

## I Want You to (Refine) Me – Canada’s Refining Sector

### *Rising Crude Oil Production Results in Self-Sufficiency and Exports*



- Canada’s refining sector has undergone major changes over the past several years, including an increasing opportunity to run domestic crude oil and imported crude from the U.S.
- Refining capacity in Canada has held steady at about 2 MMb/d since the 1980s, in sharp contrast to a 20% gain in the U.S. refining capacity over the same period.
- The nine refineries in Western Canada account for 38% of the country’s total capacity and depend entirely on in-region crude oil production for their supplies.
- Eastern Canada’s eight refineries have more than 1.2 MMb/d of capacity, and get widely varying shares of their crude oil from Western Canada and the U.S.

### 1. Introduction

The refining sectors in both the U.S. and Canada have been adjusting to big changes over the past few years. Rising domestic crude oil production. A declining need for imported oil. And, most recently, a period of severe refined-product demand destruction caused by the COVID-19 pandemic. There has been another related change too: U.S. refiners, particularly those in the Midwest, have become increasingly dependent on Western Canadian crude, and Canadian refiners, especially those in Quebec and the Canadian Maritimes, have turned to U.S. producers for a much larger share of their oil imports.

Despite the similarities, though, there is a huge difference in scale between the U.S. and Canadian refining sectors, and a wide gap between how much people know about refineries in the U.S. and their counterparts in Canada. In this Drill Down Report, we take a detailed look at the past and present state of Canada’s refining industry, including basics such as the refineries’ locations, capacities, and crude oil sources, as well as the kinds and quantities of refined products that are consumed within Canada and exported to the U.S.

Canada’s refining sector has grown from very humble beginnings. Just after the end of World War II, its combined oil throughput capacity totaled only 264 Mb/d (blue bars and left axis in Figure

1) and its refineries were small — there were 32 of them (red diamonds and right axis), with an average capacity of less than 9 Mb/d. In the 70-plus years since, the number of refineries has declined by almost half to 17, but with a much larger combined throughput capacity of 2 MMb/d — and an average capacity of about 116 Mb/d. Canada’s refining capacity has actually held fairly steady near the 2-MMb/d mark since 1983. (Over that same period, refining capacity in the U.S. increased by 20%, to about 19 MMb/d today.)

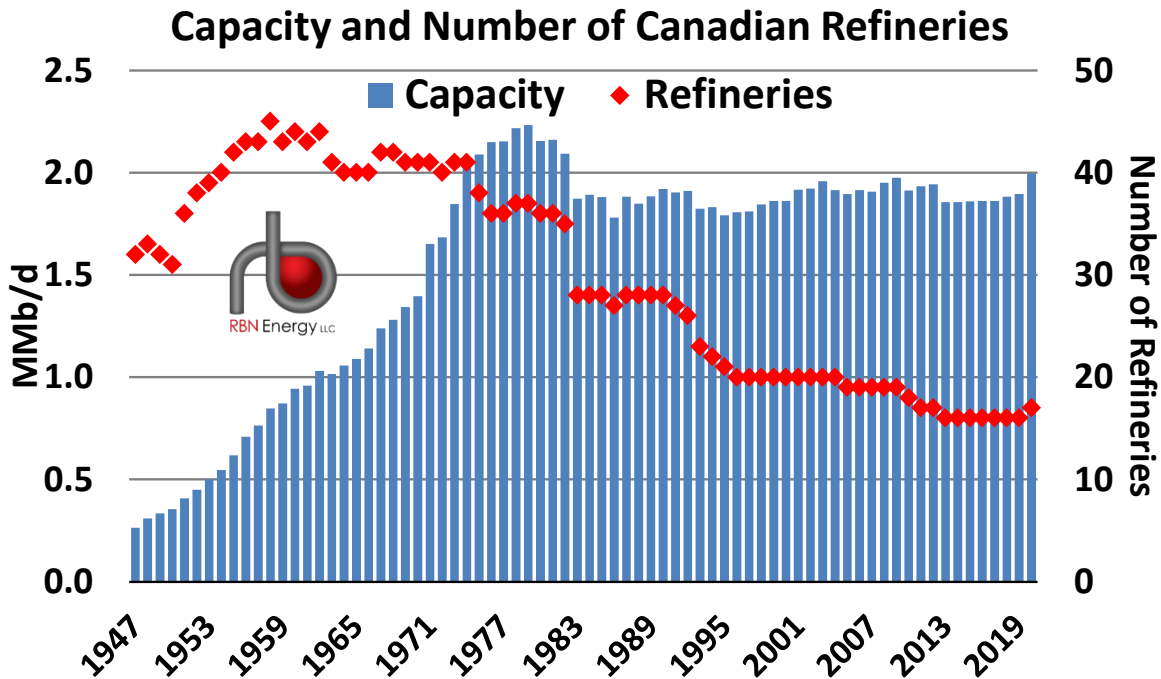


Figure 1. Capacity and Number of Canadian Refineries.

Sources: Canadian Association of Petroleum Producers, Company Reports

Like the refining business in many other parts of the world, Canada’s refineries grew up next to and are presently located near either oil supply regions or major demand regions (see Figure 2). The vast majority of Canadian crude oil production occurs in the western part of the country, where nine refineries are located (green diamonds labelled #1 to #9), with five located in oil-producing powerhouse Alberta (#1 to #5), and two in each of Saskatchewan (#6 and #7) and British Columbia (#8 and #9). The current combined crude oil refining capacity for these nine refineries is 770 Mb/d, or about 38% of Canada’s total capacity.

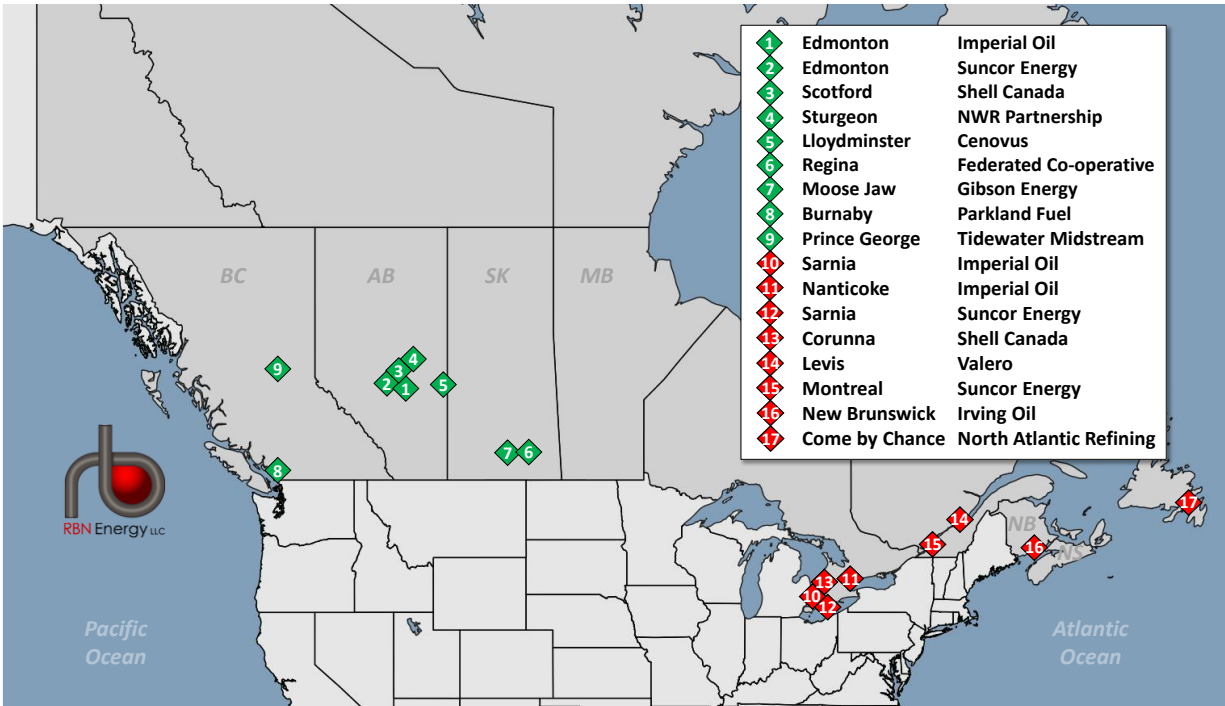


Figure 2. Location of Canadian Refineries. Source: RBN

Closer to Canada’s major population centers and demand markets in the eastern half of the country, there are eight additional refineries (red diamonds labelled #10 to #17) with a combined refining capacity of 1.22 MMb/d. Four of these are located in Ontario (#10 to #13), two in Quebec (#14 and #15), and one each in the Atlantic provinces of New Brunswick (#16) and Newfoundland & Labrador (#17). (Note that for ease of presentation, we have grouped Ontario and Quebec into Eastern Canada, though these two provinces are traditionally referred to as Central Canada.)

Not only has Canada’s refining capacity remained fairly constant at just under 2 MMb/d since the early 1980s, crude oil runs into its refineries have also stayed within a relatively narrow range: 1.6 MMb/d to 1.9 MMb/d (blue bars and left axis in left graph in Figure 3). This would place the utilization rate (red dots and right axis in left graph) between 80% on the low end (in 2020) and 99% at the high end (in 2004).

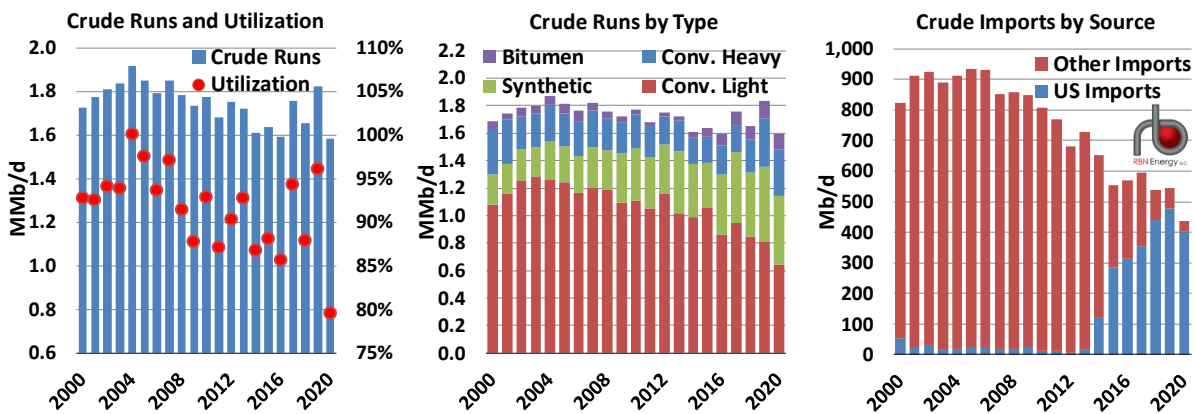


Figure 3. Canadian Refining Runs, Crude Use by Type and Source. Sources: CAPP, Statistics Canada

As Canada’s domestic oil production has grown, the type of crude oil being run through those 17 refineries has been shifting over the past 20 years. Since 2000, the share of conventional light crude (red bar segments in middle graph in Figure 3) in the mix has dropped from around 1.3 MMb/d (~65%) to under 700 Mb/d (~41%) in 2020. A good portion of that reduction has been taken up by synthetic crude oil (SCO; green bar segments), a type of light crude oil that results from the upgrading of oil sands bitumen — SCO runs have increased from 200 Mb/d in the early 2000s (12%) to just under 500 Mb/d in 2020 (31%). The runs of conventional heavy crude (blue bar segments) have risen modestly the past 20 years, from 250 Mb/d (14%) to near 350 Mb/d in 2020 (21%). Finally, the use of bitumen (purple bar segments) — the non-upgraded, extra-heavy viscous crude from the oil sands — has doubled from 50 Mb/d (3%) to just over 100 Mb/d in 2020 (7%).

Canadian oil production has increased significantly over the past couple of decades, so it comes as no surprise that its refineries have become less dependent on imports (right graph in Figure 3 above). What is most notable is that while the quantity of imported barrels (stacked red and blue bar segments) fell by about half between 2000 and 2020, the share of those barrels imported from the U.S. (blue bar segments) has risen from around 2% as recently as 2012 to about 90% in 2020. Most of the crude oil imported into Canada is delivered either to the refinery in Lévis, QC, (red diamond #14 in Figure 2) or the two refineries along Canada’s East Coast (red diamonds #16 and #17).

With the strong utilization rates that we mentioned earlier — including an 80% rate during the depths of COVID in 2020 — Canada’s 17 refineries have been cranking out refined products, mostly for use by Canadians (and some for export).

From 2010 to 2019, Canada’s combined consumption of gasoline, diesel, and jet fuel grew from 1.24 MMb/d to 1.50 MMb/d, or by about 21% (stacked bar segments in left half of left graph in Figure 4). Consumption in 2020 averaged 1.26 MMb/d, or 237 Mb/d lower than in 2019, primarily because the pandemic stifled most forms of travel demand for much of 2020. Over the same 10-year time period and using data from the U.S. Energy Information Administration (EIA), U.S. consumption — which obviously dwarfs that of Canada (right half of left graph; note the different scale) — has risen from 13.74 MMb/d in 2010 to 15.08 MMb/d in 2019. U.S. consumption pulled back to 12.86 MMb/d in 2020 (based on EIA) in 2020 because of the same pandemic-related effects. So, the U.S. typically consumes 10 to 11 times more than Canada.

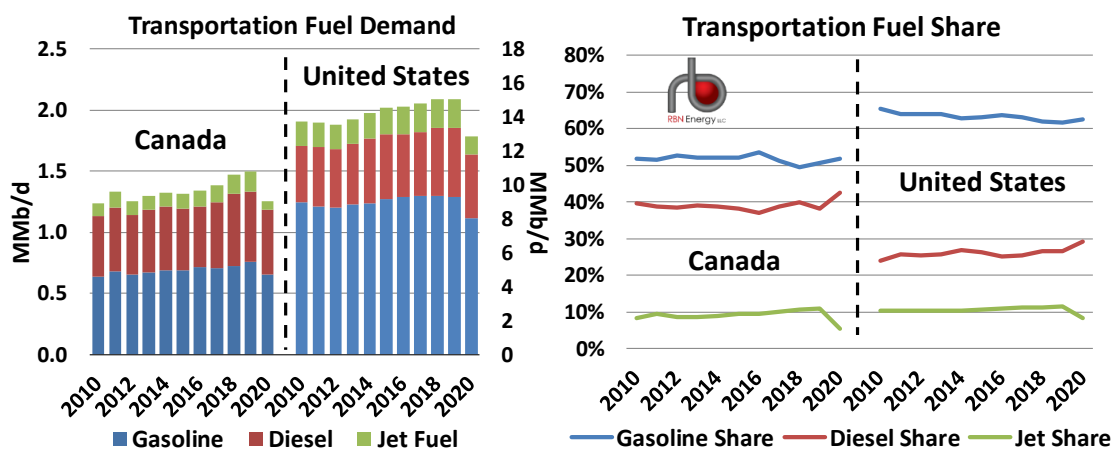


Figure 4. Demand/Share of Primary Transportation Fuels – Canada and U.S. Sources: Statistics Canada and EIA

One final point for consideration is the share of each of the three transportation fuels used in each country (right graph in Figure 4). Gasoline's share of fuel consumption (blue lines) in Canada has tended to hold pretty consistently in the low-50% range, while in the U.S. it has generally been in the mid-60% range. Jet fuel's share (green lines) has been more similar, running at 9% to 10% in Canada and 10% to 11% in the U.S., with 2020 being the COVID-related exception for both countries. However, the share held by diesel fuel (red lines) is more telling. In the U.S., diesel's share has been very steady near 25%, with some gain in 2020. In Canada, the share is considerably higher: between 38% and 40% of the total. Although the average consumer in each country drive similar vehicles, Canada does have a more resource-intensive economy (oil, grains, metals, lumber) and huge distances between areas of production and primary consumption and export. Nearly all of the resource extraction and transportation involves diesel-powered heavy-duty vehicles or rail locomotives.

In this Drill Down Report, we will begin with a detailed look at the refineries in Western Canada, followed by the refineries in the eastern half of the country.

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