CANADIAN OIL IMPORTS

Western Canadian oil-sands production offers energy security to the U.S., but trans-border pipelines are nearing capacity.

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As oil prices flirted with $100 per barrel at press time, no doubt more eyes looked north to Canada for security of supply. The continuing U.S.-Canada import-export partnership benefits a thriving Canadian oil and gas industry with access to open U.S. markets. For Americans, it means a reliable supply of energy.

Above, oil sand is a mixture of bitumen (a thick, sticky form of crude oil), sand, water and clay. (Photo courtesy of Suncor Energy Inc.)

In 2006, for the first time in many years, the value of Canadian oil exports to the U.S. exceeded that of natural gas exports, according to a recent report by Canada's National Energy Board (NEB). The growth of oil exports results from increasing production from oil sands and frontier oil off the East Coast. Meanwhile, the decrease of gas-export volumes is due to declining production from mature fields, growing domestic demand and softer prices.

"The fact that oil is now outpacing gas is, firstly, a function of the relative prices," says Bill Wall, a technical specialist for NEB. "We've had very high oil prices over the last year or so, and the gas prices have been lower and have stabilized at a fairly low level.

"Secondly, we are anticipating a rapid growth of oil-sands-derived production in Canada. Certainly the U.S. is the largest market for that. We do anticipate continuing growth of exports of Canadian crude into the U.S," he says. However, as this trend continues, there may be costs associated with underutilized gas infrastructure.

Today, Canadian oil production, including both conventional and oil sands, stands at 2.6 million barrels per day and is forecast to nearly double by 2020. Oil production is increasing due to the vast oil-sands resources in Alberta, even as conventional oil production there continues to decline.

Canada estimates it has 135 years of production at the rate of 3.5 million barrels per day, given that it has 175 billion barrels of oil-sands reserves, according to the Calgary-based Canadian Association of Petroleum Producers (CAPP).

Altogether, Canada's oil reserves total an estimated 179 billion barrels, second only to Saudi Arabia's holdings, CAPP reports.

In 2001, Canadian conventional oil production, including light and medium grades, as well as heavy oil from Alberta and Saskatchewan, totaled some 1.2 million barrels per day. That number has since fallen, and was down to little more than 1 million per day in 2006. Daily conventional oil production is forecast to decline to only 671,000 barrels by 2020, almost 35% less than its current level, according to CAPP.

Meanwhile, total oil-sands production, including mined oil sands and oil sands produced in-situ by steam-assisted gravity or other means, doubled to a little over 1.1 million barrels per day in 2006, up from 659,000 in 2001.

In mid-2007, CAPP prepared two production and supply scenarios on which to base future forecasts. In the first scenario, the "pipeline planning" case, daily Western Canadian crude supply is projected to increase to almost 5.3 million barrels by 2020. In the second scenario, the "modest growth" case, supply rises to about 4.6 million barrels per day.

Either scenario will take Canada from its current position as the eighth-largest oil producer in the world to No. 3 or No. 4, CAPP reports. This growth is driven by a tripling of oil-sands production, which will account for 3.3- to 4

Canadian Oil Production (Pipeline-Planning Case, Mbbl/d)

	2001	2002	2003	2004	2005	2006	2007E	2008E	2009E	2010E	2011E	2012E	2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E
Conventional oil	1,226	1,157	1,120	1,089	1,053	1,039	1,018	998	973	950	927	903	877	848	820	790	758	728	699	671
Oil sands	659	744	863	994	991	1,133	1,292	1,521	1,759	2,009	2,227	2,501	2,900	3,155	3,372	3,604	3,874	4,021	4,205	4,359

Source: Canadian Association of Petroleum Producers

Suncor's primary extraction plant, near Fort McMurray, Alberta, separates raw bitumen from sand in this giant separation cell. (Photo courtesy of Suncor Energy Inc.)

million barrels per day of Canada's total production by 2020.

During the coming decade, an estimated 1.43 million barrels per day of ultra-heavy oil-sands production and an additional 1.35 million barrels per day of synthetic crude will be placed in the North American market. Canada is already the largest supplier of crude oil, natural gas and petroleum products to the U.S., but further development and export of these resources will greatly contribute to the security and reliability of U.S. oil supply.

Also, due to wide fluctuations of weather-induced demand and the vast physical distances between supply sources and markets, the funding and construction of interconnecting pipeline and transmission infrastructure would not have been economically viable without the inclusion of large export volumes to absorb a share of the costs, according to NEB.

Development of pipeline infrastructure presents another choice for Canadian producers. They must decide whether to continue to export energy in its lower-value raw form, or process it to a higher-value product within Canada before export.

The latter generates higher export revenues; however, it also incurs the costs of developing processing infrastructure and challenges traditional economic rationale, which suggests benefits to processing goods closer to the end-user rather than at the point of extraction.

Whether raw or refined, Canadian producers seek sufficient pipeline capacity to U.S. markets of the growing output. Also, those markets, mostly refiners, must be ready to receive and process the oil. While Canada and the U.S. Midwest are primary markets today, the growth in supply will require new markets, refinery modifications or expansions and additional pipeline capacity.

The challenge for producers, after determining what quality of crude (heavy or upgraded to light) is transported, is to decide which pipelines get built first and where. U.S. markets must choose which refineries will be modified and expanded to process this growing supply. Cooperative decision-making is needed to avoid uncertainty and delay, according to CAPP.

Seven pipeline projects will beef up capacity by 2010.

Canadian Oil-Export Pipeline Expansion Plans

	In-Service Date	Added Capacity (Mbbl/d)	Total Capacity (Mbbl/d)
Enbridge Southern Access 2A	1Q 2008	60	60
Kinder Morgan Anchor Loop	Nov 2008	40	100
Enbridge Light Sour Line	4Q 2008	185	285
Enbridge Southern Access 2B	1Q 2009	85	370
Enbridge Line 4, Edmonton to Hardisty	March 2009	450	NA
TransCanada Keystone	4Q 2009	435	805
Enbridge Clipper	July 2010	450	1,255

Source: Canadian Association of Petroleum Producers

Existing pipelines

Currently, Western Canadian crude is delivered to market through three major Canadian trunklines that, in 2007, transported about 1.8 million barrels a day, representing more than 70% of total Western Canadian crude supply.

The first is the Enbridge Pipeline system, owned by Edmonton-based Enbridge Pipelines Inc. and originates at Edmonton, Alberta, and extends east to the U.S. border near Gretna, Manitoba. There, it connects to the Enbridge Lakehead system and delivers crude to the U.S. Midwest and to Sarnia, Ontario. The system can deliver more than 2 million barrels per day.

The second is Trans Mountain Pipeline, owned by Houston-based Kinder Morgan Energy Partners LP and originates in Edmonton and extends across British Columbia to Washington. In 2007, Kinder Morgan Canada commissioned 11 new pump stations to boost capacity on Trans Mountain from 225,000 barrels of crude per day to approximately 260,000. The pipeline has been operating at capacity since then.

In August 2007, Kinder Morgan announced it will expand Trans Mountain to 300,000 barrels per day. The project is expected to be completed in November 2008.

The third major Canadian trunkline, the 282,000-barrel-per-day Express-Platte, is also owned by Kinder Morgan. It moves light, medium and heavy crude from Hardisty, Alberta, to the Platte pipeline in Casper, Wyoming, which then moves it to Wood River, Illinois.

Other systems include the 125,000-barrel-per-day Enbridge Spearhead, which delivers to Cushing, Oklahoma; the 88,000-barrel-per-day Mustang Pipeline, which delivers to Illinois; and the 66,000-barrel-per-day ExxonMobil Pegasus, which delivers to the U.S. Gulf Coast.

The throughputs on these pipelines have recently been subject to capacity limitations either directly though apportionment or indirectly due to downstream bottlenecks.

CAPP reports that, although the recent capacity restrictions have been short-lived, Western Canadian oil pipelines are reaching the limits of their capacities, and the need for pipeline expansion is increasing.

Some 1 million barrels per day of new capacity will be needed before 2011 to avoid supply

disruptions and further bottlenecks, according to CAPP. Almost 1.3 million barrels per day of new capacity is scheduled to be in service by July 2010, but some of the proposed capacity is subject to lengthy regulatory proceedings. It currently takes about four years for a new pipeline to be put into service in Canada.

The need for incremental capacity beyond 2011 is also significant and amounts to more than 1.9 million barrels per day by 2015 and more than 2.7 million by 2020 to meet transportation demand, according to CAPP.

Refineries gear up

U.S. refiners will be tasked with processing that additional crude. On the West Coast, most of the refineries with capacity for handling heavy crude will continue to process California heavy crudes, not Canadian supplies, CAPP forecasts. Along the Gulf Coast, most of the refiners will have all they can do to handle increasing supplies of heavy crude from Mexico and Venezuela.

By 2015, more than 60% of the crude processed in the U.S. Midcontinent will be from oil sands. More than likely, the bulk of the heavy oil imported from Canada will be refined in the U.S. Midwest.

Because much of the oil-sands crude has high-acid characteristics that require metallurgy modifications to protect piping and vessels, U.S. refineries will have to invest heavily in processing unit revamps to accept the imports.

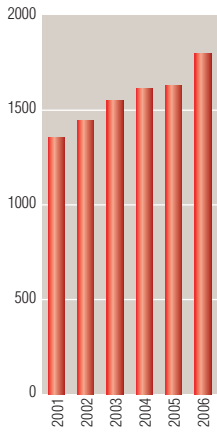
One U.S. refiner has jumped ahead of the pack. Houston-based Marathon Oil Corp. has not only acquired oil-sands assets in Canada, but is also expanding and revamping several of its refineries to process that imported production.

Other U.S. refineries are announcing plans or have begun engineering and construction projects to process heavy oil. BP Plc announced a $3-billion revamp of its Indiana refinery, and ConocoPhillips has announced a joint venture with EnCana Corp. to revamp two refineries, one in Illinois and one in Texas.

Given current and anticipated oil prices and substantial commitments already made by developers, production from the oil sands seems destined to dominate Canadian upstream development for many years to come. However, uncertainty remains about the extent and timing of development, given concerns about rising costs and the availability of water for processing, skilled labor and sufficient diluent for blending.

In fact, the NEB has reduced its forecast for daily Canadian oil-sands production by 200,000 barrels in 2015. It attributes the reduction to rising costs, pending Canadian greenhouse-gas limits and higher Alberta royalty requirements, assuming a $50-per-barrel West Texas Intermediate oil prices. □

Canadian Crude Oil Exports to U.S.
(Mbbl/d)



Since 2001, daily Canadian oil exports have grown by nearly 500,000 barrels.

MARATHON'S BIG MOVE

In October, Houston-based Marathon Oil Corp. acquired Western Oil Sands Inc., Calgary, and its heavy-oil assets. The $6.9-billion deal gives it a foothold in one of the world's most promising streams of new crude oil.

Marathon had long been looking for a partner in the Canadian oil sands, as it plans to link the Canadian fields with its U.S. refineries.

"Marathon has a relatively new business segment, our mining business. Included in that, as a result of our acquisition of interests in Canadian oil sands, is the Athabasca oil-sands project," Marathon president and chief executive Clarence Cazalot said at the IPAA annual meeting in San Antonio recently.

"Canadian oil-sands producers are building upgraders in Canada to turn the bitumen into light, synthetic crude. The cost of doing that has been escalating through the roof, to that point that, today, to build a 100,000-barrel-per-day upgrader will cost around $5 billion. And at the tailgate of that upgrader is a light synthetic crude that still needs refining."

Marathon's management looked at the oil sands and upgraders, and at its own refineries in the Midwest, and saw a good opportunity. "To the extent that we can transport that bitumen, by blending it with a lighter diluent, we can process it into refined products," Cazalot said.

With the Western Oil purchase, Marathon gains total resources of 2.6 billion barrels. The company plans to grow production from 31,000 barrels per day to 130,000 by 2020, importing that production to its U.S. refineries in the Midwest.

Marathon recently announced a $1.9-billion project to install a coker unit in its Detroit refinery to upgrade and refine the crude. "However, our Detroit refinery will not be able to handle all of the increased production, so our ultimate goal is to get some of that Canadian crude from Alberta down to our Garyville, Louisiana, refinery." The company can also expand its refineries in the Midwest.

"The $1.9 billion for the refinery upgrade is just a fraction of the $5 billion it would cost to build an upgrader in Canada. And what we get at the tailgate of our refineries is a product that you can put into your car or your truck. That's a tremendous value proposition we obtained through an integrated energy strategy."