

## UNDERSTANDING CRUDE OIL TRANSPORT STRATEGIES IN NORTH AMERICA

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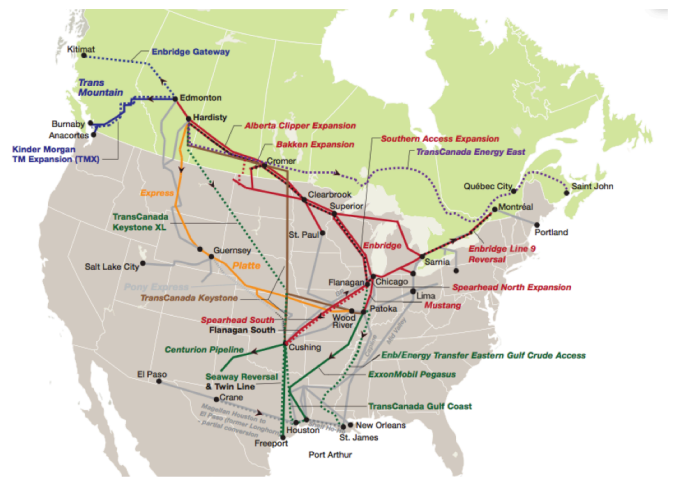
On July 6, 2013, an oil-laden unit train derailed and exploded in Lac-Mégantic, Quebec, killing 47 people and levelling its downtown. Following a dramatic increase in crude oil shipments on US Class I railroads from just 9,500 carloads in 2008 to 234,000 in 2012 (AAR 2013), this accident shocked many and led to the significantly increased public scrutiny of crude oil by rail (CBR).

Simultaneously, there has been intense scrutiny of several proposed pipelines from the oil sands of northern Alberta to the west and east coasts of Canada as well as to the US Gulf of Mexico Coast (USGC) (Figure 1). Pipeline opponents are concerned not only about negative potential environmental impacts from the pipelines themselves, such as a spill of diluted bitumen (a form of crude oil to be shipped), but also about the consequences of greenhouse gas (GHG) emissions caused by the energy-intensiveness of bitumen production and refining. Proponents counter that a denial of pipeline permits by the Canadian and US governments would lead to more CBR, which they argue would not only be less cost-effective, safe, and environmentally-friendly, but also ultimately lead to the same amount of GHG being emitted from the production and refining of oil sands bitumen (e.g. Krugel 2013). Therefore, much of the debate over proposed pipelines from the oil sands hinges on whether railroads could accommodate oil production increases economically and with comparable societal impacts as the pipelines.

The stakes are high: oil sands production could increase from 1.8 million barrels per day (Mb/d) in 2012 to 5.0 Mb/d in 2035, bringing along with it both positive and negative impacts for Canada and the US. Until these impacts are considered through political and regulatory processes in Canada and the US, railroads deciding whether to invest in capacity to

transport bitumen are presented with considerable uncertainty. This brief provides a qualitative overview of the factors driving this uncertainty.

Figure 1: Proposed Crude Oil Pipelines in North America (Source: CAPP 2013)



Three important impacts of oil sands production and its transportation system are: economic impacts (and relatedly energy security), GHG emissions/climate change impacts, and local environmental impacts. After describing each impact, the position of the Canadian and US governments related to these impacts will be explained. The federal governments of the US and Canada are the focus, because they hold authority over pipeline permit approval for interprovincial and international pipelines, though provinces and states have some jurisdiction over certain aspects of pipeline construction, such as pipeline “siting” in the US (Vann et al. 2012, CEAA 2012). The relative performance of railroads versus pipelines will then be described to understand how each government could favor one mode over the other to accomplish its strategic objectives, and the consequences they would need to be aware of. Throughout this discussion, uncertainties

of interest to both governments and the railroads are identified.

Canada would receive significant economic benefits from oil sands production growth. Assuming plausible growth, jobs in the oil sands could grow from 75,000 jobs (direct, indirect, and induced) in 2010 to 905,000 jobs in 2035, and over this period, the Government of Canada could expect to receive \$311 billion in tax revenue (Honarvar et al. 2011). As a result, all major Canadian federal political parties support (at least some of) the capacity expansion necessary to support oil sands production growth, though the New Democratic Party opposes pipelines solely designed to export unprocessed crude oil (Canadian Press 2013, Barton 2013).

Production from the oil sands also impacts the economy of the US through its trade relationship with Canada, but the magnitude of the benefits is a more contentious issue in the US. The oil sands sector could contribute to the creation and preservation of 465,000 jobs (indirect and induced) in the US in 2035, up from 21,000 in 2010 (Honarvar et al. 2011), but only some of the benefits are specifically tied to Alberta oil ending up in the US. Because oil is globally traded, US refiners may be able to import comparably priced oil from abroad regardless, although this would not necessarily be from an ally of the US (Levi 2009). As a result, the economic impacts in the US of a particular energy transport project are more difficult to quantify, leaving room for political debate.

For example, in the context of debate over the approval of a Presidential Permit for the Keystone XL (KXL, [Figure 2](#))<sup>1</sup> – which is currently being evaluated by the US Department of State -- President Obama has downplayed the economic benefits from the project, indicating that its construction would create only 2,000 construction jobs, lower than the estimate given in the Department of State's (DoS's) Draft Supplemental Environmental Impact Statement (DSEIS) of 3,900 person-years in direct construction jobs (*The New York Times* 2013, DoS 2013). By contrast, many in Congress

<sup>1</sup> Pipelines crossing the international borders into the US are required to have a Presidential Permit.

support its construction partly because of these same economic impacts (Energy and Commerce Committee 2013). Therefore, even when considering the more easily defined construction benefits of the KXL, there is significant debate over value of the economic benefits received from a pipeline project.

**Figure 2: TransCanada Keystone XL (Source: TransCanada)**



Because of the difference in the economic benefits potentially received by the Canadian and US governments, there is also divergence in their goals. The Canadian government wants a cost-effective crude oil transport system with sufficient capacity: it prefers pipelines, which are generally a lower cost mode.

Additionally, whether railroads would make the investments necessary to transport the expected 3 Mb/d in production growth is uncertain. The DoS (2014) finds that such growth would be consistent with the capacity expansion that took place to accommodate coal production from the Powder River Basin. However, Cairns (2013) opines that handling the 3 Mb/d growth is

“probably a stretch too far” for the railroads. Because of these unresolved questions and their greater comfort with pipelines, Canada is in favor of pipelines, even if railroads could plausibly handle the traffic competitively.

By contrast, from the US perspective, the desirability of the two modes depends on the prioritization of its goals. Specifically, the production and refining of crude oil derived from oil sands bitumen results in higher GHG emissions as compared to other heavy crudes refined in the US by 2 to 13% (DoS 2014). If GHG emissions reductions are the priority, then denying pipeline permits may be preferable, because rail transport generally appears less economic, and its ultimate capacity is uncertain. Notably, analysis for the DoS (2014) finds one scenario in which a denial of the KXL would result in modestly less production from the oil sands.

However, if reducing GHG emissions were the priority, encouraging a GHG-reduction policy in Canada appears to be President Obama’s preferred approach: “Canada at the *source* in those tar sands could potentially be doing more to mitigate carbon release” (The NY Times 2013, emphasis added). However, Prime Minister Stephen Harper downplays the issue: “[emissions from oil sands production are] almost nothing globally” (Fitzpatrick 2013). Although Canada has a GHG emissions reduction target for 2020, Canada does not have any federal policy for GHG emissions reductions from the oil sector. Combined with expected oil sands production growth, Canada is currently poised to *increase* carbon emissions from the baseline year (2005). Though the US is also not on track to meet the same GHG emissions-reduction goal as Canada, Canada’s oil and gas sector is a critical component to meeting that goal, because it represents 23% of Canadian emissions in 2011 (Demerse and Partington 2013).

The resistance by Canada to implementing carbon constraints, particularly when the US president views them as a key priority also suggests that there is greater uncertainty over how the incremental cost of rail

transport could impact oil sands production growth. One proposal by The Pembina Institute (an environmentally-inclined think tank) for a \$150/tonne carbon tax would result in an effective cost of \$2.87/barrel (Partington et al. 2013), which is well within the price differential between pipelines and rail. That the Canadian government has not put more modest proposals in place suggests that oil sands producers could be more cost sensitive than the DoS concludes.

The choice of transportation modes also affects the amount of GHG emissions. While pipelines are generally considered more energy efficient and produce fewer GHG emissions than unit trains, some research indicates that the opposite may be true. Because the power grid in the US Midwest relies on fossil fuels, unit trains may produce fewer GHG emissions than pipelines from Alberta to the USGC (Tarnoczi 2013). Because these results conflict with the information provided by the DoS (2014), more research is needed into the lifecycle impacts of the two modes; it should not be assumed that pipelines have lesser impacts in all cases.

The *local* environmental impacts from the bitumen production have not been a critical issue in the debate surrounding transportation capacity, unlike the issue over spills from pipelines and railcars. In terms of research, Crosby et al. (2013) finds “critical gaps in the current oversight, rules and regulations, contingency planning requirements, and response capacity to address the increasing transport of oil sands products,” though there is no evidence that the transport of bitumen causes more spills (Bartreau et al. 2013). Despite the concerns, the Canadian Government passed legislation in 2012 to give the federal cabinet final decision-making power over whether a project subject to environmental reviews proceeds, instead of the National Energy Board (NEB), the regulator of interprovincial and international pipelines in Canada, which aligns with their overall strategy of supporting pipeline development (Hoberg 2013). In the US, President Obama has emphasized concerns over GHG, but concerns over local environmental impacts are being litigated in state courts (Bernstein 2014).

Therefore, transport safety records merit examination. Railroads have a lower spill rate but a higher rate of injury as compared to pipelines. Although railroads have a lower spill rate per ton-mile than pipelines, they have a higher incident rate. Therefore, on an environmental-impact basis, railroads perform modestly better than pipelines; yet public perception may still view railroads as less safe due to their higher incident rate. On a public safety basis, railroads have an injury rate 30 times higher than pipelines for the transport of petroleum products (though it is not clear from the cited report whether these accidents were solely related to the transport of the hazardous material) (Furchtgott-Roth 2013). As a result, the modal split between pipelines and railroads has safety implications, particularly from a public safety perspective.

More importantly, using historical data as a comparison has limitations, which is particularly of concern in the case of railroads, as they have not previously used unit trains to transport oil. This historical data does not include recent accidents involving crude oil, particularly the accident at Lac-Mégantic, in which approximately 38,000 barrels of oil was released (Beaudin 2013), almost double the amount of oil released (20,600 barrels) in the largest inland pipeline spill in the US (Reuters 2013). The chair of the Transportation Safety Board of Canada also emphasizes these concerns: “In this new environment, it is no longer enough for industry and government to cite previous safety records or a gradual, 20-year decline in the number of main-track derailments” (Tadros 2013). Therefore, public safety is an impact that needs to be mitigated if rail is to take a greater role in transporting crude oil, and new approaches to identifying hazards will be necessary to deal with such a major operational change.

Ultimately, whether President Obama, with the aim of reducing GHG emissions, justifies denying pipeline permits (i.e. the KXL) because it may constrain oil sands production is a value judgment in a political context. If he does so, he should also address the rail safety implications in his policies. However, because the performance of railroads is comparable to pipelines

(though uncertain) along some dimensions of economic and societal importance, the consequences of denying pipeline permits on GHG emissions, economic, and other environmental impacts are not as great as often presented in the political debate. As President Obama’s deliberations unfold, as well as the evaluation process for pipelines in Canada, railroads are presented with considerable uncertainty.

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