Extreme Market Distortions: Canadian Crude Oil Flows

Jennifer Considine, Philipp Galkin and Abdullah Aldayel

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With extensive natural resources and strategic access to both the Atlantic and Pacific basins, Canada has the potential to become a global energy powerhouse – provided that the nation is successful in alleviating its infrastructure bottlenecks. According to the United States Energy Information Administration (EIA), Canada has the third-largest crude oil reserves in the world (EIA 2020). In 2019 it accounted for 9% of total crude oil export volumes (JODI 2020) – lagging behind only three nations: Saudi Arabia, Russia and Iraq. However, Canadian oil exports have been crippled by a shortage of available pipeline and rail takeaway capacity. America’s share of Canadian crude oil exports has remained at high levels for the past few years, falling only slightly from 99% in Q3 2015 to 97.1% of export volumes in Q1 2020 (ITC 2020) (see Figure 1).

**Figure 1.** Canadian crude oil exports.

Sources: ITC (2020); internal KAPSARC calculations.

These monopsonic market dynamics have significant implications for Canadian oil producers, manifesting most vividly in severe discrepancies between the relevant oil price benchmarks and higher price volatility on the Canadian side. The average differential between Western Canadian Select (WCS) and U.S. West Texas Intermediate (WTI) crude oil prices increased from $11.6 in 2019 (a 20% discount to the average WTI price) to $13.9 in the first eight months of 2020 – a staggering 37% discount to WTI (Government of Alberta 2020). One measure of price volatility, the standard deviation of the WCS crude oil price, was $9.41 per barrel from February 25, 2020 to November 30, 2020 but only $7.54 per barrel for WTI. At these price levels, Canadian crude exports have the potential to be competitive on the global oil market, while simultaneously contributing to the economic efficiency of global oil imports and shipping patterns. Instead, IHS estimates...
suggest transportation bottlenecks resulted in a fall in the economic value of Western Canadian crude oil production: $12 billion in the month of November 2018 alone (Brady et al. 2020).

The major impediment to reducing these market distortions is the inadequate development of Canada’s oil transportation and export infrastructure. Most major large-diameter transmission pipelines either link domestic markets or facilitate oil exports to the U.S. (see Figure 2).

**Figure 2.** Oil transportation infrastructure in Canada.

Over the past decade, large scale infrastructure and pipeline projects such as Canada’s Keystone XL have been subject to increased regulatory scrutiny and legal challenges. The setbacks are primarily a result of conflicting and seemingly incompatible visions of the future of energy. Climate change and the politicization of the regulatory process have led to an increasing number of court challenges as “some environmental activists see any fossil fuel development as inconsistent with their vision of the future” (Brady 2020). While many of the court challenges to pipelines and large-scale infrastructure projects have not succeeded, they could postpone completion deadlines and create a sufficient amount of uncertainty to dissuade investors from investing.

The uncertainty surrounding pipeline delays and expansions has also reduced investment in Canada’s upstream industry and the oilsands. TC Energy’s Energy East pipeline and Enbridge’s Northern Gateway have been canceled, and Keystone and Enbridge’s Line 3 faces environmental opposition and permit challenges in both the U.S. and Canada (Brady et al. 2020). Indeed, only one project, the expansion...
of Trans Mountain to Burnaby, British Columbia, is under construction and expected to be in service in December 2022 (Trans Mountain 2020).

Currently, the Trans Mountain pipeline is the only pipeline linking major production areas in Alberta to the Pacific Coast’s export ports. It has a current capacity of approximately 0.3 million barrels per day (MMb/d) (Trans Mountain 2020). Moreover, there is no existing pipeline connection to the Atlantic ports. The only transportation modes are truck and rail freight, which are substantially more expensive and less safe (Green and Jackson 2015). Despite that, crude shipments by rail reached 412 MMb/d in February 2020 (Government of Canada 2020).

Regulatory bottlenecks in Canada are undermining its crude export potential, and the nation actually imports as much as 0.8 MMb/d – some 17% of its output – from remote exporters such as Saudi Arabia, Russia and Azerbaijan (Government of Canada 2020; ITC 2020). Should these market distortions and infrastructure bottlenecks dissolve, the shifts in the Canadian oil flow patterns would have significant implications for world oil markets.

The extent of these regional market dislocations can be estimated by means of the simple spread option valuation methodology developed by KAPSARC (Considine et al. 2020). Figure 3 identifies the average estimated values for spread option values (SOVs) from January 1, 2014 to May 22, 2020.¹

**Figure 3.** Average SOVs in major oil import ports.

![Figure 3. Average SOVs in major oil import ports.](image)

Source: KAPSARC (2020).

¹ Note: The average SOV value at LOOP is taken from the period spanning February 1, 2014 to May 22, 2020.
To assess the extent of distortions in Canadian oil export flows, we calculated the historical spread option values (SOV) for two major Canadian ports: Burnaby on the Pacific coast and Saint John on the Atlantic coast. We used the market values for Canadian Light Sweet (CLS) and West Canadian Select (WCS) as benchmarks for Canadian light and heavy crude exports, respectively. CLS, formerly known as Edmonton Par, is a basket of light sweet grades priced out of Edmonton. WCS represents diluted bitumen produced from the oil sands at Hardisty Alberta (Oil Sands Magazine 2020; Argus Media 2020; ICE 2020).

The transportation costs from the production source (defined for the purpose of this analysis as Edmonton) to ports are represented by the historical Trans Mountain pipeline tariffs for Burnaby and by the railway costs estimated at US$11.20 (CAD $14.75) for Saint John (CER 2020). A detailed description of the methodology and model is given in Considine et al. (2020).

Figure 4 shows the historical SOVs for heavy and light oil at Saint John and Burnaby, British Columbia. It is interesting to note the extremely high SOVs in Burnaby since 2017. These values are primarily driven by transportation bottlenecks, resulting in extreme price volatility and significant discounts for Canadian crude oil price benchmarks relative to their global counterparts and competing international benchmarks. These SOV levels signal opportunities for arbitrage and the development of oil transportation and storage infrastructure.

Saint John, on the other hand, records – on average – relatively low SOVs, often equal to zero. This not only suggests that transportation tariffs are capturing a significant portion of the economic rent, but that the volatility of competing crudes is lower at this location. Lower volatility can be explained by the fact that the most competitive crude exported from the Atlantic coast of Canada is CLS delivered from Burnaby; due to transportation bottlenecks, the two streams of the same crude compete against each other.

These distortions can explain the unusual oil flows seen recently in North American markets. Given the current cost of transportation from source to Saint John by rail, it is actually cheaper to dispatch oil to Burnaby by pipeline and then ship it to Saint John via the Panama channel. The first shipment of Alberta crude left Burnaby on June 18, on a 12,000 kilometer (km) journey to arrive at Saint John. “The idea that we would send a tanker from the west coast all the way down through the Panama Canal back up the east coast to a refinery in our own country is certainly a clumsy solution,” said David Yager, an analyst with Yager Management Ltd. (Fortnum et al. 2020).

According to KAPSARC estimates, it has been more profitable to ship crude oil from Burnaby to Saint John via the Panama channel than to transport it by rail 96% of the time since 2015 for heavy oil and 100% of the time for light oil. This analysis is based on daily estimates of spread option values calculated using market prices, interest rates and transportation costs for a variety of major trading routes and vessel sizes. Shipments from Burnaby also trump foreign competition at Saint John, including such benchmarks as Arab Light, which has been competitive against oil transported by rail to Saint John 68% of the time since February 2015, Bonny Light, which has been competitive against oil transported by rail to Saint John 65% of the time, Urals Mediterranean (56% of the time), Arab Heavy (29% of the time) and Vasconia Spot (5% of the time).
In Burnaby, oil delivered by pipeline faces insignificant competition from Arab Light, which is cheaper only about 5% of the time. In all other instances, domestic oil is cheaper than any imports, both of light and heavy oil. While the completion of the Trans Mountain expansion project is expected to alleviate this situation somewhat in 2020, capacity constraints are expected to continue to wreak havoc on the differentials to major benchmarks.

These findings illustrate both the potential for the development of ports on the Canadian Pacific (although they are currently significantly constrained by the pipeline capacity) and a shortage of viable options for crude oil transportation from the oilsands to the Atlantic coast. Given the current discounts for CLS and WCS crudes against competing regional and global benchmarks, it is easy to imagine a situation whereby Canadian oil exports could become competitive in the global market. Indeed, a number of proposals are currently underway that could increase the capacity of Canada’s crude oil export infrastructure by an estimated 4 MMb/d (Selemankhel 2020). These include:

1. The A2A cross-border rail project — a 2,570 km rail link from Alberta to Alaska with a capacity of 2 MMb/d
2. The Trans Mountain expansion, with a capacity of 0.59 MMb/d
3. The Enbridge mainline expansion, with a capacity of 0.37 MMb/d
4. The Canadian Prosperity Pipeline project — the ‘new’ Energy East with a capacity of 1.1 MMb/d
To determine the potential competitiveness of Canadian oil exports to the Pacific and Atlantic basins, we calculate the SOV of CLS crude against competing oil benchmarks delivered to a number of global oil ports and storage facilities. Table 1 shows the estimated values for oilsands crude delivered via the port of Burnaby from March 2015 to May 2020.

### Table 1. Competitiveness of CLS exports from Burnaby.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ningbo</th>
<th>Jamnagar</th>
<th>Kagoshima</th>
<th>Ulsan</th>
<th>LOOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmark crude</td>
<td>Arab Light (Asia)</td>
<td>Arab Light (Asia)</td>
<td>Arab Light (Asia)</td>
<td>Arab Light (Asia)</td>
<td>Louisiana Sweet</td>
</tr>
<tr>
<td>% of days when CLS exports from Burnaby are cheaper than benchmark</td>
<td>72%</td>
<td>42%</td>
<td>66%</td>
<td>67%</td>
<td>52%</td>
</tr>
<tr>
<td>Average SOV</td>
<td>1.2</td>
<td>1.72</td>
<td>1.53</td>
<td>1.39</td>
<td>1.45</td>
</tr>
</tbody>
</table>

Source: Internal KAPSARC calculations; Bloomberg (2020); ICE (2020); Argus Media (2020); Interviews with Michael Arthurs, Diamond A Ventures Inc., Calgary, Alberta, August 2020.

The data suggest that exports from Burnaby have been very competitive in the Pacific basin and the Gulf ports of the U.S. The significant price discount makes CLS crude a viable import for customers as far away as Jamnagar, India. If the port facilities in Burnaby could handle vessels of higher capacity than Aframax/Panamax, it would give it an additional competitive edge on these markets. However, even with the current port capacities, there is an obvious potential for it to increase its oil exports.

Remarkably, despite the current seemingly prohibitive transportation costs to port, the CLS exports from Saint John have the potential to compete in the U.S., Europe, and even as far away as South Africa. However, to reach comparable competitiveness with Burnaby exports to the Pacific, the transportation costs from the oil sands to Saint John would have to be reduced significantly. The KAPSARC SOV methodology can be used to provide an estimate of the level transportation tariffs — including rail and pipeline — that have the capacity to facilitate increased global competitiveness of Canadian oil in world markets.

Table 2 shows the performance of CLS exported from Saint John compared with regional benchmarks under various transportation cost assumptions from March 2015 to May 2020.

A reduction in transportation costs by 25% to US$8.30 (CAD $11.06) would increase the competitiveness of Western Canadian crude oil exports to Rotterdam, Saldanha Bay, Trieste and New York, resulting in increased supply and lower spot prices at these import and storage ports. It is interesting to note that the pipeline tariffs proposed by the Energy East pipeline project (now CP3) were approximately CAD $10.00 in 2017 for a 20-year long-term commitment, or approximately CAD $10.50 when inflated to 2020 dollars.
which is below the CAD $11.06 required to increase the competitiveness of Western Canadian crude exports via Saint John (Leach 2019).

Table 2. Competitiveness of CLS exports from Saint John under different transportation cost assumptions.

<table>
<thead>
<tr>
<th>Transportation costs to port</th>
<th>Parameter</th>
<th>Rotterdam</th>
<th>Saldanha Bay</th>
<th>Trieste</th>
<th>New York</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Benchmark crude</td>
<td>Brent</td>
<td>Arab Light</td>
<td>Urals (Med.)</td>
<td>Louisiana Sweet</td>
</tr>
<tr>
<td>100% % of days when CLS exports from Saint John are cheaper than the benchmark</td>
<td>31%</td>
<td>11%</td>
<td>19%</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>Average SOV</td>
<td>1.85</td>
<td>2.82</td>
<td>1.00</td>
<td>1.43</td>
<td></td>
</tr>
<tr>
<td>75% % of days when CLS exports from Saint John are cheaper than the benchmark</td>
<td>49%</td>
<td>25%</td>
<td>37%</td>
<td>41%</td>
<td></td>
</tr>
<tr>
<td>Average SOV</td>
<td>1.76</td>
<td>2.56</td>
<td>0.86</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>50% % of days when CLS exports from Saint John are cheaper than the benchmark</td>
<td>66%</td>
<td>39%</td>
<td>50%</td>
<td>57%</td>
<td></td>
</tr>
<tr>
<td>Average SOV</td>
<td>1.60</td>
<td>2.23</td>
<td>0.69</td>
<td>0.96</td>
<td></td>
</tr>
</tbody>
</table>

Source: Internal KAPSARC calculations; Bloomberg (2020); ICE (2020); Argus Media (2020); Interviews with Michael Arthurs, Diamond A Ventures Inc., Calgary, Alberta, August 2020.

A reduction in transportation costs to the port of Saint John by 50% to US$5.59 (CAD $7.37) would give CLS crude a significant advantage in Europe and the U.S. It would also enable CLS to gain a certain market share in South Africa. Under this scenario, and assuming no additional transportation bottlenecks, Canadian oil exports would be increased significantly in these markets.

Given the current market environment and the potential for increased exports to target markets in both Pacific and Atlantic basins, there is a significant incentive to eliminate (or at least alleviate) existing bottlenecks in oil transportation infrastructure in the domestic market. Several such projects are already being planned and/or developed, including the Trans Mountain and Enbridge expansions, A2A, and Keystone.

There are considerable reserves located offshore in the Atlantic, including an estimated 52 billion barrels at the White Rose, Hebron, Hibernia fields and Terra Nova offshore New Brunswick and Labrador (Bundale 2020). These resources can be developed immediately and they do not incur rail and pipeline charges required by crude oil flows from Western Canada. The responsible development of these resources,
including plans to develop (convert) offshore assets to produce oil and gas reserves, the development of renewables, including wind and hydrogen-producing windfarms, and carbon capture, will ensure that the ‘economic rent’ accruing from transportation bottlenecks will be channeled to efficient uses, so that extreme market dislocations will eventually subside.

It should be noted that eliminating impediments to Canadian oil exports apart from to the U.S. would also have significant implications for regional and global oil markets. The currently dominating oil exporters and crude types may see their market shares reduced and/or face increased price pressures in certain major import and storage locations. Increased Canadian exports would also likely drive the marginal high-cost exporters from entering far away regional markets, facilitating the optimization of global oil trade flows. The potential reduction of SOVs in major oil import or storage locations from increased Canadian imports (as shown in Table 2) may also result in fewer opportunities for traders to capitalize on distortions in the global oil market, in particular import and storage locations. However, the successful resolution of a project like CP3, or the development of offshore reserves in the Canadian Atlantic may also have the opposite effect – increasing SOVs due to the lower correlation between the price benchmarks of competing crudes – as shown in the case of Saint John. The development of storage and transportation infrastructure would also facilitate trading and hedging operations, leading to stronger liquidity and a better market balance.

References


