
Rail Operators Plan Canadian Diluent Recovery

Refinery units recycle solvents.

Morningstar Commodities Research

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Data Sources for This Publication

Energy Information Administration
Canada Energy Regulator
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Freight Cost Savings

In December 2019, Alberta's provincial government granted an exception to production quotas imposed on regional producers the previous January, provided that the incremental barrels are shipped to market by rail. That ruling is expected to provide new impetus to crude-by-rail exports from Western Canada to the U.S. Gulf Coast this year. With new pipeline projects out of Canada caught in a seemingly endless permitting process, producers must rely on more-expensive rail options. Two December proposals could save rail shippers up to 40% of freight costs by recycling diluent solvents blended with heavy Canadian bitumen crude to facilitate pipeline flow. This note reviews these diluent recovery plans.

Canadian Imports

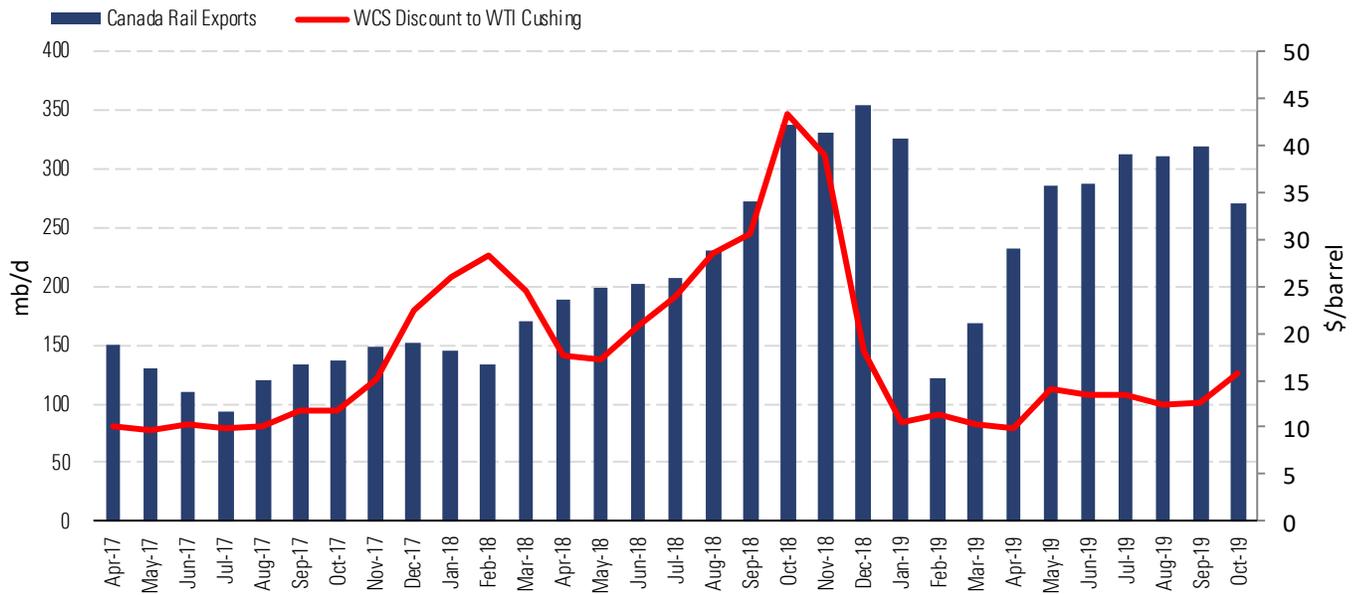
From January through September 2019, Canadian crude shipments of 3.8 million barrels/day represented an average 54% of 7.0 mmb/d in total U.S. imports on a monthly basis, according to the Energy Information Administration. Canadian imports grew 88% on an annual basis between 2010 and 2018, according to the EIA, as overall U.S. crude imports declined 16% in the face of booming shale output. Because domestic refineries are largely configured to process heavy crude grades such as those produced in Western Canada, appetite for increased supplies from our northern neighbor remains robust even as transport constraints across the border restrict new flows (see our July 2019 note [Canadian Crude Production Fails Earlier Promise](#)). Now, after a year of curtailments in the producing region meant to prop up prices discounted by pipeline congestion, the provincial government in Alberta has exempted incremental barrels shipped by rail from the cuts. As a result, rail shipments from Canada to the United States are expected to increase sharply in 2020 as frustrated producers turn to rail to bypass pipeline constraints.

Rail Costs More

Most Canadian crude comes to the U.S. by pipeline; only 263 thousand barrels/day, or 7% of the total on average, arrived by rail during the first nine months of 2019, according to the Canada Energy Regulator. Moving crude by rail costs more than by pipeline because it first must be delivered from the production site to a rail terminal, then loaded into tank cars and hauled in batches by locomotive to its destination. A continuous flow of crude by rail requires significant investment in storage and tank cars that are unused half the time because they must be returned empty. Rail traffic is subject to myriad interruptions and transfers en route that can delay shipments and add to costs. Nevertheless, rail offers flexibility of destination at a higher cost that becomes justified when congestion forces pipeline shippers to discount their crude to the point where rail economics are attractive—generally about \$20/barrel in the case of Western Canada. Assuming a level playing field, more Canadian crude shifts to rail when pipeline

congestion crushes prices by that much in Alberta. Exhibit 1 shows monthly average price discounts for oil sands benchmark Western Canadian Select crude to U.S. benchmark West Texas Intermediate since April 2017 (red line) as well as monthly average Canadian crude-by-rail export volumes according to the CER (blue bars). Rising Canadian crude-by-rail volumes reflect increasing price discounts throughout 2017 and 2018, peaking at \$43.29 in October 2018 when an average 337 mb/d was railed to the U.S. However, since the Alberta government mandated production curtailments to reduce pipeline congestion (see our December 2018 note [Alberta Intervenes to Protect Producers](#)), WCS discounts narrowed to average \$12.37/barrel between January and October 2019, leaving rail shippers out of pocket. After falling early in 2019, volumes shipped by rail recovered to reach 320 mb/d by September as production curtailments were eased and producers increased their use of rail despite poor economics.

Exhibit 1 Canadian Crude by Rail and WCS Discounts



Source: CER, CME Group, Morningstar.

Canadian crude-by-rail exports should jump in 2020 after the Alberta government announced in December 2019 an exemption from output caps for producers that ship by rail. That exemption encourages producers using rail to bring new production above their quotas to market. But while there's been some widening of WCS discounts to average \$20.40/barrel in November and \$21/barrel in December, there's no guarantee that higher rail costs won't leave shippers out of pocket again in 2020. To mitigate higher rail costs, and recognizing that new cross-border pipelines to relieve congestion are taking longer than ever to gain approval, two Canadian companies proposed in December to build diluent recovery units designed to remove and recycle solvents added to heavy crude delivered by pipeline. The resulting concentrated bitumen has up to 40% less volume and can potentially be shipped to the U.S. by rail at a similar cost to pipeline shipments that include the additional solvents.

Diluent Recovery Unit

DRU cost savings arise because once solvents are removed, concentrated grades of heavy bitumen can be shipped in rail tank cars with heating coils and insulation. The solvents or diluents—usually made from light oils or condensates—add as much as 40% to the volume flowing by pipeline (diluent volumes vary with ambient temperature). The necessary diluent usually costs more than bitumen crude at origin terminals and is worth less at destination refineries configured to process heavy crude. As a result, shipping bitumen crude by pipeline involves adding up to 40% volume of diluent that loses value en route and has to be transported separately to the production site for blending before the journey starts. Using heated rail cars offers the opportunity to reduce the diluent volume at the loading terminal and ship up to 40% more bitumen to the destination, cutting freight costs and providing refiners with a more attractive concentrated heavy crude barrel.

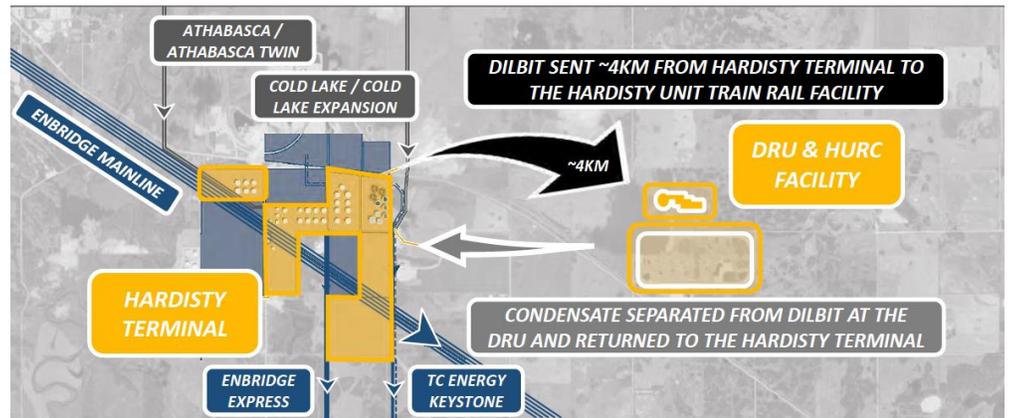
But while reducing diluent content for rail transport makes financial sense on paper, in practice it's proved hard to achieve the savings. Most oil sands bitumen crude is diluted at the production site in order to flow in pipeline gathering systems to the main Canadian export hub terminals at Edmonton and Hardisty. Once the resulting dilbit crude gets to a hub terminal, it isn't simple to separate out the diluent. That requires a distillation process to boil off and capture the light components—in effect a basic refinery. For that reason, shippers usually keep their crude diluted, even when using rail, to avoid the expense and delay of removing the diluent. Concentrated bitumen crude shipped in heated rail cars has therefore been limited to smaller producers loading direct to trains in remote producing regions.

Now the combination of Alberta government exceptions to encourage crude-by-rail shipments and potential cost savings from not sending anywhere from 25% to 40% of diluent to market with raw bitumen has led two companies to consider building DRUs in the next two years.

Gibson and US Development

On Dec. 13, 2019, Canadian midstream operator Gibson Energy and 50/50 joint venture partner US Development announced plans to build a 100 mb/d DRU at Gibson's existing crude-by-rail terminal in Hardisty, Alberta, at a cost of \$200 million-\$250 million (Exhibit 2). The project, backed by a 50 mb/d anchor commitment from producer ConocoPhillips, is expected online as early as the second quarter of 2021 if permitted. The partners are looking to attract additional shippers before making a final investment decision. Gibson is the largest independent terminal operator at Hardisty, with 12 million barrels of crude storage capacity and connections to 11 incoming pipelines from oil sands and conventional producing regions. The company's 180 mb/d unit train rail facility, located 2.5 miles from Hardisty and connected by pipeline, can load three 100-tank-car-unit trains/day. The Gibson/USD DRU would separate most of the diluent from incoming dilbit crude shipped by pipeline to the Hardisty terminal, leaving a concentrated proprietary DRUbit crude grade designed for rail transportation. The separated diluent would be recycled by pipeline to plants in the oil sands producing region. DRUbit crude will be railed to a USD terminal in Port Arthur, Texas, for processing by local Gulf Coast refiners.

Exhibit 2 Gibson/USD Hardisty DRU

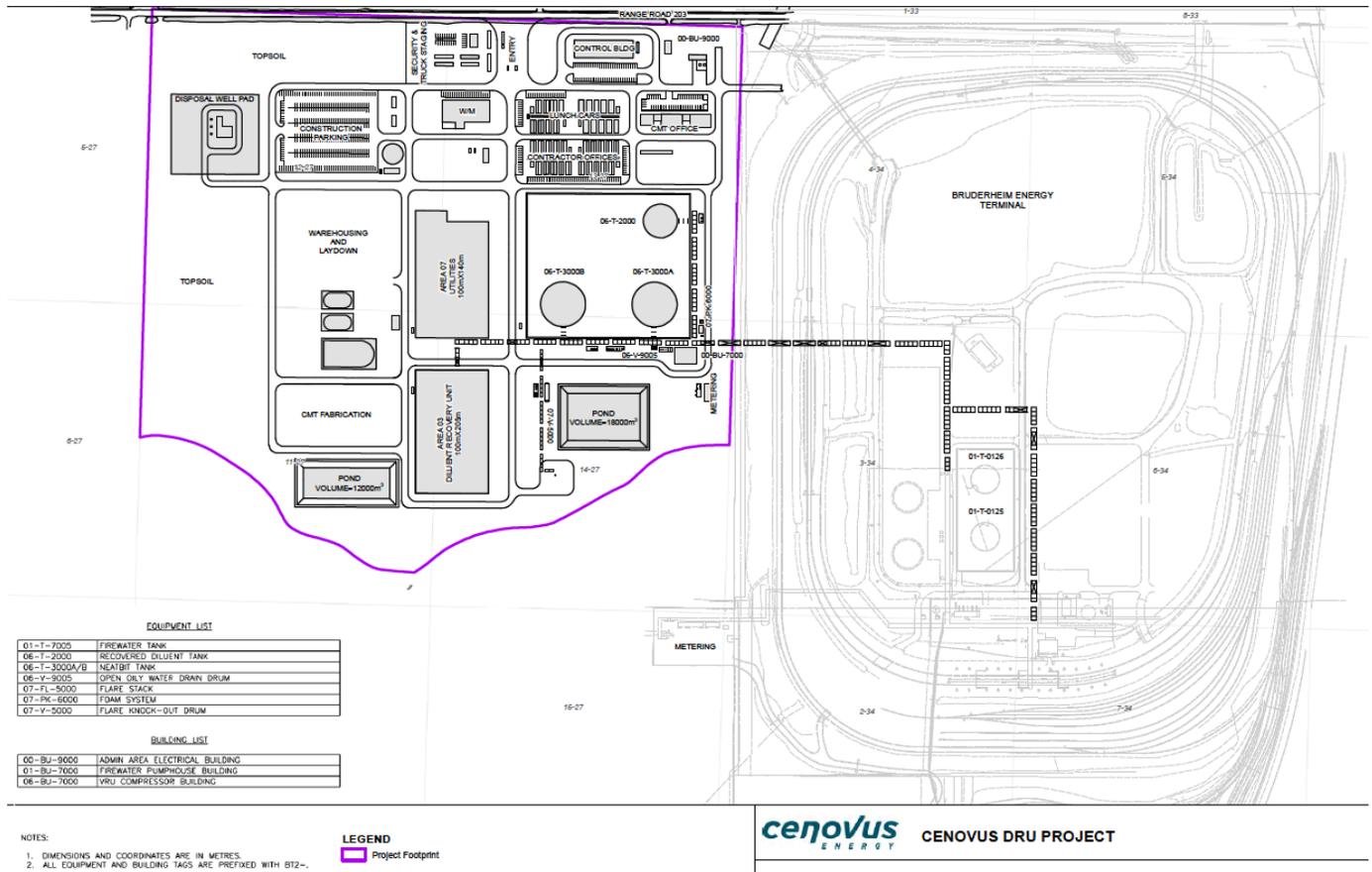


Source: Gibson Energy presentation.

Cenovus

The same day that Gibson and USD made their announcement, Canadian producer and refiner Cenovus Energy submitted a permit application to the Alberta Energy Regulator to build a 191 mb/d DRU at its existing 100 mb/d Bruderheim Energy rail terminal northwest of Edmonton at an estimated capital cost of \$0.8 billion-\$1 billion (Exhibit 3). Cenovus is a large Canadian independent with assets producing over 550 mb/d of blended oil sands dilbit. The company also has a joint venture with ConocoPhillips in the U.S. that includes a 50% interest in the 149 mb/d Borger, Texas, and 333 mb/d Wood River refineries. The Cenovus permit application details how the planned DRU will operate by first heating incoming dilbit to 150 degrees C in a preheat treater, then heating it further in a DRU distillation column to separate out the diluent (37%) and concentrated bitumen "neatbit" (63%) at temperatures between 215 and 290 degrees C. The neatbit output will be stored at 90 degrees C in two 320 thousand-barrel tanks before loading onto coiled and insulated rail tank cars. The neatbit crude will be shipped via Canadian National Railway to delivery terminals throughout the U.S. Gulf Coast region.

Exhibit 2 Cenovus Bruderheim DRU



Source: Alberta Energy Regulator.

Big Savings on Paper

If the Gibson and Cenovus DRU proposals make it through permitting and final investment decisions, they could alter the economics of crude-by-rail transport from Western Canada. These refinerylike units can potentially reduce transport volumes by up to 40% and save shippers from continually buying unwanted diluent to blend with their crude by simply recycling at the rail load terminal. DRU proposals have been made before — notably by Canexus, the previous owners of the Bruderheim terminal — but they never got off the ground due to a lack of shipper commitments. Although DRUs offer big savings on paper, the economics are far from guaranteed for such large investments. In an upcoming note, we'll run the numbers to estimate relative costs for pipeline dilbit shipments versus raw bitumen by rail. **MM**

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