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The Cost of Pipeline Constraints in Canada

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Main Conclusions

- Despite the steady growth in crude oil available for export, new pipeline projects in Canada continue to face delays related to environmental and regulatory impediments as well as political opposition.
- Canada's lack of adequate pipeline capacity has imposed a number of costly constraints on the nation's energy sector including an overdependence on the US market and reliance on more costly modes of energy transportation. These and other factors have resulted in depressed prices for Canadian heavy crude (Western Canada Select) relative to US crude (West Texas Intermediate) and other international benchmarks.
- Between 2009 and 2012, the average price differential between Western Canada Select (WCS) and West Texas Intermediate (WTI) was about 13 percent of the WTI price. In 2018 (based on the first quarter data), the price differential surged to 42 percent of the WTI price.
- From 2013 to 2017, after accounting for quality differences and transportation costs, the depressed price for Canadian heavy crude oil has resulted in CA$20.7 billion in foregone revenues for the Canadian energy industry. This significant loss is equivalent to almost 1 percent of Canada's national GDP.
- In 2018, the average price differential (based on the first quarter) was US$26.30 per barrel. If the price differential remains at the current level, we estimate that Canada's pipeline constraints will reduce revenues for Canadian energy firms by roughly CA$15.8 billion in 2018, which is approximately 0.7 percent of Canada's national GDP.
- Insufficient pipeline capacity has resulted in substantial lost revenue for the energy industry and thus imposed significant costs on the economy as a whole, and will continue to do so. This reaffirms Canada's critical need for additional pipeline capacity.

Introduction

Canada's energy industry is a major contributor to Canada's economy and provides economic benefits to all Canadians. However, that contribution could be larger still: Canadian oil producers have been facing depressed prices for their crude oil relative to other international benchmark prices, resulting in foregone revenue for the Canadian energy industry. The price differential between Canadian heavy crude (Western Canada Select or WCS) and US crude (West Texas Intermediate or WTI) has widened substantially in recent months due to insufficient transportation infrastructure and pipeline bottlenecks, which has dramatically lowered the market price of Canadian crude oil relative to other comparable oil prices.

Western Canada's oil exports have been rising steadily since 2013. Despite the steady growth in crude oil available for export, construction of pipelines to transport crude oil has been lagging, as many major pipeline projects have been delayed or cancelled. Insufficient pipeline capacity is driving increased shipments by railway—a more expensive (and slightly less safe) mode of transportation—leading to higher costs for Canadian producers.[1] The issue of inadequate transportion capacity has also resulted in rising crude oil inventories, putting Canadian oil into storage rather than into the market.

Despite the strong economic case for pipelines, new pipeline projects in Canada continue to face delays related to environmental and regulatory impediments as well as political opposition. Ultimately, Canada's lack of adequate pipeline capacity has resulted in depressed prices for Canadian heavy crude and lost revenue for oil producers and thus the Canadian economy as a whole.

This bulletin will explain the reasons behind the steep WTI-WCS price differential and will subsequently demonstrate Canada's critical need for new pipeline projects. We will examine the extent to which Canada's heavy crude is being discounted relative to other benchmark oil prices and how the price differential for Canadian crude has grown in recent months. Finally, we will estimate the revenue lost between 2013 and 2017 due to depressed prices from Canadian heavy oil exports, as well as the foregone revenue for the energy sector associated with insufficient pipeline capacity in 2018.

Reasons behind the Canadian crude oil discount and the case for pipelines

Canadian oil producers command substantially lower prices for their crude oil relative to other international benchmark prices. Some part of the differential between the Western Canadian Select (WCS) price, Canada's primary heavy crude benchmark, and the West Texas Intermediate (WTI) benchmark price is natural and can be attributed to two factors: quality differences and transportation costs.

In terms of quality differences, WCS crude oil is heavier than WTI crude (an API of 20.5 degrees versus 34.3 degrees) and it contains 3.5 percent sulphur by weight compared to WTI's 0.9 percent (BNN News, 2013). Being heavier and more viscous, WCS is more costly to trans-

1 According to the National Energy Board, "rail costs are roughly double or triple the pipeline tolls" (NEB, 2014). Meanwhile, studies show using pipeline and rail transportation of oil and gas are both quite safe; however, pipelines continue to result in fewer accidents and fewer releases of product, when considering the amount of product transported by pipeline. Based on data from 2004 to 2015, pipelines were 2.5 times less likely than rail to result in a release of product when transporting a million barrels of oil (Green and Jackson, 2017).

port by pipeline (as it requires more energy to move a given distance). Further, the heavier the crude oil, and the greater the sulphur content, the lower its value to a typical refiner as it will require more complex methods to produce fuels like gasoline. For these reasons, oil refiners generally expect to pay less for heavy WCS crude oil compared to light, low-sulphur WTI crude oil.

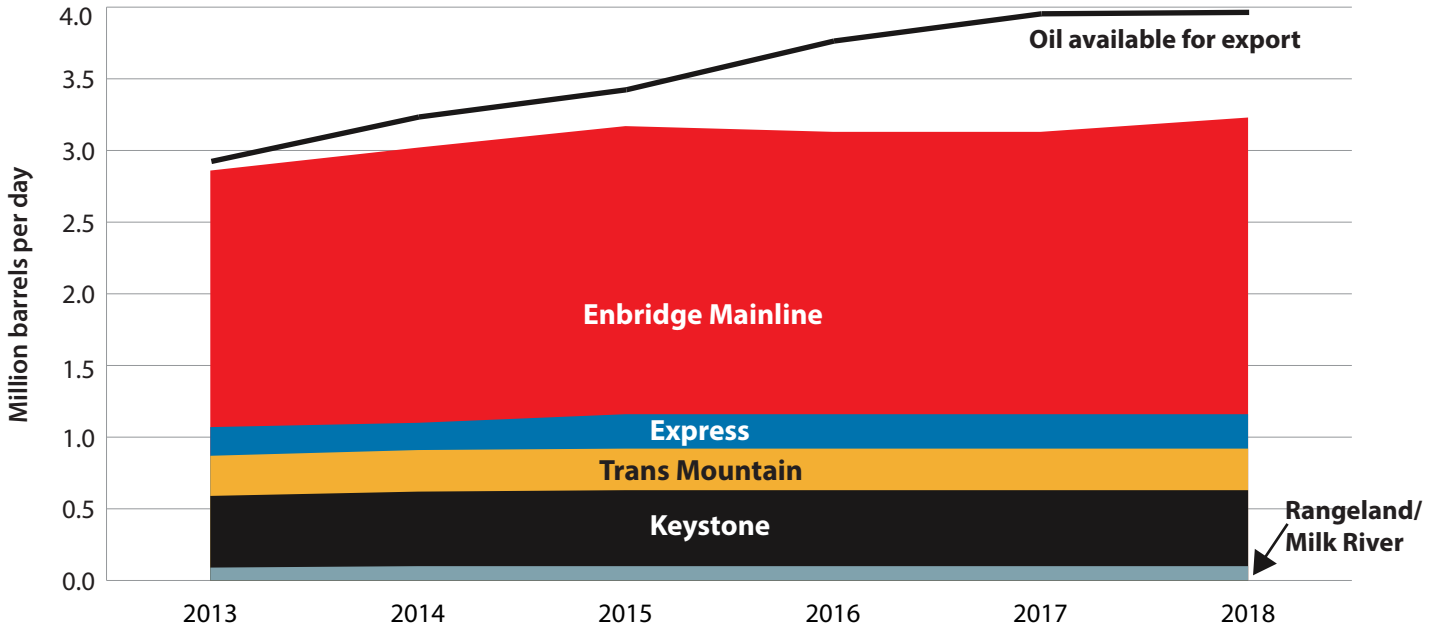
The second component of the natural differential between WCS and WTI is associated with the cost to transport oil from Western Canada to US refining hubs. WCS is priced at Hardisty, Alberta and WTI crude oil at Cushing, Oklahoma. If it were not for the quality differences and the impact that this has on refinery demand for competing crudes, the difference between the price of WTI and WCS would boil down to just the transportation cost between Hardisty and Cushing. According to the Canadian Association of Petroleum Producers, the 2017 tolls to ship heavy oil from Hardisty to Cushing are between US$5.45 and $6.85 per barrel, depending on which pipeline system is used.

While there is and will always be a natural differential between the WCS and WTI prices because of quality differences and transportation costs, Canada's insufficient transportation infrastructure and pipeline bottlenecks have dramatically increased the differential beyond its natural level in recent years.[2]

Western Canadian oil exports have been rising steadily in recent years (**figure 1**). According to the National Energy Board's analysis, Canada had 3.95 million barrels per day of oil available for export in 2017, compared to 2.95 barrels per day in 2013, an increase of 35 percent. Despite the steady growth in crude oil available for export, construction of pipelines to ship oil out of the region has been lagging (as shown in figure 1) as major pipeline projects have been delayed or cancelled. These include Enbridge's

2 The tight takeaway capacity has penalized both Canadian heavy and light crude oil in US markets. However, Canadian heavy crude oil (WCS) suffers more than light, sweet crudes due to quality differences.

Figure 1: Canadian oil pipeline capacity and exports, 2013–2018



Source: NEB, 2016.

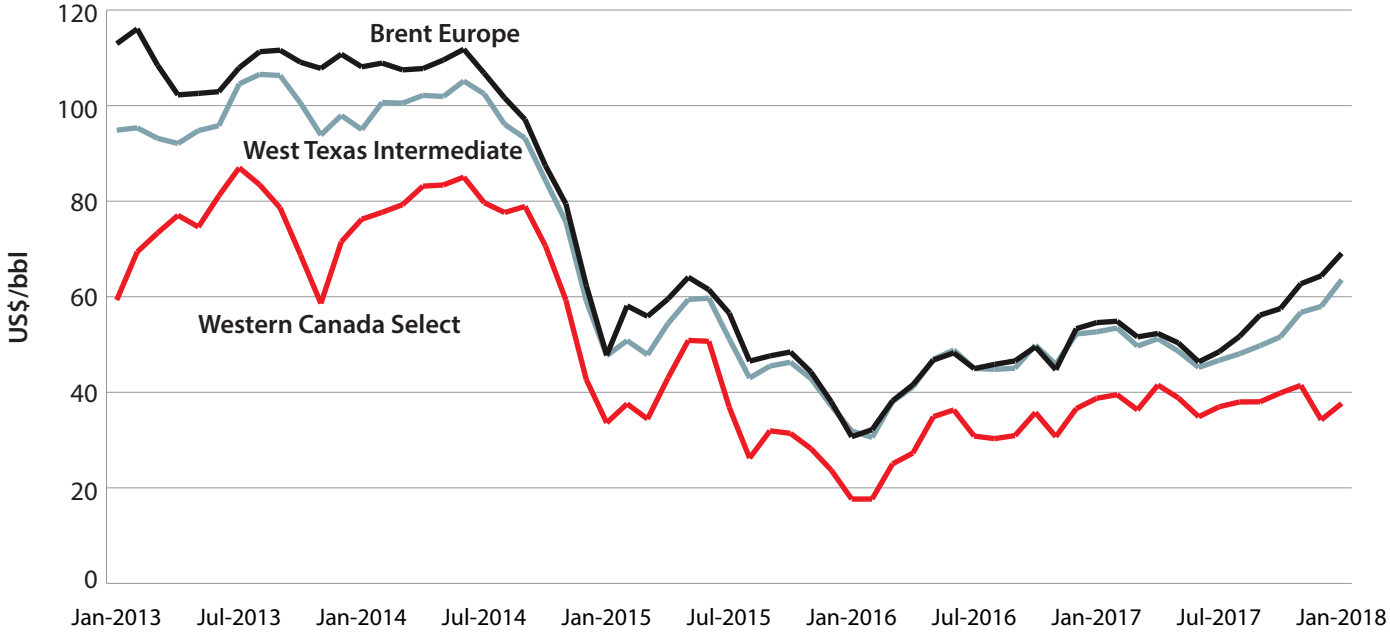
Northern Gateway Pipeline and TransCanada's Energy East and Eastern Mainline projects, which have been cancelled due to a number of factors including significant regulatory hurdles, political opposition, and changing market conditions. The Keystone XL pipeline proposal faced significant delays in the US as this project was initially rejected by the Obama administration in November 2015 and finally got approved by the Trump administration in March 2017. Despite receiving many of the necessary regulatory approvals, Canada's remaining pipeline projects—the Trans Mountain Expansion and the Line 3 Replacement Project—along with Keystone XL—continue to face delays related to environmental and regulatory concerns, political opposition, and market uncertainty (Scotiabank, 2018).

The insufficient pipeline capacity available to transport Canadian crudes to US destinations has forced increased shipments by railway. According to data provided by the NEB, in January 2017, Canadian crude oil exports by rail were more than twelve times greater than in January 2012 (NEB, 2017). Of course, those Canadian oil producers that have resorted to shipping by rail have had to absorb the higher transportation costs. The more that oil producers have to depend on rail because of insufficient pipeline capacity, the greater the average WCS transportation cost and the spread between WCS and WTI prices.

The inadequate transport capacity dilemma is also reflected in rising crude oil inventories in Alberta in recent years. Many oil producers have been forced to put excess production into storage tanks until sufficient capacity is available. Specifically, based on data provided by the Alberta Energy Regulator, crude oil inventories increased by 47 percent between January 2013 and January 2018 (AER, 2013-2018).[3]

3 Crude oil closing inventories increased from 7,055,075.5 cubic meters in January 2013 to 10,403,507.4 cubic meters in January 2018.

Figure 2: WCS vs. global benchmark prices



Sources: US Energy Information Administration, 2017; GMP First Energy, 2017.

Figure 2 illustrates the depressed value of Canadian heavy crude oil (WCS) relative to the US benchmark (WTI) and the Brent crude global benchmark. The WCS price has been and continues to be substantially below the prices of both WTI and Brent.[4]

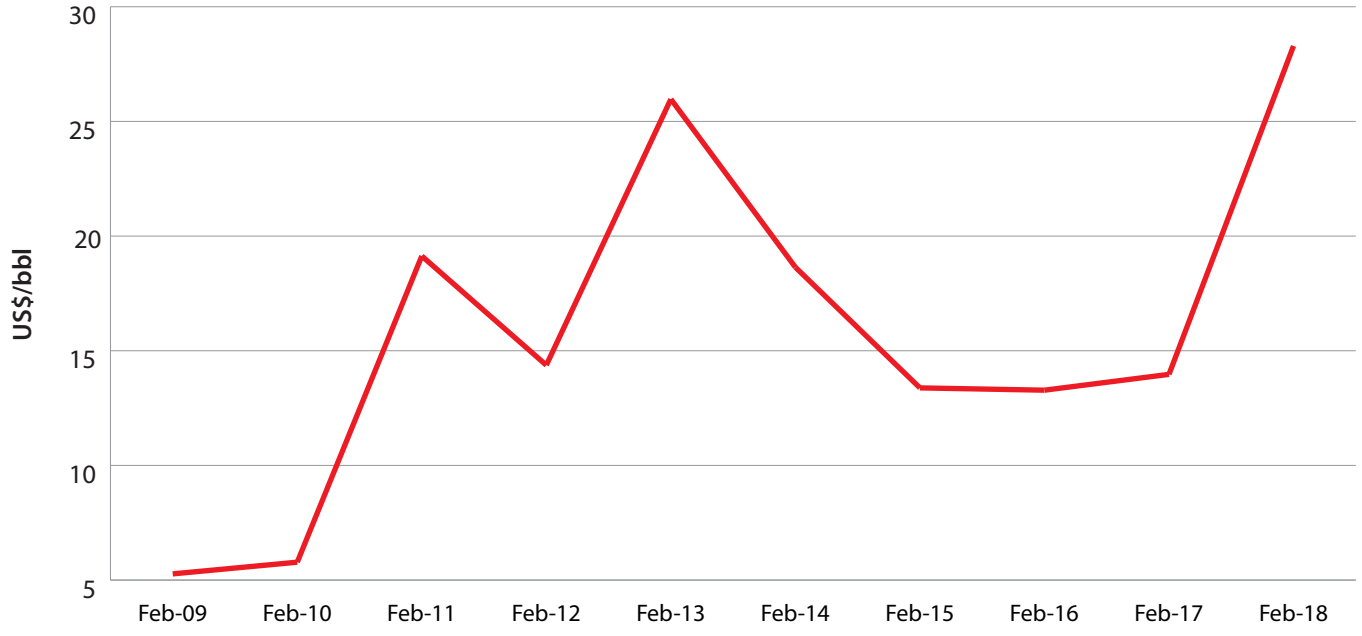
Figure 3 illustrates the difference between prices of WCS and WTI over the past decade. While the difference between WTI and WCS was only US$5.27 per barrel in February 2009, it became significantly wider in recent months, reaching a differential of US$28.29 per barrel in February 2018. Between 2009 and 2012, when transportation constraints were not apparent, the price differential, on average, was approximately $US11.17 per barrel, which can be perceived as the natural differential. However, the WTI-WCS price differential has widened substantially in recent months, due to increased Canadian heavy crude oil production and lack of adequate takeaway capacity. The price differential began to increase in 2017 and it widened even further starting in November 2017 when TransCanada's Keystone pipeline was shut down because of a spill in South Dakota. TransCanada Corp's Keystone crude pipeline is still operating at 20 percent reduced capacity after the 5,000 barrel oil leak detected in November (Process West, 2018).

More specifically, between 2009 and 2012 the average WTI-WCS differential was only 13 percent of the WTI price. However, in February 2018 the differential reached 46 percent of the WTI price (Oil Sands Magazine, 2018). This represents a striking 33 percentage point increase in the Canadian crude oil discount.

In addition, as forecast by the Canadian Association of Petroleum Producers (CAPP), crude oil production—primarily heavy crude—will continue to rise in coming years, increasing by 1.3 million barrel per day from 2016 to 2030. The increase

4 Generally, the WCS discount relative to Brent has been slightly greater, in part, because of growing US oil production and strong Asian demand.

Figure 3: WCS discount to WTI



Source: Oil Sands Magazine, 2018.

in oil production translates into "over 1.5 million barrels per day of additional crude oil supplies that [will] require transport to markets" (CAPP, 2017a). Given the steady growth in oil production and lack of adequate takeaway capacity, Canada requires new pipeline infrastructure to transport heavy crude production from Western Canada to Gulf Coast refining hubs and overseas markets. As reported by Bloomberg, the three current proposed pipeline projects (the Trans Mountain Expansion, the Line 3 Replacement Project, and Keystone XL) could transport Canada's additional oil as these pipelines can increase export capacity for Western Canada's oil producers by 1.5 million barrels per day (Denning, 2017). However, even if these projects are able to overcome their regulatory hurdles, no new capacity will come online until the latter half of 2019.

While building pipelines to secure access to the US Gulf Coast is important—as it will reduce the existing price differential—gaining access to new overseas markets is even more crucial. Currently nearly 99 percent of Canadian heavy crude gets exported to the US, meaning that the US is essentially still Canada's only export market. Given soaring US oil production in recent years and competition from American producers, finding new customers for Canadian heavy crude is critical. As a result, building Keystone XL and the Line 3 Replacement pipeline, which are set to expand capacity to the US market, are important, but expanding the Trans Mountain pipeline to gain access to new customers in Asia, where demand for oil is growing, would be even more beneficial.[5] The Trans Mountain expansion project, which is meant to triple capacity on the existing pipeline which transports crude between landlocked Alberta and the Pacific coast, is currently facing considerable political opposition. Such political opposition is causing concerns about whether the pipeline will actually be built. In particular, in April 2018, Kinder Morgan stopped all non-essential spending on the Trans Mountain (TMX) pipeline expansion, explaining that the company cannot invest more money into a project that they can't ensure will see completion (Graney and Gerein, 2018). Kinder Morgan's announcement is not suprising given the recent attempts by the BC government to block the expansion project, despite federal government and National Energy Board approvals.

Lost revenue from Canada's inability to build new pipelines

The lack of adequate takeaway capacity in recent years has resulted in depressed prices for Canadian heavy crude (WCS) relative to the US (WTI) and global benchmarks, and thereby lost revenue for oil producers and thus the economy as a whole. This section estimates the foregone revenues for Canada's energy industry from 2013 to 2017 due to constrained capacity and the subsequent Canadian heavy crude discount. It also estimates lost revenue in 2018 given the existing elevated price discount.

According to the analysis summarized in **table 1**, after accounting for quality differences and transportation costs, from 2013 to 2017, the discounted price for Canadian heavy crude resulted

5 Studies have calculated the additional revenues that would result from greater market access, which would be obtained through building pipelines to tidewater. According to the analysis by Angevine and Green (2015), if Canada were able to export 1 million barrels of oil per day to markets accessible from tidewater locations, at a $US40/bbl price the additional sales revenue would amount to CA$2 billion per year compared with selling those barrels into the already flooded US market. At an average price of US$60/bbl, the additional annual revenue would be CA$4.2 billion. At US$80/bbl, it would reach CA$6.4 billion in additional annual revenue.

Table 1: Estimated foregone revenue for the Canadian energy industry, 2013–2017

Year	WTI Price at Cushing (US$/bbl)	Transportation cost (US$/bbl)	Quality difference (US$/bbl)	Natural discount (US$/bbl)	Potential WCS price (US$/bbl)	WCS price at Hardisty (US$/bbl)	Lost revenue per barrel (US$/bbl)	Total heavy crude exports to the US (Mbpd)	Total lost revenue (CA$ billions)
2013	98.02	5.76	5.63	11.39	86.63	73.55	13.08	2.01	9.88
2014	92.89	6.26	5.63	11.89	81.00	74.37	6.62	2.22	5.92
2015	48.80	6.26	5.63	11.89	36.90	35.67	1.23	2.42	1.39
2016	43.42	6.26	5.63	11.89	31.53	29.57	1.95	2.52	2.38
2017	50.91	6.28	5.63	11.91	39.01	38.17	0.84	2.74	1.09

Notes: 1. Transportation cost is an average pipeline toll (based on two existing pipelines of Enbridge and Keystone) to ship crude from Hardisty to Cushing. / 2. The reason for the adjustment is to allow comparison of the two types of oil: WCS is a much heavier crude then WTI. In order to adjust for quality differences, we calculated a five year average price difference between LLS (Light Louisiana Sweet crude, which has similar quality to WTI) and Maya (a Mexican Seaborn heavy crude of similar quality to WCS). Both LLS and Maya get priced at the US Gulf Coast. /3. The natural differential is a the sum of the transportation costs and quality differences. / 4. The authors converted US dollars to Canadian dollars based on the actual average exchange rate for each year as published by the Bank of Canada (2013–2018).

Sources: Bank of Canada, 2013-18; CAPP, 2013-16, 2017b; EIA, 2013-18; GMP First Energy, 2013-17; Oil Sands Magazine, 2018.

in a revenue loss of CA$20.7 billion for the energy indstury. This significant loss, which is associated with an average price differential of US$16.6 per barrel, is equivalent to almost 1 percent of Canada's national GDP in 2017 (Statistics Canada, 2017).

Specifically, in 2013, we estimated the natural differential (accounting for quality differences and transportation cost) to be approximately US$11.4 per barrel, which is substantially lower than the existing differential of US$24.5 per barrel. As a result, while Canadian oil producers received US$73.5 for every barrel exported to the US, they could have received a WCS price of US$86.6, a difference of 18 percent. Given that Canada exported 2 million barrels per day to the US in 2013, the revenue that was lost due to capacity constraints in 2013 alone was roughly CA$9.9 billion.[6]

Similarly, in 2014, the difference between the potential and the real WCS price was roughly US$6.6 per barrel, meaning that the price received per barrel that was exported could have been much higher if pipelines constraints were absent. As Canada exported 2.2 million barrels per day, the US$6.6 difference per barrel translates into a revenue loss of CA$5.9 billion in 2014. During 2015 and 2017, the average differential between WTI and WCS was lower, which resulted

6 The significant price differential between WTI and WCS in 2013 can be partly attributed to growing US oil production and a subsequent supply glut in the US Midwest (TD, 2013). This supply glut in the US is reflected in figure 2 where the spread between WTI and Brent crude was wider in 2013 and became narrower in more recent years. As both US and Canadian oil production are projected to rise in coming years, and there is no sign of additional demand from refineries in the US region, the need for more pipelines and greater market access is crucial.

in approximately CA$4.9 billion in forgone revenues for the Canadian energy industry.[7]

In recent months, due to greater excess production relative to takeaway capacity, the price differential between WTI and WCS has widened substantially. In 2018, the average price differential (based on first quarter) is US$26.30 per barrel, which represents almost a 42 percent price differential. As no major pipelines will be entering service till at least latter half of 2019, we expect the WTI-WCS differential to remain elevated in 2018. The existing spread between WTI and WCS is much higher than the natural spread of nearly $US11.8 per barrel arising from transportation costs and quality differences alone, meaning that the costs associated with pipeline constraints will probably mount during 2018.

Although the significant price differential may cause some rail companies to expand their capacity to ship crude oil, sources suggest that companies have been reluctant to make long-term investments to expand capacity because of concerns that demand for their services is short term (Williams and Ngai, 2017). In addition, rail companies now demand much higher rates to move oil, which results in higher transporation costs and thereby lower prices for Canadian crude (Healing, 2018). There is also political uncertainty ramping up in regards to transporting crude-by-rail between Alberta and British Columbia, with the BC government pursuing legal options to restrict the volume of crude oil being transported by rail (Hunter, 2018). Thus, due to the higher costs and political uncertainty associated with additional crude-by-rail, we expect the elevated price differential to remain.

If the differential stays at the current level (US$26.30 per barrel), assuming that Canada exports 2.4 million barrels of heavy crude per day in 2018, and given an exchange rate of US$1 US dollar to CA$1.3, after accounting for the transportation cost and quality differences, we estimate that pipeline constraints will reduce revenues for Canadian energy firms by approximately CA$15.8 billion—or 0.7 percent of Canada's national GDP—in 2018.

Conclusion

Canadian heavy crude oil producers continue to suffer from depressed prices relative to West Texas Intermediate (WTI) and other global oil price benchmarks. Canada's steep oil price discount is a result of insufficient pipeline capacity, which has dramatically lowered the market price for Canadian crude oil and resulted in lost revenue for oil producers as well as the economy. Canada's oil producers face transportation constraints and alternatives like crude-by-rail are costly and uncertain. In addition, many new pipeline projects have been cancelled or stalled by regulatory processes and political opposition, further contributing to Canada's transportation constraints.

7 There have been some improvements in accessing the US Gulf coast in recent years but the added capacity has not been enough to solve the price differential that Western Canadian oil producers face. With completion of its "MarketLink" crude oil pipeline facility (the southernmost leg of the proposed Keystone XL Pipeline) in 2014, TransCanada Corporation now has the capacity to move crude oil from Cushing, Oklahoma to the Houston, Texas vicinity. Enbridge has also been expanding its US Mainline pipeline capacity from North Dakota to Cushing via the upgrading and addition of pumping stations in states such as Wisconsin and Illinois (Angevine and Green, 2015). Combined with the company's Seaway Pipeline expansion, this provides an alternative path to the Gulf Coast for Western Canadian crude oil. As a result, more Western Canadian crude oil has been able to reach United States coastal destinations now that TransCanada and Enbridge have some additional capacity to ship oil from Cushing OK to Texas refineries.

From 2013 to 2017, Canada's energy industry lost $20.7 billion in foregone revenue as a result of this country's lack of pipelines, after accounting for quality differences and transportation costs. In 2018, Canada's transportation constraints are estimated to reduce revenues for the energy sector by $15.8 billion. The results show that insufficient pipeline capacity has resulted in substantial lost revenue for Canada's energy industry and will continue to do so, and thus imposes signficiant costs on the economy as a whole. Ultimately, these results highlight Canada's critical need for additional pipeline capacity.

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