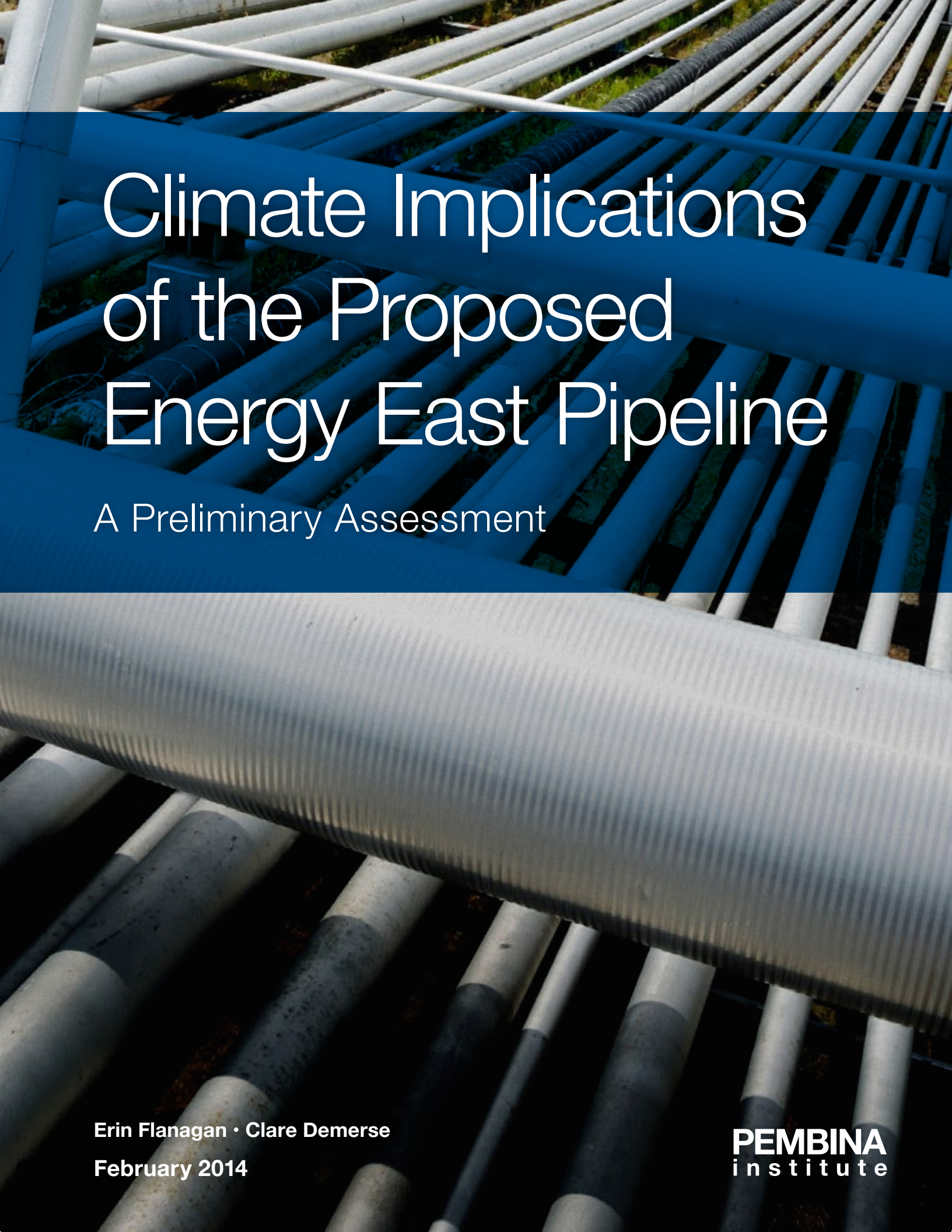

Climate Implications of the Proposed Energy East Pipeline

A Preliminary Assessment

Erin Flanagan · Clare Demerse

February 2014

PEMBINA institute

Climate Implications of the Proposed Energy East Pipeline

A Preliminary Assessment

Erin Flanagan • Clare Demerse

February 2014

Embargoed until February 6, 2014

PEMBINA
institute

Climate Implications of the Proposed Energy East Pipeline: A Preliminary Assessment
Erin Flanagan and Clare Demerse
February 2014

Cover photo: iStock

Recommended citation: Flanagan, Erin and Clare Demerse, *Climate Implications of the Proposed Energy East Pipeline: A Preliminary Assessment*. The Pembina Institute, 2014.

ISBN 1-897390-39-4

The Pembina Institute
219 19 Street NW
Calgary, AB
Canada T2N 2H9
Phone: 403-269-3344

Additional copies of this publication may be downloaded from the Pembina Institute website, www.pembina.org.

About the Pembina Institute

PEMBINA institute

The Pembina Institute is a national non-partisan think tank that advances clean energy solutions through research, education, consulting and advocacy. We have spent close to three decades working to reduce the environmental impacts of Canada's energy production and use in several key areas:

- driving down energy demand by encouraging energy efficiency and transportation powered with cleaner energy sources;
- promoting pragmatic policy approaches for governments to avoid dangerous climate change, such as increasing the amount of renewable energy plugged into our electricity grids;
- and — recognizing that the transition to clean energy will include fossil fuels for some time — advocating for responsible development of Canada's oilsands and shale gas resources.

For more information about the Pembina Institute, visit www.pembina.org.

Donate to the Pembina Institute

Donate

The Pembina Institute equips thought leaders and key decision makers with independent analysis of environment and energy policy issues. Please help us lead Canada's transition to a clean energy future by donating today. www.pembina.org/donate.

Acknowledgements

The authors wish to acknowledge the important contribution of our expert reviewers. Thanks to Dale Beugin (Sky Curve Consulting); Brendan Haley (Carleton University — School of Public Policy); Shelley Kath (independent consultant); and Nicholas Rivers (University of Ottawa) for contributing their expertise and advice. Errors and omissions remain the responsibility of the authors.

Our sincere appreciation to our Pembina colleagues for their expertise and hard work on this project, particularly Jen Grant, Matt Horne, PJ Partington, Simon Dyer, Jason Switzer, and Ed Whittingham for their helpful review comments and Bernard Rudny, Roberta Franchuk, Steven Cretney and Julia Kilpatrick for their strategic communications expertise and assistance.

Climate Implications of the Proposed Energy East Pipeline

A Preliminary Assessment

Contents

List of Figures

List of Tables

Executive summary

In August 2013, energy infrastructure company TransCanada announced its intention to build a $12 billion pipeline and export terminal project called Energy East.[1] The proposed route would run from Hardisty, Alberta, to the Canaport crude terminal near Saint John, New Brunswick. The pipeline would have the capacity to transport 1.1 million barrels per day of crude oil, including oilsands and conventional crude production.[2]

If it proceeds as proposed, Energy East would be a very significant new piece of oil transportation infrastructure. Indeed, Ontario's Minister of Energy, Bob Chiarelli, called the proposal "certainly the most significant east-west energy transportation initiative in a generation" and "the largest pipeline project in Canada in over 50 years."[3]

This report provides an initial assessment of one of the potential environmental consequences of the proposed pipeline: the effect of Energy East on Canada's greenhouse gas (GHG) emissions. Although pipeline infrastructure, such as pump stations, produces greenhouse gases, the overwhelming majority of the emissions associated with oil pipelines come from the product those pipelines carry. These GHG emissions occur both upstream and downstream of the pipeline itself.

While the precise mix of crude oils that the Energy East pipeline would transport is not yet known, it's clear that oilsands products would make up a significant part of the pipeline's contents from the outset.

While conventional oil production in Canada is projected to plateau by 2015 and remain flat to 2030, oilsands producers plan to nearly triple their production between 2012 to 2030.[4] Thus, over time, the share of Energy East's capacity devoted to shipping oilsands would be likely to increase.

Oilsands production is Canada's fastest-growing source of the GHG pollution that causes climate change. According to Environment Canada, oilsands GHG emissions are projected to nearly triple between 2005 and 2020, an increase large enough to cancel out all emission reductions that other parts of Canada's economy are projected to make over the same period.

---

[1] TransCanada, "TransCanada to proceed with 1.1 million barrel/day Energy East pipeline project to Saint John," news release, August 1, 2013. http://www.transcanada.com/news-releases-article.html?id=1746092

[2] TransCanada's Energy East website states that the pipeline would "move a variety of crude types, including conventional crude oil, diluted bitumen and synthetic crude oil." See "Oil 101," *Energy East.* http://www.energyeastpipeline.com/home/oil-101/

[3] Remarks for the Honourable Bob Chiarelli, Minister of Energy, Energy East Pipeline Announcement (November 13, 2013). Available at http://files.news.ontario.ca.s3-website-us-east-1.amazonaws.com/mei/en/learnmore/ensuring_energy_east_pipeline_benefits_ontario/Energy%20East%20Pipeline%20Announcement-Remarks.pdf

[4] Canadian Association of Petroleum Producers, *2013 Crude Oil Forecast, Markets & Transportation* (2013), i. http://www.capp.ca/getdoc.aspx?DocId=227308&DT=NTV

The Energy East pipeline would represent approximately a one-third increase in the capacity of the pipeline network carrying crude out of western Canada today, thus significantly increasing oilsands producers' access to markets. Crucially, Energy East would also carry oilsands to tidewater, where it could be exported on ocean-going tankers to wherever it fetches the best price.

By providing predictable access to desirable markets for oilsands products, a large-capacity pipeline like Energy East would make the economics of oilsands production more compelling — and thus help to unlock the GHG emissions that increased production would create.

Our assessment quantifies only the emissions from producing the crude that would fill the pipeline. By not including emissions that occur after the crude leaves the pipeline — those from refining the crude and then burning the finished product — we exclude the vast majority its life cycle emissions impact. However, our decision to focus on upstream emissions means that our analysis concentrates on emissions that take place in Canada.

The same cannot be said of the downstream emissions that would be associated with Energy East. At this point, it is far from clear that the bitumen transported on Energy East would be refined in Canada. Of the three refinery facilities that TransCanada plans to connect to the pipeline, none is currently equipped to refine extra heavy oil.

TransCanada's current plan would see the Energy East pipeline also transport lighter crudes, and eastern Canadian refineries can process those products. However, the capacity of the Energy East pipeline proposal is greater — by a significant margin — than the current capacity of the three Canadian refineries it would connect to. Thus, in order to produce a conservative assessment focused on the GHG impacts in Canada, we have left refining emissions outside of our analysis.

Similarly, given oilsands companies' focus on reaching world markets via tidewater, it is likely that a significant fraction of the emissions from burning the crude oil transported on Energy East will occur outside Canada's borders once the oil is exported.

Because the precise contents of the proposed pipeline are not known, we modelled a range of emissions scenarios. Our assumptions produce a preliminary estimate of the Energy East proposed pipeline's **upstream GHG impact of between 30 and 32 million tonnes of annual emissions.**

For an individual piece of infrastructure, this is a very significant impact. It is equivalent to the annual emissions of adding over 7 million cars to Canada's roads, which is approximately the total number of cars on the road in the province of Ontario.[5] The volume of new oilsands production associated with the Energy East pipeline's capacity would represent a 34 to 39% increase from current (2012) oilsands production levels.

As a result of these very significant GHG implications, we recommend that any regulatory review of the Energy East proposal should include upstream impacts — the environmental consequences of producing the products that would flow through the pipeline — within its scope.

[5] Statistics Canada's Canadian Vehicle Survey (2009) indicates that Ontario had 7.2 million light duty vehicles (vehicles under 4.5 tonnes) on the road in 2009. See Table 3-1, http://www.statcan.gc.ca/pub/53-223-x/2009000/t058-eng.pdf.

In addition, we recommend that the federal government adopt stringent regulations to reduce oil and gas sector GHG emissions.[6] Such regulations are urgently needed to curb Canada's fastest-growing source of GHG emissions and to help get Canada on track for its national 2020 climate target. Stringent emission regulations in the oil and gas sector would also provide the incentive companies need to invest in significant improvements to their emissions performance.

Overview of the report

This report describes the Energy East proposal in Section 1. Section 2 covers the projected GHG growth in the oilsands in the context of Canada's national emission picture. Section 3 describes the link between pipeline proposals and oilsands production growth. Section 4 provides an overview of our methodology in assessing the Energy East pipeline proposal's upstream GHG emissions impact, and Section 5 presents our conclusions. (Additional information about calculations is provided in Appendix B.) Section 6 offers recommendations to address some of the issues raised in this analysis. Appendix A lists some areas for further research.

[6] Pembina's recommendations for federal oil and gas sector GHG regulations can be found in *Getting on Track for 2020: Recommendations for greenhouse gas regulations in Canada's oil and gas sector* (2013) (http://www.pembina.org/pub/2427) and *Key issues to watch in federal oil and gas climate regulations* (2013) (http://www.pembina.org/pub/2456).

1. The Energy East proposal

In August 2013, energy infrastructure company TransCanada announced its intention to build a $12 billion pipeline and export terminal project called Energy East.[7] The proposed route would run from Hardisty, Alberta to the Canaport crude terminal near Saint John, New Brunswick. The pipeline would have capacity to transport 1.1 million barrels per day (bpd) of crude oil, including oilsands and conventional crude production.

The Energy East project would involve both converting 3,000 kilometres of existing natural gas pipeline so that it can transport crude oil, and building over 1,400 kilometres of new pipeline. TransCanada also proposes to build four new terminals to service the pipeline: in Hardisty, Alberta; in Saskatchewan; on the Saint Lawrence River near Rivière-du-Loup; and in the Saint John, New Brunswick area. The Quebec and New Brunswick marine terminals could facilitate the export of crude by tankers.[8]

TransCanada has yet to file detailed regulatory documents, but its current timeline would see the project, if approved, ready to deliver crude to Québec in 2017 and to New Brunswick in 2018.[9] If it proceeds as proposed, Energy East would be an extremely significant new piece of oil transportation infrastructure. Indeed, Ontario's Minister of Energy, Bob Chiarelli, called the proposal "certainly the most significant east-west energy transportation initiative in a generation" and "the largest pipeline project in Canada in over 50 years."[10]

Recent oilsands pipeline proposals — most notably the Northern Gateway and Keystone XL — have become flashpoints in the public debate about energy development and its environmental impacts. Canadians (and, in the case of Keystone XL, Americans) have raised concerns in very significant numbers about the risks of oil spills, the potential impact on the local environment, and the climate change impacts associated with oilsands development. In recent months, a series of derailments and explosions of trains carrying crude have added new urgency to the public debate about North America's energy infrastructure.

In light of that ongoing debate, and because of its scale, we expect that the Energy East proposal will draw significant scrutiny from Canadians.

---

[7] "TransCanada to proceed with 1.1 million barrel/day Energy East pipeline project to Saint John."

[8] TransCanada, "The Project." *Energy East.* http://www.energyeastpipeline.com/about/the-project/ (accessed December 2013)

[9] TransCanada, "Timeline." *Energy East.* http://www.energyeastpipeline.com/home/timeline/ (accessed December 2013)

[10] Chiarelli, Energy East Pipeline Announcement.

2. Oilsands greenhouse gas emissions in context

This report provides an initial assessment of one of the potential environmental consequences of the proposal: the effect of Energy East on Canada's[11] greenhouse gas (GHG) emissions.

In thinking about the environmental impact of a pipeline proposal, many Canadians' first consideration might be the risk of an oil spill if the pipeline is damaged or if a tanker leaks. Pipeline safety and integrity are crucial questions, and any regulatory review of the Energy East proposal would need to address these comprehensively.

But climate change concerns have also become an essential component of the public debate about pipelines. Although pipeline infrastructure, such as pump stations, produces greenhouse gases, the GHG impact of pipelines extends well beyond the pipeline route. The overwhelming majority of the GHG emissions associated with oil pipelines come from the product those pipelines carry. These GHG emissions occur both upstream and downstream of the pipeline itself.

To date, the most high-profile link between pipeline proposals and GHG emissions has been U.S. President Barack Obama's June 2013 "climate test" for another TransCanada proposal, the Keystone XL pipeline. In a speech at Georgetown University, President Obama declared that he would consider that proposal to be in the U.S. national interest only if it does not "significantly exacerbate" the problem of carbon pollution. Thus, the "net effects of the pipeline's impact on our climate will be absolutely critical to determining whether this project is allowed to go forward."[12]

Climate change has already been linked explicitly to the consideration of the Energy East pipeline proposal. In announcing a review of the proposal's impact on Ontarians to be conducted by the Ontario Energy Board, Energy Minister Bob Chiarelli stated that the province wants to ensure that "ecological and environmental experts who are concerned about the impact on the natural environment and climate" inform its participation in the pipeline's regulatory review.[13]

While the precise mix of crude products that the Energy East pipeline would transport is not yet known, it's clear that oilsands products would make up a significant part of the pipeline's

---

[11] Emissions from producing the oilsands and other crudes that would go into the pipeline would be generated in Canada, with the exception of oil production in the Bakken region of North Dakota. Thus, the majority of GHG emissions upstream of the pipeline would be attributed to Canada's emissions inventory. Given the uncertainty about where the crude transported in Energy East would be refined, and how much of that refined product would ultimately be consumed outside of Canada, many of the downstream emissions associated with Energy East — i.e. those after the crude leaves the pipeline — would occur in other countries. Thus, although these downstream emissions could still be considered as being linked to Energy East, they would fall into other countries' emissions inventories under the UN Framework on Climate Change accounting system.

[12] Remarks by the President on Climate Change, Georgetown University, June 25, 2013, http://www.whitehouse.gov/the-press-office/2013/06/25/remarks-president-climate-change.

[13] Chiarelli, Energy East Pipeline Announcement.

contents. TransCanada's Energy East website states that the pipeline would "move a variety of crude types, including conventional crude oil, diluted bitumen and synthetic crude oil."[14]

What are diluted bitumen and synthetic crude oil?

The hydrocarbon extracted in the oilsands is called bitumen. Because of its thick consistency, it must be diluted with a product called condensate to flow in pipelines, and that mixture of non-upgraded bitumen and condensate is called diluted bitumen or dilbit. Synthetic crude oil (SCO) is the term used to described oilsands bitumen that has been upgraded to a consistency where it can flow in pipelines without the use of condensates.

While conventional oil production in Canada is projected to plateau by 2015 and remain flat to 2030, oilsands producers plan to nearly triple their production between 2012 to 2030.[15] Thus, over time, the share of Energy East's capacity devoted to shipping oilsands would be likely to increase.

Oilsands production is Canada's fastest-growing source of the GHG pollution that causes climate change. According to Environment Canada, oilsands GHGs are projected to nearly triple between 2005 and 2020, growing from 34 million tonnes (Mt) in 2005 to 101 Mt in 2020.[16] This increase is large enough to cancel out all emission reductions that other parts of Canada's economy are projected to make over the same period, as illustrated in Figure 1 below.

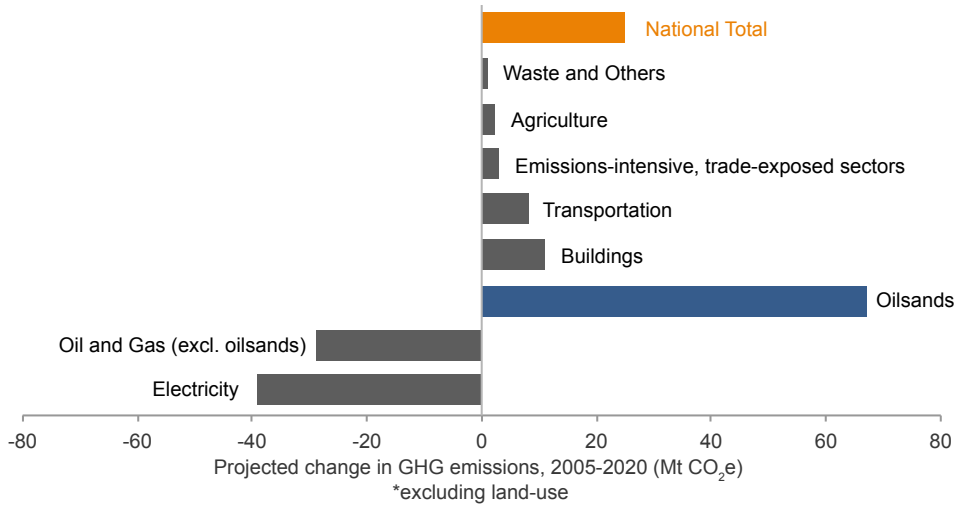

Figure 1. Change in GHG emissions by economic sector, 2005-2020

Data source: Environment Canada[17]

[14] "Oil 101," *Energy East.*,

[15] *2013 Crude Oil Forecast, Markets & Transportation*, i.

[16] Environment Canada, *Canada's Emissions Trends 2013* (2013), 25. http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=1723EA20-77AB-4954-9333-69D1C4EBD0B2. The projected oil and gas production levels in *Emissions Trends* rely on National Energy Board forecasts which, like those of the Canadian Association of Petroleum Producers, implicitly assume that the necessary transportation infrastructure to move oilsands to markets is constructed (personal communication, Environment Canada).

[17] *Canada's Emissions Trends 2013*.

In the absence of emission reduction policies strong enough to achieve the national target, the expectation of rapidly increasing production in the oilsands sector is the primary reason for the projected growth in Canada's emissions to 2020. To put it another way, the projected growth in greenhouse gas pollution from the oilsands is the single largest barrier to achieving Canada's national 2020 climate target.

Despite improved per-barrel efficiencies and technological changes, total GHG emissions from the oilsands are closely linked to the rate of development of the oilsands resource. Between 2005 and 2011, bitumen production increased 64%[18] and GHG emissions from the oilsands sector increased by 62%.[19] Production is forecast to reach twice the 2011 level by 2020,[20] with emissions nearly doubling as well.[21]

[18] Energy Resources Conservation Board, *ST98-2013: Alberta's Energy Reserves 2012 and Supply/Demand Outlook 2013-2022* (2013). http://www.aer.ca/documents/sts/ST98/ST98-2013.pdf

[19] Environment Canada, *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2011* (2013), Table 2-13.

[20] *ST98-2013*.

[21] *Canada's Emissions Trends 2013*, Table 6.

3. New pipelines and new oilsands development

3.1 Increasing access to markets

There's a reason pipelines have been in the news so often lately: companies operating in the oilsands are producing more and more bitumen, and they're running out of pipeline space to transport it to markets.

The oil and gas industry anticipates a significant increase in Canadian crude oil production in the years ahead, with the oilsands accounting for the overwhelming majority of that growth.

But as the Canadian Association of Petroleum Producers (CAPP) — the industry association representing oil and gas producers in Canada — noted in a 2013 market assessment, "Western Canadian supplies are essentially landlocked and will need additional transportation infrastructure to bring this growing oil supply to markets."[22] Partly as a result of growth in crude oil production in the United States, which now competes for space with oilsands on the existing transportation networks, CAPP foresees that "additional transportation capacity exiting western Canada will be required by 2014."[23]

Energy and infrastructure companies have responded to this demand with proposals to build new pipelines and to convert existing lines to move crude oil, as well as by building new crude-loading rail terminals. The current list of pipeline proposals includes Enbridge's Northern Gateway, TransCanada's Keystone XL, Kinder Morgan's Trans Mountain expansion, and the reversal of Enbridge's Line 9B, along with TransCanada's Energy East.

Under the assumption that "transportation capacity can grow to accommodate the projected increase in supply," CAPP's forecast shows oilsands production growing from 1.8 million barrels per day (bpd) in 2012 to 5.2 million bpd by 2030.[24]

But that growth is not inevitable. Companies and oilsands investors weigh a large number of factors when they make decisions about whether to invest in increasing oilsands production via new projects or expansions. Labour costs, projected future demand and market prices for crude oil products, access to capital, and royalty/tax requirements — to name just a few — are likely to play a role in companies' decision-making.

While these and other considerations influence the pace and scale of oilsands development, it is indisputable that reliable access to affordable crude transportation makes oilsands investments more appealing. Conversely, uncertainty about — or constraints on — the future availability of crude transportation would act as a brake on oilsands expansion.

---

[22] *2013 Crude Oil Forecast, Markets & Transportation*, iv.

[23] Ibid., 20 and 31.

[24] Ibid., iv, i.

In its 2013 energy supply and demand forecast, Canada's National Energy Board (NEB) put it this way: "Many market observers have noted that expectations for continued growth in oil sands and tight oil production are dependent on adequate transportation infrastructure being in place and sufficient markets for crude oil being found. If these assumptions do not hold, pipeline constraints and price differentials will likely impact oil producers, and the broader energy system, in coming years."[25]

By providing predictable access to markets for oilsands products, a large-capacity pipeline like Energy East would make the economics of oilsands production more compelling. Indeed, by virtue of its size, Energy East alone would represent a notable increase in the capacity of the pipeline network carrying crude out of western Canada today. Currently, crude oil pipeline takeaway capacity from western Canada is approximately 3 million bpd.[26] The 1.1 million bpd Energy East proposal would represent approximately a one-third increase in this capacity, thus significantly increasing oilsands producers' access to markets.

3.2 Reaching global markets

Crucially, Energy East would also carry oilsands to tidewater, where it could be exported on ocean-going tankers to wherever it fetches the best price. That includes the "emerging markets" — fast-growing economies such as those in India and China — that have become a priority for oilsands producers. It also includes countries that have pre-existing refining equipment capable of processing extra-heavy crudes, such as Spain.[27]

As CAPP wrote in its 2013 market forecast, "demand for oil in North America is either flat or even declining but the demand for crude oil and petroleum products in the Asia-Pacific countries comprising the fastest growing in the world." Tidewater would give oilsands companies access to "what is now the world's premium crude oil market," while, conversely, "[c]ontinued delays in establishing tidewater access could translate into a foregone opportunity to serve these large markets."[28]

[25] National Energy Board, *Canada's Energy Future 2013: Supply and Demand Projections to 2035* (2013), 13. http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyftr/2013/nrgftr2013-eng.pdf

[26] Deloitte and Touche LLP, *Energy East: The economic benefits of TransCanada's Canadian Mainline conversion project* (2013), 10. http://www.energyeastpipeline.com/wp-content/uploads/2013/09/Energy-East-Deloitte-Economic-Benefits-Report.pdf

[27] Jeff Lewis, "TransCanada to proceed with Energy East pipeline project, deepwater port in Atlantic Canada," *Financial Post / Vancouver Sun*, August 1, 2013. http://www.vancouversun.com/business/energy/TransCanada+proceed+with+Energy+East+pipeline+project/8738585/story.html?__lsa=c1a1-b95e

[28] *2013 Crude Oil Forecast, Markets & Transportation*, 19.

Figure 2. Map of proposed Energy East pipeline route

Source: TransCanada[29]

Indeed, TransCanada's success in attracting customers for the Energy East pipeline proposal provides indirect confirmation of the appeal of tidewater access for Western Canadian oil producers. In August 2013, the company announced that it had secured firm long-term contracts for 900,000 bpd of Energy East's 1.1 million bpd capacity.[30]

By opening up affordable access to desirable markets, the Energy East pipeline would make the economic case for growth in oilsands production more compelling — and thus help to unlock the GHG emissions that production would create.

[29] TransCanada, "Route Map," *Energy East.* http://www.energyeastpipeline.com/home/route-map/

[30] "TransCanada to proceed with 1.1 million barrel/day Energy East pipeline project to Saint John."

Q and A: Pipelines and oilsands production

The connection between pipelines and growth in oilsands production has been the subject of heated debate in recent months. While this report sees a clear link between pipeline construction and expanded oilsands production, some have argued that new pipelines would have virtually no impact on oilsands production because the oilsands will be developed whether or not new pipelines are built.

An important recent example of this line of reasoning is the U.S. State Department's March 2013 draft supplemental environmental impact statement for the Keystone XL pipeline proposal. The assessment concluded that, in light of global demand for oil and the availability of other transportation options (notably rail), the "approval or denial of the proposed Project is unlikely to have a substantial impact on the rate of development in the oil sands."[31]

That line of reasoning relies on some key assumptions about other transportation options and about oil demand. In this section, we provide responses to some of those assertions.

Even if a given pipeline isn't built, won't the oil just get to market on other pipelines? In that case, a pipeline wouldn't actually be responsible for any new emissions.

Although current pipeline capacity out of western Canada is nearly full, Energy East is just one of many proposals for new pipelines. Keystone XL, Northern Gateway, and Trans Mountain are all significant proposals that could increase pipeline capacity exiting the oilsands and give oilsands producers increased access to desirable markets. If you assume that all the others will go ahead, it might appear that taking one option off the menu wouldn't matter much.

However, each of the major proposals faces at least some uncertainty in its prospects. Moreover, CAPP's production forecast is so large that every pipeline proposal currently on the books is still inadequate to transport all the bitumen that the industry hopes to produce.[32] This is illustrated in Figure 3 below.

[31] U.S. Department of State, *Keystone XL Project —Draft Supplemental EIS* (2013), Executive Summary, ES-15, http://keystonepipeline-xl.state.gov/documents/organization/205719.pdf. State Department's Final Supplemental Environmental Impact Statement, released in January 2014, also concluded that "approval or denial of any one crude oil transport project, including the proposed Project, is unlikely to significantly impact the rate of extraction in the oil sands." Unlike the draft document, however, the final statement found that under a specific set of circumstances "higher transportation costs could have a substantial impact on oil sands production levels — possibly in excess of the capacity of the proposed Project." U.S. Department of State, *Final Supplemental Environmental Impact Statement for the Keystone XL Project* (2014), Executive Summary, ES-16 and ES-12, http://keystonepipeline-xl.state.gov/documents/organization/221135.pdf

[32] CAPP's production forecast assumes that "transportation capacity can grow to accommodate the projected increase in supply." (*2013 Crude Oil Forecast, Markets & Transportation*, iv.)

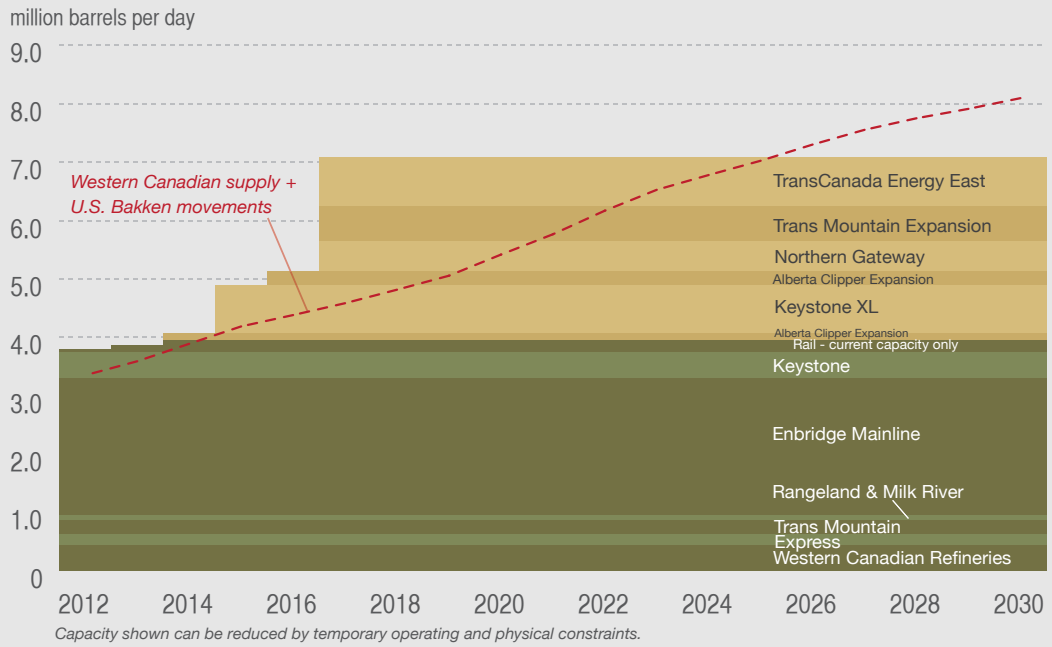

Figure 3. Supply forecast and pipeline capacity

Source: CAPP[33]

Thus, in order to achieve its production goals, the oilsands sector doesn't need Energy East *or* the other pipelines but Energy East *and* all the other proposed pipelines. In that context, a decision not to build any given pipeline would likely be linked to a slowdown in oilsands expansion.

What about transporting oilsands on rail?

In addition to large-capacity pipeline proposals like Keystone XL or Energy East, oilsands companies can consider moving their products on rail, and even on barge or on trucks.

However, as CAPP states in its 2013 crude market forecast, "pipelines will remain the preferred mode of transportation for crude oil."[34] Bitumen is harder to transport on trains than lighter crudes, requiring heated cars, and the long distances Alberta oil must travel make rail expensive.[35]

That's not to say that oilsands producers don't make use of rail. Canadian crude products already move on rail today, and the volumes have been growing.[36] But there is an important distinction between the transportation costs that existing producers are willing to pay and the conditions needed to encourage future production growth.

Once a company has spent the millions (often billions) of dollars needed to build and operate an oilsands facility, that company needs to get its product to market to recover those costs. If you've got bitumen to sell and no pipeline capacity readily available, it makes sense that to put that bitumen on rail: higher transportation costs (and thus lower profits) are better than not selling your product at all.

[33] *2013 Crude Oil Forecast, Markets & Transportation*, Figure 4.6, 31.

[34] *2013 Crude Oil Forecast, Markets & Transportation*, 31.

[35] In addition, a number of serious derailments and explosions of crude transported on rail have made new safety regulations in both the United States and Canada a likely prospect, potentially leading to higher costs and more community concern about the prospect of rail infrastructure expansion.

[36] *2013 Crude Oil Forecast, Markets & Transportation*, 29.

But if you were considering whether to build a new facility or expand production, access to reliable and lower-cost pipelines would help make the case that your expansion would be profitable. So while rail can be a complement and a stop-gap,[37] oilsands producers want to see large-capacity pipelines built to give them the confidence to invest in new operations.

When considering a pipeline proposal that would only be fully in service in 2018, and could operate for decades after that, it's not today's production that matters most. Instead, we need to consider what Energy East would mean to future oilsands production.

But as long as there is global demand for oil, won't companies keep producing it?

Yes — but it's not clear that Alberta's oilsands producers will be able to reach those markets.

The oilsands region is landlocked, with access to tidewater currently extremely limited. At present, virtually all of Canada's oil exports are headed to the United States. So until pipelines give oilsands companies access to tidewater, the state of global oil demand is not directly relevant for oilsands operators.

This situation helps to explain the urgency with which the oilsands industry, and supportive governments, has pursued increased market access through the construction of new pipelines.

In the past, the large appetite for oil in the United States meant that one customer was sufficient for Canada's production. But thanks to fuel efficiency policies as well as structural changes to the U.S. economy, U.S. oil demand is already dropping. At the same time, U.S. domestic oil production is growing. Canada's domestic market is far too small to absorb the production that oilsands companies envision for the future. Thus, a significant expansion of oilsands production depends on the ability to sell oilsands outside of the North American market.

Even if we set aside the transportation constraints on getting oilsands to global markets, however, it's not certain that global oil demand will always remain as strong as it is today. In a world that takes action to avoid dangerous global warming, demand for fossil fuels will fall from today's levels.

The International Energy Agency's (IEA's) 2013 energy outlook[38] concluded that the share of fossil fuels in the world's total primary energy demand would fall from 82% in 2011 to 64% in 2035 if countries adopt the policies needed to stay below 2°C of global warming, the threshold that most of the world's governments have identified as constituting dangerous climate change that should be avoided.

In that scenario, the world's demand for oil peaks in 2020 and dips to 13% below its 2011 level by 2035.

For the oilsands specifically, the IEA's 2010 World Energy Outlook showed that a far slower rate of oilsands development than current industry projections would be the result if the world takes strong action to curb climate change. Rather than reaching 3.2 million bpd in 2020 and 5.2 million bpd in 2030, as the industry's current projections show, the IEA's modelling found that 2.5 million bpd in 2020 and 3.3 million bpd in 2035 of oilsands production would occur if governments adopt the policies needed to stay below 2°C of global warming.[39]

If pipeline constraints mean the oilsands are not developed, won't other crudes just fill the gap? In that case, there would be no global emission benefit.

[37] Ibid.

[38] International Energy Agency, *World Energy Outlook 2013*, Chapter 2, Table 2.1. http://www.worldenergyoutlook.org/

[39] International Energy Agency, *World Energy Outlook 2010*, Chapter 4, Table 4.1. http://www.worldenergyoutlook.org/

That might be true if the oilsands were like most oil sources. But because of its physical and chemical composition, bitumen requires extra energy to extract and process. It is among the world's most emissions-intensive crudes.[40,41] For example, the State Department's Keystone XL assessment found that there would be an emission benefit whether oilsands imports were displaced by U.S. conventional crude or by imported crudes such as Mexican Maya, Venezuelan Bachaquero, or Middle Eastern Sour, with the size of the benefit ranging from 1.3 to 27.4 million tonnes annually.[42]

So while the greatest global climate benefit would come from consuming less oil, there is still a relative climate benefit to be gained by consuming less emissions-intensive crudes rather than oilsands bitumen.

It's important to note that the relative emissions impact of oilsands bitumen could be reduced if producers invest in GHG-reduction technologies such as carbon capture and storage. At present, Canada lacks the kind of stringent climate policies that would provide a strong incentive for those kinds of investments, but that could change over time.

[40] 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), 13, table 2-4. http://www.netl.doe.gov/energy-analyses/pubs/NETL LCA Petroleum-Based Fuels Nov 2008.pdf

[41] P.J. Partington and Marc Huot, *Oilsands, heavy crudes, and the EU fuel-quality directive* (Pembina Institute, 2012), 5, Figure 2.

[42] U.S. Department of State, *Final Supplemental Environmental Impact Statement for the Keystone XL Project* (2014), Chapter 4.14, Greenhouse Gases and Climate Change, 4.14-5 and 4.14.2-4. http://keystonepipeline-xl.state.gov/documents/organization/221190.pdf

4. Approach

Because the Energy East pipeline proposal is still preliminary, detailed project information is not yet available. As a result, we have relied on a set of assumptions to reach a preliminary estimate of the project's potential emissions impact.

We plan to revise our analysis as more specific information becomes available during the regulatory process. TransCanada plans to file both a pre-application and full application for its project with the National Energy Board (NEB) in the first half of 2014, which allows the regulator to determine whether a hearing under the *Canadian Environmental Assessment Act* (2012) is required.[43]

This section describes our specific analytical assumptions and approach.

4.1 Scope

Our assessment quantifies only the emissions generated to fill the pipeline (i.e. the upstream[44] emissions correlated to Energy East's expected throughput). The technical term for the scope of this assessment is "Well-to-Refinery Entrance Gate." Our analysis includes emissions associated with extracting oilsands (via mining or in situ production techniques) and with extracting conventional crude. For the fraction of the pipeline's capacity that would be filled with synthetic crude oil (SCO), we include the emissions associated with upgrading bitumen to SCO. All these GHGs would be emitted before the product would enter the proposed Energy East pipeline.

Geographically, extracting and upgrading bitumen would take place in Alberta. The conventional oil in the pipeline could be extracted in Alberta or from Bakken shale deposits under Saskatchewan and Manitoba, as the Energy East proposal includes an interconnection to feeder (smaller-gauge) pipelines in that region.[45, 46]

Our decision to assess only the Well-to-Refinery Entrance Gate emissions means we are capturing only a portion of the full GHG picture. The full life cycle emissions of the crude oil that would be transported in the proposed pipeline would be much greater than the upstream emissions included in this assessment. The subsequent stages in the product's life cycle include refining, transportation and combustion, all of which generate further GHG emissions. The final

---

[43] "Regulatory Process" and "Timeline" pages of TransCanada's Energy East project website, http://www.energyeastpipeline.com/home/regulatory-process/ and http://www.energyeastpipeline.com/home/timeline/ (accessed December 2013).

[44] The UNFCC defines upstream emissions as follows: GHG emissions associated with the production, processing, transmission, storage and distribution of a fossil fuel, beginning with the extraction of raw materials from the fossil fuel origin and ending with the delivery of the fossil fuel to the site of use. Our analysis uses a more limited version of this definition known as Well-to-Refinery Entrance Gate.

[45] Deloitte, *Energy East*, 7.

[46] While the pipeline could potentially contain some products extracted outside of Canada, our analysis currently assumed all production happens in Canada. Future studies could include GHG models that reflect products extracted outside of Canada.

stage in the life cycle — burning the oil, most often in vehicle engines — accounts for the vast majority of the fuel's emission impact. As illustrated in Figure 4 below, a "Well-to-Tank" emissions assessment would also include emissions from refining and distribution, while a full "Well-to-Wheels" assessment would add the emissions from the combustion of the finished product.

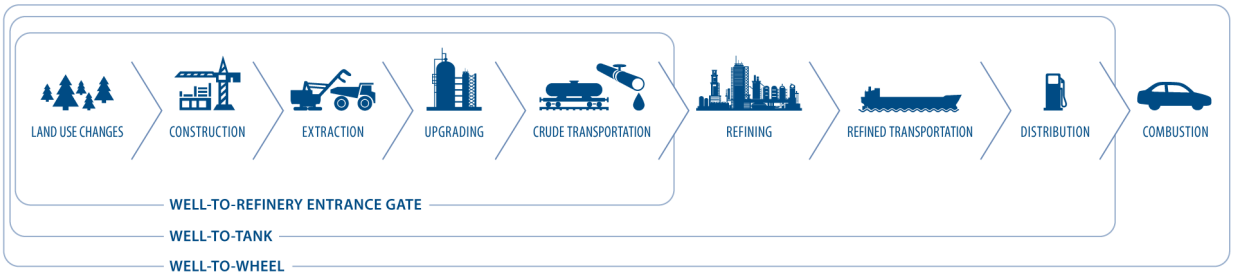

Figure 4. Boundaries of life cycle GHG assessments

Narrowing the scope of our analysis to upstream emissions means that we focus on the implications of the Energy East pipeline proposal on oilsands production.

A focus on Canada

The Well-to-Refinery Entrance Gate analysis we have chosen ensures that the bulk of the emissions captured in our analysis would occur in Canada.[47] We consider a focus on Canadian emissions to be important for several reasons:

- Regulatory decisions about the Energy East proposal will be made by Canadian governments and agencies, notably the federal cabinet and the National Energy Board.
- Unlike downstream emissions, which could occur outside of Canada, Canadian governments and companies have the ability to influence the upstream emissions that would be associated with Energy East.
- Canada has a national GHG target for 2020 that we are currently on track to miss by a significant margin.

At this point, it is not clear that the refining of bitumen transported in Energy East would take place in Canada. Of the three refinery facilities that TransCanada plans to connect to the pipeline, none is currently equipped to refine extra heavy oil.

The refineries in question are Suncor's Montreal facility, Ultramar / Valero's facilities near Quebec City, and the Irving Oil refinery in Saint John.[48] An assessment of the economic benefits of the Energy East

[47] The exception would be light crude sourced from the Bakken in North Dakota. As noted earlier, the Energy East proposal includes an interconnection to that region, so some fraction of Energy East's proposed capacity could generate upstream emissions in the United States.

[48] Deloitte, *Energy East*, 7. A September 2013 TransCanada presentation from Steve Pohlod (President, Energy East Pipeline) also noted refining capacity in Newfoundland (North Atlantic Refining) and Nova Scotia (Imperial) — though the Energy East proposal does not currently include interconnections to those facilities (Steve Pohlod, "Energy East Pipeline — Delivering Energy to People," presentation to Canadian Energy Summit, Toronto, September 25, 2013, slide 4. Available at http://www.energy.ca/users/getdownload.asp?DownloadID=977). In addition, Imperial announced in June 2013 that it will convert the Dartmouth, Nova Scotia refinery to a marine terminal (Imperial Oil, "Imperial to convert Dartmouth Refinery to Terminal," news release, June 19, 2013, http://www.imperialoil.ca/Canada-English/about_media_releases_20130619.aspx).

pipeline proposal from consulting firm Deloitte and Touche LLP assumed that "eastern Canadian refineries continue to use light crude oil as their feedstock" in assessing the pipeline's impact on refineries.[49] The implication of this assumption is that bitumen transported on Energy East would be refined outside of Canada, and thus that the resulting emissions would be added to other countries' emission inventories.[50]

In the future, the refineries in question could choose to invest in the equipment required to process heavier oil. Deloitte's benefits assessment noted that, in other locations where refineries can process heavy crude, "investments in refinery upgrades for processing heavy crude oil were made once increased access to heavy crude oil was provided. A similar outcome may occur in eastern Canada if heavy western Canadian crude oil is more readily accessible."[51] At present, Suncor is reportedly considering the addition of a coker — equipment that allows a refinery to process significant volumes of heavy oil — to its Montreal refinery,[52] while an official at Irving's Saint John refinery described the cost of adding a coker as "a big stretch" for the company.[53]

As currently envisioned, the Energy East pipeline would also transport SCO and conventional oil, and Eastern Canadian refineries can process those lighter products. Indeed, the ability to move those refineries off of imported crude and onto "competitively priced" domestic crude is one of the benefits touted by Energy East's proponent.[54] However, the capacity of the Energy East pipeline proposal is greater — by a significant margin[55] — than the current capacity of the refineries it would connect to. In addition, those refineries have existing agreements with crude suppliers (some in North America, but also in the Middle East, Venezuela, and elsewhere),[56] and some of those agreements are likely to be long-term commitments.[57] Thus, in order to produce an assessment focused on the GHG impacts in Canada, we have left refining emissions outside of our analysis.

[49] Deloitte, *Energy East*, 16.

[50] The lighter hydrocarbons proposed to be transported in the pipeline could be refined in Canada with limited capital investment from the refineries.

[51] Ibid., 12.

[52] Pat Roche, "Suncor Upbeat about Line 9 Re-Reversal, Montreal Upgrader Potential," *Daily Oil Bulletin / Oilsands Review*, September 12, 2013. http://www.oilsandsreview.com/issues/article.asp?article=dob%5C130912%5Cdob2013%5Fsc0021%2Ehtml (accessed December 2013).

[53] Jeff Lewis, "The Hub: Saint John end point of 'Energy East' readies for crude revolution," *The Financial Post*, September 11, 2013. http://business.financialpost.com/2013/11/09/the-pipeline-that-could-turn-canadas-oil-diet-on-its-head/?__lsa=c0d9-cc28.

[54] See, for example, TransCanada's summary of benefits at http://www.energyeastpipeline.com/benefits/the-benefits/.

[55] Deloitte's analysis puts the capacity of the three refineries specifically connected to Energy East at a total of 695,000 bpd. See Deloitte, *Energy East*, Appendix F, 33. TransCanada stated in September that "Current refinery consumption in Quebec and Atlantic Canada is 800,000 bpd (86% from foreign sources)," while Energy East's planned capacity is 1.1 million bpd — 27% greater than their estimate of the relevant refining capacity. Pohlod, "Energy East Pipeline — Delivering Energy to People," slide 4. The difference between the two estimates is likely accounted for by the inclusion of the 115,000 bpd North Atlantic Refining facility at Come-by-Chance, NL, in TransCanada's presentation. While this refinery is located in Atlantic Canada, it would not have a direct interconnection to Energy East.

[56] Canadian Association of Petroleum Producers, *Statistical Handbook*, Tables 07-04A and 07-04B. Accessed December 2013. http://www.capp.ca/library/statistics/handbook/pages/statisticalTables.aspx?sectionNo=7

[57] Deloitte's benefits study does not attempt to quantify the total benefit to Eastern Canadian refineries from using Western Canadian crude, noting that "the extent of the benefit is dependent on many factors, including but not limited to the type of input crude, potential volume discounts if fixed supply agreements are agreed with producers and the degree of utilization of the supply pipeline." See Deloitte, *Energy East,* 16.

Similarly, given oilsands companies' focus on reaching world markets via tidewater, it is likely that a significant fraction of the emissions from burning the crude oil transported on Energy East will occur outside Canada's borders once the oil is exported.

The NEB's 2013 Canadian energy market assessment takes a much wider perspective than a single project, but its analysis lends weight to the assumption that much of the future production growth in Canadian oil production would be exported. The NEB foresees total Canadian oil (both heavy and light) export growth of 139% from 2012 to 2035, with 182% growth in heavy oil exports over the same period, in their central ("reference") scenario.[58] Meanwhile, thanks in part to fuel efficiency standards for passenger vehicles, Canadians' projected demand for gasoline falls by 0.2%, per year, from 2012 to 2035, while diesel consumption is projected to grow by 1.6% per year over the same period.[59]

4.2 Pipeline contents

Because the precise contents of the proposed pipeline are not known, we modelled a range of emissions scenarios. The GHG emissions associated with filling a pipeline vary significantly depending on the type of crude it transports. Extracting and upgrading oilsands bitumen requires significantly more energy, and thus generates more GHG emissions, than conventional oil.[60]

TransCanada has stated that Energy East would carry a mix of crudes that include diluted bitumen, conventional oil and SCO,[61] but has yet to publicly estimate the proportion of each feedstock it expects to transport in the proposed pipeline. Thus, we have modelled a range of plausible scenarios for Energy East's contents. These "throughput scenarios" are described in Table 1 below. These are based on recent estimates of bitumen, SCO[62] and Alberta conventional light crude[63] production generated by the Alberta Energy Regulator.

[58] *Canada's Energy Future 2013*, 47.

[59] Ibid., 30–31.

[60] NETL, Life Cycle Greenhouse Gas Emissions of Petroleum-Based Fuels, 13, table 2-4.

[61] "Oil 101," *Energy East.*

[62] 1.2 m^3 of bitumen is required to produce 1 m^3 of SCO.

[63] Alberta produces a large amount of both conventional light and conventional heavy oil. In order to make our analysis more conservative, we have assumed the proposed pipeline would be filled only with conventional light crude oil.

Table 1. Percentage of diluted bitumen, SCO and conventional crude approximated for each GHG emissions scenario

	% of total pipeline capacity		
	Heavy crude oil	Light crude oil[64]	
	Diluted bitumen	Canadian conventional[65]	Synthetic crude oil (SCO)
Scenario One	80	10	10
Scenario Two	50	20	30
Scenario Three	20	25	55

In 2012, all mined bitumen (as well as 7% of bitumen from in situ production) was upgraded to produce SCO.[66] Historically, all diluted bitumen has come from in situ oilsands production.[67] However, Imperial Oil began employing a new paraffinic froth treatment plant in 2013, allowing the company to process mined bitumen into diluted bitumen without an upgrader.[68]

According to Alberta Energy Regulator and National Energy Board projections, a significant portion of the forecast growth in oilsands development over the next decade will be in situ production. Thus, much of the growth in product transported on new pipelines, such as Energy East, would be diluted bitumen.

4.3 Other factors

4.3.1 Capacity

We assumed that the pipeline would operate at 85% of its 1.1 million bpd capacity. A 2009 NEB analysis of the current state of Canadian pipelines found that crude oil pipelines typically operate between 75 to 80% of installed capacity.[69] More recently, a 2012 Canadian Energy Research Institute report on oilsands and market access assumed that pipelines operate at 95% of their nameplate capacity, 365 days per year, for its throughput calculations.[70] Our throughput analysis assumes that Energy East would operate at 85% of its nameplate capacity year-round.

[64] In accordance with American Petroleum Institute (API) categorization, our model treats SCO and conventional crude as light crude and diluted bitumen as heavy crude.

[65] Conventional oil in the U.S. has lower average emissions than conventional produced in Canada. Thus, using U.S.-specific emissions factors would decrease the reported emission values slightly.

[66] *ST98–2013.*.

[67] National Academy of Sciences*, Effect of Diluted Bitumen on Crude Oil Transmission Pipeline* (2013), Transportation Research Board Special Report 311, 20-21. http://www.nap.edu/catalog.php?record_id=18381

[68] Imperial Oil, Paraffinic Froth Treatment description: http://www.imperialoil.com/Canada-English/operations_sands_kearl_excel.aspx

[69] National Energy Board, *Canadian Pipeline Transportation System: Transportation Assessment,* 10-13.

[70] Dinara Millington and Jon Rozhon, *Pacific Access: Part I – Linking Oil Sand Supply to New and Exisiting Markets,* Study No. 129 – Part I, (Canadian Energy Research Institute, 2012), 11-15.

4.3.2 Emission factors

Estimates of GHG emissions are based on average upstream emission factors taken from existing literature. This analysis employed the GHGenius[71] model v3.20 to generate industry-average GHG emission values. GHGenius is an independent model that uses multiple data sources to generate its estimates, and has been found to be an accurate representation of energy consumption in the oilsands.[72]

Another way to add it up

In this analysis, we calculated the emissions impact of producing enough bitumen, SCO and conventional crude to match Energy East's proposed capacity, allowing us to ascertain an "average" value for the GHG emissions associated with Energy East.

Another approach would be to consider the "marginal" impact of the Energy East pipeline proposal. For some companies, access to Energy East might convince them to proceed with building a new facility or an expansion that they would otherwise have shelved. In those cases, all of those facilities' emissions could be "attributed" to Energy East, even if only a fraction of their production is actually transported on the pipeline.

While this approach would be more rigorous to calculate, it would provide an assessment of the pipeline's climate impact that would complement the approach we have taken here.

[71] The GHGenius model was developed by S&T Squared Consultants Inc. under contract to Natural Resources Canada.

[72] Adam R. Brant, "Variability and Uncertainty in Life Cycle Assessment Models for Greenhouse Gas Emissions from Canadian Oil Sands Production." *Environmental Science and Technology* 26 (2012).

5. Results

The assumptions outlined above produce a preliminary estimate of the Energy East pipeline's upstream GHG impact of between 30 and 32 Mt of annual emissions.

For an individual piece of infrastructure, this is a very significant impact. It is equivalent to the annual emissions of adding over 7 million cars to Canada's roads, which is approximately the total number of cars on the road in the province of Ontario.[73]

Relative to current (2012) oilsands production levels, the production associated with filling the Energy East pipeline proposal would represent a 34% increase even in our lowest-emission scenario. Our results are presented in Table 2 below.

Table 2. Upstream GHG emission impact of the Energy East pipeline proposal

	Annual emissions (millions of tonnes)	Annual emissions equivalent in new cars on the road (millions)[74]	Additional bitumen production (barrels per day)	Oilsands expansion from 2012 production level (%)[75,76]
Scenario One	29.8	7.5	650,760	34
Scenario Two	30.6	7.6	673,200	35
Scenario Three	32.3	8.1	751,740	39

For comparison:

- The emissions associated with Energy East would cancel out most or all of the reductions generated by Canada's single most effective climate policy. According to recent analysis from Environment Canada, phasing out the use of coal power in Ontario will produce a 31.6 Mt reduction in annual emissions in 2020, making it Canada's most effective climate policy by a significant margin,[77] while our estimate of the emissions impact of Energy East ranges from 29.8 to 32.3 Mt.

[73] Statistics Canada's Canadian Vehicle Survey (2009) indicates that Ontario had 7.2 million light duty vehicles (vehicles under 4.5 tonnes) on the road in 2009. See Table 3-1, http://www.statcan.gc.ca/pub/53-223-x/2009000/t058-eng.pdf.

[74] Environment Canada's 2013 *National Inventory Report* estimates one passenger vehicle emits 4.0 metric tonnes of CO_2 equivalent per year.

[75] Oilsands production was 1.9 million bpd in 2012. *ST98–2013,* 10.

[76] All condensate and conventional crude was excluded from this calculation. Only the bitumen required to produce diluted bitumen and SCO was employed to calculate per cent expansion. For further details on this calculation, see Appendix B.

[77] Environment Canada, *Canada's Sixth National Report on Climate Change: 2014* (2013), Annex 1: Canada's First Biennial Report, 215. http://unfccc.int/files/national_reports/non-annex_i_natcom/submitted_natcom/application/pdf/final_nc_br_dec20,_2013%5B1%5D.pdf

- Pembina's estimate of the upstream GHG impact of the Keystone XL pipeline proposal totaled 22.4 Mt, equivalent to adding over 4 million new cars a year to Canada's roads.[78] Thus, even our lowest-emission estimate of the GHG impact of Energy East is 25% larger than the result determined for Keystone XL.
- Our estimated emissions impact of Energy East is more than the total current provincial emissions of five provinces, as seen in Figure 5 below.

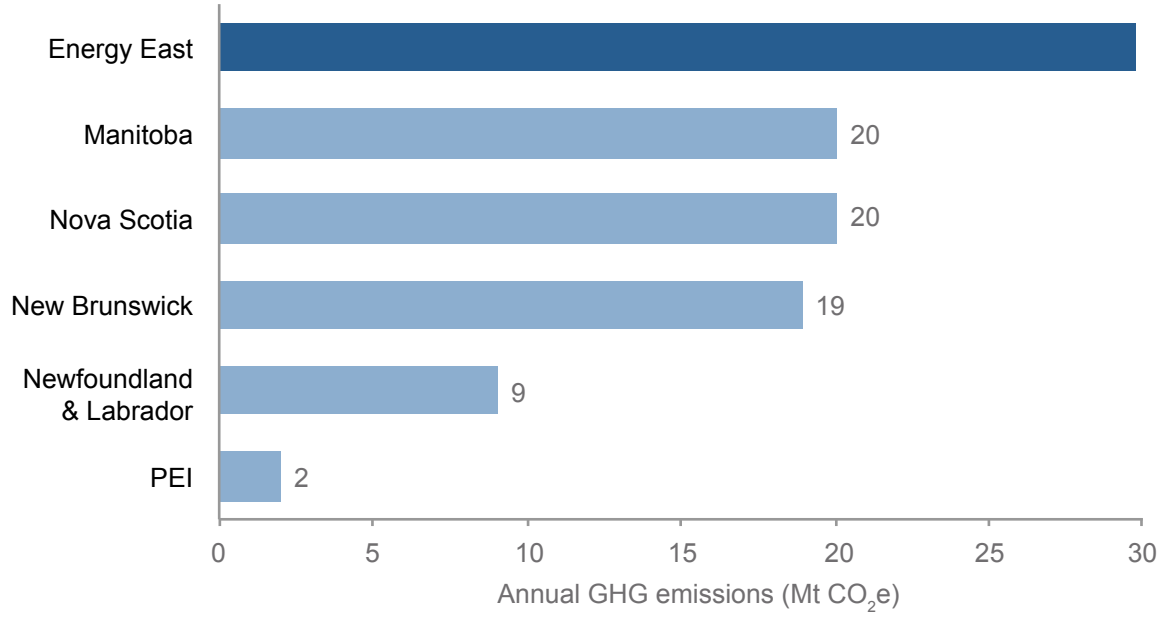

Figure 5. Greenhouse gas emissions associated with Energy East compared to those of selected provinces

Data source: Environment Canada [79]

- Canada's total national emissions in 2011, the most recent year for which the data is available, were 702 Mt. Environment Canada's estimate of the gap between the national 2020 climate goal and Canada's actual emissions is 122 Mt.[80]

Full emissions factor data is available upon request.

[78] Nathan Lemphers, *The climate implications of the proposed Keystone XL oilsands pipeline* (Pembina Institute, 2013). http://www.pembina.org/pub/2407.

[79] *National Inventory Report* (2013), Part 3.

[80] *Canada's Emission Trends 2013.*

6. Recommendations

This paper makes the case that there is an important connection between the construction of new oilsands transportation infrastructure and the rate of growth of future oilsands production.

Expanded oilsands production carries a number of environmental consequences. While this assessment concerns the GHG impacts of growing oilsands production, there are also significant regional impacts on the land, air and water — as well as to species at risk, such as caribou, in the oilsands region.

In the coming months, TransCanada plans to submit a project application to the National Energy Board, thus triggering a decision about the kind of regulatory review required.[81]

We recommend that any regulatory review of the Energy East proposal should include upstream impacts — the consequences of producing the products that would flow through the pipeline — within its scope.

Energy East's proponent is already touting economic benefits upstream of the proposed pipeline. Deloitte's economic benefits analysis, which was commissioned by TransCanada,[82] cites the following benefits to Canadian oil producers from the construction of Energy East:

> ...increased takeaway capacity, market diversity and reductions in the Alberta discount regardless of where crude oil is shipped, whether it be to eastern Canadian, U.S., or global refiners. A reduced Alberta discount would increase profitability for producers — giving them the ability to invest in their operations — as well as increase the viability of oil sands projects by lowering the economically viable oil production break-even price.[83]

The study also suggests potential benefits for refiners, natural gas producers and consumers.[84] Thus, TransCanada's assessment of Energy East's potential benefits is not restricted to the pipeline itself; rather, it includes benefits both upstream and downstream of the project, including in the oilsands.

It is both likely and appropriate that regulators and governments will be interested in understanding the full economic impact of the Energy East pipeline proposal. However, the environmental impact of the pipeline should be treated in an equivalent manner, so that regulators, elected officials and Canadians can make decisions about the proposal with a complete picture of its environmental consequences.

---

[81] TransCanada, "Regulatory Process," *Energy East.* http://www.energyeastpipeline.com/home/regulatory-process/

[82] TransCanada's summary of the results is presented in a fact sheet entitled "Economic Analysis of Energy East Project," available at https://www.energyeastpipeline.com/wp-content/uploads/2013/09/Energy-East-Economic-Analysis-Backgrounder.pdf.

[83] Deloitte, *Energy East*, 17.

[84] Ibid., 16–17.

The Pembina Institute was one of many interested parties that requested that the Joint Review Panel (JRP) considering the Northern Gateway pipeline proposal include consideration of environmental impacts upstream of the proposed pipeline. [85]

Unfortunately, the panel opted not to include these impacts in its Terms of Reference. In its final report on the project, the panel stated that there was not a "sufficiently direct connection between the project and any particular existing or proposed oil sands development or other oil production activities to warrant consideration of the effects of these activities."[86] The JRP's definition of "sufficiently direct" was extremely narrow: the panel cited the fact that the Northern Gateway pipeline itself does not produce oil, and that its Alberta endpoint is not directly connected to the oilsands, as reasons not to consider any environmental impacts upstream of the proposed pipeline.[87]

Today, large numbers of Canadians take a far broader view of impact of pipeline proposals. Indeed, as the JRP members considering the Northern Gateway proposal noted in their report, "many people" throughout the hearing process urged consideration of upstream impacts, including GHG emissions.

Energy East's proponent, TransCanada, already has significant experience with a broader approach to assessing pipeline impacts: climate considerations will be at the heart of the Obama Administration's decision about whether TransCanada's Keystone XL proposal is found to be in the national interest. Canadians deserve a full and informed consideration of the environmental impact of pipeline proposals, including those impacts that take place before the crude reaches the pipeline.

While our analysis does not consider the environmental impacts downstream of the proposed pipeline — including refining and combusting the oil — we fully support including these impacts in all future regulatory considerations for Energy East. While many of these impacts would occur outside of Canada's borders, a broader geographical scope is often appropriate when considering the global environmental challenge of climate change.

In addition, we recommend that **the federal government should adopt stringent regulations to reduce oil and gas sector GHG emissions.**[88] Such regulations are urgently needed to curb emissions in Canada's fastest-growing source of GHG emissions and to help get Canada on track for its national 2020 climate target. Stringent emission regulations in the oil and gas sector would

[85] See http://www.pembina.org/pub/1963 for a copy of Pembina's letter to the Joint Review Panel for the Northern Gateway proposal concerning its final Terms of Reference.

[86] National Energy Board and Canadian Environmental Assessment Agency, *Connections: Report of the Joint Review Panel for the Enbridge Northern Gateway Projec*t, Volume 1 (2013), 17. http://gatewaypanel.review-examen.gc.ca/clf-nsi/dcmnt/rcmndtnsrprt/rcmndtnsrprtvlm1-eng.pdf

[87] The JRP gave four reasons in total for excluding any consideration of upstream impacts. In addition to those cited in the text above, the panel said that oilsands and other oil production activities are already regulated by provincial and federal governments, and that oilsands projects were not part of their panel's Terms of Reference (although, as noted above, several organizations requested consideration of those impacts as part of the public consultation on the JRP's draft Terms of Reference).

[88] Pembina's recommendations for federal oil and gas sector GHG regulations can be found in *Getting on Track for 2020: Recommendations for greenhouse gas regulations in Canada's oil and gas sector* (2013) (http://www.pembina.org/pub/2427) and *Key issues to watch in federal oil and gas climate regulations* (2013) (http://www.pembina.org/pub/2456).

also provide the incentive companies need to invest in the technology required to produce significant improvements in oilsands emissions performance.

The current absence of such regulations on Canada's oil and gas production — and the prospect of further delays[89] in adopting federal GHG regulations for the sector — makes the inclusion of upstream impacts in any regulatory consideration of the Energy East proposal even more important.

While much of the oil carried by the proposed pipeline would likely be consumed outside of Canada, **the federal government should nonetheless take further measures to reduce oil consumption in Canada.** These include stronger fuel efficiency standards for vehicles over time and increased support for public transit and low-emission vehicles.

[89] In a December 2013 interview with Global News, Prime Minister Harper said that the interconnected nature of the oil and gas industry in Canada and the United States require working with the U.S. on regulations for the sector, something he says he hopes to do "over the next couple of years." A transcript of the interview is available at http://globalnews.ca/news/1045614/transcript-in-conversation-with-prime-minister-stephen-harper/.

7. Conclusion

Energy East is a very significant proposal, both by virtue of its size and because of its implications for Canada's energy future. It is being brought forward at a time when Canadians are asking more questions than ever before about the relative risks and rewards of expanding pipeline infrastructure. As such, it gives us an opportunity to have a national conversation about climate change, oilsands development, and our energy future.

We have presented a preliminary assessment of GHG impacts associated with this proposed pipeline, and we found that they would be very significant — equivalent to adding over 7 million cars a year to the roads.

Our calculation rests on the specific set of assumptions described in this report and uses preliminary information. (We hope to update our analysis as more information becomes available about this proposal.) Others could reach a different conclusion about the magnitude of the impact by making a different set of assumptions. We would welcome that discussion.

Pembina's perspective on oilsands transportation infrastructure and climate change

The Pembina Institute has a long track record of advocating solutions to advance responsible oilsands development. In our view, responsible oilsands development means that the cumulative impacts of oilsands development remain below science-based limits, both for the regional ecosystem and the global climate.

As a starting point in fulfilling our climate change responsibilities, we believe the oilsands sector should make an adequate contribution to the achievement of Canada's national 2020 emission reduction goal. The Pembina Institute has published recommendations for the design of a federal oil and gas sector greenhouse gas regulation strong enough to help get Canada on track for its national 2020 climate target, which would lay the foundation for greater emission reductions thereafter.

At present, there are no federal greenhouse gas regulations in place for the oil and gas sector in Canada. Thus, in our view, the federal government is not adequately managing the climate impacts of today's oilsands production.

Until we have strong enough policies in place to ensure that the climate impact of current and future oilsands production remain below science-based limits, approving transportation infrastructure that enables expanded oilsands production is the wrong choice.

Pembina's full oilsands transportation perspective is available at http://www.pembina.org/pub/2497

Appendix A. Areas for further study

While the following areas fell outside the scope of this paper, further research into the questions below would help inform a more complete consideration of the impact of the Energy East proposal:

- **Implications for natural gas production.** The Energy East pipeline proposal involves converting part of TransCanada's Mainline natural gas pipeline to allow the transport of bitumen and other hydrocarbons. This may have the effect of displacing natural gas that is currently carried on the Mainline. Further studies of the potential GHG impact could factor in the emission consequences of Energy East for natural gas production as well as oilsands production.
- **Downstream emissions:** A study that was not focused solely on Canadian emissions could quantify the full life cycle impact of the crude that would be carried on the proposed Energy East pipeline.
- **Quantification of the emission impact of U.S. production:** Energy East's design currently includes the interconnections needed to allow the pipeline to carry some products extracted outside of Canada, mainly from the Bakken shale. Our analysis currently assumed all production happens in Canada. Future studies could include GHG models that reflect a fraction of the products transported on Energy East being extracted outside of Canada.
- **Changes over time in North American oil production:** The emission factors we use in this analysis are likely to change over time. For example:
    - The emissions intensity of oilsands production is likely to increase over time as much of the growth in production shifts towards in situ technology, which is more emissions-intensive than mining
    - On the other hand, stringent GHG policy could incent improvements in oilsands emissions intensity over time
    - According to the United States Energy Information Administration, the U.S. tight oil boom is expected to peak around 2020.[90] Growing U.S. production is one factor responsible for the congestion in North America's pipeline network. The earliest the Energy East pipeline could be fully operational, if approved, would be 2018. Thus, one feasible scenario is that U.S. demand for access to pipeline capacity could begin to fall shortly after Energy East comes into service.
- **Changes over time in global oil demand:** When considering the emission impact of an export pipeline that could last for decades, it is important to understand future global oil demand scenarios. For example, if global oil demand drops to the point that oilsands development becomes uneconomic, Energy East may not be filled to capacity.

[90] U.S. Energy Information Administration, "Outlook for shale gas and tight oil development in the U.S.," *Annual Energy Outlook 2013: Early Release and Short-Term Energy Outlook* (2013), 13.

Appendix B. Notes on assumptions and calculations

Treatment of SCO as light crude: Crude oil is commonly classified as light, medium, heavy or extra heavy. These classifications refer to the hydrocarbon's weight relative to that of water as measured on the American Petroleum Institute (API) Scale. The API values for each type of crude are as follows:

- Light – API > 31.1°
- Medium – API between 22.3° and 31.1°
- Heavy – API < 22.3°
- Extra Heavy – API < 10.0°

Bitumen from the oilsands has an API gravity of less than 10°. Once upgraded to Synthetic Crude Oil (SCO), the product has an approximate API gravity of 33°. SCO resembles light sweet crude oil and is produced from bitumen upgraders, either integrated or freestanding, at an oilsands facility.

Ratio of bitumen to diluent in diluted bitumen: According to energy consultants IHS-CERA, a typical diluted bitumen blend is 72% bitumen and 28% condensate.[91] This is the bitumen-to-condensate ratio we used in our quantification of GHG emissions from diluted bitumen.

Well-to-Refinery Entrance Gate (WTR) system boundaries: Our assessment includes the emissions from the extraction and processing of bitumen and conventional crude oil. This includes emissions from land use changes; construction; on-site venting, flaring, and fugitive emissions; as well as the emissions associated with producing the electricity and natural gas inputs used in extraction processes. The inclusion of emissions from refining, transportation, and combustion of the fuel would further increase total GHG emissions.

Other excluded emissions: Our analysis does not currently include the GHG emissions generated by operating the pipeline itself. These emissions are typically much less than those generated during the extraction and upgrading processes.[92]

While the majority of the Energy East route would consist of converting an existing natural gas pipeline (the Mainline) to crude oil service, this conversion would generate additional GHG emissions relative to its current operation. Natural gas pipelines use compressors while the transportation of crude oil requires more energy-intensive pumping stations be installed along the line.

In addition, the movement of heavy crude creates greater frictional resistance than light crude. Due to viscosity and drag issues, a pipeline's throughput is typically reduced when it transports

[91] IHS CERA, *Oil Sands, Greenhouse Gases, and U.S. Oil Supply: Getting the Numbers Right - 2012 Update*, Special Report (2012).

[92] Further information about the emissions factors employed in this analysis is available upon request.

heavy crude oil, requiring additional pumping stations to "push" the oil through the pipeline. Deloitte's assessment of Energy East's potential benefits foresees the construction of 69 new pumping stations.[93,94]

Calculation of bitumen throughput: For each scenario, the throughput of bitumen was calculated by summing the barrels per day of bitumen as diluted bitumen, as well as the barrels per day of bitumen required to produce the assumed quantity of SCO. The results are as follows:

	% of total pipeline capacity	Average flow rates (barrels per day)
Scenario One		
Conventional	10	93,500
SCO	10	93,500
Diluted Bitumen	80	748,000
	Bitumen	538,560
	Condensate	209,440
Scenario Two		
Conventional	20	187,000
SCO	30	280,500
Diluted Bitumen	50	467,500
	Bitumen	336,600
	Condensate	130,900
Scenario Three		
Conventional	25	233,750
SCO	55	514,250
Diluted Bitumen	20	187,000
	Bitumen	134,640
	Condensate	52,360

Current production: According to the Alberta Energy Regulator's 2013 Supply and Demand outlook, oilsands production was approximately 1.9 million bpd in 2012.[95] The per cent of future expansion attributable to the Energy East pipeline is calculated with reference to this level of production. The total barrels per day of bitumen required for each scenario includes the amount of bitumen necessary to produce diluted bitumen as well as the amount of bitumen necessary to produce SCO. The production of condensate and conventional oil was not included in calculating the growth in oilsands production.

[93] Deloitte, *Energy East*, 6. In a September 2013 presentation, TransCanada's Steve Pohlod put the number of pump stations at 69 ("Energy East Pipeline — Delivering Energy to People," slide 6).

[94] This number will be subject to variation as the project proponent goes through the regulatory process and potentially modifies its proposed route.

[95] *ST98-2013*.

	Additional bitumen production[96] (barrels per day)	Expansion in oilsands production (%)
Scenario One	650,760	34
Scenario Two	673,200	35
Scenario Three	751,740	39

Discrepancy with previously reported GHG intensity values: A recent Pembina Institute paper, *Forecasting the Impacts of Oilsands Expansion*,[97] included GHG intensities for mining and in situ oilsands production. These values are lower than those employed in this study, as they captured only those emissions generated on site. In contrast, the GHGenius model includes indirect emissions, including those generated from off-site power and hydrogen production; on-site cogeneration; and the production of natural gas.

[96] 1.2 barrels of bitumen are required to produce 1 barrel of SCO. For further analysis, see N. Choquette-Levy, H.L. MacLean and J.A. Bergerson, "Should Alberta upgrade oil sands bitumen? An integrated life cycle framework to evaluate energy systems investment tradeoffs," *Energy Policy* 61 (2013).

[97] Simon Dyer, Jennifer Grant and Eli Angen, *Forecasting the Impacts of Oilsands Expansion* (The Pembina Institute, 2013). http://www.pembina.org/pub/2455.