

# Assessing the adequacy of western Canadian crude oil export capacity

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Crude Oil Markets | **Strategic Report**

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# Assessing the adequacy of western Canadian crude oil export capacity

## Key implications

The Russian invasion of Ukraine has heightened the global conversation about energy security and the adequacy and affordability of oil supply. Canada is a major global producer and is one of the few producing regions expected to grow this decade. However, Canada has consistently struggled with the adequacy of its pipeline export capacity, which at times has contributed to large price discounts for Canadian barrels compared with the global market. In turn, this price instability has diminished investor confidence in the western Canadian upstream sector, reducing the prospects of growth to lower than they otherwise would have been with a more stable pricing environment. Recent pipeline capacity additions like Enbridge's Line 3 Replacement Project—plus the expected completion of the Trans Mountain Pipeline Expansion by late 2023—may finally give the industry some breathing room. But will these projects provide Canadian producers the security they have lacked for so long?

This Strategic Report explores the outlook for the adequacy of western Canadian pipeline export capacity. Simple comparisons between expected export supply and pipeline capacity mask a more complex reality in which the unimpeded future flow of Canadian supply may not be as secure as it appears.

- **Western Canadian pipeline takeaway capacity appears adequate in the years ahead.** The upcoming Trans Mountain Pipeline Expansion and assumed additional capacity expansions through optimization projects of existing systems will add 900,000 b/d of pipeline capacity this decade (on top of the recently completed Line 3 Expansion project). Supply will grow by 715,000 b/d by 2030. This implies that there may not be a resumption of major export bottlenecks over the next decade.
- **However, despite capacity growth, pipeline adequacy could still become quite tight, making it difficult to manage periods of maintenance or unforeseen operational upsets.** As supply grows, we expect that the western Canadian pipeline system will run at about 90% of effective capacity. Furthermore, pipelines cannot be assumed to be homogenous or interchangeable, and the adequacy of the entire system's export capacity can be overstated if bottlenecks exist on lines that ship heavy crude since excess capacity on lines shipping light crudes may be unavailable for heavy crude service.
- **Current pipeline operations and downstream markets for Canadian crude can change over time, reducing effective system capacity.** Refineries served by individual Canadian pipelines may shut down for competitive reasons—especially as the energy transition accelerates—creating “dead ends” in the pipeline system. Also, some pipelines leaving western Canada were put into service nearly 70 years ago. Their throughput capacity can be reduced if operators put in place pressure limitations for safety reasons.

—8 August 2022

## About this report

**Purpose.** Over the past decade, Canada has struggled with the adequacy of its pipeline export capacity, which contributed to price insecurity and negatively impacted producer returns and investor confidence in the region. With the recent capacity addition of the Enbridge Line 3 Replacement Project and the potential completion of the Trans Mountain Pipeline Expansion Project, the prospects for a more stable price environment may be on the horizon for western Canadian producers. This Strategic Report examines the adequacy of western Canadian pipeline export capacity.

**Context.** Since 2009, IHS Markit has provided research on issues surrounding the development of the Canadian oil sands. This report is part of a series of reports from the IHS Markit Canadian Oil Sands Dialogue. The dialogue convenes stakeholders to participate in an objective analysis of the benefits, costs, and impacts of various choices associated with Canadian oil sands development.

This report and past Oil Sands Dialogue reports can be downloaded at [www.ihsmarkit.com/oilsandsdialogue](http://www.ihsmarkit.com/oilsandsdialogue).

**Methodology.** IHS Markit conducted extensive research and analysis on this topic, both independently and in consultation with stakeholders. IHS Markit has full editorial control over this report and is solely responsible for its content (see the end of the report for the IHS Markit team).

**Structure.** This report has three sections:

1. Introduction
2. Western Canadian supply to continue growing
3. Will pipeline capacity remain sufficient?

# Assessing the adequacy of western Canadian crude oil export capacity

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## Introduction

One of the main challenges for the growing western Canadian oil industry has been a recurring shortfall in export pipeline capacity—and the oil price instability that it has created. Over the years, proposed Canadian pipeline projects have faced intense scrutiny from opposition and long delays—both in Canada and the United States. Over the past decade, three proposed projects (representing nearly 2.5 MMb/d of capacity) were either denied or canceled (see Table 1).

More recently, however, the industry has experienced some relief with the completion of the Enbridge Line 3 Replacement Project, which added 370,000 b/d of incremental takeaway capacity to the Enbridge Mainline system in late 2021. As of mid-2022, pipeline access remains unencumbered, with no signs of transportation bottlenecks or excessive discounting of western Canadian crude prices.

And more capacity is expected, including the 590,000 b/d Trans Mountain Pipeline Expansion Project (TMX) expected in late 2023. Existing systems, including the Enbridge Mainline and TC Energy's Keystone system, have the potential for further optimizations, which could add as much as 360,000 b/d to overall export capacity from Canada.

Table 1

### Summary status of major Canadian crude oil pipeline projects in the past decade (sorted by first proposed)

Project	Proponent	Commodity	Added capacity	Project type	Routing	First proposed	Status
Northern Gateway	Enbridge Pipelines	Heavy, sour crude oil	525,000 b/d	New	Alberta, British Columbia	2006	Rejected by federal government of Canada in 2016
Keystone XL	TC Energy	Heavy, sour crude oil	830,000 b/d	New	Alberta, Saskatchewan, Montana, South Dakota, Nebraska	2008	Rejected by US President Joseph R. Biden in 2021 and then canceled by TC Energy
Energy East	TC Energy	Heavy, sour crude oil	1,100,000 b/d	New	Alberta, Manitoba, Ontario, Quebec, New Brunswick	2013	Canceled by TC Energy in 2017
Enbridge Line 3 Replacement Project	Enbridge Pipelines	Mixed use: heavy, sour; medium; and light crude oil	370,000 b/d	Replacement	Alberta, Saskatchewan, Manitoba, North Dakota, Wisconsin, Minnesota	2013	Completed 4Q 2021
Trans Mountain Expansion	Government of Canada	Heavy, sour crude oil	590,000 b/d	Expansion	Alberta and British Columbia	2013	Construction; expected late 2023

Source: IHS Markit

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But supply will also continue to grow this decade. Will existing and expected new pipeline capacity be sufficient?

The question is important because, in the past, insufficient pipeline takeaway has frequently weakened western Canadian oil prices, resulting in billions of dollars in lost revenue for the industry—and for Canadian federal and provincial governments.<sup>1</sup> When pipeline takeaway capacity is insufficient, producers are forced to reduce their selling price to entice buyers. Shippers unable to secure pipeline transportation are forced to rely on rail to move the crude, which entails a higher transportation cost (thus reducing the “netback” price a producer receives).

Over time, this environment of price instability—including a period in late 2018 of price discounts so extreme that the Alberta government decided to intervene and mandate a production curtailment—has tended to sour investor appetite for new upstream projects in western Canada.<sup>2</sup> Had more pipeline capacity existed, investor confidence in the sector would have been stronger, and production today would likely be greater.

## Western Canadian supply to continue growing

Despite the headwinds to investment caused by past price instability, today, Canada is the fourth-largest producer of crude oil in the world. Most of the country’s oil originates from the western Canadian Sedimentary Basin, which underlies Alberta, and parts of Saskatchewan, British Columbia, Manitoba, and the Northwest Territories. In the past 15 years, western Canadian crude oil supply has almost doubled, from about 2.4 MMb/d in 2008 to 4.6 MMb/d in 2021, led mostly by oil sands developments.<sup>3</sup>

Most western Canadian crude oil is shipped via pipelines to refineries in the US Midwest, Gulf Coast, and to a lesser extent, Ontario and Quebec (see Figure 1). The western Canadian crude complex is critical to the North American oil supply framework, with about 95% of Canada’s oil production, or 3.8 MMb/d, sold to the United States in 2021 and the rest used for domestic Canadian consumption and sold internationally.

IHS Markit expects western Canadian production to continue to grow this decade. By 2030, annual average supply could exceed 5.3 MMb/d—growth of about 715,000 b/d compared with 2021. Most of western Canadian supply is composed of low-decline oil sands production, which allows supply to grow with less capital investment compared with other oil-producing regions globally, where growth requires more investment to exceed steep natural production declines.

Although IHS Markit views large new greenfield oil sands projects as unlikely, the industry has considerable range to expand. The industry is expected to boost utilization from projects that were brought online before the COVID-19 pandemic. There also exists scope to expand the capacity of existing projects through efficiency gains, technology improvements, debottlenecking, and other optimizations (e.g., improved placement of wells, infill drilling, and use of stream displacements). Beyond 2030, western Canadian crude oil production is expected to plateau owing to the flat, no-decline aspect of existing operations.<sup>4</sup>

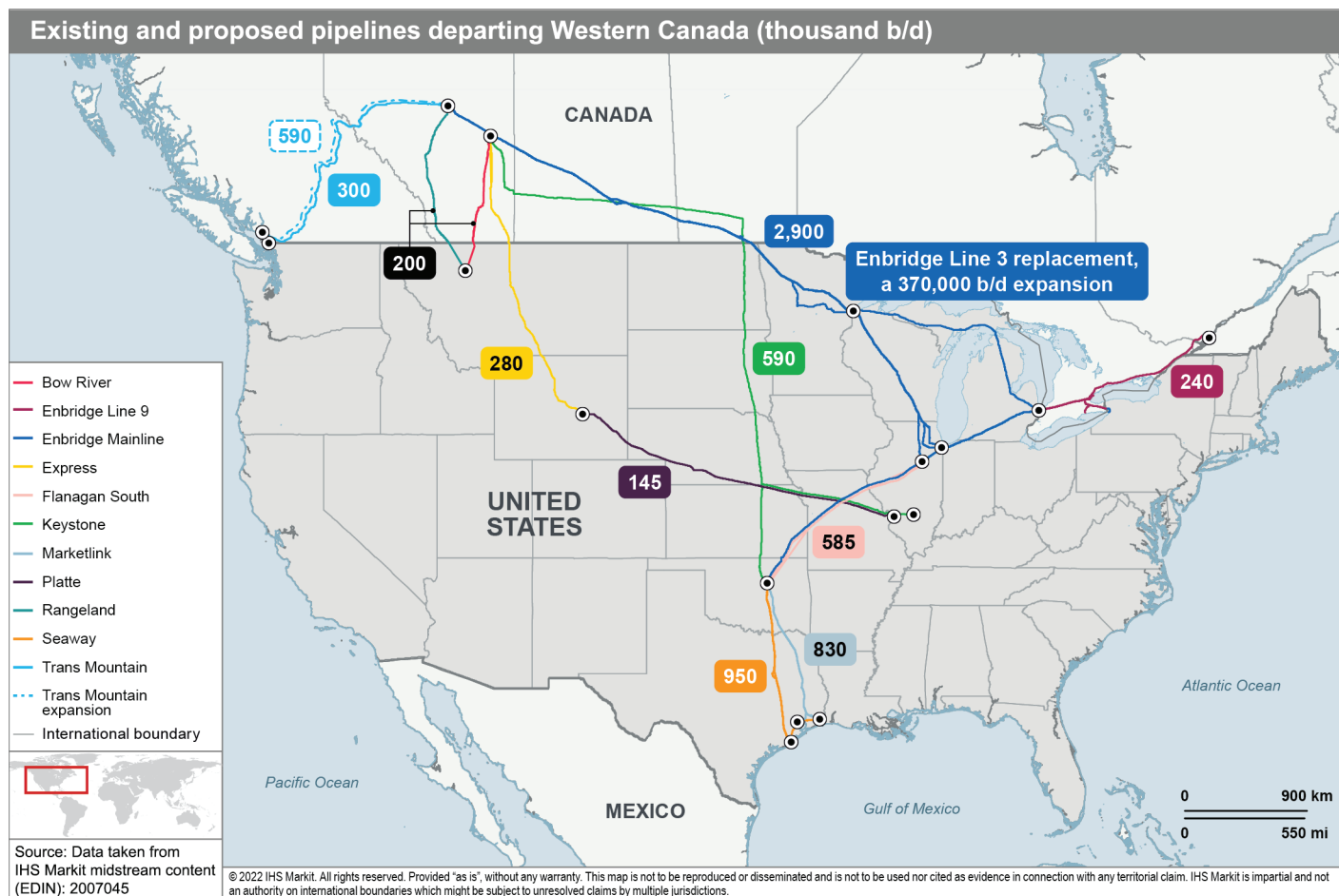
1. IHS Markit made a conservative estimate that the cumulative lost revenue between 2015 and 2019 was greater than US\$14 billion. See the IHS Markit Strategic Report *What is different about differentials? Understanding the price of oil in western Canada*.

2. In October 2018, Western Canadian Select (the heavy crude benchmark in Canada) fell to a record \$50/bbl below West Texas Intermediate (WTI).

3. Supply equals production plus blended diluent for marketed volumes.

4. For more information, see the IHS Markit blog *Heightened energy security hasn't changed long-term oil sands outlook*, published 26 July 2022.

Figure 1



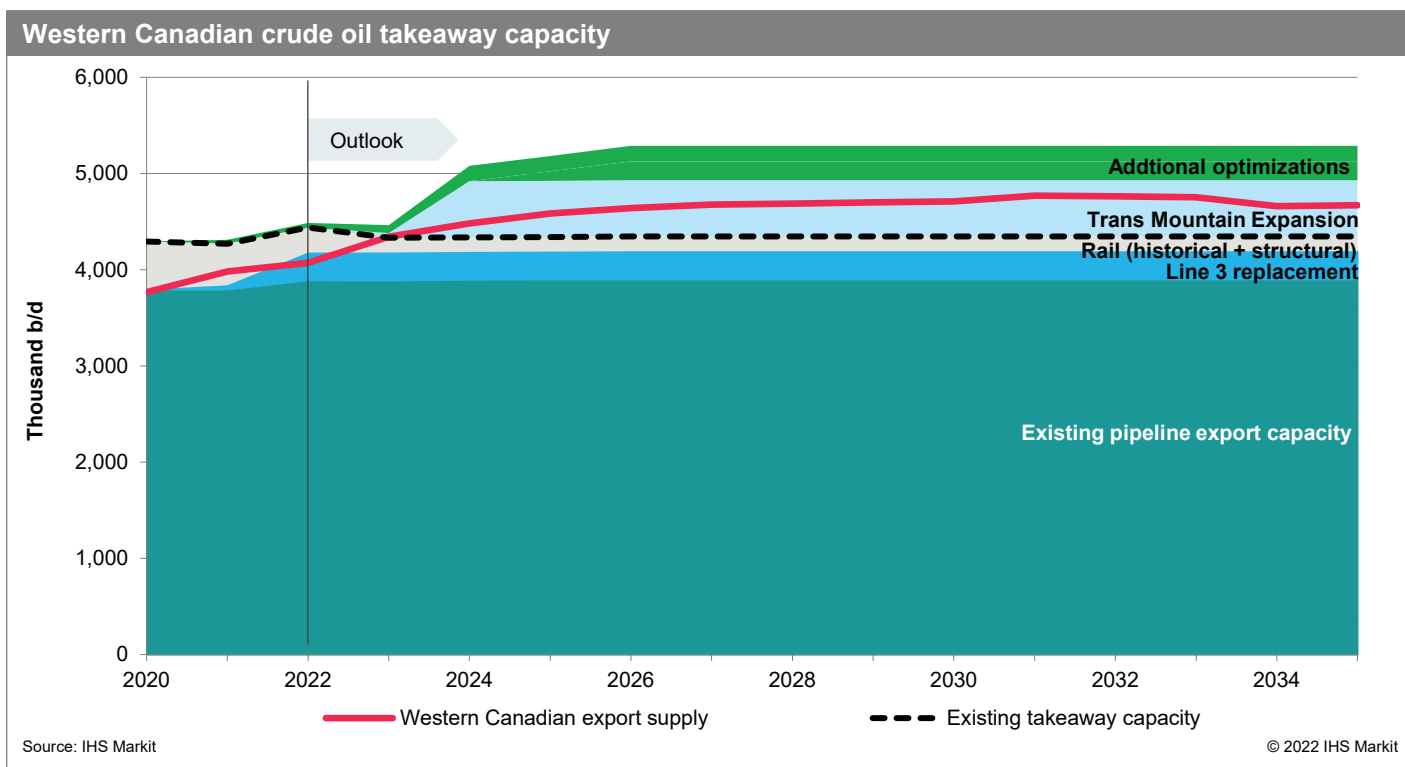
## Will pipeline capacity remain sufficient?

Although western Canadian supply will grow, the pipeline capacity recently added from the Line 3 Replacement Project and the anticipated completion of the TMX project is significant. Existing systems have some room to expand modestly via optimizations and other operational enhancements. Altogether, pipeline capacity may have the potential to increase by 900,000 MMb/d by 2030 (in addition to the 370,000 b/d associated with the Enbridge Line 3 Replacement Project that was completed in late 2021).

This outlook assumes no further delays to the 590,000 b/d TMX project, anticipated to be completed toward the end of 2023. If it is further delayed, export supply could overlap available pipeline export capacity, and western Canadian crude oil prices would likely weaken as more rail is called upon in hopes of bridging the gap.

At first glance, a comparison between the current IHS Markit western Canadian supply outlook and a stack-up of existing, expected, and potential pipeline capacity suggests that Canadian crude exports may avoid any major bottlenecks over the next decade (see Figure 2).

Figure 2



However, simple comparisons between expected export supply and pipeline capacity mask a more complex system in which the unimpeded future flow of Canadian crude oil exports may not be as secure as it appears.

First, nameplate pipeline capacity is not equivalent to effective capacity. Outlooks that rely upon nameplate capacity will present an overly optimistic outlook for western Canadian egress. Pipelines seldom operate at nameplate capacity—a 90% operating rate is more typical. For example, there can be seasonal variations in operating rates owing to shifts in the type of crude being shipped that can impact system capacity (heavy crude travels more slowly in pipelines than light crude, lowering effective system capacity). Seasonal pipeline maintenance and occasional operational upsets also push down effective capacity below design capacity. The IHS Markit outlook for supply and pipeline capacity attempts to adjust for effective capacity but still may be imperfect.

Secondly, some outlooks for pipeline capacity assume that pipelines are homogenous or interchangeable and can service all grades of crude exported by western Canadian producers. Indeed, Figure 2 presents a homogenous view of the Canadian pipeline export system. However, some pipelines are dedicated to heavy crude oil transport, while others service only lighter grades. Some more complicated systems (collections of interconnected pipelines) may have some ability to manage shifts in supply of light versus heavy grades. However, the adequacy of the entire western Canadian pipeline system's export capacity can overstate the capacity available for a particular grade. Indeed, the IHS Markit outlook for the adequacy of western Canadian heavy, sour crude oil pipeline capacity is much tighter than for light—particularly during winter months, when western Canadian heavy, sour output is at its volumetric seasonal maximum.

Downstream markets can also change over time, having the effect of reducing export capacity. Canada is unique among major global crude oil exporters in that it relies almost entirely on overland pipeline transport to access end markets. Its pipeline systems offer less optionality than waterborne transport where exported cargos can move to the greatest source of demand globally. The risk for Canadian producers is that over time,



and especially as the energy transition accelerates, downstream refinery demand at the end of pipelines could shift. Refineries may shut down for competitive reasons (in the past three years, more than 1.3 MMb/d of North American refining capacity has been rationalized, with more expected). To the extent that some of these pipeline systems do not connect to other larger and more liquid refining markets, some systemwide pipeline export capacity could simply not be available to producers. This highlights the unique value of the TMX project, which is the only western Canadian pipeline designed to boost Canada's global maritime trade of crude oil.

Most pipeline adequacy assessments assume no change to current operations—including our own. However, pipeline operations can degrade over time. For example, some pipelines leaving western Canada were put into service nearly 70 years ago; as pipelines age, pressure limits may be required for safety reasons, reducing throughput capacity. Aging pipelines can be replaced with the latest technology, as was the case with the Line 3 Replacement Project. However, even projects that are designed to increase safety and address any previous shortcomings have met opposition. The Line 3 Replacement Project was originally proposed in 2014 and faced numerous regulatory and legal delays in its long journey to completion seven years later in 2021. For safety reasons, Enbridge struck a deal with the state of Michigan in 2018 to replace and bury a contentious portion of the Enbridge Line 5 pipeline that crosses the Mackinac Strait (a major waterway in Michigan) in a protective concrete tunnel 100 ft below the bedrock. But that effort has still faced conflict, with opponents seeking to have the line shut permanently.

Finally, there may be more upside potential to the current IHS Markit western Canadian production outlook, which would increase the risk that supply could exceed export pipeline capacity. The oil sands industry has a rich history of technological innovation, and new advances could enable a higher production growth rate. For example, steam displacement technologies have the benefit of not only lowering the steam requirement (and thus emissions per barrel produced) but also of increasing productivity. A simple 1% annual improvement on a system of more than 3 MMb/d from 2021 to 2030 could result in more than 250,000 b/d of new production.

Forecasting the adequacy of western Canadian export capacity is more complex than simply comparing expected supply projections with static assumptions about pipeline export capacity. A realistic, cautious outlook should consider the real-life operating constraints that occur in a pipeline system as complex as that of western Canada, through which many grades of both light and heavy crude are shipped to widely dispersed refineries across North America. Future outlooks must account for those segments of the pipeline system that remain highly dependent on the continuing operations of its US refinery customers, some of whom may not be operating by the end of this decade. And existing pipelines themselves are not guaranteed to operate as they do today; indeed, some face an uncertain future, given their age and, in some cases, ongoing opposition.

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