NATURAL RESOURCES DEFENSE COUNCIL

White Paper: Climate Impacts from the Proposed Keystone XL Tar Sands Pipeline

July 2013

I. Introduction

The Obama administration is reviewing whether to issue a Presidential Permit for the proposed Keystone XL pipeline, which would transport 830,000 barrels per day (bpd) of tar sands from the Canadian province of Alberta to the U.S. Gulf Coast.[1] In his June 25, 2013, climate address, President Obama pledged not to approve the Keystone XL permit if such approval would "significantly exacerbate the problem of carbon pollution."

Tar sands oil production causes the release of huge amounts of carbon pollution, both from its energy-intensive extraction methods and refining processes and also from its destruction of Boreal forests, peatlands, and wetlands.[2] The economically viable expansion of tar sands production is limited by the capacity of transport systems—mostly pipelines—to move the product to refineries and especially to access overseas markets. Keystone XL, by increasing transport capacity, would enable increased tar sands production and thus trigger all the attendant increases in greenhouse gas emissions. Because Keystone XL would link Alberta to international markets, it would enable the tar sands industry to access higher world oil prices. This would make tar sands development more profitable, encouraging expanded development. In the absence of the Keystone XL pipeline, expansion of tar sands extraction is not inevitable. Other pipeline proposals to take tar sands to overseas markets face severe legal and public opinion obstacles. And rail is not an economically viable alternative for tar sands oil transport. Expansion of tar sands extraction depends on the Keystone XL pipeline.

In short, approval of the Keystone XL pipeline permit will trigger very large increases in carbon pollution that will significantly worsen climate change. Denial of the permit will prevent these increases.

This paper reviews the greenhouse gas emissions from tar sands oil production and shows how the Keystone XL tar sands pipeline would be a major driver of increased tar sands extraction if built.

This paper outlines how the Keystone XL tar sands pipeline would **add 935 million to 1.2 billion metric tons of carbon pollution** to our atmosphere—a significant increase in greenhouse gas emissions over the 50-year life span of the project. The net effects of the pipeline's impact on the climate will be to significantly worsen carbon

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[1] Such a permit is required by Executive Order for transboundary energy projects. Executive Order 13337 of April 30, 2004, Issuance of Permits with Respect to Certain Energy-Related Facilities and Land Transportation Crossings on the International Boundaries of the United States, http://www.gpo.gov/fdsys/pkg/FR-2004-05-05/pdf/04-10378.pdf.

[2] "Tar sands" is the term that this backgrounder will use for bitumen that is found under the Boreal forest in northeastern Alberta mixed with sand and clay. The forest and wetlands region under which tar sands are found covers an area approximately the size of Florida. Bitumen is extracted through strip-mining for shallower deposits or pumping steam under the ground to melt the bitumen so that it can be pumped to the surface for the deeper deposits. Once extracted, the thick bitumen must undergo a partial refining process known as upgrading to turn it into "synthetic crude oil," or be diluted with various chemicals, turning it into "diluted bitumen," to make it liquid enough to be pumped at high pressure through a pipeline. Keystone XL will carry predominantly diluted bitumen, but may also carry some synthetic crude oil.

pollution. The Keystone XL tar sands pipeline permit does not serve the national interest, and accordingly, its permit application should be denied.

II. A "climate test" will determine the future of the Keystone XL pipeline.

In May 2012, TransCanada applied for a Presidential Permit for the northern section of the Keystone XL tar sands pipeline from Hardisty, Alberta, to Steele City, Nebraska, where it would connect to the southern section of the Keystone XL pipeline already under construction to the Gulf of Mexico. The northern section requires the State Department–administered Presidential Permit because it crosses the international border with Canada.

The State Department released a draft environmental review of the Keystone XL tar sands pipeline project in March 2013 and must consider the more than 1 million comments it received in response. The next step will be a final environmental impact statement, followed by a determination of whether the pipeline is in the national interest, as required under Executive Order 13337.

In his June 2013 address on climate change, President Obama identified the climate impacts associated with the proposed Keystone XL tar sands pipeline as a "climate test" or threshold issue for determining whether or not to permit the project. Specifically, the president said:

> Our national interest will be served only if this project does not significantly exacerbate the problem of carbon pollution. 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.[3]

The State Department's draft environmental review of the proposed Keystone XL pipeline concluded that the lifecycle carbon intensity of tar sands crudes is higher than crudes typically refined in the Gulf Coast,[4] and also found that over the course of one year, the Keystone XL tar sands pipeline would cause at least 18.7 million metric tons more carbon pollution than the equivalent quantity of the average crude oil used in the United States.[5]

However, the State Department did not associate the vast majority of these climate impacts with the approval of Keystone XL, claiming that expansion of tar sands crude production would occur at the same scale and pace with or without the Keystone XL pipeline. That conclusion was based on the assumption that other pipelines or rail would provide sufficient alternative transportation capacity for tar sands in a timely and economic manner.

This paper will show that this key State Department conclusion and the assumptions behind it are incorrect. A decision to approve Keystone XL would in fact result in significant increases in tar sands production and associated carbon pollution. In short, Keystone XL fails the president's climate test for the following reasons:

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

[4] The State Department compares tar sands crude to the 2005 U.S. Average crude, as well as Venezuelan crude, Mexican crude, and Saudi Arabian crude and finds that tar sands causes 17% more GHG emissions than the U.S. 2005 average, 9-19% more GHG emissions than Middle Eastern Sour, 5-13% more GHG emissions than Mexican Maya, and 2-18% more GHG emissions than Venezuela. U.S. Department of State, Keystone XL Draft Supplemental Environmental Impact Statement, Appendix W: Life-Cycle Greenhouse Gas Emissions of Petroleum Products from WCSB Oil Sands Crudes Compared with Reference Crudes, pg. 61, March 1, 2013, http://keystonepipeline-xl.state.gov/documents/organization/205563.pdf. (Keystone XL DSEIS)

[5] Keystone XL DSEIS, Appendix W pg. 64.

- Tar sands production is energy intensive and has significantly higher greenhouse gas emissions than production of conventional oil. The State Department acknowledges this. The Keystone XL tar sands pipeline would **add 935 million to 1.2 billion metric tons of carbon pollution** to our atmosphere—a significant increase in greenhouse gas emissions—over the 50-year life span of the project.

- The tar sands industry faces both short and long term transportation constraints. Based on current industry expansion plans, tar sands production is expected to exceed existing pipeline capacity sometime before 2015.[6] To meet its production growth forecasts, the tar sands industry requires more than 4 million barrels per day (bpd) of new transportation capacity by 2030.[7]

- By affecting tar sands crude prices and market expectations, Keystone XL would greatly encourage overall expansion. The pipeline would link tar sands crude to international oil markets, giving the tar sands industry access to higher oil prices and making new tar sands projects more profitable.

- Numerous statements by industry and the Canadian government confirm that the approval of Keystone XL will lead to increased tar sands production and the greater climate emissions associated with it, and that the disapproval of the pipeline would slow the pace and reduce the scale of tar sands production expansion.[8]

- The industry needs Keystone XL in order to move forward with both its short and medium term tar sands expansion plans and to reach overseas markets. Keystone XL is the largest of the proposed tar sands pipelines and farthest along in its permitting process. Even if all other proposed new export pipelines were built—which is highly unlikely—they would not supply the export capacity needed to enable the tar sands industry's growth plans.

- Other pipeline proposals face considerable obstacles that will likely lead to delays and/or cancellations.

- While the State Department draft supplemental environmental impact statement (DSEIS) asserts that rail transport is a viable alternative to Keystone XL, rail is too costly to enable substantial tar sands expansion.

- Canada does not have strong regulations in place for carbon emissions from the tar sands nor are any expected under the current governments of Alberta and Canada.

III. Tar sands-derived crudes are significantly more carbon intensive than conventional crude oil.

The extraction, production, and refining of tar sands are much more energy intensive than those processes are for conventional oil. The State Department and the Environmental Protection Agency both concluded that

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[6] Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 31, http://www.capp.ca/forecast/Pages/default.aspx.

[7] *Id* at pg. 37

[8] See for example: Nathan Vanderklippe and Shawn McCarthy, "Without Keystone XL, oil sands face choke point," *The Globe and Mail,* June 8, 2011, http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/without-keystone-xl-oil-sands-face-choke-point/article2052562/; Angel Gonzalez, "Imperial Oil CEO: Expansion Of Pipeline From Canada Vital To US," *Dow Jones Newswires*, March 10, 2011, http://www.epcengineer.com/news/post/4002/imperial-oil-ceo-expansion-of-pipeline-from-canadavital-to-us..

carbon emissions from tar sands processing are 81 percent higher than those from conventional oil on a well-to-tank basis.[9] This comparison singles out the area where tar sands crude is significantly different from conventional oil: in extraction and refining. When the extraction and refining emissions are folded into a full lifecycle emissions analysis (including production, upgrading, refining, transportation and dispensing at gas stations, and the very emissions heavy stage of final combustion), fuel derived from tar sands causes roughly 17 percent more greenhouse gas emissions than fuel from conventional oil.[10] However, these are conservative comparisons and do not account for carbon emissions from the burning of petroleum coke (a by-product of the tar sands refining process), emissions associated with forest destruction and land-use change, and a variety of other carbon-intensive factors that further exacerbate the climate impacts of tar sands development.

Significant amounts of energy are required to extract oil from tar sands.[11] Greenhouse gas emissions vary considerably from project to project because of differences in technologies, practices and tar sands quality.[12] The majority of the current extraction is done by strip-mining tar sands and then washing the bitumen from the sand with heated water. Most future tar sands extraction will be done by some type of *in situ* process by which steam is pumped underground in order to melt the bitumen enough that it can be pumped to the surface. *In situ* tar sands extraction is even more greenhouse gas intensive than strip-mining. This means that as more *in situ* projects come online, the climate impacts compared to conventional oil production will rise.

The land use impacts of tar sands development on greenhouse gas emissions are significant, but they are not currently included in the estimates of tar sands emissions. A study in the *Proceedings of the National Academy of Sciences* found that in addition to the reduced carbon sequestration potential of the Boreal forest, landscape changes caused by currently approved tar sands mines will result in the release of 11 million to 47.3 million metric tons of CO_2e from affected peatlands.[13]

In addition to higher extraction emissions, refining a barrel of tar sands bitumen leads to higher greenhouse gas emissions than conventional light crude oil.[14] When refined, tar sands bitumen generates significant volumes of petroleum coke or petcoke, a high-carbon refining byproduct that is increasingly being used as a cheaper, more carbon-intensive substitute for coal. Gulf Coast refineries export the majority of petcoke internationally.[15] The

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[9] U.S. Department of State, Keystone XL DSEIS Appendix W pg. 64, http://keystonepipeline-xl.state.gov/documents/organization/205563.pdf; see also U.S. Environmental Protection Agency, Letter to Assistant Secretary Jose W. Fernandez, U.S. Department of State, April 22, 2013, http://www.epa.gov/compliance/nepa/keystone-xl-project-epa-comment-letter-20130056.pdf. Well-to-tank emissions include greenhouse gas emissions from production, upgrading, refining, and transportation and dispensing at gas stations but do not include combustion emissions in vehicles.

[10] Keystone XL DSEIS, Appendix W pg. 44. In general, lifecycle emissions refer to extracting, in some cases upgrading, transporting, refining, and combusting the tar sands. The 18.7 million metric tons incremental emissions associated with the tar sands in Keystone XL are based on analysis be the National Energy Technology Lab (NETL), which State recognized doesn't account for additional emissions from the use of co-products besides gasoline and diesel produced from tar sands crude, such as petroleum coke (Keystone XL DSEIS at 4.15-105-106).

[11] Extracting and upgrading tar sands into synthetic crude oil – a substance similar to conventional crude oil – causes three times more greenhouse gas emissions than extracting conventional crude. Keystone XL DSEIS, Appendix W pgs. 43-44.

[12] Pembina Institute, Oil Sands 101, http://www.pembina.org/oil-sands/os101/climate.

[13] Rebecca Rooney et. al., Oil sands mining and reclamation cause massive loss of peatland and stored carbon, Proceedings of the National Academy of Sciences, March 27, 2012 vol. 109 no. 13 4933-4937, http://www.pnas.org/content/109/13/4933.

[14] A barrel of bitumen contains 24 percent more CO_2 than a barrel of light oil. Oil Change International, Petroleum Coke: The Coal Hiding in the Tar Sands, January 2013, pg. 11, http://priceofoil.org/content/uploads/2013/01/OCI.Petcoke.FINALSCREEN.pdf.

[15] *Id.*

increased emissions associated with the combustion of tar sands–derived petcoke increases the carbon intensity of tar sands bitumen in a manner that is not fully captured in lifecycle emission comparisons.[16]

IV. Keystone XL would create significant additional climate emissions.

The United States has committed to reducing its greenhouse gas emissions to 17 percent below the year 2005 level in 2020. Meeting this goal will require a large and sustained commitment across many sectors.[17] Keystone XL would generate a large new pool of carbon that would undermine efforts to achieve these savings. Moreover, the failure to adopt a policy of rejecting infrastructure projects that would increase the average carbon intensity of U.S. energy consumption would undermine efforts to realize the country's climate commitments.

The Keystone XL–induced greenhouse gas emissions would represent a significant increase in U.S. carbon pollution. The State Department's draft analysis of Keystone XL concluded that replacing 830,000 bpd of conventional crude with tar sands would cause the release of an additional 18.7 million metric tons CO_2e.[18] As the State Department recognizes, this number does not account for additional emissions from the use of other products besides gasoline and diesel produced from tar sands crude, such as petroleum coke.[19] Including the emissions from those products raises the estimate of Keystone XL's incremental carbon pollution by 30 percent, from 18.7 to 24.3 million metric tons CO_2e.[20] **Over the 50-year assumed life span of the project, replacing 830,000 bpd of conventional crude with tar sands would add 935 million to 1.2 billion metric tons of carbon pollution to our atmosphere.**[21] Moreover, none of these estimates include carbon emissions from burning the

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[16] TIAX found that coke combustion could increase WTW emissions by 14 percent, and Pembina estimated that coke gasification at the upgrader could account for a 50 percent increase in GHG emissions from extraction and upgrading bitumen; IHS CERA found that if petroleum coke combustion is included, tank-to-wheel combustion emissions of refined crude increase about 13 percent. Keystone XL DSEIS, Appendix W pg. 30.

[17] *See, e.g.,* World Resources Institute, Can the U.S. Get There from Here? Using Existing Federal Laws and State Action to Reduce Greenhouse Gas Emissions, Feb. 2013, www.wri.org/publication/can-us-get-there-from-here. The report finds that to reduce U.S. emissions 17 percent below 2005 levels in 2020 will require the federal government to apply the most ambitious suite of policies evaluated.

[18] Keystone XL DSEIS Market Analysis, pg. 4.15-105-106, http://keystonepipeline-xl.state.gov/documents/organization/205618.pdf. (based on the average slate of crude refined in the United States in 2005).

[19] *Id*

[20] The State Department's analysis shows that replacing 830,000 bpd of conventional crude (based on the 2005 U.S. average) with higher carbon tar sands from Keystone XL would increase annual emissions by 18.7 million metric tons CO_2e (Keystone XL DSEIS, pg. 4.15-105). This figure is based on analysis by the National Energy Technology Lab (NETL), which State recognized doesn't account for additional emissions from the use of co-products besides gasoline and diesel produced from tar sands crude, such as petroleum coke (Keystone XL DSEIS, pgs. 4.15-105-106). By request of State, NETL adjusted its framework to include other product emissions, finding that they increased the differential in incremental emissions from tar sands compared to the 2005 U.S. average crude oils by roughly 30 percent (Keystone XL DSEIS, pg. 4.15-106; U.S. Environmental Protection Agency, Comments on Draft SEIS, pg. 2, http://www.epa.gov/compliance/nepa/keystone-xl-project-epa-comment-letter-20130056.pdf). Including these emissions in Keystone XL's incremental emissions increases them from 18.7 million metric tons CO_2e to 24.3 million metric tons CO_2e. Over its estimated fifty year lifespan (Keystone XL DSEIS, p. 4.15-2), replacing conventional crude with tar sands from Keystone XL would generate 1.215 billion metric tons in increased emissions.

[21] Replacing conventional crude with tar sands from Keystone XL would generate between 18.7 to 24.3 million metric tons CO_2e (see footnote 20). Over its estimated fifty year lifespan (Keystone XL DSEIS, pg. 4.15-2), this would add between 935 million and 1.2 billion metric tons of carbon pollution to our atmosphere.

fuel or that result from the land use changes associated with destruction of the Boreal forest, peatlands, and wetlands in tar sands extraction areas.[22]

The rejection of Keystone XL would avoid 18.7 million to 24.3 million metric tons of CO_2e per year.[23] By comparison, the first-ever U.S. carbon reduction and fuel efficiency standards for heavy-duty trucks are expected to reduce annual greenhouse gas emissions by 27.4 million metric tons CO_2e by 2020.[24] In the Northeast and Mid-Atlantic, the Regional Greenhouse Gas Initiative (RGGI) program to reduce CO_2 emissions from power plants[25] is projected to reduce emissions by up to 11.9 million metric tons CO_2 per year.[26] Thus, as a single, discrete decision, the rejection of Keystone XL would deliver significant carbon emission savings that are on a scale similar to that of some of the most significant and ambitious emission reduction programs underway in the United States.

Moreover, the climate benefits of a rejection of Keystone XL should be considered within the broader context of U.S. policy regarding high-carbon infrastructure. In addition to the Keystone XL permit decision, the State Department is also considering a proposal to expand the capacity of the Alberta Clipper pipeline by 350,000 bpd. It also has jurisdiction to consider a proposal to reverse the Portland-Montreal pipeline, which could take 192,000 bpd from a reversed Enbridge Line 9 pipeline through Quebec and New England to the coast of Maine.[27] These projects would increase annual U.S. carbon emissions by 16.2 million metric tons CO_2. Rejecting Keystone

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[22] Rebecca Rooney et. al., Oil sands mining and reclamation cause massive loss of peatland and stored carbon, Proceedings of the National Academy of Sciences, March 27, 2012 vol. 109 no. 13 4933-4937, http://www.pnas.org/content/109/13/4933.

[23] The distinction between these two figures that bound the range is whether other product emissions like petroleum coke are included (see footnote 20).

[24] This includes an annual reduction 27 million metric tons CO_2 emissions and 0.4 million metric tons CO_2e in methane emissions. National Highway Transportation Safety Administration (NHTSA), Medium and Heavy Duty Fuel Efficiency Rule Final EIS, June 2011, 4.46, www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FEIS-MedHD.pdf).

[25] RGGI is a cooperative effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont to cap and reduce CO2 emissions from the power sector. Regional Greenhouse Gas Initiative, RGGI 2012 Program Review: Summary of Recommendations to Accompany Model Rule Amendments, http://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Recommendations_Summary.pdf.

[26] Environment America, A Double Success Tackling Global Warming While Growing the Economy with an Improved Regional Greenhouse Gas Initiative, pg. 15-16, Spring 2013, http://www.environmentamerica.org/sites/environment/files/reports/A%20Double%20Success%20cover%20vUS%20web.pdf; *see also* RGGI Inc., RGGI IPM Analysis: Amended Model Rule, 8 February 2013, www.rggi.org/docs/ProgramReview/February11/13_02_11_IPM.pdf.

[27] The incremental emissions from these projects are calculated by multiplying their barrels per day capacity by the State Department's estimate that substituting tar sands crude for the U.S. average crude produces 2.3 million metric tons CO2e per year per 100,000 barrels displaced, based on a study by the National Energy Technology Laboratory (NETL) (Keystone XL DSEIS, pg. 4.15-104). The Alberta Clipper expansion would enable an additional 350,000 bpd expansion while the reversal of the Portland-Montreal Pipeline would enable an additional 192,000 bpd of pipeline capacity. Replacing 542,000 bpd of U.S. average conventional crude with tar sands crude would increase annual U.S. emissions by 12.5 million metric tons CO2. This estimate doesn't account for additional emissions from the use of co-products besides gasoline and diesel produced from tar sands crude, such as petroleum coke (Keystone XL DSEIS, pgs. 4.15-105-106). Incorporating those emissions would increase the annual incremental emissions of these projects by 30 percent, to 16.2 million metric tons CO2 (Keystone XL DSEIS, pg. 4.15-106; EPA comments, pg. 2).

XL and these pipeline modifications would reduce U.S. carbon emissions by 40.6 million metric tons CO_2 per year.[28]

V. Keystone XL is necessary to the expansion of tar sands production, due to limited regional refining and export pipeline capacity.

The Keystone XL tar sands pipeline is a necessary element in the oil industry's plan to increase western Canadian heavy tar sands production from 1.4 million bpd in 2012 to 5.8 million bpd by 2030.[29] Beyond its 2030 production plans, the industry has proposed a long-term goal of 9.4 million bpd of tar sands bitumen production.[30] Because export pipelines from the tar sands region are reaching capacity and the ability of refineries to take additional tar sands is limited in both Canada and most regions of the United States where tar sands currently flows, such as the Midwest and the Rockies, Keystone XL will facilitate expansion of tar sands to Gulf Coast refining facilities. Without additional export pipelines, the planned expansion to these levels is technically and economically infeasible, for want of a way to get the product to new and especially overseas markets. In other words, without significant additional pipeline capacity, such as the proposed Keystone XL project, the expansion to these industry targets will not occur. Therefore, the U.S. decision on whether to approve the Keystone XL pipeline will have a direct bearing on whether the tar sands industry can attain those goals, with their attendant increases in carbon pollution.

Export pipelines from the northern Alberta tar sands region are quickly reaching capacity, making new export pipelines essential to expand the tar sands industry. The combined capacity of western Canada's local refineries and export pipelines to outside markets is 3.5 million bpd.[31] The Canadian Association of Petroleum Producers (CAPP) forecasts that production increases, driven primarily by tar sands, will exceed this transportation capacity around 2014 (see Fig. 1).[32] Moreover, the oil industry plans to bring Western Canadian oil production to 7.8 million bpd by 2030 as they plan to bring 4.4 million bpd of additional heavy tar sands production online.[33]

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[28] This includes incremental emissions of 24.3 million metric tons CO2e for Keystone XL, 10.5 million metric tons CO2e for Alberta Clipper, and 5.7 million metric tons CO2e for the Portland Montreal Pipeline reversal.

[29] Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 37, http://www.capp.ca/forecast/Pages/default.aspx.

[30] Oilsands Review, October 2012.

[31] Western Canadian crude which cannot be processed in local refineries must be shipped to other refinery markets via export transportation facilities to be sold. Western Canada has 649,000 bpd of local refinery capacity, and 2.9 million bpd of export pipeline capacity including 1.78 million bpd for Enbridge mainline; 590,000 bpd for Keystone I; 300,000 bpd for TransMountain; 155,000 bpd for Express; and 55,000 bpd for Western Corridor. Goldman Sachs, Oil Infrastructure Research Roundtable: Getting oil out of Canada: Heavy oil diffs expected to stay wide and volatile, June 2, 2013, pg. 13.

[32] CAPP estimates Western Canadian oil production as between 3.4 and 3.7 million bpd in 2014. Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 37, http://www.capp.ca/forecast/Pages/default.aspx.

[33] Raw bitumen must be either upgraded or diluted before being transported on transmission pipelines, and these processes increase their volume. CAPP forecasts raw bitumen production to reach 5.2 million bpd and transportation ready tar sands production to reach 6.6 million bpd by 2030, in addition to 1.2 million bpd of conventional crude production. Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 37, http://www.capp.ca/forecast/Pages/default.aspx

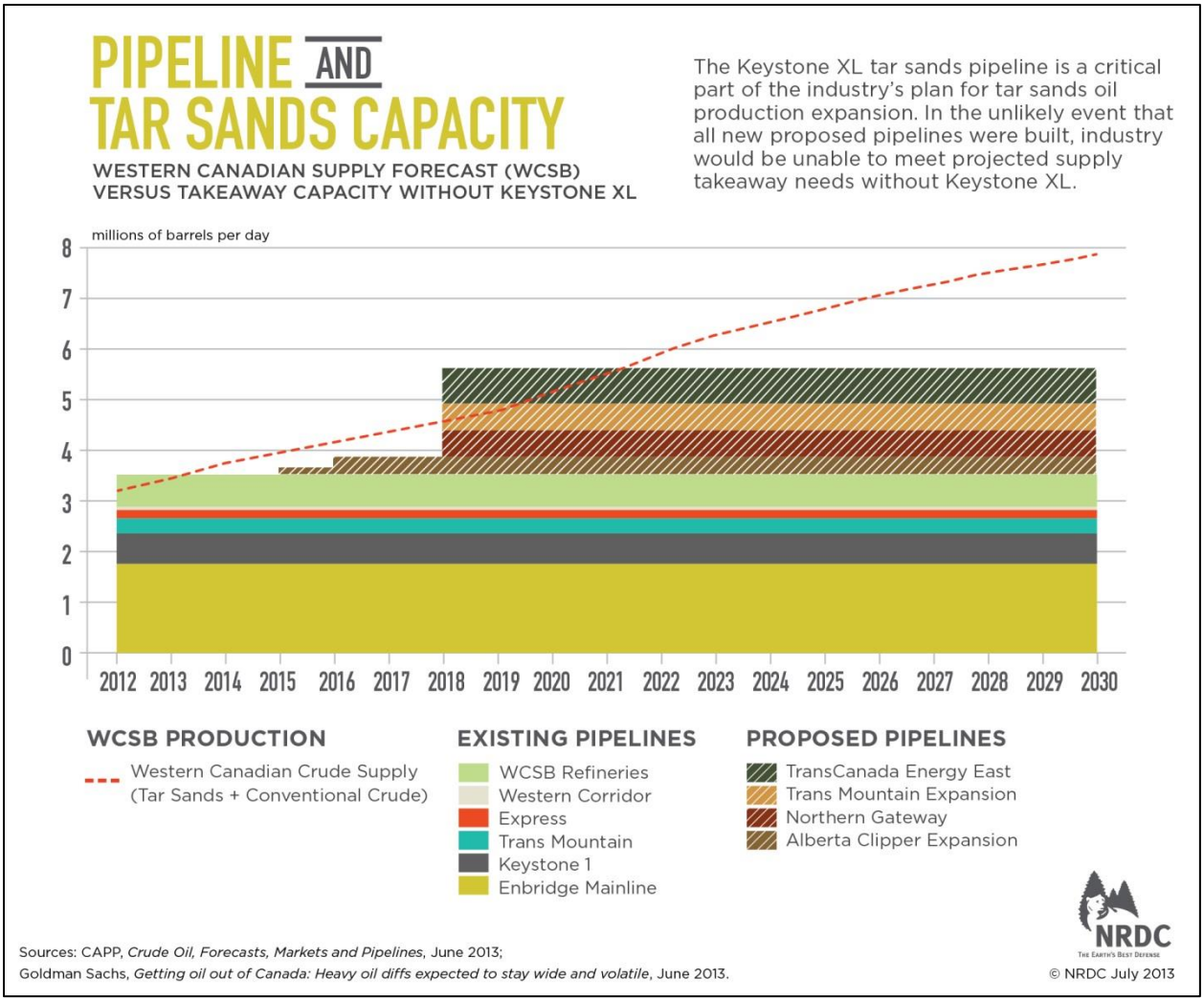

Figure 1: Pipeline and Tar Sands Capacity: Western Canadian Supply Forecast (WCSB) versus Takeaway Capacity without Keystone XL[34]

The Gulf Coast, with its ability to process significant volumes of heavy crude oil, is a critical target for Canadian producers who desire the refining capacity and the access to overseas markets.[35] Western Canada currently produces 3.2 million bpd of tar sands and conventional crude oil but has limited refining capacity.[36] The region's refineries have the capacity to process 680,000 bpd of production – the rest must be exported to other refineries markets.[37] Over ninety percent of Western Canadian production increases – or 4.4 million bpd - are

[34] Comparing industry's forecast of Western Canadian crude production through 2030 with local refining capacity, current export pipelines out of Western Canada and proposed export pipeline projects. Ninety-six percent of Western Canada's planned increased production is from tar sands crude. Goldman Sachs, Oil Infrastructure Research Roundtable: Getting oil out of Canada: Heavy oil diffs expected to stay wide and volatile, June 2, 2013, pgs. 13-14, 21. Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 37, http://www.capp.ca/forecast/Pages/default.aspx.

[35] Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 9, http://www.capp.ca/forecast/Pages/default.aspx.

[36] *Id* at pg. 37.

[37] *Id* at pg. 10.

expected to be heavy tar sands crude which can only be processed by specialized refineries.[38] Refineries on the East Coast of North American have only limited heavy crude processing capacity, and this capacity is largely saturated.[39] The U.S. Midwest, which has 1.1 million bpd of heavy crude processing capacity, is also saturated with Canadian crude.[40] CAPP estimates that Midwestern refinery receipts will only increase by 100,000 bpd through 2020.[41] CAPP forecasts that Canadian exports to refineries in the Rocky Mountain region will be stable through 2020.[42] California has only 300,000 bpd of heavy crude processing capacity.[43] In contrast, the Gulf Coast contains the world's largest concentration of refineries capable of processing heavy crude oil, with up to 6.1 million bpd of heavy crude capacity.[44] Only 100,000 bpd of Western Canadian crude oil was transported to the Gulf Coast in 2012, which leaves room for a substantial increase in tar sands oil.[45]

Constrained pipeline capacity has had a significant impact on the price of tar sands oil, as heavy crude supplies saturate the heavy crude processing capacity of Midwestern and Canadian refineries. Tar sands crude, marketed as Western Canadian Select (WCS), has recently sold at a significant discount—at times approaching $50 a barrel—relative to international heavy crudes, such as Mexican Maya, which have historically sold at equivalent prices.[46] Keystone XL would provide tar sands producers with cheap access to lucrative international markets and divert heavy crude away from saturated refinery markets in Canada and the Midwest. This would significantly increase the profitability of existing and new tar sands production projects. Conversely, Goldman Sachs recently concluded that if Keystone XL is delayed or canceled, Canadian tar sands supply will remain landlocked, putting additional downward pressure on WCS prices.[47] RBC Capital recently concluded that a delay or rejection of Keystone XL would reduce investment in tar sands by $9.4 billion.[48] The rejection of Keystone XL would create sustained adverse economic conditions for tar sands expansion, resulting in the cancelation or postponement of new tar sands production projects.

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[38] As Canadian crude production increases from 3.1 million to 7.8 million bpd from 2012 to 2030, 4.3 million bpd is expected in the form of heavy crude (include 4.4 million bpd of increased heavy tar sands production and a decrease in 100,000 bpd of conventional heavy) while only 400,000 bpd of increased production is expected to be light crude. Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 38, http://www.capp.ca/forecast/Pages/default.aspx.

[39] PBF Energy's Paulsboro and Delaware City refineries and NuStar Energy's asphalt refinery in New Jersey are the only refineries on the east coast with the coking capacity to process heavy bitumen blends from western Canada, with 122,000 bpd of capacity. Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 13, http://www.capp.ca/forecast/Pages/default.aspx.

[40] Canadian Association of Petroleum Producers (CAPP), Crude Oil, Forecasts, Markets and Pipelines, June 2013, pg. 14, http://www.capp.ca/forecast/Pages/default.aspx.

[41] *Id.*

[42] *Id* at pg. 17.

[43] *Id* at pg. 18.

[44] The Gulf Coast has 6.1 million bpd of heavy crude processing capacity, of which 2.1 million bpd is supplied by foreign sources. Goldman Sachs, Oil Infrastructure Research Roundtable: Getting oil out of Canada: Heavy oil diffs expected to stay wide and volatile, June 2, 2013, pg. 12; *Id* at pg. 16.

[45] *Id* at pg. 15; U.S. Energy Information Administration, Gulf Coast Impacts of Canadian crude oil, accessed July 14, 2013, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mcripp3ca2&f=a.

[46] Bloomberg, Valero Looking at Rail, Barges to Ship Canadian Crude to Gulf, Jan. 29, 2013, http://www.bloomberg.com/news/2013-01-29/valero-looking-at-rail-barges-to-ship-canadian-crude-to-gulf.html.

[47] Goldman Sachs, Oil Infrastructure Research Roundtable: Getting oil out of Canada: Heavy oil diffs expected to stay wide and volatile, June 2, 2013, pg. 25

[48] RBC Capital Markets Equity Research, Keystone XL and Canadian Oilfield Services, May 27, 2013.

VI. Other proposed tar sands pipeline projects face obstacles and even if pursued would be insufficient to enable the industry's expansion plan.

Because the tar sands industry's expansion plans are dependent on more than 4 million bpd of additional transportation capacity for heavy crude, they require all proposed pipelines to move forward on schedule.[49] TransCanada's proposed Keystone XL pipeline is the only major proposal for transporting additional bitumen to market in the near term.[50] For the longer term, four pipeline projects have been proposed that would increase the crude export capacity from Western Canada. These include two pipelines through British Columbia to Canada's western coast, Enbridge's Northern Gateway and Kinder Morgan's Trans Mountain pipeline expansion; Enbridge's Alberta Clipper pipeline expansion into the U.S. Midwest; and TransCanada's Energy East pipeline to Canada's East Coast. There is an additional pipeline reversal proposed—of Enbridge's Line 9 and the Portland-Montreal Pipeline—which would transport tar sands to Portland, Maine, but this would only increase capacity from Ontario, not from the tar sands region. However, each of these projects faces significant obstacles that render their ultimate viability uncertain. And none of these projects will come online in time to alleviate the short-term transportation constraints facing tar sands expansion plans.

Moreover, even if all other proposed export pipelines from Western Canada are constructed, they will provide no more than 2.3 million bpd of additional transportation capacity.[51] Together they would still not support the transportation capacity needed to enable the tar sands industry's medium-term expansion plans. This makes Keystone XL a key contributor to the cumulative growth of tar sands production, responsible for the attendant increase in greenhouse gas emissions.

A. Proposed Enbridge Northern Gateway tar sands pipeline (British Columbia)

Enbridge's proposed Northern Gateway project is a controversial 525,000 bpd tar sands pipeline across the mountainous terrain and salmon-bearing rivers of north-central British Columbia. In May 2013, the British Columbia government opposed the project in its formal comments to the federal review panel.[52] This announcement mirrors significant opposition from the public and from legally powerful First Nations. Polling shows that more than two-thirds of British Columbians oppose the Northern Gateway project.[53]

More than 100 First Nations that have aboriginal rights and title and that are affected by the proposed pipeline have publicly opposed both the pipeline and the additional tanker traffic that would result from the project.[54] Given the strong legal rights afforded Aboriginal Peoples in Canada under the constitution, especially those on

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[49] Western Canada has 3.7 million bpd of pipeline capacity. Industry plans to expand production to 7.8 million bpd by 2030 will require an additional 4.1 million bpd of transportation capacity.

[50] Pembina Institute, The Climate Implications of the Proposed Keystone XL Oilsands Pipeline, January 17, 2013, http://www.pembina.org/pub/2407.

[51] Enbridge's Northern Gateway (525,000 bpd), the Trans Mountain expansion (adding 590,000 bpd), the Alberta Clipper expansion (adding 350,000 bpd) and TransCanada East (adding up to 850,000 bpd)

[52] Argument of the Province of British Columbia Re: Hearing Order OH-4-2011 and File No. OF-Fac-Oil-N304-2010-01 01 Enbridge Northern Gateway Project Application, May 31, 2013, http://www.env.gov.bc.ca/main/docs/2013/BC-Submission-to-NGP-JointReviewPanel_130531.pdf; "B.C. officially opposes Enbridge Northern Gateway pipeline," *CBC News,* May 31, 2013, http://www.cbc.ca/news/canada/british-columbia/story/2013/05/31/bc-northern-gateway-rejected.html.

[53] "Your Insights on the Northern Gateway Pipeline," *Insights West*, February 4, 2013, http://www.insightswest.com/news/your-insights-on-the-northern-gateway-pipeline/.

[54] Alex Stoymenoff, "First Nations resist Enbridge Northern Gateway pipeline cross Canada with Freedom Train," *Vancouver Observer*, April 28, 2012, http://www.vancouverobserver.com/sustainability/2012/04/28/first-nations-resist-enbridge-northern-gateway-pipeline-cross-canada.

unceded territory such as in British Columbia, their opposition represents a considerable legal barrier to the likelihood of the project going forward.[55]

Many thought leaders in western Canada are now calling for a time-out on the pipeline, which was originally proposed in 2005.[56] Even oil industry commentators and federal cabinet ministers who historically have been boosters of west coast pipelines have become significantly more muted in their support.[57] In the unlikely event that the Northern Gateway project is approved by 2019, as Enbridge projects, such a decision will likely be contested in courts for many years by concerned British Columbians and First Nations. These obstacles have led financial analysts to downgrade their expectations for Northern Gateway.[58]

B. Proposed Kinder Morgan TransMountain pipeline expansion (British Columbia)

Canadian pipeline company Kinder Morgan, which is pursuing an expansion of its TransMountain pipeline from Alberta to Vancouver, British Columbia, also faces considerable hurdles. While the company has not yet submitted an application to the government, it has announced it plans to expand its TransMountain pipeline from 300,000 bpd to 890,000 bpd.[59] The expansion would require new permits, the renegotiation of landowner agreements along the route, agreements with First Nations, the dredging of the Vancouver harbor and changes in regulations to allow increased tanker traffic. Even at this early stage, some of these elements of the project proposal have already generated substantial opposition. The mayors of Vancouver and Burnaby, British Columbia, have spoken out strongly against the pipeline proposal and the associated tanker traffic.[60] Environmental and indigenous activists have staged numerous protests against the pipeline.[61]

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[55] Carrie Tait and Nathan Vanderklippe, "First nations dig in against Enbridge Pipeline," *The Globe and Mail*, May 13, 2011, http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/first-nations-dig-in-against-enbridge-pipeline/article2021928/page1/.

[56] Deborah Yedlin, "Yedlin: Is it time for a 'time-out' for the Northern Gateway?" *Calgary Herald,* October 12, 2012, http://www.calgaryherald.com/business/time+time+northern+gateway/7379233/story.html; Barbara Yaffe, "Barbara Yaffe: 'Time out' needed in Enbridge pipeline debate," *Vancouver Sun,* October 15, 2012, http://www.canada.com/business/2035/Barbara+Yaffe+Time+needed+Enbridge+pipeline+debate/7393011/story.html; Rod Love, "A bold way out?," *Rod Love Letters: Random observations on politics and life,* August 17, 2012, http://rodlove.com/pipeline-solution-duh/; Tex Enemark, "Dead pipeline walking," *Financial Post,* October 18, 2012, http://opinion.financialpost.com/ 2012/10/18/dead-pipeline-walking/.

[57] Andy Radia, "Northern Gateway may soon need extraordinary political measures to survive," *Yahoo News*, December 3, 2012, http://ca.news.yahoo.com/blogs/canada-politics/northern-gateway-pipeline-may-soon-extraordinary-political-measures-183201589.html.

[58] Canadian Press, "Oil industry faced with 'serious challenge' as pipelines pill up, TD warns," *Financial Post*, December 17, 2012, http://business.financialpost.com/2012/12/17/oil-industry-faced-with-serious-challenge-as-pipelines-fill-up-td-warns/.

[59] In January 2013, KinderMorgan decided to expand the scope of the expansion project to 890,000 bpd. As of January 2013, Kinder Morgan stated that they planned to file an application for a permit for the expansion in late 2013. Kinder Morgan Energy Partners, L.P., Trans Mountain Updates Customer Commitments for Proposed Expansion Project, http://phx.corporate-ir.net/phoenix.zhtml?c=119776&p=irol-newsArticle&ID=1773410&highlight.

[60] Jeff Lee and Brian Morton, "Vancouver and Burnaby mayors decry Kinder Morgan pipeline expansion," *Vancouver Sun,* April 14, 2012, http://www.vancouversun.com/business/Vancouver+Burnaby+mayors+decry+Kinder+Morgan+pipeline+expansion/6457014/story.html.

[61] See, eg. "Protest at Kinder Morgan Trans Mountain Pipeline," *Vancouver Media Coop*, August 27, 2011, http://vancouver.mediacoop.ca/photo/protest-kinder-morgan-trans-mountain-pipline/8030; and "First Nations protest Kinder-Morgan pipeline," *Drive-by Planet*, September 5, 2012, http://www.drivebyplanet.com/2012/09/first-nations-protest-kinder-morgan.html.

C. TransCanada Energy East (Alberta to New Brunswick)

TransCanada is in the early stages of exploring the option of a west-to-east pipeline project in Canada to transport up to 850,000 bpd of oil, including tar sands, across six Canadian provinces from Alberta to New Brunswick, a project it has named Energy East. This proposal would require the conversion of a several-decades-old natural gas pipeline (one of the lines that make up the TransCanada Mainline) into an oil pipeline, as well as significant new pipeline construction through Quebec and New Brunswick.

An application for regulatory approval of the project had not been submitted as of July 2013. If and when an application is submitted, the regulatory and siting process is likely to be long and complex, with not only a review process by Canada's National Energy Board (NEB) for the pipeline conversion, but also:

- A more complex NEB review process for the 870 miles of new pipeline construction.[62]
- The potential for additional provincial environmental review from Quebec and New Brunswick regarding the new pipeline construction. These provincial reviews are likely in Quebec given that the Quebec government has called for a provincial review of the Enbridge Line 9 reversal.[63] In fact, Quebec Premier Pauline Marois and New Brunswick Premier David Alward have together created a working group to assess the risks of allowing tar sands to be pumped across their provinces.[64]
- Consultations with dozens of First Nations that the pipeline could affect in Alberta, Saskatchewan, Manitoba, Ontario, Quebec, and New Brunswick.[65]

This project will likely face considerable public opposition in Quebec. Quebec has been a leader in fighting climate change, with an aggressive Climate Change Action Plan to cut greenhouse gas emissions in the province to 20 percent below 1990 levels by 2020.[66] Supporting tar sands expansion would be out of step with these goals, and in fact, the Ontario and Quebec governments have previously expressed concerns about the high and growing greenhouse gas emissions associated with tar sands development.[67] Further, given the major tar sands oil spills into the Kalamazoo River in 2010 and into the community of Mayflower, Arkansas, in March 2013, the public is concerned about transporting tar sands oil via an aging, repurposed pipeline through Quebec. Ontario's

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[62] The pipeline would consist of 3,000 km (1,864 miles) of existing pipeline, and 1,400 km (870 miles) of new pipeline. TransCanada, Energy East Pipeline, Safety Overview, http://www.energyeastpipeline.com/about/overview/#.

[63] Shawn McCarthy and Kelly Cryderman, "Quebec to hold own hearings on Enbridge pipeline plan," *The Globe and Mail,* May 23, 2013, http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/quebec-to-hold-own-hearings-on-enbridge-pipeline-plan/article12114484/.

[64] Andy Blatchford, "Quebec, N.B., agree to take closer look at oilsands pipelines," *The Canadian Press*, February 18, 2013, http://atlantic.ctvnews.ca/quebec-n-b-agree-to-take-closer-look-at-oilsands-pipelines-1.1161462.

[65] TransCanada's process for the pipeline includes "aboriginal engagement" and TransCanada claims that it "respects the legal and constitutional rights of Aboriginal Peoples and recognizes that its relationships with Aboriginal Peoples are separate and different from that of the Crown." TransCanada Energy East Pipeline, Our Commitment, http://www.energyeastpipeline.com/aboriginal-relations/our-commitment/.

[66] Government of Quebec, 2013-2020 Climate Change Action Plan, http://www.mddefp.gouv.qc.ca/changements/plan_action/pacc2020-en.pdf.

[67] Kelly Cryderman, "Ontario, Quebec say they won't shoulder oil sands burden," *Canwest News Service*, December 13, 2009, http://www.nationalpost.com/news/story.html?id=2336575.

Energy Minister has also voiced concern about the project.[68] Numerous environmental groups in Canada also oppose this project.[69]

D. Enbridge Alberta Clipper tar sands pipeline expansion proposal (U.S. Midwest)

While Canadian pipeline company Enbridge has proposed a significant expansion of its Alberta Clipper tar sands pipeline (also known as Line 67), the expansion would facilitate a capacity increase less than half of Keystone XL's capacity, adding just 350,000 bpd.[70] Therefore, even should this project move ahead, it would not enable the same level of expansion as Keystone XL. Furthermore, the pipeline project will undergo a comprehensive review by the State Department and is already facing considerable opposition from local communities.[71] The State Department published a notice in the Federal Register in January 2013 acknowledging receipt of an application from Enbridge for this expansion; it published a subsequent notice in March indicating its intent to prepare a supplemental environmental impact statement (SEIS) and requesting scoping comments on the SEIS.[72] Since this pipeline was originally permitted, the debate about tar sands has changed dramatically in the United States, with much more awareness and understanding about pipeline safety and climate risks from tar sands, and a strong coalition has come together to oppose this expansion project.[73]

E. Reversal of Enbridge-ExxonMobil pipeline (Central Canada and New England)

The oil industry also faces considerable opposition to the transport of tar sands oil eastward through some of the most important natural and cultural landscapes in central Canada, Vermont, New Hampshire, and Maine. Enbridge has a plan to reverse and expand its Line 9 going through Ontario and Quebec, enabling transport of up to 300,000 bpd of Canadian tar sands oil. A portion of this oil could flow from Quebec to the United States via one of the two ExxonMobil majority owned lines that make up the Portland-Montreal pipeline.[74] Moreover, this project would not expand export capacity for tar sands production, as the reversal of Enbridge's Line 9 pipeline does not add incremental capacity to Enbridge's mainline pipeline system out of western Canada but only

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[68] Vito Pilieci, "We need more information on proposed pipeline for Ottawa, politicians say," *Ottawa Citizen*, June 27, 2013, http://www.ottawacitizen.com/technology/need+more+information+proposed+pipeline+Ottawa+politicians/8583849/story.html.

[69] Environmental organizations opposing the project include Équiterre, Environmental Defence Canada, Greenpeace Quebec, Council of Canadians, Climate Justice Montreal, and the Canadian Climate Youth Coalition.

[70] Alberta Clipper (Line 67) Capacity Expansion Phase II, Enbridge, http://www.enbridge.com/MainlineEnhancementProgram/Canada/Alberta-Clipper-Capacity-Expansion-Phase-II.aspx. The expansion proposal would enable an increase in capacity from 450,000 barrels per day to 800,000 barrels per day.

[71] Jim Snyder and Rebecca Penty, "Enbridge Expansion Could Turn Into Keystone-Like Fight," *Bloomberg News*, May 2, 2013, http://www.bloomberg.com/news/2013-05-02/enbridge-expansion-could-turn-into-keystone-like-fight.html.

[72] See Federal Register Notices from January 2, 2013 https://www.federalregister.gov/articles/2013/01/02/2012-31557/application-for-a-presidential-permit-to-operate-and-maintain-pipeline-facilities-on-the-border-of and March 15, 2013 https://www.federalregister.gov/articles/2013/03/15/2013-06039/notice-of-intent-to-prepare-a-supplemental-environmental-impact-statement-seis-and-to-conduct.

[73] Even before the State Department announced receipt of the application for the expansion project from Enbridge, tens of thousands of activists emailed the State Department requesting that this expansion require a Presidential Permit. State Department to Review Tar Sands Pipeline Expansion, January 7, 2013, http://sierraclub.typepad.com/compass/2013/01/state-dept-to-review-tar-sands-pipeline-expansion.html. There has also been significant activity from grassroots and environmental organizations calling for a robust Environmental Impact Statement.

[74] The Portland-Montreal pipeline is made up of two pipelines with capacities of 192,000 barrels a day and 410,000 barrels a day.

extends it to carry crude east from Sarnia, Ontario.[75] Enbridge has applied to Canada's National Energy Board to reverse and expand its Line 9 pipeline; there has not yet been a formal application for the Portland-Montreal pipeline reversal.

The project faces considerable opposition from the public as well as from government officials at the local, state, and national level. The opposition to the Portland-Montreal pipeline and Enbridge Line 9 reversal has included these actions:

- A coalition of Ontario municipalities, including the cities of Hamilton, Mississauga, Toronto, and Kingston, has raised concerns over the reversal of Enbridge Line 9 and has launched the formal comment process with Canada's National Energy Board over the proposal.[76]
- The province of Quebec announced it would conduct its own public review of the proposed Line 9 pipeline, indicating it would want to have a say in the project.[77]
- Canada's current opposition party in federal Parliament, the New Democratic Party, recently announced its opposition to the Enbridge Line 9 reversal based on flaws in the environmental review process managed by Canada's National Energy Board.[78]
- The Vermont Natural Resources Board has ruled that any effort to reverse the flow of the Portland-Montreal pipeline to transport tar sands will require a state permit.[79]
- Dozens of communities have launched efforts through eastern Canada and New England to express opposition to the flow of tar sands through the Enbridge Line 9 and ExxonMobil Portland-Montreal pipeline.[80] This includes the passage of dozens of resolutions in Quebec, Vermont, and Maine.[81]
- State and federal representatives, including the entire U.S. House delegation as well as several U.S. senators from the states the pipeline traverses (Vermont, New Hampshire, and Maine), have called for a new Presidential Permit and comprehensive environmental impact statement for the project, expressing concern about the potential impact to climate and communities.[82] The Vermont Governor Peter Shumlin and New Hampshire Governor Maggie Hassan have sent similar letters.[83]

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[75] Goldman Sachs, Getting oil out of Canada: Heavy oil diffs expected to stay wide and volatile, June 2, 2013, pg. 21.
[76] Jeff Lewis, "Ontario municipalities raise oil spill concerns on Enbridge pipeline reversal," Financial Post, March 13, 2013, http://business.financialpost.com/2013/03/25/ontario-municipalities-raise-oil-spill-concerns-on-enbridge-pipeline-reversal/?__lsa=8a80-a16e.
[77] Valier Volcovici, "Quebec to do own review of Enbridge pipeline project," *Reuters*, May 23, 2013, http://uk.reuters.com/article/2013/05/23/quebec-pipeline-idUKL2N0E41IH20130523.
[78] Martin Croteau, "Enbridge: Thomas Mulcair rejoint les opposants," *La Presse*, March 15, 2013 http://www.lapresse.ca/environnement/economie/201305/15/01-4650948-enbridge-thomas-mulcair-rejoint-les-opposants.php.
[79] Jurisdictional Opinion Re: 10 V.S.A. Sec. 6007(c) disclosure statement; jurisdictional determination Modification of the Portland Pipe Line (where located in Vermont, Northeast Kingdom Region), Vermont Natural Resources Board, District 7 Environmental Commission, April 15, 2013; see also Andrew Stein, "Act 250 coordinator: Tar sands requires Vermont permit," April 2013, http://vtdigger.org/2013/04/15/act-250-coordinator-tar-sands-requires-vermont-permit/.
[80] Beth Quimby and Edward Murphy, "Huge crowd turns out to denounce possible transport of tar sands in region," *Portland Press Herald,* January 27, 2013, http://www.pressherald.com/news/Tars-sands-oil-opponents-march-in-Portland.html?pagenum=full.
[81] "Dozens of New England Towns Reject Tar Sands Expansion," Natural Resources Council of Maine, March 6, 2013, http://www.nrcm.org/news_detail.asp?news=5238.
[82] Letter to Secretary Kerry from 15 Representatives and 3 Senators regarding the Portland-Montreal pipeline, February 26, 2013, http://pingree.house.gov/index.php?option=com_content&view=article&id=960.
[83] Governor Hassan Calls on Federal Government to Protect NH from Potentially Dangerous Tar Sands Oil Pipeline, April 22, 2013, http://www.governor.nh.gov/media/news/2013/pr-2013-04-22-tar-sands.htm. Gov. Shumlin calls for new federal

VII. Rail is not an economically feasible alternative for heavy tar sands transport.

The State Department has argued that in the absence of pipelines, rail would provide an equally feasible way to transport the same volume of tar sands crude, and thus would facilitate the same rate of expansion of tar sands production. The State Department used this argument as a central part of its flawed assertion that tar sands development and transportation would happen regardless of whether Keystone XL was approved. However, rail is not an economically viable alternative to pipelines. There are significant economic and logistical obstacles to moving large volumes of heavy tar sands to the Gulf Coast via rail. When the State Department put rail forward as an alternative way to move tar sands, it was not basing its arguments on the economic realities. The high costs of rail for tar sands and the growing concerns over its safety show that the Keystone XL project is a linchpin for the industry's desired tar sands extraction expansion plans and the associated climate emissions.

The July 2013 derailment and explosion of rail tankers carrying oil that killed 50 people in Lac-Mégantic, Quebec, also shows that there are substantial safety concerns with rail. The safety issues are not dealt with in this analysis, but the tragic accident in Quebec shows that they will need to be considered in any review of rail as an alternative mode of transportation. What this paper does show is that if Keystone XL is rejected, rail will not provide an economic means to enable the same level of tar sands expansion and associated climate emissions.[84]

A. Rail is more costly for heavy tar sands crude than for light crude.

While producers are moving increasing volumes of light crude oil from North Dakota, Saskatchewan, and southern Alberta by rail, economic and logistical obstacles have prevented significant volumes of heavy crude such as tar sands oil from moving by rail. The challenges to moving heavy tar sands crude by rail increase its cost, and therefore its feasibility as an option, relative to light crude by rail.

There are several major differences between moving light crude from, for example, North Dakota, and heavy tar sands from northern Alberta.

- Northern Alberta's tar sands are about 900 miles farther away from refinery markets than the North Dakota Bakken oil fields.[85]
- Trains moving light crude can carry nearly 30 percent more crude than trains moving heavy tar sands diluted bitumen (700 barrels versus 550 barrels).[86]
- Moving tar sands requires specialized rail offloading terminals, onloading terminals and heated railcars.[87]

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review of proposed tar sands pipeline, June 20, 2013, http://governor.vermont.gov/blog-gov-shumlin-urges-sec-john-kerry-pipeline-review.

[84] Thomas Homer-Dixon, "No trains, no Keystone XL?," *Globe and Mail*, July 11, 2013, http://www.theglobeandmail.com/commentary/no-trains-no-keystone-xl/article13118294/#dashboard/follows/.

[85] The greater distance requires longer transit times and more trains to supply a given daily capacity of tar sands to the Gulf, increasing per barrel costs. Patrick Ruckers, "Analysis: Oil-by-train may not be substitute for Keystone pipeline," *Reuters*, http://www.reuters.com/article/2013/04/18/us-usa-keystone-railroads-idUSBRE93H07I20130418; The trip between northern Alberta and the Gulf Coast takes 18 days roundtrip by train. Keystone XL DSEIS, pg. 1.4-47.

[86] Heavy crude is denser than light crude, and therefore a barrel of tar sands weighs more than a barrel of light crude oil. Train car weight restrictions will allow loading of approximately 700 barrels of light crude oil or 550 barrels of heavier tar sands. Doug Wilkins, Integrated Midstream Solutions, TD Securities 'Crude By Rail Forum,' October 2, 2012, pg. 11, http://www.gibsons.com/Doc/Gibson%20Presentation%20-%20TD%20Rail%20Forum%20October%202012.pdf.

[87] Doug Wilkins, Integrated Midstream Solutions, TD Securities 'Crude By Rail Forum,' October 2, 2012, pg. 11, http://www.gibsons.com/Doc/Gibson%20Presentation%20-%20TD%20Rail%20Forum%20October%202012.pdf.

- Onloading and offloading heavy tar sands requires steam heating at terminals.

All of these factors increase the number of railcars and per-barrel costs required to move a given daily capacity of tar sands relative to conventional light crude.

B. Rail is unlikely for new tar sands extraction projects, given high start-up costs.

Given a combination of increasingly high production costs and the likelihood of stable or declining global oil prices, many oil companies will find it difficult to justify the already high start-up costs of new tar sands extraction projects if they also need to account for the greater transportation costs associated with rail. This is why heavy crude such as tar sands has largely been absent in the crude-by-rail boom. While some Canadian oil is moving by rail, both Reuters and Goldman Sachs report that the vast majority of it is light crude, not heavy tar sands.[88] From 2009 to 2013, transport of oil by rail in North Dakota increased from a few thousand barrels a day to nearly a million bpd.[89] From January 2012 to January 2013, rail transport of light crude from North Dakota increased from 145,000 bpd to 564,000 bpd, or from 27 percent to 76 percent of production.[90] In comparison, Reuters reported that heavy Canadian oil by rail to the Gulf Coast only increased only from 15,000 bpd to 25,000 bpd during the same time, or from 0.9 percent to 1.3 percent of production.[91] From January to April of 2013, light crude oil shipments by rail in North Dakota increased by a further 230,000 bpd, compared with an increase in rail shipments of heavy Canadian crude of 3,700 bpd for the same time period.[92]

Higher transportation costs associated with rail will undermine the economic feasibility of many new tar sands production projects and will reduce investment in tar sands expansion. The economic feasibility of many tar sands expansion projects is already being undermined by increasing costs and declining crude oil prices. Companies considering tar sands extraction expansion projects will be significantly less likely to commit their capital if they must internalize the higher cost of moving tar sands by rail rather than by pipeline.

i. Rapidly escalating costs in other areas make new tar sands extraction projects especially sensitive to higher transportation costs.

The tar sands industry has a declining ability to absorb any cost increases from transportation by rail because they are already facing rapidly escalating costs in labor and materials. Higher transportation costs from northern Alberta to the Gulf Coast would increase break-even prices and further diminish the economic feasibility of new

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[88] Patrick Ruckers, "Analysis: Oil-by-train may not be substitute for Keystone pipeline," *Reuters*, http://www.reuters.com/article/2013/04/18/us-usa-keystone-railroads-idUSBRE93H07I20130418; Goldman Sachs, Getting oil out of Canada: Heavy oil diffs expected to stay wide and volatile, June 2, 2013.

[89] North Dakota Pipeline Authority, U.S. Williston Basin Rail Export Estimates, April 1, 2013, http://ndpipelines.files.wordpress.com/2012/04/ndpa-website-data13.xlsx.

[90] In January 2012, 2012 North Dakota produced 535,000 bpd, of which 145,000 bpd was transported by rail; while in January 2013, North Dakota production increased to 738,000 bpd, of which 564,000 bpd move on rail. U.S. Energy Information Administration, North Dakota Field Production, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=MCRFPND2&f=M. North Dakota Pipeline Authority, U.S. Williston Basin Rail Export Estimates, April 1, 2013, http://ndpipelines.files.wordpress.com/2012/04/ndpa-website-data13.xlsx.

[91] Patrick Ruckers, "Analysis: Oil-by-train may not be substitute for Keystone pipeline," *Reuters*, http://www.reuters.com/article/2013/04/18/us-usa-keystone-railroads-idUSBRE93H07I20130418.

[92] "North Dakota Sees Record Shipments by Rail," *Associated Press,* June 21, 2013, http://fuelfix.com/blog/2013/06/21/north-dakota-sees-record-oil-shipments-by-rail/; Energy Information Administration, Company Level Import Data, April 2013.

tar sands projects, given this context of other already high production costs. Higher transportation costs will play an important role in decisions about investment in future tar sands extraction mines and *in situ* facilities.

Alberta's landlocked location, constrained labor pool, and climate raise costs of building and operating tar sands projects relative to conventional production, particularly during periods of expansion.[93] Tar sands production costs have been rapidly increasing and are likely to continue to do so.[94] The upper bound of tar sands break-even prices increased by about $15 a barrel across all types of projects from 2011 to 2012.[95]

ii. Lower world oil price scenarios are less favorable for tar sands expansion and should have been considered in the State Department draft environmental review.

The State Department's analysis of Keystone XL projected global oil prices using the U.S. Energy Information Administration's (EIA) 2011 International Energy Outlook, which was published before the full extent of the tight oil boom was understood.[96] Expected future oil prices play a key role in a company's decision about whether to go ahead with new tar sands extraction projects and are another factor in the relative importance of transportation costs in decisions about tar sands expansion.

Both the International Energy Agency (IEA) and Chicago Mercantile Exchange point to lower crude oil prices in the medium term than those assumed in the State Department's draft environmental analysis, providing another reason why the relatively higher cost of rail to pipelines will be an important factor in decisions about tar sands extraction expansion projects.

IEA's Medium-Term Oil Market Report forecasts additional shale oil production will create downward pressure on oil prices as they trend down to reach $93 a barrel in 2018 (in 2013 USD).[97] In contrast, EIA's older estimates,

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[93] IHS CERA, Extracting Economic Value from the Canadian Oil Sands Upgrading and refining in Alberta (or not)? Special Report, 2013, pg. 4.

[94] The Canadian Energy Research Institute (CERI) found that year-over-year break-even costs for new tar sands projects have continued to increase. Canadian Energy Research Institute (CERI), Canadian Oil Sands Supply Costs and Development Projects (2012-2046), May 2013, pg. 31, http://www.ceri.ca/images/stories/2013-05-27_CERI_Study_133_-_Oil_Sands_Update_2012-2046.pdf In particular, 2013 break-even costs for new in situ projects reached $77.85 per barrel (6.3 percent higher than 2012), breakeven costs for new standalone mines reached $99.49 per barrel (13.2 percent higher than 2012) and new mines w/ upgraders required $103.16 per barrel (10.9 percent higher than 2012). These estimates assume low transportation costs. CERI assumed transportation from the field to Cushing, Oklahoma would cost $4.51 per barrel. CAPP estimates the costs of moving a barrel of oil by pipeline from Alberta to the Gulf at $9 a barrel. Moving heavy tar sands by rail costs $20 to $30 a barrel.

[95] Energy Conservation Resources Board, ST98-2011: Alberta's Energy Reserves 2010 and Supply/Demand Outlook 2011-2020, June 2011, pg. 3-24, http://www.aer.ca/documents/sts/ST98/st98-2011.pdf; Energy Conservation Resources Board, ST98-2012, Alberta's Energy Reserves 2011 and Supply/Demand Outlook 2012–2021, June 2012, pg. 3-30, http://www.strategywest.com/downloads/ERCB_ST98_2012.pdf.

[96] Keystone XL DSEIS, pg. 1.4-55.

[97] IEA's Medium Term Market report forecasts that increasing tight shale oil production will allow global oil production to reach 103.6 million bpd by 2018. This is over six million bpd higher than in EIA's international estimates used by the State Department. These additional supplies will create downward pressures on oil prices. IEA's forecast suggests that global oil prices will trend downward to reach $93 a barrel in 2018 (in 2013 USD). International Energy Administration, Oil Medium Term Report: Market Trends and Projections to 2012, 2013, pg. 8, 18. Energy Information Administration, International Energy Outlook, pg. 26; Keystone XL DSEIS, pg. 1.4-55. Bureau of Labor Statistics, CPI Inflation Calculator, http://www.bls.gov/data/inflation_calculator.htm.

predicting a much more constrained international oil market, had forecast that international oil prices would steadily increase to reach $117 a barrel in 2020 (in 2013 USD).[98]

Commodity market expectations validate the IEA's more recent lower oil price scenario. Chicago Mercantile Exchange futures traders currently anticipate Brent crude prices to decline from their current levels of $106 per barrel in August 2013 to $88 per barrel in December 2019.[99] Future traders expect West Texas Intermediate (WTI) price levels to decline to $81 a barrel by 2020.[100] These prices are substantially below those assumed in the State Department's environmental review, which assumed that in 2020 Brent crude prices would approach $130 a barrel and WTI prices would exceed $100 a barrel.[101]

Companies bear very high costs to build new tar sands mines and *in situ* drilling facilities. Tar sands oil companies depend on high oil prices as well as lower fuel, materials, labor, and transportation costs to justify building new extraction facilities. The anticipated lower oil prices highlight the economically marginalized position occupied by proposed tar sands expansion projects and suggest that these projects will be significantly more sensitive to higher transportation costs associated with alternatives such as rail than assumed by the State Department in its draft environmental review of Keystone XL.

VIII. Industry and market expert opinion points to the Keystone XL pipeline as a linchpin for tar sands expansion.

Statements from the financial community further show that Keystone XL is critical to the expansion of tar sands production. Goldman Sachs, TD Economics, Standard & Poor's, CIBC, and other market observers have noted that the current pace of tar sands expansion plans cannot continue if Keystone XL is rejected. The following is a selection of statements showing the widespread view among market analysts, industry experts, and think tanks that Keystone XL will enable increased tar sands production:

> "The… decision regarding Keystone XL is critical because it constitutes a vital export link for Canadian oil production in the 2015–17 time frame. Should Keystone XL be rejected, Canadian oil sands producers will need to rethink expansion plans, timelines, and export pipeline solutions." —RBC Capital Markets[102]

> "The logistics are critical in the development of the oil sands. If Keystone is delayed this year, I believe the industry will not be able to keep up with the current pace of development." —André Goffart, managing director, Total Exploration and Production Canada[103]

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[98] EIA's most recently published International Energy Outlook, published in 2011, estimated that global oil prices would reach $108 a barrel in 2020 (in 2009 USD) or $117.27 in 2013 USD, which is $24.24 a barrel less than IEA's 2013 global oil price estimate of $93 a barrel (in 2013 USD). Energy Information Administration, International Energy Outlook 2011, September 2011, pg. 28; Bureau of Labor Statistics, CPI Inflation Calculator, http://www.bls.gov/data/inflation_calculator.htm (accessed July 11, 2013).

[99] All in 2013 USD. Chicago Market Exchange (CME) Group, Brent Crude Oil Last-Day Financial Futures, http://www.cmegroup.com/trading/energy/crude-oil/brent-crude-oil-last-day_quotes_globex.html (accessed June 16, 2013).

[100] All in 2013 USD. Chicago Market Exchange (CME) Group, WTI Crude Oil Last-Day Financial Futures, http://www.cmegroup.com/trading/energy/crude-oil/light-sweet-crude_quotes_globex.html (accessed June 16, 2013).

[101] Keystone XL DSEIS, pg. 1.4-53.

[102] RBC Capital Markets, Energy Insights: Keystone XL – Weighing the Outcomes, February 11, 2013, pg. 5.

[103] Sylvia Pfeifer, "Faster and cheaper is watchword for Canada's oil sands," *Financial Times*, May 27, 2013, www.ft.com/cms/s/0/771d7062-bef0-11e2-87ff-00144feab7de.html#axzz2UmxXtgyT.

"[T]he approval of the [Keystone XL] project could bring forward investments in oil sand projects which would add upside to our production forecasts." —International Energy Agency[104]

"[W]ith [Keystone] XL in place and operating at capacity, bitumen production could increase substantially." —Canadian Energy Research Institute[105]

IX. Canada is not pursuing climate policy that would effectively enable it to counteract the significant growth of greenhouse gas emissions or meet its international climate target.

In the review process for Keystone XL, there is a new focus on the effectiveness of Canada's climate policies to address high levels of greenhouse gas emissions from tar sands development. However, Canada and the province of Alberta have weakly regulated the rapid growth in greenhouse gas emissions from the tar sands, and this is unlikely to change in the near term. The United States cannot assume that Canadian climate regulations will reduce the high greenhouse gas emissions from the tar sands.

The growth of greenhouse gas emissions from the tar sands sector is a major barrier to enabling Canada to meet its international climate target of a 17 percent reduction below 2005 levels by 2020.[106] In fact, the Government of Canada projects that Canada's national emissions will grow from today's level, with the result that Canada will miss its 2020 target by 113 million metric tons CO_2e, or more than the current emissions of Canada's entire electricity sector.[107] The projected growth of greenhouse gas emissions from the tar sands sector from 2005 to 2020 is large enough to cancel out many of the emission reductions taking place elsewhere in the Canadian economy over the same period.

Given the growth of the tar sands sector, total emissions have continued to rise. While in the past, technological improvements marginally reduced the intensity of greenhouse gas emissions from tar sands operations, additional improvements are not likely without a substantial improvement in climate policies at both the federal and the provincial levels.[108] Current regulations from the province of Alberta are inadequate to counteract the growth of emissions.[109] And despite promises made from the last four federal-level Canadian environment ministers, the Canadian federal government has yet to introduce new rules for limiting greenhouse gas pollution from the nation's oil and gas sector. For Canada to meet its international climate target, it would need to substantially reduce the growth of emissions from the tar sands sector. According to the Pembina Institute, a

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[104] International Energy Agency, Oil: Medium-Term Market Report 2013, May 2013, pg. 129.

[105] Canadian Energy Research Institute, Pacific Access: Part I – Linking Oil Sands Supply to New and Existing Markets, July 2012, pg. 28, www.ceri.ca/images/stories/part_i_-_impacts_of_oil_sands_production_-_final_july_2012.pdf.

[106] Environment Canada, Canada's Emissions Trends (201), Figure 6 and pgs. 19-24, http://www.ec.gc.ca/Publications/253AE6E6-5E73-4AFC-81B7-9CF440D5D2C5/793-Canada's-Emissions-Trends-2012_e_01.pdf.

[107] The Government of Canada projects that Canada's national emissions will grow from 701 million metric tons CO_2e to 720 million metric tons CO_2e. This analysis factors in the effects of all current government policies, including Alberta's greenhouse gas regulations of heavy industry and the federal government's regulations on coal power plants. Clare Demerse, One more time with feeling, why we're not halfway there yet on climate, The Pembina Institute, April 25, 2013, http://www.pembina.org/blog/713.

[108] Matthew Bramley, Simon Dyer, Marc Huot and Matt Horne, Responsible Action? An assessment of Alberta's Greenhouse Gas Policies, The Pembina Institute, 2011, pg. 31, http://www.pembina.org/pub/2295.

[109] *Id* at pgs. 12-15.

Canadian think tank, this would translate to a 42 percent reduction from the projected 2020 emissions level.[110] If the federal government proceeds as it has indicated to develop federal regulations that offer companies an option to reduce intensity or seek offsets through a financial levy, such oil and gas regulations would need an intensity target of 42 percent and a financial levy of $100 to $150 per ton.[111] In contrast, reports of the federal government's negotiating position show an intensity target of 30 percent and a financial levy of $30 a ton.[112] This position would leave oil and gas emissions in 2020 higher than they are today.[113]

X. Conclusion

The approval of the Keystone XL tar sands pipeline would result in a significant net increase in climate emissions. Keystone XL would increase annual climate emissions by 18.7 million to 24.3 million metric tons CO_2e. This amount is similar to the emission reductions from the U.S. heavy-duty truck rulemaking, which is expected to result in an annual reduction of 17.5 million to 32.2 million metric tons CO_2 per year.[114] Over the 50-year life span of the project, the pipeline would add between 935 million and 1.2 billion metric tons of carbon pollution to the atmosphere, representing a significant increase in greenhouse gas emissions. Because the pipeline would have a significant impact on the profitability and expansion of tar sands production, its approval would send a market signal to the tar sands industry to pursue expansion plans. The pipeline is also the largest project under consideration for approval in the near term that would provide the transportation capacity necessary to enable tar sands production growth beyond 2015. Other pipeline proposals either are speculative or face significant hurdles to approval. Regardless, even if all of the other pipelines proposals were to move ahead, they would not provide western Canada with sufficient capacity to support the tar sands industry's expansion plans through 2030. Logistical and economic factors associated with moving heavy crude by rail render it too expensive to support tar sands expansion.

Absent the Keystone XL pipeline, tar sands production would not expand in the same way that it would with Keystone XL. The Keystone XL pipeline would significantly exacerbate carbon pollution, and therefore is not in the national interest.

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[110] P.J. Partington, Matt Horne, and Clare Demerse, Getting on Track for 2020: Recommendations for greenhouse gas regulations in Canada's oil and gas sector, The Pembina Institute, April 2013, http://www.pembina.org/pub/2427.
[111] *Id*.
[112] Nathan Vanderklippe, "Alberta, industry face wide gap on carbon tax," *The Globe and Mail*, April 9, 2013. http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/alberta-industry-face- wide-gap-on-carbon-tax/article10911280/#dashboard/follows/
[113] Clare Demerse and P.J. Partington, Key issues to watch in federal oil and gas climate regulations, The Pembina Institute, June 24, 2013, http://www.pembina.org/pub/2456.
[114] National Highway Transportation Safety Administration (NHTSA), Medium and Heavy Duty Fuel Efficiency Rule Final EIS, June 2011, pg. 4.47, www.nhtsa.gov/staticfiles/rulemaking/pdf/cafe/FEIS-MedHD.pdf.