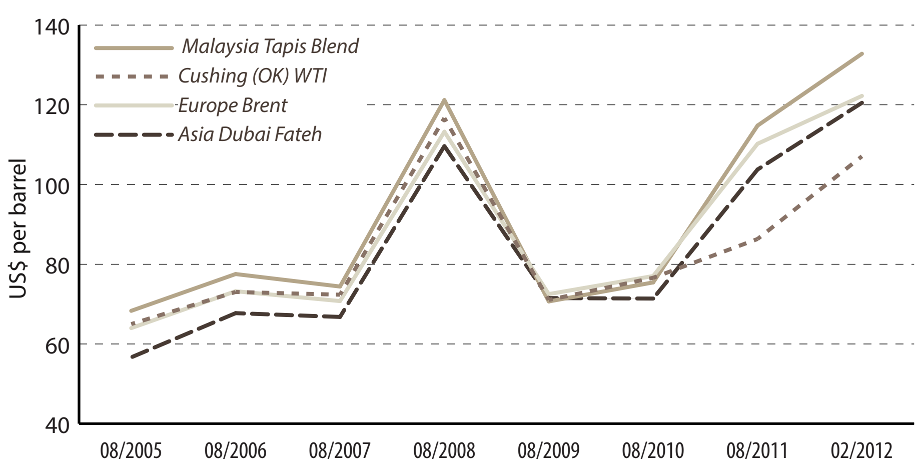


Sources: US Energy Information Administration, 2011c, 2011d; Bloomberg, 2012b.

During most of 2011, the Libyan turmoil improved the attractiveness of refining Brent-related crudes in Asia. This widened the differential between Dubai and Brent crudes (Blas, 2011, June 28). Figure 8 shows how all of the leading crude oil price markers have fluctuated since August 2005. Since the summer of 2010, the spreads in relation to WTI have become larger because of political tensions in the Middle East, decreasing oil production in North Sea fields, and the oil-transportation bottleneck between the US Midwest and the Gulf Coast, which pushed up crude oil inventories at Cushing, Oklahoma where the price of WTI is determined.

While it is not possible to determine how the spread between the WTI price and the prices that buyers in the Asia-Pacific region pay for crude oils will evolve, stronger demand growth in China, India, and other countries in

Figure 8: Comparison of WTI, Brent, Tapis, and Dubai spot prices (US$/barrel FOB), 2005–2012



Sources: US Energy Information Administration, 2011c, 2011d; Bloomberg, 2012a, 2012b.

the region than in Canada and the United States is likely to support prices there and keep the differential from collapsing. Goldman Sachs project that the growth of oil demand in the Asia-Pacific region should eventually narrow the differential between the prices of WTI crude and the other leading crude oil prices by attracting greater supplies to the region, but it is still unclear when, and to what extent, this may occur (AFP, 2011, September 15). While the key differentials are bound to fluctuate with supply and demand, as long as they are sufficient to offset the greater cost of transporting Canadian crude oil and equivalent to markets in the Asia-Pacific region rather than to US refineries, it will be advantageous for Canadian producers to take advantage of the emerging market opportunities overseas.[3]

The costs of shipping crude oil to the Asia-Pacific region from Edmonton are at least US$2.20 per barrel greater than deliveries to the US Midwest. For example, as indicated in table 3, the shipping cost from Edmonton to South Korea is estimated as between US$5.72 and US$6.43 per barrel (including pipeline tolls from Edmonton to Kitimat and freight costs from Kitimat to Korea) (Muse Stancil, 2010). In comparison, the shipping cost from Edmonton to Lockport, Illinois (via pipeline) varies from US$3.49 to US$4.20 per barrel (Enbridge Pipelines, 2011). Crude oil prices in the Asia-Pacific region would therefore need to be approximately $2.23 per barrel greater than the comparable US marker price to offset the additional cost spread. Given the outlook for growth in demand for crude oil in China, India, Japan, Korea and other countries in the region, there is a strong likelihood that this, as a minimum, can be achieved. In fact, if the present differentials between the key oil price markers hold up, sales to markets in the Asia-Pacific region hold the promise of greater "netbacks" than sales to US refiners.[4]

3 The discussion here underscores the fact that betting on favourable spreads between the WTI price and the markers used to price crude oil in the Asia-Pacific region being sustainable is not without risk; there is no guarantee that they will always be advantageous. Although the prices of raw and upgraded bitumen are derived from the price of light sweet crude, the differentials between the prices of light and heavy crudes (including bitumen) are subject to variation according to market conditions. (As discussed on page 20 a recent study by Wood Mackenzie suggests that Canadian heavy crudes are likely to fare better in China than in the United States because the oil-refinery configurations there are more favourable.)

4 "Netbacks" are the sales margins calculated at the point of production, that is, the price that is obtained by the seller less the cost of transportation from the source of supply to the point of delivery to the buyer. In order to obtain the highest available return on their investment, producers naturally desire to achieve the highest possible netbacks. If access to markets in the Asia-Pacific region results in the realization of higher prices than are available in Canada or the United States, the netbacks on barrels of oil shipped to Asia will be greater than on barrels marketed to US refiners as long as the positive price differential more than offsets the increased cost of transportation.

Table 3: Pipeline and freight costs (US$ per barrel) from Edmonton, Alberta to the Asia-Pacific region and the United States

From	To	Synthetic crude oil	Diluted bitumen
Edmonton, Alberta	Southern China (Quanzhou)	6.08	6.82
	Northern China (Qingtao)	5.95	6.68
	Japan (Chiba)	5.66	6.36
	South Korea (Yosu)	5.72	6.43
	Lockport, Illinois	3.49	4.20

Sources: Muse Stancil, 2010; Enbridge Pipelines, 2011.

Presumably, long-term contracts for exports of raw bitumen, synthetic crude oil (SCO), or crude oil would be priced against a crude-oil price marker commonly used in the Asia-Pacific region such as the Tapis Blend price; the Japan Customs Cleared (JCC) price for Japanese crude oil imports, which is compiled by the Japanese government; or the price of North Sea Brent crude, which the JCC closely tracks. One advantage of this would be that the price of bitumen would not be subject to as much volatility as in the United States, where the light-heavy spread fluctuates with changes in supply and demand, widening when a glut in the supply of heavier crudes pushes their prices and that of raw bitumen lower. Further, long-term contractual arrangements would reduce uncertainty about cash flow and return on investment.

Impact of Canadian oil exports to the Asia-Pacific region on the price of WTI (that is, on netbacks from exports to the United States)

Recently, bottlenecks have been preventing some crude oil supplies in the US Midwest from reaching oil refineries on the Gulf of Mexico. This has been placing downward pressure on the WTI oil price (determined at Cushing, Oklahoma) and making it more difficult for Canada's bitumen and heavy oil producers to market their output even at significant discounts to WTI. If markets for Canadian crude oil in the Asia-Pacific region are developed this could, by reducing the volume of Canadian supplies being marketed in or via the central United States, improve netbacks on sales of Canadian raw bitumen and heavy oil to American refiners.

This is implied by a recent study, *A Netback Impact Analysis of West Coast Export Capacity* by Wood Mackenzie, that the Alberta Government submitted to the Joint Review Panel examining the Enbridge Northern Gateway Project application in December 2011 (Wood Mackenzie, 2011). The study suggests that Canadian producers would forego a large amount of revenue without export capacity to the Canadian west coast that would provide access to suitable refinery configurations in the Asia-Pacific region for Canadian heavy oil supply (including conventional heavy crude and raw

and upgraded bitumen)—a supply that Wood Mackenzie's projections show growing from 2017 to 2025. According to Wood Mackenzie, this loss of revenue will occur because, without access to markets in the Asia-Pacific region (and especially in China) with oil refinery coking or hydrocracking technologies, the marginal barrels of Canadian heavy oil would have to be absorbed by refineries in the US Midwest that use less-efficient configurations ("cracking" rather than coking or hydrocracking as refinery processing techniques).[5] Wood Mackenzie claim that this would result in lower netbacks not only for the marginal barrels but also, because of competition, for every barrel of Canadian conventional heavy crude oil and oil sands bitumen that is produced.

A study by consultants Muse Stancil that Enbridge submitted to the National Energy Board in support of the Northern Gateway Project application claims that, with reduced oil shipments to the United States because of exports to the Asia-Pacific region (made possible by the Northern Gateway project), Canadian oil producers would benefit from an "uplift" of $2 to $3 in oil prices on shipments to US refiners (Muse Stancil, 2010). Like the Wood Mackenzie analysis, the Muse Stancil study assumes that, with the Northern Gateway oil pipeline in place, there would be a significant drop in the volume of Canadian oil available for export to US oil refineries. Using a current (and therefore more robust) forecast of western Canadian oil production instead of the Canadian Association of Petroleum Producers' 2009 forecast that was used for the Enbridge study, Muse Stancil would find that it would take substantially greater capacity to export Canadian oil to markets in the Asia-Pacific region than the Northern Gateway project could provide to reduce Canadian oil shipments to the United States sufficiently to increase netbacks from those sales.

Regardless of whether the development of oil market opportunities to the Asia-Pacific region would result in higher netbacks on shipments to US refiners, developing a niche for Canadian oil in Asia would help ensure that Canadian oil producers are in a position to secure the best netbacks overall. Further, the producers would be less vulnerable to delays in the development of additional capacity to export oil to the United States because of virulent opposition such as has plagued TransCanada's Keystone XL project.

5 In this context, "marginal" barrels are those that could not be absorbed by US refineries with coking or hydrocracking configurations because of limited US refinery capacity of that type. "Cracking" involves using heat, pressure, and catalysts to convert heavy oils into lighter products like gasoline. "Coking" is a thermal cracking process that is used to convert low-value residual fuel oil to higher-value (lighter) gas oil and petroleum coke. "Hydrocracking" is a catalytic cracking process that uses pressurized hydrogen gas to aid in the removal of sulphur and nitrogen atoms from the from the oil and to add hydrogen to oil to assist in the production of light oil products such as jet fuel, diesel, and high-octane gasoline. Hydrocracking is more common in Europe and Asia where the demand for diesel and kerosene is greater than it is in the United States and Canada.

As an example of interest by producers in developing opportunities for oil exports to the Asia-Pacific region, consider Cenovus Energy Inc., which shipped approximately 250,000 barrels of crude oil to an unspecified Chinese customer in February, 2012 (Healing, 2012, February 16).[6] Cenovus is one of several oil producers that have pledged support for the Enbridge Northern Gateway project. The trial shipment was made possible by Cenovus securing 12,000 barrels per day of firm service on TransMountain Pipeline from Edmonton to the Westridge Marine Terminal near Vancouver. According to Cenovus President, Brian Ferguson, this is an important first step as it allows the company to "establish a relationship with refineries in terms of how they value and price Cenovus crude … it's very significant strategically" (Healing, 2012, February 16).

Clearly, development of alternative markets is important for the Canadian oil industry. But, as discussed in the following section, it is also of vital importance for the Canadian economy and for the many workers who would benefit, both directly and indirectly, from employment opportunities in the construction and operation of the required facilities—including oil sands production, pipelines, and marine terminals.

6 Cenovus could not confirm that the oil that was shipped was taken up by an oil refinery in China, although this was likely the case. Also, the company did not provide any information about the composition of the shipment (in terms of bitumen and heavy crude oil) other than to indicate that the oil was sourced from Cenovus' northern Alberta production facilities that mainly consist of in-situ bitumen recovery operations.

Economic benefits from oil exports to the Asia-Pacific region

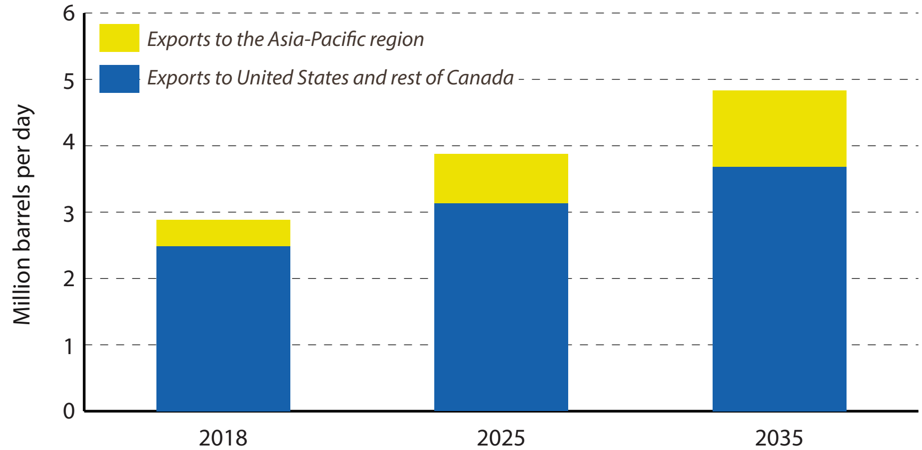
In order to assess the economic benefits—and especially the contribution to employment and GDP—from exporting crude oil and bitumen to markets in the Asia-Pacific region, we developed a hypothetical but highly plausible scenario in which a portion of the raw bitumen and SCO produced in Alberta is exported to countries in the Asia-Pacific region commencing in 2018 when, we assumed, the proposed Enbridge Northern Gateway Pipeline from Edmonton to Kitimat with a capacity of 525,000 barrels per day and related port facilities will in service. Our Base Case, which assumes that no new oil pipelines to Canada's west coast are built and that no significant amounts of crude oil, bitumen, or SCO are exported to countries in the Asia-Pacific region, serves as a benchmark against which the economic benefits from projects to ensure the export of Canadian oil to markets in the Asia-Pacific region can be measured.

Case 1 for exports to the Asia-Pacific region (figure 9) assumes that Alberta's crude-oil-equivalent production is the same as in the Base Case (5.4 million barrels per day) but also that oil exports to the Asia-Pacific region commence at the rate of 400,000 barrels per day in 2018 and reach 1.15 million barrels per day by 2035. Oil exports to the Asia-Pacific region of that magnitude would not only require construction of the Northern Gateway Project but subsequent additions to oil-pipeline capacity from the Edmonton area to ports in British Columbia. In order to form a basis for estimation of the economic benefits from construction and operation of the required capacity, we assumed that the oil pipeline infrastructure to the west coast (then comprising the Northern Gateway facility and the TransMountain Pipeline) would be expanded over time as shown in table 4.[1]

1 Shortly before this study was released the owners of TransMountain Pipeline, Kinder Morgan Energy Partners, indicated that they are planning to expand the capacity of that pipeline by 450,000 barrels per day (from 300,000 barrels per day to 750,000 barrels per day) (Kinder Morgan, 2012a). The company plans to file an application for the expansion with the National Energy Board in 2014. Depending on the outcome, construction could commence in 2016 with the added capacity in service as early as 2017 (Kinder Morgan, 2012b).

It is not possible to predict precisely when, how, and to what degree transportation infrastructure needed to ship Canadian crude oil to markets in the Asia-Pacific region on a regular, commercial basis will become available. Note, however, that the development scenario that we present assumes that the capacity to move crude oil from the Edmonton area to BC ports will be increased by more than the combined capacities of the current Northern Gateway and TransMountain proposals.

Figure 9: Alberta's oil exports (million bbl/day), 2018, 2025 & 2035, Case 1—exports to the Asia-Pacific region via BC ports



Source: Authors' assumptions.

Table 4: Additions to oil pipeline capacity (bbl/day), 2018–2035, Case 1

	Pipeline capacity to west-coast terminals	Additions
2018	525,000	Start Northern Gateway: 525 kbd (1,000 barrels per day)
2025	775,000	Pipeline Facilities Expansion: add 250 kbd
2028	975,000	Pipeline Facilities Expansion: add 200 kbd
2030	1,075,000	Pipeline Facilities Expansion: add 100 kbd
2032	1,175,000	Pipeline Facilities Expansion: add 100 kbd

Source: Authors' assumptions

With the Northern Gateway Pipeline in operation and expansions to that and other facilities, Alberta crude oil production could reach 5.4 million barrels per day in 2035, with 1.15 million barrels per day exported to the Asia-Pacific region and 3.7 million barrels per day exported to the United States and the rest of Canada. At the same time, approximately of 546,000 barrels of oil per day of oil would be available to meet Alberta demand.

As a variation on Case 1, yearly increments in Canadian SCO and non-upgraded bitumen exports (combined) of 20,000 barrels per day commencing in 2026 were assumed in our Case 2—as a result of an assumed increase in bitumen production capacity and output compared with the first Case. Here, greater oil-export volumes to the Asia-Pacific region than in the first case are made possible by increased raw bitumen and SCO production arising from expanded or accelerated investment in oil sands projects that is triggered by eight years of success in shipping oil to countries in the Asia-Pacific region. Case 2 results in oil exports of 1.35 million barrels per day in 2035, an increase of 200,000 barrels per day compared with Case 1 (figure 10).

In Case 2, with increased bitumen production, we estimate that Alberta crude oil production will reach 5.6 million barrels per day of crude oil by 2035, including 200,000 barrels per day of additional raw bitumen[2] and SCO compared with the previous case. The additional production grows in annual increments of 20,000 barrels per day commencing in 2026. In order to accommodate delivery of the additional supplies to the west coast of British Columbia, we assume that an additional 195,000 barrels per day of pipeline capacity will be required (25,000 barrels per day of additional capacity in 2025; 40,000 barrels per day of additional capacity in 2028; and 130,000 barrels per day of additional capacity in 2032), as shown in table 5.[3] These additions are complementary to those included in table 4. In Case 2, Canadian oil exports to the Asia-Pacific region reach 1.35 million barrels per day and the share of Asian exports as a percentage of total Canadian oil exports increases to 27%, compared with 24% in Case 1, and exports to the United States and the rest of Canada remain the same.

1 Benefits from construction of the Enbridge Northern Gateway Project

Construction of the Northern Gateway oil-export pipeline is estimated to contribute $3.9 billion[4] (in 2009 dollars) to Canadian GDP (Enbridge Northern Gateway Pipelines, 2010a). Much of the economic benefit would flow to British Columbia and Alberta because that is where the construction would take place. Other parts of Canada, especially Ontario and Quebec, would also realize considerable benefits because of the need for manufactured equipment, steel, and other supplies.[5]

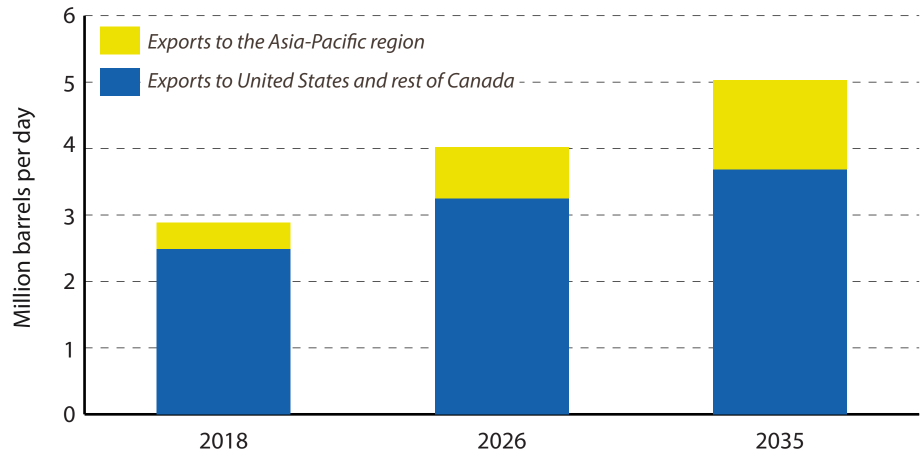
2 In accordance with the ERCB forecast, we assumed that the increase in raw bitumen production will come from in-situ operations.

3 We assumed that 195,000 barrels per day of additional pipeline capacity would be needed to transport an additional 200,000 barrels of oil per day in 2035. This is because the additions in the first export scenario (Table 4) were based on the assumption that the pipelines would not be operated at full capacity and included a small amount of unused capacity.

4 Construction of the Northern Gateway Project (which includes construction of a diluent pipeline and a terminal as well as the oil pipeline) is estimated to contribute $6.3 billion (in 2009 dollars) to Canadian GDP (Enbridge Northern Gateway Pipelines, 2010a). In the Northern Gateway application to the NEB, approximately 85% of the project capital cost is indicated to be required for construction of the pipelines and pumping stations (Enbridge Northern Gateway Pipelines, 2010a). This suggests that the contribution to GDP from construction of just the two pipelines would be approximately 85% of the $6.3 billion or $5.4 billion. Based on the capacity of the two pipelines, we estimate that construction of the oil export pipeline would give rise to approximately 62% of the overall economic (GDP) impact from the Project and the diluent pipeline, 23%.

5 The benefits referred to here, as with other impacts estimated via input-output model analysis, refer to the "gross" value added rather than net impacts. That is, they do not take account of GDP and employment reductions that occur if, for example, workers relinquish employment elsewhere in order to work on the construction project that is being assessed.

Figure 10: Alberta's oil exports (million bbl/day), 2018, 2026 & 2035, Case 2—exports to the Asia-Pacific region via BC ports, with increased bitumen production



Source: Authors' assumptions.

Table 5: Additions to oil pipeline capacity (bbl/day), 2018–2035, Case 2

	Pipeline capacity to west-coast terminals	Additions
2018	525,000	Start Northern Gateway: 525 kbd (1,000 barrels per day)
2025	800,000	Pipeline Facilities Expansion: Case 1 +25 kbd
2028	1,040,000	Pipeline Facilities Expansion: Case 1 + 65 kbd
2030	1,140,000	Pipeline Facilities Expansion: Case 1 + 65 kbd
2032	1,370,000	Pipeline Facilities Expansion: Case 1 +195 kbd

Source: Authors' assumptions

Approximately 38,905 person-years[6] of employment (including on-site workers and indirect and induced employment during the construction phase) would be generated throughout Canada during construction of the project. Approximately 56% of the employment would be generated in British Columbia and 24%, in Alberta. The remainder of the employment contribution would be

6 About 62,700 person-years of employment will be required during construction of the Northern Gateway Project, which includes the marine terminal and the oil and diluent pipelines (Enbridge Northern Gateway Pipelines, 2010b). Since about 15% of the total cost is in relation to the terminal, approximately 85% of the 62,700 person-years of total construction employment or 53,295 person-years will be required to construct both pipelines. If, based on capacity, 73% of the overall pipeline construction effort is attributed to the oil line, about 38,905 person-years of employment will be required to construct it alone.

in other provinces, especially Ontario and Quebec. At the peak of construction, the workforce would total approximately 3,000 workers (Enbridge Northern Gateway Pipelines, 2010b).[7]

2 Benefits from construction of pipeline expansions

Construction of the assumed expansions of the TransMountain pipeline and the Northern Gateway oil pipeline would also generate significant employment and real GDP benefits in British Columbia, Alberta, and other provinces. On a per-kilometre basis, these benefits, while substantial, would be less than those generated by construction of a new pipeline since existing facilities (access roads, pumping stations, supply depots, and so on) could be used to some extent and the clearance of entirely new right-of-ways would not be required. Also, in some cases the desired capacity increases would likely be achievable by adding compression and looping portions of the existing facility.

We based our estimates of the impact upon GDP and employment from construction of the pipeline expansions on the estimated impact from construction of the Enbridge Northern Gateway oil pipeline as summarized above. For the reasons outlined in the preceding paragraph, construction costs would not be as great in the case of the expansions as for entirely new pipelines. We therefore arbitrarily assumed that the cost per kilometre of expanding the pipelines would be only two thirds the cost of building the Northern Gateway oil pipeline. On this basis, in Case 2—exports to the Asia-Pacific region via BC ports with increased bitumen production—expanding oil pipeline capacity to west-coast terminals in British Columbia from the Northern Gateway initial capacity of 525,000 barrels per day to 1.37 million barrels per day would contribute approximately $4.2 billion to GDP and create about 41,700 person-years of employment. Construction of the total 1.37 million barrel per day capacity to transport oil to the coast would therefore contribute as much as $8.1 billion to GDP and generate 80,605 person-years of employment.

3 Benefits from operation of the Northern Gateway Project

Once the Northern Gateway Project (including both pipelines and the marine terminal) is built and in service, operation of the facility is anticipated

7 The employment estimates were taken from the study that Wright Mansell Research undertook for the Enbridge Northern Gateway Project (Wright Mansell Research, 2010). The estimates are the based on the gross number of full-time equivalent job positions indicated from standard input-output model analysis. As is generally the case with input-output analysis, these estimates no doubt overstate the net gain in employment to some extent. Essentially, this is because they do not account for jobs that are lost because of the movement of workers from other employment positions. Moreover, if wages in a region are inflated because of construction labour requirements, some industries in the region may not be able to afford to spend as much on labour as they had planned.

to contribute $9 billion (in 2009 dollars) to Canadian GDP annually ($270 billion over 30-year operating period) and generate 1,150 long-term jobs (Enbridge Northern Gateway Pipelines, 2010b).[8] Total federal and provincial government revenue accruing from construction and operation of the Northern Gateway facility is estimated to average a total of $81 billion (Wright Mansell Research, 2010).

4 Benefits from operation of expanded pipeline capacity

We had no basis upon which to estimate the contributions to GDP and employment from operation of the additional transportation capacity we assumed will be put in place by way of oil pipeline capacity expansions after the Northern Gateway oil pipeline is built. If one assumes that required additions to the workforce in order to operate and maintain the expanded facilities would be small, the incremental economic impacts from operation of the expanded facilities would also be rather small. For these reasons, we have not attempted to account for these impacts in table 6, which provides an overview of the estimated impacts on both GDP and employment from construction and operation of the Northern Gateway Project and the oil pipeline facility expansions that are assumed in Case 2 (exports to the Asia-Pacific region via BC ports, with increased bitumen production).

5 Training and employment benefits for First Nations

It is important to note that much of the direct employment required for the construction of new pipelines to transport oil from Alberta to the west coast and for the construction of new marine terminals, as well as for the expansion of existing TransMountain Pipeline facilities would occur in rural areas of Alberta and British Columbia where citizens of First Nations make up significant shares of the population. The envisaged construction would therefore bring opportunities for the training and consequent employment of aboriginals amongst which, in British Columbia for example, the population is generally younger (on average) than the non-aboriginal population and unemployment rates, higher (British Columbia, BCStats, 2006). With training and experience under their belts some aboriginals would consequently be in a position to work in oil and gas production and other sectors of the economy. In short, if administered responsibly, the construction of new pipeline and related facilities could bring significant and even life-changing economic and social benefits to a segment of society where the youth often have few local or even regional employment opportunities.

8 Long-term employment includes direct, indirect, and induced jobs, including approximately 560 jobs in British Columbia with annual labor income of $32 million and 380 jobs in Alberta with annual labor income of $26 million (Enbridge Northern Gateway Pipelines, 2010b).

Table 6: Gross economic impacts from construction and operation of the Northern Gateway Project and the assumed oil pipeline facilities expansions (Case 2, exports to the Asia-Pacific region via BC ports, with increased bitumen production)

	Northern Gateway Project (terminal plus the oil and diluent pipelines)	Assumed oil pipeline expansions*	Total
Construction			
GDP (2009 dollars)	$6.3 Billion	$4.2 billion	$10.5 billion
Employment	62,700 person-years	41,700 person-years	104,400 person-years
Operations			
GDP	$9 billion per year	Not Available	At least $9 billion per year
Long-term jobs	1,150 jobs	Not Available	At least 1,150 jobs

Note *: The assumed facility expansions do not consider the possibility that the proposed Enbridge diluent pipeline might be expanded or that other diluent pipelines could be built in conjunction with the oil pipeline expansions that are assumed to occur. If the Enbridge diluent pipeline were expanded at some point or additional diluent pipelines were built, either or both of which could occur, their construction and operation would add to the economic benefits summarized in this table and discussed in this section. Similarly, no allowance has been made alongside the assumed expansion of oil pipeline infrastructure itself for possible expansions of terminal facilities at BC ports. Along with the possible need to increase the capacity to ship diluent to Alberta from the coast at some point, this suggests that the gross economic impacts from construction and operation of the infrastructure required to meet the suggested targets for exporting oil to the Asia-Pacific region could be significantly greater than the impacts summarized in table 6.

Note: The estimates provided in table 6 were obtained from studies that used input-out analysis for which no indications of statistical confidence or tolerance levels were provided.

Source: Joint Review Panel, 2011; and authors' assumptions.

6 Improved netbacks

In addition to the contributions to employment and GDP from bitumen production facility and pipeline construction and operation, Canada would benefit from the increased netbacks to the oil producers. If, for example, 5.7 billion barrels of crude oil were exported to refiners in the Asia-Pacific region during the period from 2018 to 2035 and the netback to the bitumen and SCO producers were, say, $2.50 per barrel (2011 constant dollars) greater than if the same volumes were sold to refiners in the United States, a net gain of $14.25 billion dollars would be realized. Part of this windfall would end up in the pockets of company shareholders. Although some of those shareholders reside in other countries, the incremental income distributed to Canadian shareholders would, as it is spent, have favourable economic repercussions as a result of the induced employment, labour income, and GDP growth across the country.

7 Benefits for pensioners

Pensioners would also benefit because the Canada Pension Plan Investment Board, the Ontario Teachers Pension Plan, and other public pension plans have invested a portion of their holdings in shares of companies involved in oil

sands production. For example, the Canada Pension Plan Investment Board holds publicly traded shares valued in the vicinity of $1.8 billion of companies with major oil sands activities and has made a direct private investment of $250 million in Laricina Energy Ltd., which is developing a major Alberta oil sands production facility (Canada Pension Plan Investment Board, 2011; Laricina Energy Ltd., 2010). Also, the Ontario Teachers Pension Plan has invested approximately $1 billion in companies engaged in oil sands activities (Ontario Teachers Pension Plan, 2011). Many private pension plan funds can also be assumed to hold shares in such companies.

The value of the pension funds will appreciate as the net asset value of the oil sands companies whose shares they hold increases as a consequence of growth of production and earnings. Also, the funds' annual investment income will increase as oil sands companies are able to increase returns to shareholders via dividends as the result of improved netbacks from access to the crude-oil market in the Asia-Pacific region and increased sales volumes.

It is clear that construction and operation of the transportation infrastructure necessary to export raw bitumen and synthetic crude oil produced from the Alberta oil sands to the Asian Pacific would generate substantial economic benefits not only in Alberta and British Columbia, but in other parts of Canada. The envisaged benefits encompass large numbers of temporary (construction) and permanent jobs, increased labour and investment income, and greater economic growth than otherwise. The resulting growth in federal and provincial government revenues would help to support essential education and health programs. Moreover, it would improve the governments' fiscal positions and, in some cases, allow for tax reductions that could improve the ability of households to meet their financial objectives.

Considering, also, the economic benefits that would flow from increased oil export revenues as the result of securing markets in the Asia-Pacific region, the potential contribution to Canada's economic development is comparable to former nation-building events in the country's history such as the building of the transcontinental railways and construction of the TransCanada natural gas pipeline. Unfortunately, a number of unnecessary obstacles and non-market barriers are either preventing the required infrastructure development from proceeding, or unnecessarily slowing its progress.

Obstacles to investment in required infrastructure

1 Time and cost of regulatory process and procedures

Considerable time is frequently required from when an application is filed with the National Energy Board for permission to construct a pipeline or a related facility for the export of crude oil or raw or upgraded bitumen until a decision is made on the application. The regulatory process that is unfolding in relation to the proposed Enbridge Northern Gateway Project (comprising the proposed oil export pipeline, a condensate import pipeline, and storage tank and marine terminals at Kitimat, BC) provides an example.

On January 20, 2010, the Chairman of the National Energy Board and Canada's Minister of Environment announced that, in anticipation of the Project application being filed later in the year, they had appointed a Joint Review Panel (JRP) to review and make a decision on the application (National Energy Board, 2010b).[1] The formal application by Northern Gateway Pipelines Inc. to construct the Northern Gateway Project was filed with the Board on May 27, 2010, yet it took until May 5, 2011 (almost a full year) for the JRP to issue a Hearing Order describing its plans for the review process (Canada, NEB & CEAA, Joint Review Panel, 2011). The regulatory process outlined in that Hearing Order was disconcertingly protracted, to say the least. According to a more recent Hearing Order, the situation has since deteriorated, with final public hearings on the Project application now not scheduled to begin until April 2013 (Canada, NEB and CEAA, Joint Review Panel, 2012). Following its deliberations the Joint Review Panel must submit an environmental assessment for the government to review. The Panel cannot make a decision on the project application until it has received the government's comments on that assessment. As a consequence, a decision is unlikely to be reached until sometime early in 2014—some four years from when the final version of the Enbridge application was filed.

Given the economic opportunities for oil exports to countries in the Asia-Pacific region that we have outlined, regulatory proceedings that are drawn out to this extent will be costly in terms of the foregone employment,

1 The Canadian government chose to appoint a joint panel in this case because of the concerns that have been raised about the risk of oil spills that some groups opposed to the project say the pipeline, marine terminal, and coastal shipping pose for the environment. The JRP will therefore be examining the project from both the requirements of the Canadian Environmental Assessment Act and the National Energy Board Act.

labour income, and economic growth. Canadians could also suffer as tax revenues from construction and operation of projects that are postponed or never realized could have been used to fund tax reductions or necessary infrastructure projects.

The responsible government agencies appear oblivious to the commercial and economic costs of protracted regulatory approval procedures and the fact that Canada could lose huge amounts of investment to competing petroleum-exporting nations with more efficient and less costly regulatory requirements (Angevine and Cervantes, 2011). The NEB does have a self-imposed "service standard" target that requires that it endeavour to have 80% of its reasons for a decision completed and released within 12 weeks following the completion of a public hearing (National Energy Board, 2011c). However, there is no guarantee that this target will be achieved. Further, the target does not apply to hearings that involve the issuance of a separate Environmental Assessment Report requiring a government response or a decision by the Minister of the Environment.[2] Moreover, the Board has no service standards prescribing the time from when an application is filed until a public hearing commences and no time constraints are imposed on public hearings.

Perhaps in part because the Joint Review Panel that was put in place to examine socioeconomic and environmental implications of the proposed Mackenzie Gas Project took so long to complete its task and report its findings to the National Energy Board, the federal government now assigns responsibility for environmental assessments (EAs) under the Canadian Environmental Assessment Act (CEAA) in the case of energy project applications for which the National Energy Board is responsible under the National Energy Board Act to the NEB itself instead of to a separate review panel under the CEAA. This will provide the Board with the ability to manage the EA process in step and in conjunction with its responsibilities in relation to pipeline project applications filed in accordance with the National Energy Board Act.

According to Section 52 of the National Energy Board Act (which deals with pipelines), among other things the Board's responsibilities include consideration of: 1. the availability of oil or gas to supply a proposed pipeline; 2. the existence of actual or potential markets; 3. the economic feasibility of a proposed pipeline; 4. the financial responsibility of the applicant; 5. methods of financing the pipeline; and 6. the extent to which Canadians will have opportunities to participate in the financing, engineering, and construction. One wonders why the NEB must spend time examining such matters as economic feasibility and the existence of markets. Surely, if a project is not

2 Presumably, it also does not apply in the case of a Joint Review Panel charged with examining a project from the perspective of both the CEAA and the National Energy Board Act. A case in point is the present review and public hearing of the Enbridge Northern Gateway project application.

feasible investors will not be willing to take the risk. In the case of a pipeline, for example, evidence that the applicant has long-term contractual commitments with shippers for much of the pipeline capacity should be sufficient evidence of the commercial viability of the project—and, of the availability of the commodity in question to would-be consumers. If it is clear from the contractual arrangements that third parties will not be placed at risk in the event of project failure, then what role should the NEB have with respect to such matters?

With regard to the Board's mandate to scrutinize the extent of Canadian involvement in the financial, engineering and construction of a project, we note that the National Energy Board Act was promulgated well before the North American Free Trade Agreement was put in place. This mandate therefore also requires review.

Having a Joint Panel instead of separate panels (one appointed under the CEAA to adjudicate environmental concerns plus the NEB to discharge its statutory responsibilities) may not speed up the process if, as with the Northern Gateway Project, opponents flood the panel with requests to speak. At time of writing, the Joint Panel was committed to hearing more than 4,000 registered interveners speak for up to 10 minutes at the oral hearings that were scheduled to commence in January, 2012. This translates into more than 700 hours of hearings given the time required for introductions, session breaks, and time lapses between speakers (Penty, 2011, October 19). In addition, most of the interveners are expected to file written evidence, which will take considerable time for the panel secretariat to digest.

Regulatory procedures and processes in relation to a major project application before the NEB and most other regulatory bodies around the world are not only arduous, long (and therefore costly), but essentially unpredictable in terms of time and cost. Because of these costs and uncertainties, applications with respect to many feasible energy projects no doubt never materialize and the projects simply do not get built. In some cases, developers may instead decide to invest in similar projects in jurisdictions where the cost of regulatory compliance is less onerous and the probability of securing approval within reasonable time frames is higher.

The government of Canada's plan, Responsible Resource Development, announced in April 2012 indicates that the government is not only aware of the economic burden imposed by inefficient regulatory procedures and processes for review of energy project applications, but that it is prepared to act to ensure that regulatory reviews are completed in a more timely and predictable manner and that the extent of duplication in the requirements of federal agencies and departments and between federal and provincial authorities is reduced (Natural Resources Canada, 2012). Among other things, the government plans to establish maximum beginning-to-end timelines: 24 months for decisions to be reached in the case of joint panels and 18 months for National

Energy Board Reviews. Standard environmental assessments would need to be completed within 12 months. Further, legally binding timelines are to be set for key regulatory permitting processes including the Fisheries Act and the Canadian Environmental Protection Act.

In order to reduce duplication, the Responsible Resource Development plan promises to consolidate responsibilities among federal agencies and to integrate federal and provincial regulatory requirements more closely. Most important, the federal government will seek the authority through substitution and equivalency provisions to allow provincial environmental assessments that meet the substantive requirements of the Canadian Environmental Assessment Act to replace federal environmental assessments as a means of eliminating duplication between the two levels of government. Further, the federal government will seek equivalency of Fisheries Act regulations with their provincial counterparts.

As indicated in Bill C-38 that was brought before Parliament during the last week of April, 2012, the changes that the federal government is planning will require amendments to a number of laws and regulations. This suggests that they will not be implemented for some time. Consequently, they will have little or no impact on regulatory processes already in progress as, for example, with the Enbridge Northern Gateway Project application.

Duplicate applications

A matter of considerable concern in relation to the regulatory burden and its costs is that detailed applications must be filed with respect to closely similar projects, to be located in the same general area, even when little time has elapsed since the first application was filed. For example, a public hearing was launched in June, 2011 with respect to the application filed by Kitimat LNG in September, 2010 to export liquified natural gas (LNG) from British Columbia's west coast to the Asia-Pacific region. A similar application, which BC LNG Export Cooperative LLC filed with the NEB in March 2011, was the focus of another public hearing during the first trimester of 2012. Although the duplicate regulatory processes for these closely related projects may have been lucrative for the teams of lawyers and other professionals that the project proponents assembled to assist them, the unnecessary procedural repetition inevitably added to the time and cost required to secure approval of the second application and others that are expected to follow.[3]

This form of regulatory duplication, which is not addressed in the government's Responsible Resource Development Plan, adds to the potential oil

3 As explained in the following section in which we put forward a number of suggestions for policy reform, we are not in favour of simply waiving requirements for "later" proposals. In some cases, that would simply provide an incentive for would-be applicants to delay filing with the intent of becoming a "later" applicant.

and gas exporters' costs. The incremental regulatory cost burden arising from duplicated and repeated regulatory processes and procedures must ultimately be borne by the shareholders of the exporting companies since the price of oil is determined by the market. Faced with costs higher than expected and regulatory delays, some potential investors may decide to turn their attention to investment opportunities in other countries.

The challenge of avoiding regulatory costs from duplicative and repetitive regulatory processes and procedures in the case of similar projects would undoubtedly surface in relation to applications to construct new pipelines to ship crude oil and bitumen from the Fort McMurray or Edmonton to export terminals in British Columbia in addition to Northern Gateway. But similarities, and the prospect of regulatory duplication, are also present in the case of competing projects involving different terminal destinations, as with the Northern Gateway Project route and the soon expected application by Kinder Morgan Partners for expansion of capacity on the TransMountain Pipe Line from Edmonton to Vancouver. This is because the oil would be coming from the same source in both cases, at least a portion of the pipeline route would be the same, and both would involve potential marine transport risks.

2 Opposition from First Nations groups

Development of energy projects has, at times, been opposed by native groups with ancestral rights or self-awarded stewardship over lands through which proposed energy pipelines must pass. Unlike the situation in most of the rest of Canada, in British Columbia most native bands are living on Indian Act reservations and do not hold title to the lands upon which they and their ancestors have depended for generations. Further, they do not have the right to self-government; their economic and social needs are being met by administration of regulations under the federal Indian Act. To address these issues, the BC Treaty Commission is striving to negotiate treaties with First Nations that have never entered into agreements with the provincial government. Treaties generally award the right to self government and to ownership of at least portions of ancestral lands. First Nations in British Columbia that are under treaty must generally abide by provincial legislation pertaining to matters such as environmental protection, health, and education but the treaties respect the need to preserve cultural traditions. Property rights and mechanisms for resolution of disputes that are embedded in treaties help to clarify native rights with respect to their territories and to facilitate economic development (BC Ministry of Aboriginal Relations and Reconciliation, 2011). Moreover, if a First Nation has a treaty agreement with the government, prospective investors know precisely who to negotiate with and on what basis.

In the case of First Nations without treaties who claim to have "unceded aboriginal rights and title" over tracts of land, the extent of their land rights is essentially undefined (Carrier Sekani Tribal Council, 2006). However, a

non-treaty First Nation that successfully asserts "title" to land in court that is recognized as valid under the Canadian Constitution has a degree of control over how the land is developed (Penty, 2011, November 21). Proponents of energy pipelines that would cross reservations and other lands occupied by non-treaty native groups must therefore work diligently to convince such groups that construction and operation of the projects would be in their interest. If First Nations who would be directly affected simply dig in their heels and say "no," then it may prove very difficult to overcome their opposition.

Impact and benefit agreements

An impact and benefit agreement (IBA) is typically sought between a resource developer and affected aboriginal communities to address the impacts of a proposed project and to outline how those communities will benefit from the project—that is, to establish the relationship between the communities and the proponents of the project. IBAs can reached either with or without government involvement. Whenever federal or provincial governments are involved, such participation generally reflects the obligation that governments have to consult with aboriginal groups on resource development issues (Isaac and Knox, 2010). But the extent of the required "consultation" and what constitutes fulfillment of the "obligation" are not well defined. Moreover, if aboriginal groups do not heed the advice that is offered by the Crown, it is unclear whether the Crown has the right to force its will upon them. IBAs take many forms and are highly dependent upon the features of a particular project, including the nature of the resource to be developed and the location. They often address such factors as training and employment opportunities; social, cultural, and community support; environmental protection and monitoring; and financial benefits such revenue sharing and compensation provisions.

Compensation and offers of equity interest in projects

Resource project development is frequently stymied or delayed, sometimes indefinitely, because of the inability of the project proponents and First Nations groups to agree on compensation aspects of a proposed IBA. Recently, resolution of the compensation issue in relation to energy pipelines has begun to focus on encouraging and assisting First Nations groups whose lands would be affected to acquire an equity position in the pipeline. This approach provides an ongoing flow of revenue to First Nations that is directly tied to operation of the pipeline.

In the case of the proposed Mackenzie Gas Project, the project's proponents agreed to provide an equity interest in the Mackenzie Valley (gas) Pipeline to First Nations bands through whose lands the pipeline would run. Agreement has been reached with the Sahtu, Gwich'in and Inuvialuit, the present shareholders of the Mackenzie Valley Aboriginal Pipeline Limited Partnership (the Aboriginal Pipeline Group or APG), which has acquired a

one-third interest in the Mackenzie Valley Pipeline. An agreement has not yet been reached with the fourth band whose lands would be affected by pipeline, the Decho. Given that the Sahtu, Gwich'in and Inuvialuit stand to benefit through APG's equity position in the pipeline, they are generally supportive of the entire Mackenzie Gas Project. APG's equity in the pipeline has been financed via a loan from a group of banks (Aboriginal Pipeline Group, 2011).

In an effort to win First Nations' support for the proposed Northern Gateway Project, Enbridge Gateway Pipelines Inc. (Enbridge) is offering a 10% equity position in the $5.5 billion pipeline and the Kitimat Marine Terminal to "eligible" aboriginal communities[4] in three geographic regions: Alberta and the interior and coastal regions of British Columbia. In order to ensure that lack of financing does not prevent eligible First Nations communities from taking advantage of this offer, Enbridge is offering to finance their ownership position fully. According to Enbridge, the 10% equity position would generate approximately $280 million in net income for the eligible groups during the first 30 years of the pipeline's operation (Enbridge Northern Gateway Pipelines, 2011). The company is also seeking agreements with First Nations on training and employment opportunities, and business opportunities. The economic benefits to First Nations would therefore be considerable.

Continued opposition

In spite of the benefits that it has offered, Enbridge is struggling to gain the support of First Nations that strongly oppose the project on the grounds that it could have disastrous environmental consequences. If the project receives regulatory approval, there are indications that the First Nations will mount a fierce and prolonged legal battle (Tait & Valderklippe, 2011, May 13)—including appeal of a possible JRP decision to approve the project application—to block the project. Given the First Nations' constitutional rights and the absence of treaties with most of British Columbia's First Nations (and their claims to ancestral rights) such a battle could continue for some time, not only jeopardizing the Enbridge Northern Gateway Project but also plans by oil-sands bitumen producers to gain access to oil markets in the Asia-Pacific region via the proposed Northern Gateway Pipeline.

3 Opposition to projects because of environmental risk concerns

The risk of oil spills from the Enbridge Northern Gateway Project and possible similar projects is of great concern to First Nations and private land owners whose territories, lands, and way of life could be affected. Although First Nations band members and others stand to gain from employment during

4 Presumably, "eligible" means aboriginal communities holding land through which, or in close proximity to which, the pipeline would pass; or living on or near the coast along which tankers would pass.

the construction and operation of the Northern Gateway pipeline and marine terminal, many fear that oil leaks from the pipeline, however small, could be disastrous to the Fraser River's salmon-bearing watershed in the interior of British Columbia and that oil spills from large tankers coming and going from the marine terminal pose similar threats to the coastal environment.

Many of the First Nations in British Columbia are united in opposition to construction of the proposed Enbridge Northern Gateway Project that would ship crude oil, bitumen diluted with pentanes plus (a light liquid hydrocarbon compound), and synthetic crude oil and blends of these commodities from the Edmonton area to Kitimat, British Columbia for shipment via tanker to markets in the Asia-Pacific region. This group includes a majority of the some 50 First Nations through whose lands and waters the pipeline and oil takers would pass. Their opposition is based on the generally accepted view that oil spills are inevitable and unwanted at virtually any price.

The list of strongly opposed First Nations includes the Haida (Queen Charlotte Islands), the Haisla and other bands in the region close to Kitimat, and bands located in large regions between Kitimat and Prince George such as the Nadleh Whut'en, the Naka'zdli, and the Wet'suwet'en. Some of the strongest opposition is from the Yinka Dena Alliance that comprises the Nadleh Whut'en, Wet Suwet'en, Takla Lake, Siak'uz and Nak'azdi. Members of the Yinka Dene Alliance are very concerned about the damage that a leak from an oil pipeline might bring to the environment, especially salmon-bearing streams and rivers (Hoekstra, 2011). They are among the signatories of the "Save the Fraser Declaration," which states that, in upholding their ancestral laws, title, rights, and responsibilities, the parties "will not allow the proposed Enbridge Northern Gateway Pipelines, or similar Tar Sands projects, to cross our lands, territories, and watersheds, or the ocean migration routes of Fraser river salmon" (Gathering of Nations, 2011).

While the reasons for the environmental risk concerns are understood and must be taken very seriously, oil pipelines do not often leak and, when they do, the damage can generally be readily and quickly confined. The Canadian Energy Pipeline Association (CEPA) defines a "significant failure" of an oil pipeline operation as an incident with one or more of the following characteristics:

1. caused a serious injury or fatality;
2. caused a liquid release of greater than 8 cubic meters (50 US barrels);
3. produced an unintentional ignition or fire; or,
4. occurred as a rupture.

Significant failures are extremely rare and their frequency of occurrence has been declining (table 7). Based on data from the Canadian Energy Pipeline Association, ruptures on liquid pipelines in Canada during the nine-year

Table 7: Incidents of failure on liquid pipelines, CEPA members, 2002–2010

	2002	2003	2004	2005	2006	2007	2008	2009	2010
Length of liquid pipeline (1,000 km)	17.1	17.8	16.3	15.8	15.0	21.8	28.1	28.6	28.1
Number of significant incidents of failure (per 1,000 km)	0.190	0.090	0.0	0.0	0.0	0.198	0.091	0.044	0.017
Liquid released, all incidents (m^3)	64	25	2	0	8	2,402	58	605	251
Fatalities	0	0	0	0	0	0	0	0	0

Source: Canadian Energy Pipeline Association, 2012.

period from 2002 to 2010 averaged about one per year (CEPA, 2012). The CEPA indicated that the average annual volume of fluids released from pipelines transporting liquid products was just two liters for every million liters transported: 99.99% of the commodities put into the pipelines were transported safely. In addition, all leaks were completely cleaned up, usually within days of their occurrence, with no residual health or environmental effects (CEPA, 2011).

Some opponents to the transportation of raw bitumen mixed with diluents like pentanes plus in order to lower the viscosity and allow the bitumen to travel more easily through a pipeline, claim that the introduction of diluents speeds up the corrosion process and, therefore, the risk of rupture. To the contrary, there is no evidence that this is the case. A recent study from Alberta Innovates indicates that diluted bitumen from Alberta's oil sands is no more corrosive than conventional oil. The study found there are differences in the chemical makeup of the types of oil, but not necessarily in corrosive qualities (Been and Wolodko, 2011). In fact, no instances of crude-oil releases caused by internal corrosion from pipelines carrying Canadian crude oil products blended with diluents are evident in the US Department of Transportation's pipeline accident data from 2002 through early 2011 (American Petroleum Institute, 2011). Furthermore, Alberta's Energy Resources Conservation Board (ERCB) has indicated that the analysis of pipeline failure statistics for Alberta has not identified any significant differences in failure frequencies between pipelines transporting conventional crude oil and those carrying bitumen-diluent blends, or other oil blends that include diluents (American Petroleum Institute, 2011). It therefore does not appear that diluted bitumen poses greater risk of pipeline corrosion than conventional crude oil.

In the United States, leaks of crude oil along oil pipeline right-of-ways have fallen from 2 incidents per thousand miles in the period from 1999 to 2001, to 0.8 incidents per thousand miles in the period from 2007 to 2009, a decline of 59%. The annual average leakage volume has fallen from just over 600 barrels per thousand miles of pipeline in the earliest period to about 365

barrels in the most recent period, a decline of 41% (Association of Oil Pipe Lines, 2011). In spite of the low incidence of serious incidents, ongoing monitoring of pipeline operations is very important.

One of the more common causes of oil pipeline failure is when operators attempt to increase throughput volumes[5] by operating a pipeline at volumes greater than it was designed for (Chis, 2007). If a pipeline is designed to operate within specified temperature and pressure ranges, then operation at higher pressures or temperatures can result in failure. Pipeline inspectors appointed by the regulator (or the provincial or state agency in question in the case of non-regulated pipelines) help to ensure that pipeline operators do not exceed the approved pipeline operating limits.

An effective monitoring process used before a new pipeline is approved for operations is to send so-called "smart pigs" through the line. These are mechanical devices capable of detecting and measuring thickness and integrity as well as the extent of any corrosion. The process is therefore an effective means for identifying the risk of failure so that repairs can be made before a leak occurs. Although the use of pigs is becoming normal practice during pipeline construction, regular line inspections employing pig technology after a pipeline has entered service will help to further reduce the likelihood of oil pipeline leaks (Association of Oil Pipe Lines, 2011).

Some pipeline companies undertake risk assessments in relation to so-called "High Consequence Areas" (HCAs) as part of their regular integrated management planning processes. Typical HCAs include areas with high population densities, near facilities (such as hospitals or schools) that are difficult to evacuate, and locations where people congregate (such as churches, office buildings, or stadiums). Assessments of HCAs help to identify which pipeline segments are most likely to pose a risk to the environment or to people. Moreover, the process compels pipeline operators to evaluate and assess the capability of various automated systems to detect leaks and to determine whether equipment replacement, upgrading or backup is required (Association of Oil Pipe Lines, 2011).

The Canadian Energy Pipeline Association encourages its members to develop integrated management plans which include HCA risk assessments in order to ensure that their pipeline operations are environmentally responsible and that the companies are prepared to respond to accidents or pipeline malfunctions in a timely manner. If companies are not willing to do this on their own, government officials who are responsible for pipeline safety should encourage them to do it (Association of Oil Pipe Lines, 2011). Once a pipeline is operating, providing accurate, comprehensive information as soon as possible about any leaks or spills that occur to groups that might be affected will help them to decide whether they need to become involved in mitigation processes.

5 Throughput volumes refer to physical deliveries of crude oil through a pipeline system.

Marine spills

With regard to marine transportation risks, the International Tanker Owners Pollution Federation has reported that the vast majority of shipping spills are small (less than 50 barrels). Moreover, the number of major spills (> 5,130 barrels) has decreased significantly during the last 41 years. The average number of major spills from 2000 to 2009 is just over three per year, approximately 8 times less than in the 1970s. Spills of medium size (50–5,130 barrels) have also decreased: the annual average number of spills in the period from 2000 to 2009 was close to 15, whereas in the 1990s the average was almost double this number (International Tanker Owners Pollution Federation Limited, 2011).

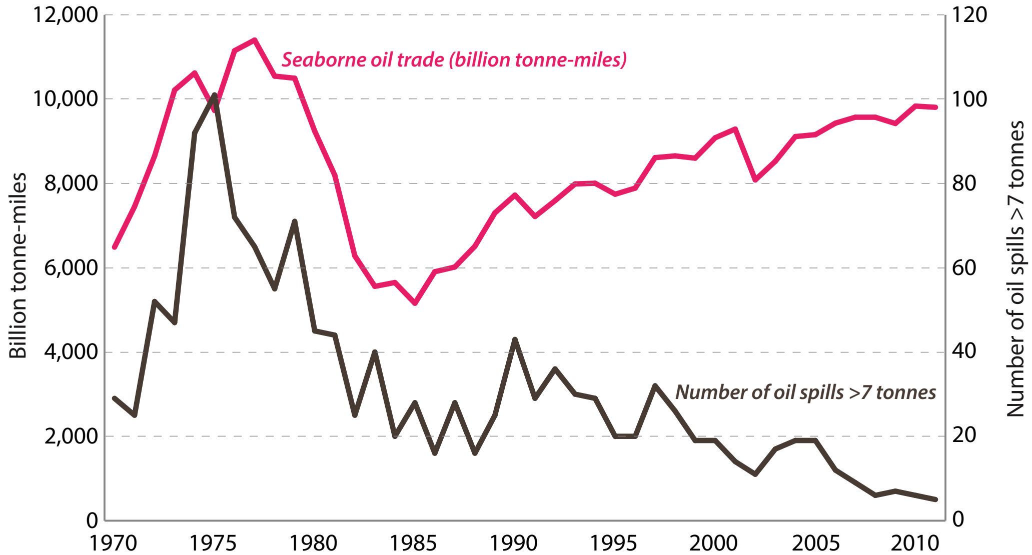
Consistent with the reduction in the number of oil spills from tankers, the volume of oil spilled also shows a marked reduction. However, when looking at the frequency and quantities of spills, it is noteworthy that a few very large spills have been responsible for a high percentage of the amount of oil spilt. In the 1990s, there were 360 spills of over 50 barrels, resulting in 8,334,210 barrels of oil lost; but 73% of that amount was spilled in just 10 incidents. In the 2000s, there were 182 spills of over 50 barrels, resulting in 1,553,960 barrels tonnes of oil lost; 47% of this amount was spilt in just 2 incidents[6] (International Tanker Owners Pollution Federation Limited, 2011). While this does not demonstrate that the risk of truly catastrophic events occurring has been removed, it does indicate that the frequency and size of spills involving volumes greater than 50 barrels are trending downwards.

The causes and circumstances of marine oil spills are varied, but can have a significant effect on the amount of oil spilt. Most spills from tanker ships result from routine operations such as loading, discharging, and bunkering, which normally occur in port or at oil terminals. However, the majority of operational spills of these kinds are small, with some 91% involving quantities less than 50 barrels.

Accidental causes, such as collisions and groundings, generally give rise to much larger spills, with at least 88% of these incidents involving quantities in excess of 5,130 barrels (International Tanker Owners Pollution Federation Limited, 2011). Seaborne oil trade as measured in billions of tonne-miles has grown steadily since about 1985. While increased movements on the high seas might imply increased risk, it is encouraging that, at during same time, there has been a continuing downward trend in the number of oil spills from both routine operations and accidents (figure 11). Over the past 10 years, the Canadian Coast Guard has recorded a total of 169 oil spills in Canadian waters involving tankers and other vessels, but only 53 of them required either cleanup or mitigation operations (De Souza, 2011, September 28).

6 Between 2000 and 2010, two major oil spills occurred: the *Prestige* spill in 2002 where 461,790 barrels were spilled and the *Hebei Spirit* spill in 2007 with 76,965 barrels.

Figure 11: Comparison of seaborne oil trade (billion tonne-miles) and number of oil spills greater than 7 tonnes, 1970–2011



Note: One barrel of WTI crude oil is equivalent to 0.1364 tonnes of oil.

Sources: Fearnresearch 1970–1989; Lloyds List Intelligence 1990–2011. Figure adapted from International Tankers Owners Pollution Federation, 2011; used by permission of ITOPF.

4 Environmental review processes

In June, 2008, Pacific Trail Pipelines Limited (PTP) received a provincial environmental assessment (EA) certificate for the Kitimat–Summit Lake Pipeline Project following a comprehensive review process undertaken by the BC Environmental Assessment Office. In addition to the provincial EA, the project also required approval by the federal government under the Canadian Environmental Assessment Act. A favourable federal decision was made in March, 2009. With hindsight, it would have been more efficient if a joint federal-provincial environmental review could have been undertaken. While this example pertains to a gas pipeline, it applies equally to oil pipelines.

5 Transportation alternatives

Railway transportation is providing an alternate mode of transportation for bitumen and SCO in some cases. For example, CN Rail and Canadian Pacific are both shipping crude oil from the developing Bakken oil formation in North Dakota and Saskatchewan[7] to US Gulf Coast refineries. Randy Meyer, CN's

7 In February 2011, CN was moving approximately a unit train of crude oil per week from the Bakken formation in Saskatchewan (Vanderklippe, 2011, February 7). Assuming that a unit train consists in 150 cars and each car holds 550 barrels of crude, CN is carrying about 82,500 barrels every week or 11,000 barrels per day.

Senior Manager of Business Development, has indicated that rail transportation offers certain advantages. For example, if accessible railroad infrastructure is already in place, the regulatory approval processes required to obtain pipeline construction approvals can be avoided. Also, there is lower financial risk to the producers because they do not have to enter into long-term take-or-pay commitments vis-à-vis capacity as shippers on a pipeline owned by others or invest in a pipeline of their own. Moreover, the need to add diluents to reduce the viscosity of bitumen disappears (Harrison, 2011).

Although the success that the railroads are now having in the shipment of crude oil in certain situations, as in North Dakota, is largely because pipeline capacity is not yet available or readily accessible from the producing oil fields, it does raise the question whether rail transportation could compete with pipelines in large-volume long-haul situations. For large volumes, pipeline transportation appears to be less costly than rail (Campbell, 2011, August 31). In fact, Enbridge Inc. have indicated that, although rail transportation can be competitive with a new pipeline in the case of volumes up to 150,000 barrels per day, at volumes greater than that amount cost comparisons are clearly in favour of pipelines (Vanderklippe, 2011, February 7). For example, CN roughly estimates that the shipping cost of bitumen from Fort McMurray to Vancouver to be around $3,978 per rail car or $7.23 per barrel of crude oil,[8] compared to $2.05 per barrel on the TransMountain pipeline system.

Even if railway transportation is not competitive in such cases, the cost could be sufficiently low to consider it as an available option if necessary. For example, a case in point would be if it appears that opposition to the construction of new pipelines to the west coast, as with the Northern Gateway Project, is likely to prevent producers from being able to reap the benefits from access to overseas markets in step with growth in oil sands production capacity. Public opposition to the Keystone XL project helps to explain why Altex Energy has proposed a "pipeline-on-rail" system in which specialized rail cars would transport the raw, undiluted bitumen from Fort McMurray to the US Gulf Coast (Campbell, 2011, August 31).

In the short term, it is anticipated that rail will continue to serve as a complementary means of transport used by industry, depending on economic factors unique to each producer and refiner. For example, rail could allow producers to bypass short-term pipeline bottlenecks. But, in the longer term, growth in shipments of bitumen by rail will depend on several factors, such as the availability and supply of diluent, the prices that other commodity producers already committed to rail are willing to pay for railroad transportation, and the development of crude oil handling facilities to fill cars with bitumen (Energy Resources Conservation Board, 2011).

8 Each rail car can hold 550 barrels of crude oil.

Policy options

The non-market obstacles outlined in the preceding section are clearly inhibiting the development of the pipelines and port facilities needed to ship crude oil, raw bitumen, and synthetic crude oil to the west coast and thereby preventing Canada from taking full advantage of opportunities to develop crucial alternative markets in the Asia-Pacific region for oil and oil equivalent. These barriers are keeping the benefits, employment, and income opportunities that would accrue to the citizens of Alberta and Canada if such development were to proceed beyond their grasp. This section identifies policy options that could, if implemented, remove or, at least, significantly reduce unnecessary barriers (that is, those that do not serve an environmental, social, or economic purpose) to developing infrastructure essential for Canadian economic development and prosperity. If Canadians desire to develop Alberta's conventional crude oil and oil-sands resources expeditiously and efficiently in view of current market conditions, legitimate environmental concerns, and global investment opportunities, then discussion of the required policy framework is necessary.

Time and cost of regulatory process and procedures

1 The National Energy Board Act could be revised to restrict the scope of the Board's mandate with regard to applications to approve the construction of energy pipelines to matters necessary to protect the public interest—that is, construction and operating standards and efficiency, property rights and claims, and environmental impacts. Consequently, the Board would no longer be involved in investigating the commercial feasibility and risks associated with proposed capital investment as these would presumably be examined by the project proponents as risk takers and the ultimate users of the facilities, the oil and natural gas shippers. Similarly, the Board would no longer need to be concerned with the quality and extent of markets that a facility would serve or the availability of oil or gas or some other commodity (as the case may be) to the pipeline assuming that the proponent(s) are able to demonstrate that the would-be shippers had made long-term commitments with respect to most of the capacity of the proposed facility.[1]

1 The NEB would continue to be responsible for determining whether proposed oil exports are in the public interest in view of the outlook for domestic oil production and demand. But the decision to issue an export license would be left to the federal government.

The National Energy Board would, of course, continue to regulate tolls on pipelines that fall under federal jurisdiction.[2]

By way of example, the National Energy Board Act might remove the Board's mandate to consider opportunities for Canadians in the design and construction of a proposed pipeline. There are at least two reasons for this: the North America Free Trade Agreement was not in place when the National Energy Board Act was enacted; and it is generally recognized that employers should have the economic freedom to employee those skilled and unskilled workers who are best suited for the job.

Reducing the scope of the Board's involvement in matters such as these[3] would shorten the time required for the NEB to arrive at decisions on project applications. It would also result in lower regulatory compliance costs since the Board would no longer be required to assess information about the economic feasibility of a project, including the ability of the targeted markets to absorb the oil or gas to be exported.[4]

2 Discussion of the required policy framework might conclude that it makes sense to establish limits on the number of registered interveners who would be heard at a public hearing in order to prevent special-interest groups from dominating and prolonging the hearing process unnecessarily. This could be managed by allocating specified amounts of time to representatives of each of the stakeholder groups that have essentially the same arguments: the project proponents, other industry participants that are supportive, other industry representatives who are non-supportive, government departments and agencies, landowners, First Nations, "environmentalists," non-government organizations, and the general public. This would ensure that none of the stakeholder groups and no individuals would be able to command an inordinate amount of time to express their opinion. A balanced approach would, if necessary, allow the interveners as a group the same amount of time to make their arguments as the project proponents. As a consequence, the time required to complete the oral hearing process with respect to any project application could be limited to some reasonable time period.

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2 Potential shippers would be responsible for examining the range of tariffs (and therefore cost risks) that they could expect to face during the lifetime of the project and, on that basis, decide whether to enter into commercial arrangements with the project proponent.

3 Undoubtedly, more exhaustive scrutiny of the National Energy Board Act would identify other opportunities for improvement.

4 Before any revisions to the National Energy Act along the lines suggested here, more in-depth analysis would be required to ascertain that they would have no undesirable consequences.

3 A policy review might also conclude that limits should be established on the time that the National Energy Board or a Joint Review Panel may take to arrive at its reasons for decision in relation to project applications that fully address the NEB's or a panel's informational requirements. Depending on the scope (size and length), nature (new or an extension), and location (environmental factors) of a pipeline proposal, these might range from 6 months to a year from the date that a final application is filed.[5] In exceptional situations—say, applications to construct new, large-diameter, long pipelines in new, environmentally sensitive locations—more time might be granted.[6]

4 Further, the National Energy Board could consider convening "generic" public hearings if two or more similar project applications are likely to be brought forward during the next 10 to 20 years affecting the same regions of the country (Alberta and British Columbia, in this case). At such hearings the full range of public safety and environmental issues common to such projects could be examined with a view to determining the public safety and environmental protection measures that prospective project applicants would be expected to undertake. Generic hearings could also establish export market volumes, and so on and, therefore, eliminate the necessity for repeating the process with each application. In this manner, the extent to which fundamental issues would need to be addressed when reviewing specific, separate project proposals would be reduced.

5 Governments of the province(s) involved, First Nations organizations, and the federal government could meet with industry representatives to identify and approve transportation corridors to be used to transport crude oil or bitumen from the same regional points of origin (e.g., vicinity of Edmonton) to the same general destination points. The advance approval of transportation corridors would greatly reduce the potential number of land access and claim issues that have to be addressed. Further, such issues would only need to be considered in depth once—in relation to the first application that involves them rather than in each of a number of successive project applications.

The federal government should probably play the lead role in the identification of strategic energy transportation corridors with sufficient right of ways to accommodate all foreseeable projects. The need for consultation with

5 This assumes that the application is "complete" and contains all of the required information as set out in the application filing criteria.

6 The federal government's Responsible Resource Development plan targets limits of 24 months for panel reviews under the Canadian Environmental Assessment Act, and 18 months for projects under the National Energy Board Act. In our opinion, the "normal" limit should probably be a full year with prolongation beyond a year possible only under clearly defined circumstances.

First Nations organizations that would be directly affected by the construction and operation of new pipelines is, however, essential, and their reasonable concerns would need to be addressed. If the federal government, the governments of the provinces through which the corridors would pass, and the First Nations cannot reach agreement on routes for transportation corridors and on what constitutes fair compensation for the use of land to which those groups have ancestral or treaty title claims, then the government might consider project-specific legislation to break the impasse ensuring, of course, that fair compensation is provided.

Objections from First Nations

1 Project proponents should generally discuss their plans with any First Nations that would be directly affected well before their applications are filed with the NEB, a Joint Review Panel, or a provincial regulator. Although only government (the "Crown") is required to consult with First Nations about the possible impacts of proposed projects, early discussions initiated by project proponents would improve First Nations' understanding of what is being proposed before they hear about it "second hand." This would help to promote an element of trust with the First Nations that what the proponent will eventually put forward to government in the form of a formal project proposal will fully reflect their concerns.

If the regulatory body responsible for undertaking the environmental assessment finds that environmental risks, including legitimate concerns raised by First Nations, cannot be addressed, development should be refused. On the other hand, if the assessment were to conclude that the developmental and operational risks in relation to the environment that are raised by First Nations can be successfully addressed, and the project developers are willing to proceed knowing that they would be required to absorb the full costs of risk management and mitigation, then the review board or panel may decide to approve the project application if there is no other reason to reject it.[7]

2 Federal legislation and regulations that would provide for mandatory settlement (arbitration) mechanisms should be considered as a means of resolving disputes about compensation with First Nations that stand in the way of a project's proceeding if they remain unresolved a specified number of months following approval of a project application by the NEB or a joint

7 In the absence of treaties, or even where treaties have been signed, First Nations' counsel may argue that the Crown does not have authority to approve construction of a pipeline through their territories because of their "ancestral" rights. If this occurs, the matter may be left to the courts to decide.

panel.[8] If necessary to avoid inconsistencies with federal requirements in this regard, similar legislation could also be enacted in the provinces.[9]

Although First Nations (and others) may be adamantly opposed to arbitration as a means for settling disputes, in some instances it may be the only means to enable projects with substantial economic and social benefits to First Nations and to society as a whole to proceed. This may be necessary if First Nations are intransigent because of environmental or cultural concerns. Where the concern is about environmental issues, a decision enforced by arbitration or special legislation must ensure, of course, that the project proponents are prepared to repair any damage that is caused or to provide compensation if full repair is not possible as, for example, with oil spills. Where the opposition is based on spiritual perspectives—for example, where it is claimed by First Nations that they would betray their ancestors if they agreed to have the land altered in some way and that no amount of compensation would be acceptable—, there is no available alternative to arbitration.[10]

Environmental hazards

In order to reduce the risk of leaks in the pipelines that will be needed to transport crude oil from Alberta to west-coast Canadian or American ocean terminals for export to the Asia-Pacific region, and marine transportation oil spills, the following guidelines are put forward for consideration.

Pipeline transport

1 Require pipeline operators to undertake risk assessments in relation to High Consequence Areas (HCAs)[11] as part of their integrated management plans;

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8 No new legislation may be required if the Expropriation Act is sufficiently clear regarding the right to expropriate land to which a First Nation holds treaty rights in cases where the project proponent appears to have fully satisfied the obligation to consult with that First Nation. Where contested, though, this could, once again, be a matter for the courts to decide.

9 If the issue is provincial, provincial legislation specific to the issue of interest may be required.

10 If an impasse in relation to construction of a project that has been approved by the National Energy Board is not resolved or expected to be resolved quickly through arbitration, and the government believes that it is in the national interest to have the project built expeditiously, it may wish to consider promulgating special legislation to that end. To help to ensure that the legislation is not overturned by the Supreme Court, the government would need to explain why the project is important to the nation as a social and political organization and why it is in the nation's interest to have it proceed quickly. The political events surrounding passage of the 1956 "pipeline bill" (which allowed the TransCanada pipeline to be built by the government of Canada providing loan guarantees) suggests that the government might well be hesitant about taking such a step.

11 Typical HCAs are: high-population-density areas, difficult-to-evacuate facilities (such as hospitals or schools), and locations where people congregate (such as churches, office buildings, or stadiums).

2 ensure that environmental protection monitoring of pipeline operations is sufficiently frequent and thorough, using "smart pigs" (for example) to reduce the risk of ruptures;

3 eliminate the risks associated with crude-oil pipelines being operated at greater-than-approved pressures;

4 when oil leaks do occur, take appropriate steps to ensure that affected individuals are informed as quickly as possible about what has occurred, what mitigation measures are being used, and what they may be able to do to help to ensure that the risk to the environment is minimized.

Marine transport

A proactive risk management approach to lower the frequency and severity of oil tanker spills is warranted. Causes of previous marine oil-tanker accidents and the increase in global terrorism and hijackings on the high seas suggest that actions such as the following should be given consideration:

1 improvements in ship and terminal safety and security systems;

2 modifications and improvements in rules and procedures for the use of tanker escorts, vessel movement control zones, and safety procedures near ports and terminals;

3 improved surveillance and searches of personnel and visitors (when in port);

4 removal of unused and redundant offshore mooring and off-loading systems;

5 improved emergency response coordination and communications.

Environmental assessment

1 Joint federal-provincial environmental review processes should be considered in the case of all crude-oil transportation infrastructure projects that require approvals from both levels of government. Alternatively, as per the government of Canada's Responsible Resource Development plan, provincial reviews that meet the requirements of the Canadian Environmental Assessment Act should be substituted in place of a federal review.

2 Where federal government agencies in addition to the National Energy Board or Environment Canada (e.g., Fisheries and Oceans) may be responsible for managing environmental risk under specific legislation, then such agencies

and department(s) should be jointly responsible for carrying out an environmental assessment. That is, as suggested in the Responsible Resource Development plan, responsibility for environmental assessment should be consolidated under a single federal agency or, via equivalency provisions, ceded to a provincial environmental assessment that meets the key provisions of the Canadian Environmental Assessment Act.

5 Transportation alternatives

In view of the time and cost of the regulatory approval processes and the intense opposition by First Nations and environmentalists to construction of new oil pipelines, and the foregone benefits if oil sands bitumen does not acquire access to oil markets in the Asia-Pacific region, Canadian oil sands producers and developers should work closely with the railroads and the governments of Alberta, British Columbia, and Canada to determine whether and under what circumstances pipeline-by-rail systems using would be feasible for shipping crude oil to west-coast terminals for export to the Asia-Pacific region. The suggested involvement by governments is not meant to imply that governments should consider subsidizing rail or any other form of transportation. Rather, participation by provincial and federal government representatives (and municipal representatives as appropriate) would allow for direct and frank discussion of laws and regulations that may be inhibiting the development of pipeline-by-rail transportation.

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