

The climate implications of the proposed Keystone XL oilsands pipeline

by Nathan Lemphers

At a Glance

Canada's oilsands industry is growing quickly, with plans to nearly triple production from 1.8 to 5.2 million barrels a day by 2030.

To realize this substantial growth, pipelines to export markets are essential. TransCanada's Keystone XL pipeline from the oilsands to a new market on the U.S. Gulf Coast is the most significant proposal awaiting approval.

If built, Keystone XL will be a key driver for oilsands growth. Other alternatives to ship oilsands to the west or east coast of Canada will, for the short to medium term, play a less dominant role in accelerating oilsands development. These other proposals are smaller in pipeline capacity than Keystone XL, are in the very early stages of development, or face major public opposition.

Regardless of whether other oilsands transport options move ahead, approval of Keystone XL will lead to substantial expansion of oilsands production and therefore an increase in global greenhouse gas emissions.

Filling Keystone XL with oilsands will cause a 36 per cent increase from current oilsands production, for which the higher upstream emissions alone will be equivalent to the annual emissions from 6.3 coal-fired power plants or over 4.6 million cars. This value will be higher when the additional emissions from upgrading and refining in the U.S. are considered.

In the absence of a credible plan for responsible development of the oilsands, including mitigating GHG emissions growth to a level that would allow Canada to meet its international climate commitments, the United States should not go ahead with the proposed Keystone XL pipeline. It would send a clear signal to oilsands producers, the Canadian government and financial markets that the current high carbon content of oilsands has become a liability for future oilsands growth and the long-term competitiveness of the U.S. economy.

Canada's oilsands industry plans ambitious growth

Currently, operating oilsands projects produce around 1.8 million barrels of oil per day. However, as Figure 1 indicates, the federal and provincial governments have already given the green light to increase production to more than 5.2 million barrels per day. When announced and disclosed oilsands projects are added to approved projects, oilsands production could more than quintuple from current levels to over 9.3 million barrels per day.¹ While not all of this production capacity will be built in the near future, the Canadian Association of Petroleum Producers does project that oilsands production will surpass 5 million barrels per day by 2030.²

Note that this level of production was approved even before the federal and provincial governments overhauled the oilsands permitting system in 2012 in an effort to further accelerate the permitting process and reduce the environmental assessment “burden” for oilsands and pipeline projects. Future projects might receive approvals even more quickly than they do now, thus further increasing the rate of production.

Regardless of the rate at which production increases, all oilsands production is contingent upon a transportation plan to get the bitumen to market.

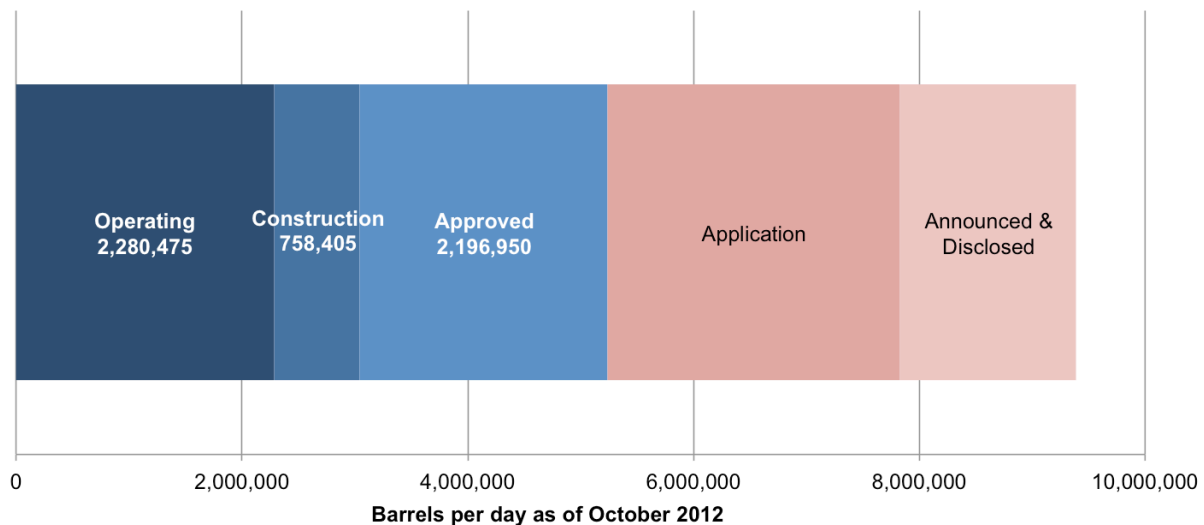


Figure 1: Planned expansion of Canada's oilsands, measured in barrels of bitumen produced per day.

Data source: Oilsands Review

Climate consequences of oilsands growth plans

As scientists are calling for a global decrease in greenhouse gas emissions to mitigate the impacts of climate change, oilsands emissions are growing rapidly. Figure 2 below illustrates the growth in absolute oilsands emissions resulting from extraction and upgrading in Canada from 1990 to 2010, and includes recent government projections for oilsands emissions in 2020. As

shown in the figure, from 1990 to 2010 the emissions from oilsands in Canada nearly tripled. The actual global emissions associated with oilsands is much higher, as these figures do not account for the emissions from raw bitumen transported, upgraded or refined in the United States. This trend of rapid growth will continue well into the next decade, with oilsands emissions expected to more than double again between 2010 and 2020.

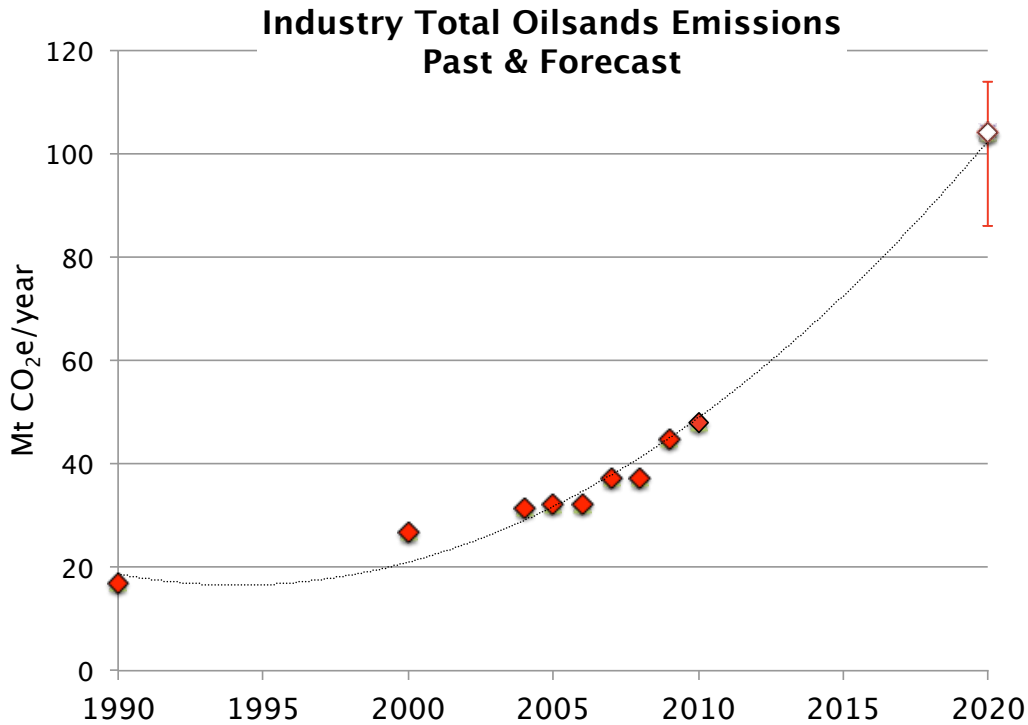


Figure 2: Actual and forecast emissions growth from oilsands extraction and upgrading in Canada.

Data source: Environment Canada³

Pipelines are the primary enabler of oilsands growth

Besides operating and capital cost increases and depressed market price for oilsands crude,⁴ pipelines are a key determinant of oilsands growth. Current constraints in pipeline capacity will reach critical levels as early as 2016, substantially limiting industry expansion plans according to a new report by CIBC World Markets Inc.⁵ TD, a major Canadian financial institution, has also recently warned investors that oilsands production growth cannot occur without additional pipelines out of Western Canada.⁶ This tightening bottleneck is the result of an unanticipated boom in shale oil output in the United States which is competing for space in pipelines transporting Canada’s growing oilsands production.⁷ Consequently, this lack of pipeline capacity for oilsands has depressed regional oil prices. The energy research firm Wood Mackenzie predicts that these low oil prices could ultimately threaten the commercial viability of oilsands projects.⁸ As a result, any additional pipeline capacity from Alberta will directly enable additional oilsands growth.

Oilsands production is significantly more GHG emission intensive than conventional oil production

In a comparison of production emissions only, the per-barrel greenhouse gas emissions associated with oilsands extraction and upgrading are estimated to be 220 to 350 per cent (3.2 to 4.5 times) higher than conventional crude oil produced in Canada or the United States.⁹

Full life cycle (well-to-wheels) calculations look at all processes, from extraction up to and including combustion (which accounts for around 80 per cent of total emissions). Looking at this scope, a comparison of oilsands emissions intensities from seven data sources to the EPA's 2005 U.S. baseline showed that average values for oilsands emissions range from eight to 37 per cent higher than the baseline.¹⁰

In this context, the project emissions from Keystone XL are significant. A U.S. Environmental Protection Agency analysis found that Keystone XL would cause up to 27.6 Mt in additional greenhouse gas emissions compared to existing sources of crude oil.¹¹

Keystone XL is the most significant pipeline proposed to date to facilitate oilsands growth

TransCanada’s proposed Keystone XL pipeline would, if approved, facilitate a significant increase in oilsands production both directly through increased pipeline capacity and indirectly by opening access to new markets that could offer higher prices for oilsands products.

Increased oilsands pipeline capacity

Additional pipeline capacity is critical for the continued growth of the oilsands industry. CIBC predicts existing pipeline capacity (3.7 million barrels per day) will be filled around 2016.¹²

To address this concern, a number of projects have been proposed to transport bitumen to market (Figure 3). Currently, there are two pipeline proposals to Canada’s west coast, two more to Canada’s east coast, several options for rail, a number of pipeline expansions to the U.S., and the largest proposal of them all, Keystone XL.¹³

If the oilsands industry is to realize its 5 million barrels per day production goal, all of these proposals will be needed. However, with a capacity of 830,000 barrels per day, Keystone XL is the largest and most significant proposed oilsands pipeline. If Keystone XL was filled, it would support over a 36 per cent increase in oilsands production.¹⁴

The upstream emissions alone from filling the Keystone XL pipeline is equivalent to the annual greenhouse gas emissions from 6.3 coal-fired power plants or over 4.6 million passenger vehicles.^{15,16} This number only accounts for the upstream greenhouse gas emissions associated with producing oilsands and does not include the higher emissions associated with transporting the oilsands or from refining or upgrading any additional oilsands in the United States.

A U.S. Environmental Protection Agency analysis found that Keystone XL would cause up to 27.6 Mt in additional or incremental greenhouse gas emissions compared to existing sources of crude oil.¹⁷ This estimate reflects the higher-than-average greenhouse gas emissions from extracting, transporting, upgrading and refining oilsands.

Proposed Project	Company	Capacity (bpd)	Location	Status
Keystone XL	TransCanada	830,000	Alberta to U.S. Gulf Coast	In application
Northern Gateway	Enbridge	525,000	Alberta to B.C. Coast	In application
TransMountain Expansion	Kinder Morgan	450,000	Alberta to B.C. Coast	Proposed
Line 9 Reversal	Enbridge	300,000	Ontario to Quebec	In application
East Coast Pipeline	TransCanada	625,000	Alberta to Atlantic Canada	Conceptual
Pipeline on Rail	CN Rail, CP Rail	20,000 (2011)	Multiple markets	Pilot stage

Figure 3: Proposed transportation options for oilsands

Source: CAPP¹⁸

Access to new markets and higher prices for oilsands products

Currently 99 per cent of all oilsands exports are to the United States. Nearly all of those exports are to refineries in the U.S. Midwest. Booming oilsands exports, combined with massive increases in U.S. shale oil production and declining U.S. oil demand, has caused a significant surplus of oil to accumulate in the U.S. Midwest. The result of this oil glut has been declining oil prices in that region compared to other regions in the U.S. and even lower prices for less desirable heavy sour crudes like those from the oilsands — although oilsands products are currently receiving a \$40 per barrel discount even compared to similar heavy sour crude blends like Mexican Maya, which should trade at parity. With almost no other markets available, oilsands producers are forced to accept the lower price or to scale back production. Some oilsands companies have already reduced production schedules and 2013 capital budgets to remain profitable in this environment.^{19,20}

Keystone XL would allow the oilsands producers both to access new markets and to receive a higher price for oilsands. The proposed pipeline would for the first time directly link Canada's oilsands with the refining complex on the U.S. Gulf Coast. Furthermore, since these refineries are at tidewater, oilsands production shipped via Keystone XL could then be exported easily via tanker to either coast of the U.S., the E.U. or even Asia.

A new pipeline to the U.S. Gulf Coast would also enable oilsands producers to arbitrage: to take advantage of price differentials among different markets by sending (or threatening to send) their product to the market with the highest price.

Approval of KXL would send a strong market signal for increased oilsands development

Keystone XL would increase pipeline capacity, access new markets, and raise the price paid by refiners for oilsands products. All three of these aspects send a strong market signal for accelerated oilsands development. The response to this signal is seen in the number of confirmed shippers on the proposed Keystone XL²¹ and the support of the pipeline by the broader oilsands industry²² and the governments of Alberta and Canada.²³

Oilsands are the fastest growing source of GHG emissions in Canada

Between 2010 and 2020, Canada's greenhouse gas emissions are projected to increase by 28 Mt.²⁴ In that same time period, emissions from the oilsands, including in situ, mining and upgrading, are expected to grow by 56 Mt.²⁵ Under these projections, many reductions made in other economic sectors are neutralized and reversed by the growth in oilsands emissions. In situ emissions are expected to grow from 18 Mt in 2010 to 55 Mt in 2020, a net increase of 37 Mt. By 2020, oilsands extraction and upgrading will make up 14 per cent of Canada's greenhouse gas emissions.²⁶

As **Figure 4** shows, between 2010 and 2020 the oilsands stand out as both the fastest growing source of emissions and the most significant across Canadian economic subsectors. As the flow of raw bitumen to the United States is expected to rapidly increase in the future, the global emissions associated with oilsands production and refining will be significantly higher.

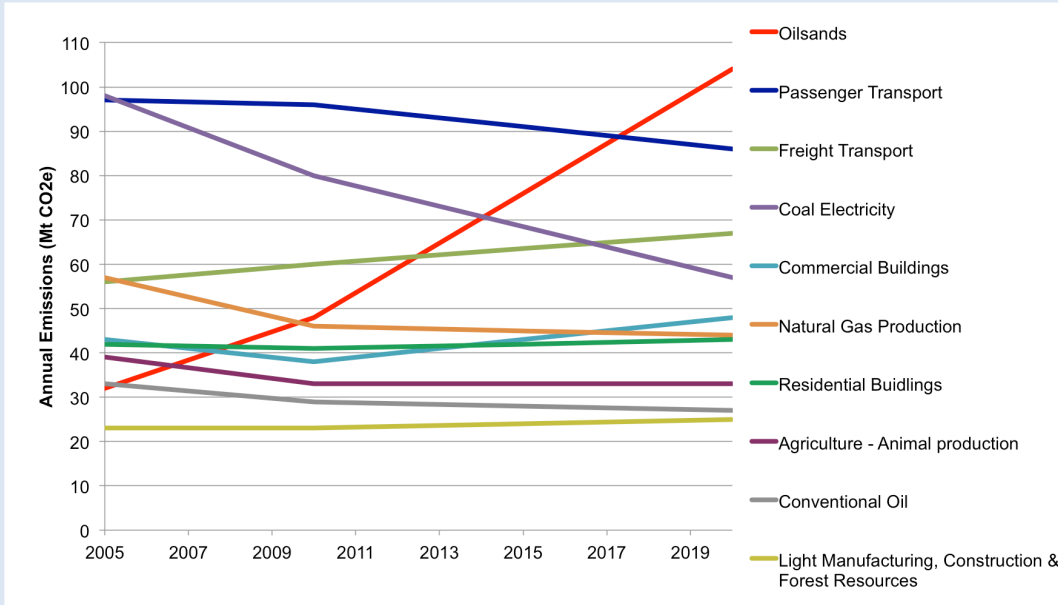


Figure 4: Oilsands greenhouse gas emissions (past and forecast) in Canada under existing policies compared to the other major economic sub-sectors

Data Source: Environment Canada²⁷

Alternatives to Keystone XL play a less dominant role in accelerating oilsands development

As mentioned above, there are a growing number of proposals to transport bitumen to market: two pipeline proposals to Canada's west coast, two more to Canada's east coast, several options for rail, and a few pipeline expansions to the U.S. including Keystone XL.²⁸ The other proposals individually do not offer the capacity of Keystone XL, are at earlier stages of development and face growing public opposition.

Alternative transport options smaller and at earlier stage of development

Compared to Keystone XL, other proposed transportation options for oilsands are smaller in scale and an earlier stage of development (Figure 3). While shipping by rail is in the pilot stages, in 2011, only 20,000 barrels of crude oil per day left western Canada on rail.²⁹ This volume may well grow in the future, but relative to large diameter pipelines, rail's contributions to total exports will remain very small.

Of the two proposed west coast pipelines, Kinder Morgan's TransMountain Expansion has not yet submitted an application to the government, and Enbridge's Northern Gateway is over a year and a half away from a federal government decision. The decision on Northern Gateway will likely be contested in courts for many years by concerned British Columbians and legally powerful First Nations groups. Even oil industry commentators and federal cabinet ministers who historically have been boosters of west coast pipelines have become less vocal in their support in recent months.³⁰

Major west-to-east oilsands pipelines are only at the conceptual stage. TransCanada's nascent proposal to retrofit and reverse an underutilized natural gas pipeline to carry 625,000 per day of bitumen to Eastern Canada is years away from application. While Phase 1 of the relatively smaller 240,000 barrel per day Enbridge Line 9 Reversal project has received federal approval, another segment of this project and a proposed capacity increase to 300,000 barrels per day still needs government approval. Regardless, the Line 9 Reversal project is significantly smaller than the proposed 830,000 barrel per day Keystone XL pipeline. This Enbridge project may also connect to a Montreal to Portland, Maine pipeline, for export to the United States. However, this proposal is already seeing growing public opposition in New England.

Intensifying public opposition

The U.S. National Transportation Safety Board's scathing report released July 2012 regarding Enbridge's reponse to the May 2010 Marshall, Michigan pipeline spill was a major turning point and caused several formerly supportive politicians to issue warnings to the company.³¹ Enbridge, who was likened in the report to the "Keystone Cops" and was said to have a "culture of deviance,"³² has pipeline proposals to the west and east coast of Canada.

For instance, regarding Enbridge's proposed Northern Gateway pipeline to British Columbia, the premier of that province has come out with a list of five demands addressing the economic benefits, aboriginal consultations and environmental risks from the pipeline.³³ In August, the United Church of Canada, the country's largest protestant denomination, "categorically rejected" the Northern Gateway pipeline.³⁴ In late October, a rally in British Columbia's capital saw 5,000 concerned Canadians gather in front of the legislature and a few days later there were rallies in 70 communities across British Columbia with more than 7,000 people participating.³⁵ Within the past few months, many conservative thought leaders in Western Canada are now calling for a 'time-out' on the pipeline which was originally proposed in 2005.^{36,37,38,39}

CIBC, a major Canadian financial services firm, now estimates that there is a 50 per cent probability that the west coast proposals by Enbridge and Kinder Morgan will not be built before 2020.⁴⁰

Enbridge's Line 9 Reversal Phase 1 project, which intends to ship bitumen to the east coast of Canada, has been delayed by over a year due to growing concerns from local communities, First Nations and environmental groups.

Neither Canada nor Alberta has adequate climate policies to counteract oilsands emissions growth

Alberta's carbon price on heavy emitters is too weak to provide an incentive for oilsands operators to meaningfully reduce greenhouse gas emissions. An oilsands facility must only reduce emissions by a maximum of 12 per cent at a maximum cost of \$15 per tonne, which works out to a net compliance cost of \$1.80 per tonne. In other words, compliance with Alberta's climate policies costs oilsands operators an equivalent of between 18 and 22 cents per barrel. As a consequence, the oilsands industry will continue to be the fastest growing source of greenhouse gas emissions in Canada.

One possible solution, capture and storage of oilsands carbon emissions, could be implemented on a large scale in the oilsands only if federal or provincial regulators make the technology mandatory for oilsands projects, scale up incentives, or put a price on emissions approximately five times higher than they have proposed to date. Current government approaches are not close to making this happen. Technology cost improvements on the necessary scale are similarly unlikely.

The current federal government has chosen not to pursue a price on carbon but rather is proceeding with sector-by-sector regulations to achieve emissions reductions. Progress has been made on vehicle and coal power plant regulations, but at this time there are no federal climate regulations for the oil and gas sector. Federal oil and gas climate regulations are anticipated to be drafted sometime in 2013, although it remains to be seen if they will be effective at reducing this sector's emissions. Given current federal and provincial actions, the federal government will miss its 2020 emission reduction target by 50 per cent, with oilsands emissions making up the largest part of this exceedance.

Conclusion

Keystone XL will increase global greenhouse gas emissions

Canada's oilsands industry has an ambitious long-term growth strategy that is inextricably linked to oil demand from the United States. This growth is projected to cause a doubling of the industry's climate emissions within the next decade and would be the central reason why Canada fails to meet its carbon reduction targets. To achieve this growth the oilsands industry relies on large export pipelines to transport bitumen to the United States. If the oilsands industry is to realize its 5 million barrels per day production goal by 2030, all existing pipeline proposals will need to be built.

Currently, however, TransCanada's proposed Keystone XL pipeline is the only major proposal for transporting bitumen to market in the near term. This pipeline would provide needed export capacity, diversify its market, and improve the profitability of oilsands production by capitalizing on the current price difference with lighter oils and oil pegged at higher international prices. These factors in turn would encourage increased investment in additional oilsands production.

Given its size, scope and market potential, the Keystone XL pipeline, if approved, would result in significantly increased oilsands production and increased global greenhouse gas emissions, regardless of whether other transportation options go ahead.

In the absence of a credible plan for responsible development of the oilsands, including mitigating GHG emissions growth to a level that would allow Canada to meet its international climate commitments, the United States should not go ahead with the proposed Keystone XL pipeline. It would send a clear signal to oilsands producers, the Canadian government and financial markets that the current high carbon content of oilsands has become a liability for future oilsands growth and the long-term competitiveness of the U.S. economy.

¹ Production of 9.3 million barrels per day of bitumen produces even more pipeable crude (dilbit and synthetic) in which case, takeaway capacity would need to be even higher than 9.3 million barrels per day to get the bitumen to market.

² Canadian Association of Petroleum Producers, *2012 CAPP Crude Oil Forecast, Markets & Pipelines Report*, 37.

³ Sources include: Environment Canada, National Inventory Report (1990-2008 & 1990-2010), and Environment Canada, *Canada's Emissions Trends*, (2012), 24. http://www.ec.gc.ca/Publications/253AE6E6-5E73-4AFC-81B7-9CF440D5D2C5/793-Canada's-Emissions-Trends-2012_e_01.pdf

⁴ Lack of pipeline capacity is also a major factor responsible for the current depressed market price.

⁵ Jeff Lewis, "New pipelines needed to hit oil sands growth targets: CIBC," *Alberta Oil*, September 21, 2012, <http://www.albertaoilmagazine.com/2012/09/new-pipelines-needed-to-hit-oil-sands-growth-targets-cibc/>

⁶ TD Economics, *Pipeline expansion is a national priority*, Special Report, December 17, 2012, http://www.td.com/document/PDF/economics/special/ca1212_pipeline.pdf

⁷ Scott Haggett, "Canada's 'Cushing moment': A northern pipeline crisis loom," *Reuters*, March 29, 2012, <http://uk.reuters.com/article/2012/03/29/uk-oil-idUKBRE82S04B20120329?feedType=RSS&feedName=GCA-GoogleNewsUK>

⁸ Nathan Vanderklippe, "Crude glut, price plunge put oil sands projects at risk," *The Globe and Mail*, June 4, 2012, <http://www.theglobeandmail.com/report-on-business/crude-glut-price-plunge-put-oil-sands-projects-at-risk/article4230759/>

⁹ National Energy Technology Laboratory, *Development of Baseline Data and Analysis of Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels*, DOE/NETL-2009/1346 (2008), 12.

¹⁰ Natural Resources Defense Council, *Setting the Record Straight: Lifecycle Emissions of Tar Sands* (2010), 2.

¹¹ United States Environmental Protection Agency, *Letter to Dr. Kerri-Ann Jones and Mr. Jose W. Fernandez, United States Department of State*, June 6, 2011, insideclimatenews.org/sites/default/files/EPAAnalysisStateDeptDraftEISJune2011INSIDECLIMATENEWS.pdf

¹² Jeff Lewis, "New pipelines needed to hit oil sands growth targets: CIBC," *Alberta Oil*, September 21, 2012, <http://www.albertaoilmagazine.com/2012/09/new-pipelines-needed-to-hit-oil-sands-growth-targets-cibc/>

¹³ For a more detailed summary of these options see: Canadian Association of Petroleum Producers, *2012 CAPP Crude Oil Forecast, Markets & Pipelines Report*.

¹⁴ This assumes a) 80 per cent of oil shipped in the pipeline would be diluted bitumen and 20 per cent would be synthetic crude oil b) a 72:28 bitumen to diluent ratio and c) current oilsands production is 1.776 million barrels per day (2012 oilsands production estimate from 2012 CAPP Crude Oil Forecasts, Markets and Pipelines Report).

¹⁵ The estimated amount of upstream greenhouse gas emissions would be 22.4 Mt. Pembina calculations are based on the following assumptions: a) An 80:20 diluted bitumen to synthetic crude oil (SCO) ratio of product is realistic given i) the capacity of U.S. Gulf Coast refiners to accept heavy sour crudes, ii) much of the growth in oilsands production will be diluted bitumen and iii) larger refinery margins with diluted bitumen b) Bitumen for SCO is derived 89 per cent from mines and 11 per cent from in situ projects (ERCB ST-98 2011) c) Bitumen for diluted bitumen is 100 per cent from in situ d) Diluted bitumen is 72 per cent bitumen and 28 per cent condensate and e) emissions are based on average life cycle emission factors taken from existing literature that reflects current/recent past emissions intensities.

¹⁶ Calculated from the U.S. EPA Greenhouse Gas Equivalencies Calculator. <http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results>

¹⁷ Based on a comparison to Middle Eastern sour crude oil as examined in the Keystone XL FEIS (pg. 3.14-55). United States Environmental Protection Agency, *Letter to Dr. Kerri-Ann Jones and Mr. Jose W. Fernandez, United States Department of State*, June 6, 2011, insideclimatenews.org/sites/default/files/EPAAnalysisStateDeptDraftEISJune2011INSIDECLIMATENEWS.pdf

¹⁸ Canadian Association of Petroleum Producers, *2012 CAPP Crude Oil Forecast, Markets & Pipelines Report*.

¹⁹ Nathan Vanderklippe, "Suncor pulls back on growth ambitions," *The Globe and Mail*, July 25, 2012, <http://www.theglobeandmail.com/globe-investor/suncor-pulls-back-on-growth-ambitions/article4439872/>

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²⁴ *Canada's Emissions Trends* (2012), 19. Note: This decrease includes the 25 Mt reduction contributed by the reporting of the Land Use, Land-Use-Change and Forestry sector (LULUCF).

²⁵ *Ibid.* 24.

²⁶ *Ibid.* 20, 24.

²⁷ *Canada's Emissions Trends* (2012), 24.

²⁸ For a more detailed summary of these options see: Canadian Association of Petroleum Producers, *2012 CAPP Crude Oil Forecast, Markets & Pipelines Report*.

²⁹ Canadian Association of Petroleum Producers, *2012 CAPP Crude Oil Forecast, Markets & Pipelines Report*.

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