‹ Countries

Canada

Last Updated: September 17, 2012

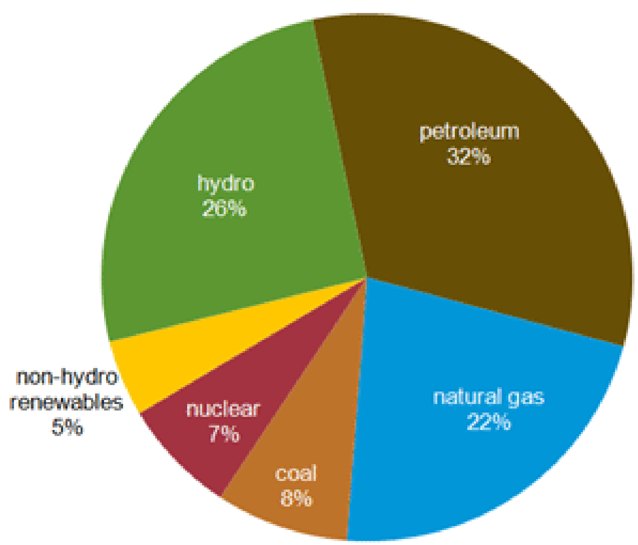
Background

Canada is one of the world's five largest energy producers and is the principal source of U.S. energy imports.

Canada is a net exporter of most energy commodities and is an especially significant producer of conventional and unconventional oil, natural gas, and hydroelectricity. It stands out as the largest foreign supplier of energy to the United States, its southern neighbor and one of the world's largest consumers of energy. Just as the United States depends on Canada for much of its energy needs, so is Canada profoundly dependent on the United States as an export market. However, economic and political considerations are leading Canada to consider ways to diversify its trading partners, especially by expanding ties with emerging markets in Asia.

Canada's large territory is endowed with an exceptionally rich and varied set of natural resources, which enables it to rank among the five largest energy producers in the world. It produced an estimated 18.2 quadrillion British thermal units (Btu) of primary energy in 2009, relative to 13.0 quadrillion Btu of primary energy consumed. Its economy is relatively energy-intensive when compared to other industrialized countries, and is largely fueled by petroleum for transportation purposes, natural gas, and hydroelectricity.

Canada's total energy consumption by type, 2010

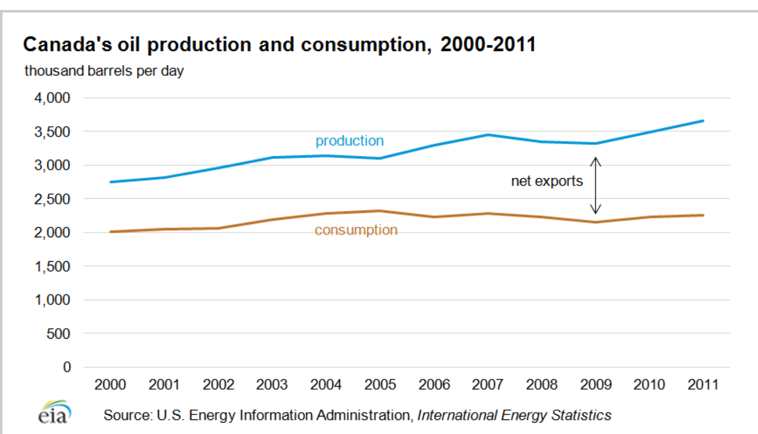


Source: U.S. Energy Information Administration

Oil

Canada's unconventional oil sands are a significant contributor to the recent and expected growth in the world's liquid fuel supply and comprise the vast majority of the country's proven oil reserves, which rank third globally.

Canada is the world's sixth-largest oil producer, and virtually all of its crude oil exports are directed to U.S. refineries. Long a major onshore and offshore producer of conventional crude, the recent growth in its liquids production has been driven by bitumen and upgraded synthetic crude oil produced from the oil sands of Alberta. The vast majority of Canada's reserves and the expected future growth in Canada's liquids production will derive from unconventional resources.



Reserves

According to *Oil & Gas Journal* (*OGJ*), Canada had 173.6 billion barrels of proven oil reserves as of the beginning of 2012. Canada controls the third-largest amount of proven reserves in the world, after Saudi Arabia and Venezuela. Among the top ten reserve-holders, the only other state that is not a member of the Organization of the Petroleum Exporting

Countries (OPEC) is Russia. Canada's proven oil reserve levels have been stagnant or slightly declining since 2003, when they increased by an order of magnitude after oil sands resources were deemed to be technically and economically recoverable. The oil sands now account for approximately 170 billion barrels, or 98 percent, of Canada's oil reserves. Aside from other reserves in conventional onshore and offshore producing areas, additional resources are known to be under the Beaufort Sea in the Arctic, off the Pacific coast, and in the Gulf of St. Lawrence.

Sector organization

Canada has a privatized oil sector that includes the active participation of many domestic and international oil companies. Many Canadian oil firms recently underwent strategic corporate restructuring, including a wave of consolidation in the wake of the recent economic downturn. At the same time, the unique and technically sophisticated production processes required in the exploitation of Canada's unconventional resources promote regional and functional specialization by independents and the subsidiaries of major companies.

Myriad Canadian firms have a presence in the upstream oil and gas industry, from large-scale active or planned commercial projects to smaller pilot projects that serve as test beds for new technologies. Among the largest Canadian energy companies with a presence in the domestic upstream and downstream are Suncor (which acquired Petro-Canada in 2009), Canadian Natural Resources Limited, Imperial Oil, Cenovus (which was spun off from Encana, a leading natural gas producer), and Husky. Other Canadian companies, particularly Enbridge, KinderMorgan, and TransCanada, dominate midstream pipeline infrastructure.

The participation of international oil companies (IOC), both private and state-owned, in Canada's oil sector has risen rapidly. Aside from economic and political motivations, investments in the oil sands enable foreign companies to gain technological expertise that can be applied to unconventional resources elsewhere. The Investment Canada Act stipulates that any large investment in Canada must be of "net benefit" to Canada, indicating possible limits on foreign control of strategic commodities, even though it has been invoked infrequently. U.S. private sector firms involved in Canada's upstream and/or downstream oil industry include Chevron, ConocoPhillips, Devon Energy, and ExxonMobil. BP, Shell, Statoil, and Total are among the other major IOCs with producing or planned projects in the oil sands.

Chinese companies, including PetroChina and its China National Petroleum Corporation (CNPC) parent company, the China National Offshore Oil Corporation (CNOOC), and Sinopec, have invested in the oil sands and other parts of Canada's energy sector. PetroChina purchased sixty-percent stakes in the MacKay River and Dover projects from Athabasca Oil Sands Co. in January 2010, followed by full acquisition of MacKay River in January 2012. In 2010, Sinopec acquired ConocoPhillip's stake in Syncrude Canada. CNOOC purchased a minority stake in MEG Energy in 2005. One notable planned foreign acquisition is CNOOC's recent $15 billion bid for Nexen. If the Nexen deal is approved, CNOOC would be the first Chinese company to operate a commercial-scale oil sands operation.

Federal and provincial bodies coordinate policy and regulation in Canada. Provincial authorities, the largest and most influential of which is the Alberta Energy Resources

Conservation Board (ERCB), handle most sector oversight. The national regulatory body is the National Energy Board (NEB).

Exploration and production

Canada produced almost 3.7 million barrels per day (bbl/d) of total oil in 2011, an increase of nearly 200 thousand bbl/d from 2010. Of this, 2.9 million bbl/d was crude oil and a small amount of lease condensate.

Oil production in Canada comes from three principal sources: the oil sands of Alberta, the conventional resources in the broader Western Canada Sedimentary Basin (WCSB), and the offshore oil fields in the Atlantic. Production from the oil sands accounted for over half of Canadian oil output in 2011, a proportion that has steadily increased in recent decades. In total, Alberta was responsible for almost 75 percent of Canadian oil production in 2011, according to an analysis of data from Statistics Canada. Other noteworthy producing provinces are Saskatchewan, with almost 14 percent of national output from its share of the WCSB, and offshore areas of Newfoundland and Labrador. Production in conventional offshore reserves off of the eastern provinces comes from mature oilfields, with few opportunities to mitigate decline rates. Accordingly, western provinces are expected to comprise an increasing proportion of overall Canadian oil production in the future.

Canada is expected to be one of the largest sources of growth in global liquid fuel supply, in both the near-term and long-term. Recent editions of EIA's *Short-Term Energy Outlook* forecast that Canada's production will grow by an annual average of approximately 200 thousand bbl/d in 2012 and 2013. Looking forward, the 2011 *International Energy Outlook* projects that Canadian production could grow to 6.6 million bbl/d by 2035 due to an expansion of unconventional output from the oil sands.

Oil sands

Canada's most important oil producing region is the Alberta sands, especially the Athabasca deposit. The oil sands – also referred to, often pejoratively, as the "tar sands" – are permeated with bitumen, which is a form of petroleum in solid or semi-solid state that is typically found blended with sand, clay, and water in its natural state.

Unconventional techniques are required of operators in the oil sands, which use two predominant methods to extract petroleum: traditional pit mining on the surface and in-situ production underground. When mined at the surface, bitumen-rich earth is shoveled into trucks for separation at a processing facility. Surface mining has historically been the largest source of production from the oil sands, but its share is expected to decline over time because approximately 80 percent of bitumen reserves are situated too deeply underground to be accessible to surface mining. The other method, in-situ extraction, entails the injection of steam into underground formations to soften the bitumen and pump it to the surface through wells. Steam-Assisted Gravity Drainage (SAGD) and Cyclic Steam Stimulation (CSS) are the two leading in-situ extraction techniques. Given the sophisticated and expensive techniques involved, oil sands production has a relatively high break-even price: commonly cited ranges are $40-70/bbl for new in-situ projects and $80-100/bbl for new surface mining projects. Consequently, oil sands investments are uniquely sensitive to sustained changes in oil prices.

Once extracted, bitumen is a heavy, viscous type of crude oil. In order to flow in a pipeline, the bitumen must be diluted with condensate or other light oils or "upgraded" by complex processing units ("upgraders") into a light, sweet "synthetic" crude oil (SCO). Of the crude oil and equivalent production reported by Statistics Canada in 2011, roughly 28 percent was synthetic crude oil and 25 percent was non-upgraded crude bitumen.

The largest oil sands projects are surface mining operations, though there are a greater number of in-situ projects. The most notable current and planned oil sands operations include:

- **Syncrude Canada** is a joint venture by leading oil sands operators in mining and upgrading operations in Aurora North and Mildred Lake, with a total estimated capacity of approximately 350 thousand bbl/d. Syncrude received regulatory approval for a roughly 200 thousand bbl/d expansion in Aurora South, but the completion of the project has been pushed back until the next decade.

- **Suncor Energy's** production averaged 305 thousand bbl/d of upgraded SCO and non-upgraded bitumen in 2011, less than the nameplate capacity from its core Millenium mining site, as well as the Firebag and MacKay River in-situ projects. Suncor has announced a number of planned greenfield and brownfield expansions, of which an additional phase of Firebag is the closest to fruition (planned start-up in 2013). Other phases of Firebag, which would add another 200 thousand bbl/d, are expected by the end of the decade. A second phase of Mackay River and the Voyageur upgrader are expected for 2016 or later. Suncor also plans to jointly develop the Fort Hills mine (190 thousand bbl/d) with Total around the same timeframe, along with its Joslyn mine.

- **Shell Canada** is the leading owner and operator of the Athabasca Oil Sands Project, which includes the Muskeg River mine (155 thousand bbl/d), Jackpine mine (100 thousand bbl/d), and the Scotford upgrader. Shell also has two small in-situ projects in the Cold Lake and Peace River deposits. A 100-thousand bbl/d expansion of Jackpine is scheduled for 2014, with other projects for later years in various stages of planning and regulatory review.

- **Canadian Natural Resources** has two significant producing projects, as well as a number of large planned projects. Horizon Oil Sands is an integrated mining and upgrading facility that can produce 110 thousand bbl/d of light, sweet SCO in its first phase. Horizon will undergo process improvements and small expansions over the next few years, with much larger expansions tentatively planned for the more distant future. Its other large project, Primrose/Wolf Lake, has an in-situ capacity of 120 thousand bbl/d. The company also plans to bring online the in-situ Kirby project, with first-phase peak production of 40 thousand bbl/d after start-up in 2013 or 2014 and expansions possible by 2016. Later this decade and into the next, Canadian Natural Resources aspires to construct other medium-sized in-situ projects, including Grouse, Birch Mountain, Leismer, and Gregoire Lake.

- **Imperial Oil** operates one of the largest in-situ projects, Cold Lake, which has a current capacity of approximately 140 thousand bbl/d and could grow further with a 40-thousand bbl/d CSS expansion in 2014. Its Kearl mining project is among the most important new projects due in the short-term. Over the next year, it is supposed to ramp-up to an initial capacity of 110 thousand bbl/d, followed by an increase to 145 thousand bbl/d by the end of 2015. Imperial Oil has received regulatory approval for a total future Kearl capacity of up to 345 thousand bbl/d.

- **Cenovus** operates two large in-situ projects, Foster Creek and Christina Lake, through a joint venture with ConocoPhillips. Foster Creek was the first commercial SAGD project and now produces approximately 120 thousand bbl/d. Production from its next three phases is expected to start in 2014, and ultimately to increase capacity to 210 thousand bbl/d after 2017. Christina Lake has been developed in three phases: the first two phases, of almost 60 thousand bbl/d in total, is joined by a 40-thousand bbl/d expansion that began its production ramp-up in the summer of 2012. Future expansions could increase production to almost 300 thousand bbl/d.

- **Devon Canada** operates the Jackfish project, which includes one fully operational stage, one in construction, and one planned, each of which have a capacity of 35 thousand bbl/d. Jackfish II began production in June 2011 and is supposed to attain full production capacity by the end of 2012, while Jackfish III is scheduled to come online in 2015.

- **Nexen**, which **CNOOC** is attempting to purchase, operates the Long Lake project. It includes a SAGD facility that is producing approximately 35 thousand bbl/d from the first tranche of well pads. The company plans to increase output to 72 thousand bbl/d of bitumen, from which 60 thousand bbl/d of SCO will be produced from an upgrader that became operational in 2009. The next phase of Long Lake, Kinosis, has a planned capacity of 15-25 thousand bbl/d, which could be followed by larger expansions in future years.

- **ConocoPhillips** produces almost 30 thousand bbl/d from the first phase of the Surmont in-situ project, with an expansion to 100 thousand bbl/d planned for 2015. It also acts in a 50-50 partnership with Cenovus on Christina Lake and Foster Creek.

- **Husky Energy** operates 30 thousand bbl/d of current production, through the Tucker in-situ project in Cold Lake. It plans to eventually bring online a much larger Athabascan in-situ project, known as Sunrise. Sunrise will developed in three phases over the 2014-2020 timeframe, with an initial capacity of 60 thousand bbl/d and eventual capacity of 200 thousand bbl/d.

- **MEG Energy** operates 25 thousand bbl/d of combined production from the first two phases of the Christina Lake in-situ project. A 35 thousand bbl/d expansion is currently underway. A third phase is in regulatory review, which would add 150 thousand bbl/d for a total project capacity of over 200 thousand bbl/d.

- **PetroChina** recently purchased the MacKay River and Dover in-situ projects from Athabasca Oil Sands Corp. Neither project is currently producing at a commercial scale, but the first phase of MacKay River is scheduled to come online in 2014, at 35 thousand bbl/d, with an eventual expansion to 150 thousand bbl/d.

- **Statoil's** presence in the oil sands is focused on the Kai Kos Dehseh in-situ project. A 40-thousand bbl/d expansion of the limited production there is planned by 2015.

- **Sunshine Oil Sands** has announced three separate in-situ projects that it intends to bring online over the next decade, with a combined future capacity of 150 thousand bbl/d. However, over the next few years, initial phases of each project will only produce approximately 10 thousand bbl/d.

- **Total** received regulatory approval for the 100-thousand bbl/d Joslyn North mine, but the company has reportedly not yet made a final investment decision. It would jointly develop Joslyn and the Fort Hills mine with Suncor.

Environment

All forms of oil and gas development pose environmental challenges and risks, but concerns about the environmental implications of oil sands production are unique and in some respects more acute. Many objections to oil sands development center upon the relatively energy-intensive and carbon-intensive extraction and processing methods required. Calculations of the climate impacts of oil sands development are complicated and often yield different results but, caveats and exceptions aside, well-to-tank greenhouse gas emissions are typically higher for oil produced from the oil sands than oil produced through conventional means. The potential to exacerbate climate change is merely one of the environmental costs that accompany the development of Canada's oil sands. Other environmental concerns regarding oil sands development relate to land use, water use, water quality, the impacts of toxic tailing ponds, and the possibility of oil spills from pipelines emanating from producing regions.

Environmental tradeoffs are inherent in the use of any energy source, and even between different types of oil sands technology. For example, while the land use impacts of in-situ production are arguably less severe than they are for surface mining, the energy inputs can be higher. Federal and provincial authorities have issued regulations to ameliorate the environmental impacts of oil sands development. Nonetheless, there have been domestic and international attempts to impede future oil sands expansions for environmental reasons, including through opposition to new export infrastructure.

Western Canada Sedimentary Basin

The traditional center of Canada's oil production has been the Western Canada Sedimentary Basin (WCSB), which stretches from British Columbia across Alberta and Saskatchewan to Manitoba. This basin contains some of the most abundant supplies of oil and natural gas in the world. The WCSB remains a significant source of conventional oil production, despite the fact that it was surpassed by unconventional output from the oil sands in 2006. According to an analysis of data from the National Energy Board, of Canada's production of crude oil and equivalent in 2011, approximately 18 percent was conventional light crude production from WCSB provinces and an additional 14 percent was conventional heavy crude from Alberta and Saskatchewan.

The depletion rates of conventional oil production in the WCSB are expected to fall in the coming years, as enhanced recovery techniques are applied to old wells and new resource deposits. In particular, technological advances like horizontal drilling and hydraulic fracturing have made tight oil production from shale formations an increasingly attractive alternative to conventional petroleum production. According to National Energy Board data, tight oil production in the WCSB exceeded 200 thousand bbl/d by the end of 2011 and was quite evenly divided between Alberta and Saskatchewan, with smaller amounts of production from Manitoba. The two most prolific plays are the Bakken – which stretches across southern Saskatchewan and Manitoba as well as the northeast corner of Montana and North Dakota – and the Cardium formation in Alberta. In the United States, the Bakken has been largely responsible for the recent growth in U.S. crude oil production.

Offshore

Most offshore oil production in Canada occurs in the Jeanne d'Arc Basin, off of the eastern shore of Newfoundland and Labrador. Light crude oil production from offshore areas in eastern Canada amounted to approximately 265 thousand bbl/d in 2010, which was almost 10 percent of Canada's total crude oil production. Most of Canada's offshore output derives from the Hibernia field, which came online in 1997 and is operated by ExxonMobil, accounting for over 150 thousand bbl/d of production in 2011. Two other significant fields in the region are Terra Nova and White Rose. Terra Nova is operated by Suncor on behalf of a large consortium and accounted for slightly more than 40 thousand bbl/d of production in 2011, a substantial decline from the levels achieved in the last decade. Husky Energy operates White Rose, which also produces well below its peak levels, at 35 thousand bbl/d in 2011. In May 2010, Husky started production at the North Amethyst field, which is one of the satellites to White Rose that could offset declines elsewhere and extend the field complex's production life. The large Hebron field, which could have up to 1 billion barrels of recoverable heavy oil resources, is expected to begin production by 2017.

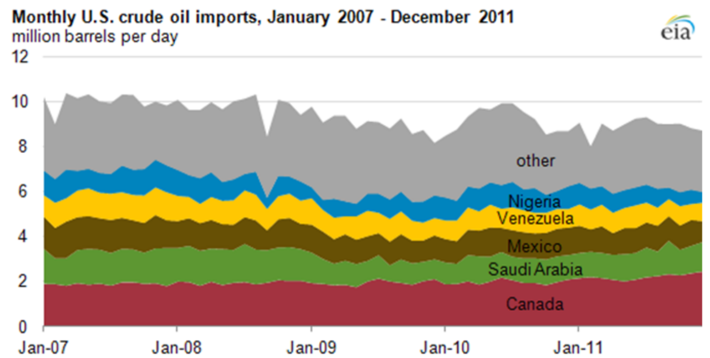
Canada's offshore exploration and production is confined by numerous regulatory and legal impediments. A 1972 moratorium proscribes field development off the Pacific coast, where there are an estimated 9.8 billion barrels of recoverable resources. A federal review of offshore drilling prevents progress in the Arctic, but oil majors such as Imperial Oil, ExxonMobil, BP, and Chevron have invested to secure acreage in the Beaufort Sea.

Trade

Essentially all (almost 99 percent) Canadian oil exports are directed to the United States and Canada is by far the largest supplier of foreign oil to the United States. Canada accounted for approximately 25 percent of U.S. crude oil imports in 2011. That year, the United States imported 2.7 million bbl/d of oil and petroleum products from Canada, of which 2.2 million bbl/d were crude oil.

Though the United States is a large net oil importer from Canada, at 2.4 million bbl/d in 2011, the cross-border oil trade flows in both directions. Canada is essentially the only country to import U.S. crude oil, the exports of which face legal restrictions, in the amount of 46 thousand bbl/d in 2011. The United States exported a more meaningful volume of petroleum products to Canada, 250 thousand bbl/d, in 2011.

At least some of the bilateral trade in oil can be explained by geography. Most Canadian oil is exported from western provinces, from which approximately 70 percent the country's total exports are sent to refineries in the U.S. Midwest (Petroleum Administration for Defense District II). The eastern provinces, which are more densely populated but have less oil production, import some of the energy products they consume. Including the small amount of crude oil imported from the United States, refineries in the Atlantic provinces, Quebec, and Ontario imported approximately 680 thousand bbl/d of crude oil in 2011.



Source: Nearly 69% of U.S. crude oil imports originated from five countries in 2011, Today In Energy, U.S. Energy Information Administration

Pipelines

Pipelines connect the centers of Canadian production with refining and export centers in eastern provinces, the West Coast, and especially the United States. Pembina, Plains Midstream, Spectra Energy, Access Pipeline, and Inter Pipeline operate some of the largest domestic pipeline systems in Western Canada. Three Canadian companies operate the most export pipelines: Enbridge, Kinder Morgan, and TransCanada. In total, members of the Canadian Energy Pipeline Association transport 3.2 million bbl/d of oil over almost 25 thousand miles of pipeline. However, an increasing amount of oil is transported by rail to overcome infrastructural constraints in the midcontinent region.

Operational export pipelines

Enbridge operates the largest export oil pipeline network. In combination, two of its related systems – the Canadian Mainline from Edmonton to Quebec and the U.S. Mainline (Lakehead) to Chicago – transport 2.5 million bbl/d. The Lakehead system includes the Alberta Clipper pipeline to Superior, Wisconsin that was completed in 2010, which expanded the system capacity by 450 thousand bbl/d with an ultimate capacity of 800 thousand bbl/d available. The Southern Lights pipeline is parallel with the Alberta Clipper but runs in the opposite direction in order to transport lighter hydrocarbons back to Alberta for use as a diluent in transporting and processing bitumen. Along with its other smaller pipelines on both sides of the border, Enbridge's large pipeline systems transport 65 percent of the oil exported from Western Canada.

Kinder Morgan operates the Trans Mountain Pipeline System, which is the only pipeline system that transports crude oil and petroleum products to the West Coast of North America. The pipeline originates in Edmonton, Alberta and travels to various marketing and refining stations near Vancouver, British Columbia. Its capacity is rated at 300 thousand bbl/d. Kinder Morgan also operates the cross-border Express pipeline (280 thousand bbl/d), which connects with the smaller Platte pipeline in Casper, Wyoming and then travels to Illinois.

TransCanada has established a foothold in Canada's crude export market through its Keystone system, which includes two operational phases, one in construction, and another awaiting regulatory approval. The first phase of Keystone, which travels from Hardisty, Alberta to Illinois, commenced operation in June 2010 at a capacity of 435 thousand bbl/d. A second phase became operation in February 2011, connected the Keystone system to the

Cushing, Oklahoma hub, and increased the system's rated capacity to 591 thousand bbl/d.

Proposed export pipelines

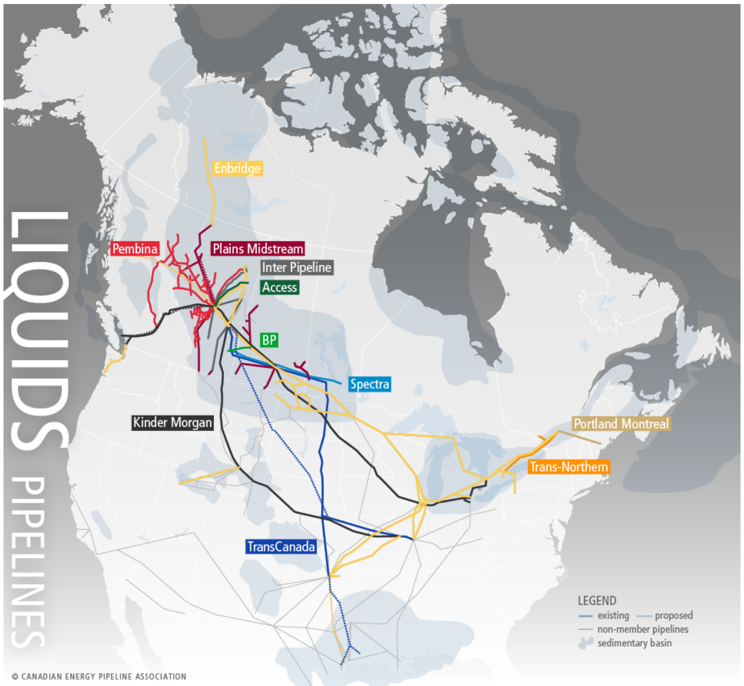
TransCanada's proposed addition to the Keystone system, Keystone XL, has become a controversial front in broader political debates about energy policy, climate change, and oil sands development. Keystone XL would travel from Hardisty, Alberta to Steele City, NE, with a capacity of 830 thousand bbl/d. Since it would cross an international border, a presidential permit must be granted stating that the project is in the national interest. In May 2012, TransCanada reapplied for a presidential permit after the U.S. Department of State denied its initial application due to environmental concerns that had not been resolved as of the deadline for a decision. While environmentalists urged the administration to reject the pipeline for a variety of reasons, the controversy ultimately centered on risks that pipeline spills might pose to the Ogallala aquifer in Nebraska's Sand Hills region. TransCanada's new application includes alternative routes through Nebraska, and the Department of State tentatively expects to rule on Keystone XL in the first quarter of 2013. If granted the requisite permits, TransCanada expects to begin construction soon thereafter with a potential in-service date of 2015.

While Keystone XL was initially proposed as an integrated pipeline from Canada to the U.S. Gulf Coast, a shorter section that is entirely within the United States was pursued as a separate project when the presidential permit for the cross-border segment was rejected. The TransCanada pipeline to connect Cushing, Oklahoma with the Texas refining sector is now known as the Gulf Coast Pipeline Project, and would resolve some of the infrastructural constraints that have led to a glut of oil at the Cushing hub. Construction on the Gulf Coast Pipeline Project commenced in August 2012 following final approval of its permits by the U.S. Army Corps of Engineers, and the company aspires to achieve an in-service date of mid-to-late 2013. The pipeline will have an initial capacity of 700 thousand bbl/d with the potential to expand to 830 thousand bbl/d.

Enbridge and Kinder Morgan have proposed new or expanded pipelines to the West Coast, which are only in the preliminary stages of planning and regulatory review. Kinder Morgan aims to expand its existing Trans Mountain system by building a second pipeline within the same right-of-way. The expansion would increase Trans Mountain's capacity to 850 thousand bbl/d. The company has yet to file a permit application with the NEB, but construction would begin in 2016 and the pipeline could come online in 2017 if the project proceeds according to the company's timeline. Meanwhile, Enbridge is pursuing the Northern Gateway Pipeline Project, which would have its terminus at a deepwater port in Kitimat, British Columbia. Northern Gateway would include a 525 thousand bbl/d crude oil pipeline and a smaller parallel pipeline to carry condensate back to Alberta. Enbridge has already filed regulatory applications associated with Northern Gateway and is in the midst of public consultations and government review. If approved on time in 2014, Northern Gateway could be commissioned in 2017.

The completion of either or both of the competing Kinder Morgan and Enbridge projects would create a new export outlet for the oil sands. Additional pipeline capacity to the West Coast would reduce Canada's overland dependence on the United States market while providing access to growing Asian economies in the Pacific Basin, which could have important implications for trade flows and the prices received by Canadian oil producers. Yet like Keystone XL, the proposed West Coast projects must overcome differing degrees of opposition, particularly due to concerns about the risk of pipeline or tanker spills in British Columbia and among affected aboriginal First Nations groups, in order to be completed.

Canada's liquid fuels pipelines



Source: Canadian Energy Pipeline Association

Downstream

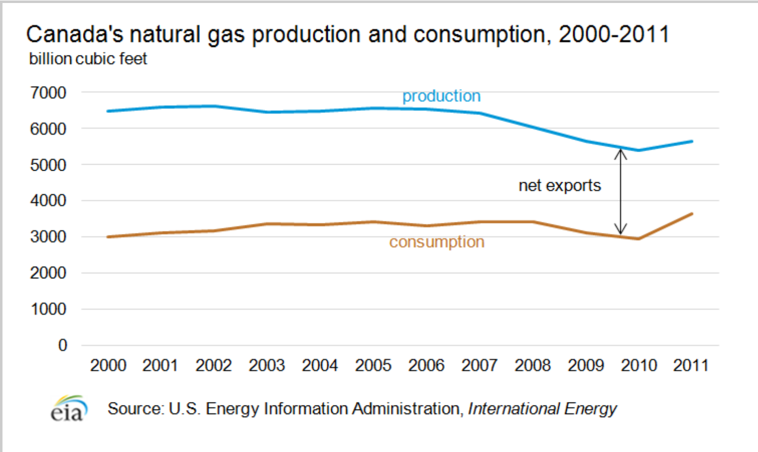
According to *OGJ*, Canada has 17 refineries with a total crude processing capacity of 1.9 million bbl/d. Ontario (470 thousand bbl/d), Alberta (460 thousand bbl/d), and Quebec (370 thousand bbl/d) possess the most capacity, but Canada's refineries are spread across eight provinces and the single largest is in New Brunswick. Imperial Oil is Canada's largest refiner, with significant capacity also operated by Suncor, Irving Oil, Valero, Shell, and Husky. According to data from Statistics Canada, Canada's refineries produced 1.9 million bbl/d of petroleum products in 2011 (including refinery processing gain).

Canada consumed an estimated 2.26 million bbl/d of petroleum products in 2011, a slight increase from 2010. According to official data, motor gasoline accounts for approximately 40 percent of the refined petroleum products sold in Canada, with roughly another 30 percent attributable to diesel fuel demand. Ontario and Quebec account for over half of the country's refined product sales.

Natural gas

Canada is the world's third-largest producer of dry natural gas and the source of most U.S. natural gas imports.

Despite holding a relatively small share of the world's proven natural gas reserves, Canada ranks third in dry natural gas production. It is the fourth-largest exporter of natural gas, behind Russia, Norway, and Qatar. Though Canada has plans to export liquefied natural gas (LNG), all of Canada's current natural gas exports are sent to U.S. markets via pipeline. The proportion of Canada's natural gas production that is devoted to meeting domestic requirements has risen in recent years, while net exports to the United States have fallen.



Reserves

OGJ estimates that Canada's proved natural gas reserves amounted to 61 trillion cubic feet (Tcf) as of January 2012, a slight decline from the year before. Most of Canada's natural gas reserves are conventional resources in the WSCB, including those associated with the region's oilfields. Other areas with significant concentrations of natural gas reserves include offshore fields near the eastern shore of Canada, principally around Newfoundland and Nova Scotia, the Arctic region, and the Pacific coast.

Shale gas

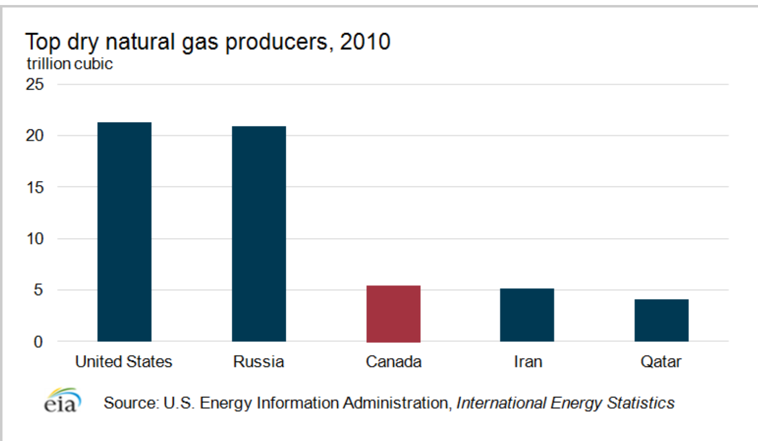
Vast deposits of unconventional natural gas reside in the WCSB in the form of coal bed methane (CBM), shale gas, and tight gas, though they have not been as extensively developed as similar formations in the United States. Canada has an estimated 388 Tcf of technically recoverable shale gas resources, according to an initial assessment prepared by EIA. Five large sedimentary basins in Western Canada with thick, organic-rich shales – the Horn River, Cordova Embayment, and Liard in northern British Columbia, the Deep Basin/Montney in central Alberta and British Columbia, and the Colorado Group in central and southern Alberta – account for 355 Tcf of the total. The Horn River Basin claims the largest share of the total resource. The remaining assessed resources are in four potential shale gas plays of Quebec, Nova Scotia, and New Brunswick, in which exploration has been limited and resource numbers are especially preliminary.

Exploration and production

Canada is the third largest producer of natural gas, but trails both the United States and Russia by a considerable margin. Dry natural gas production increased in 2011, after declining from peak levels reached in the first half of the last decade. EIA estimates that Canada produced 6.7 Tcf of gross natural gas in 2010 (18 billion cubic feet per day, Bcf/d), of which 5.9 Tcf was marketed (5.4 Tcf of which was dry natural gas), 730 Bcf was reinjected, and 55 Bcf was vented or flared. The vast majority of Canada's natural gas production derives from conventional production in the WCSB. Alberta produced over two-thirds of Canada's gross natural gas in 2011, according to Statistics Canada data, with most of the remainder coming from British Columbia.

Although production of conventional natural gas is undergoing declines due to reserve depletion, technological advances have spurred rapid investment in the region, and natural gas production from the WCSB will increasingly come from shale gas, tight gas, and CBM. A number of major and independent companies, including Encana, Apache, Devon, Quicksilver, and Nexen, are already active in British Columbia's Horn River shale play. Foreign interest in the resource was also demonstrated by the joint development agreements that Encana signed with CNPC and Korean Gas Corp. (KoGas) in 2010. Shale gas production in Canada is currently limited, and the shale gas basins in eastern Canada are in even earlier stages of exploration and development.

Offshore natural gas production has been focused primarily off the coast of Eastern Canada, in the Scotian Shelf geological area. The most mature project is the Sable Offshore Energy Project (SOEP), in which ExxonMobil has a majority stake. SOEP produces as much as 500 million cubic feet per day (MMcf/d) from an area that is described by operators as one of the largest known natural gas deposits remaining in North America. Encana is developing another major natural gas project off Newfoundland, the Deep Panuke Project, which is set to come online in late 2012. The project is designed to produce 300 MMcf/d initially, with estimated recoverable reserves of over 600 Bcf.



Trade

All of Canada's natural gas exports are directed to the United States via pipeline. The United States imported 3.1 Tcf (8.5 Bcf/d) of natural gas from Canada in 2011, down from near-peak levels of 3.8 Tcf in 2007. Canada accounts for almost 90 percent of U.S. natural gas imports, most of which come from western provinces. Though the United States is a net importer of natural gas from Canada, it exported over 900 Bcf of natural gas to Canada in 2011, a dramatic increase from less than 100 Bcf in 2000. As prospects for domestic U.S. natural gas production continue to improve, in the future the United States is expected to have lower natural gas import needs while exporting more to its North American trading partners.

Pipelines

Canada's natural gas pipeline system is highly interconnected with the U.S. pipeline system. TransCanada operates the largest network of natural gas pipelines in North America, including thirteen major pipeline systems and approximately 37,000 miles of gas pipelines in operation. Within Canada, TransCanada Pipeline operates a 25,600-mile network that includes the 10.6-Bcf/d Alberta System and the 7.2-Bcf/d Canadian Mainline. Spectra Energy operates a 3,540-mile, 2.2-Bcf/d pipeline system connecting western Canadian gas supply regions with markets in the U.S. and Canada. Spectra Energy also operates the Maritimes and Northeast Pipeline linking eastern Canadian supplies with consumers in the eastern United States. Finally, the Alliance Pipeline, a 2,311-mile pipeline system, is a significant source of natural gas for the U.S. Midwest that delivers 4.6 Bcf/d to both Canadian and U.S. markets.

After six years of regulatory review, the NEB approved the MacKenzie Valley Pipeline, part of the MacKenzie Gas Project, in 2011. Imperial Oil would construct and operate the pipeline; other partners are ConocoPhillips, Shell, ExxonMobil, and the Aboriginal Pipeline Group. The 1.2-Bcf/d pipeline would travel 745 miles from Canada's Beaufort Sea to Alberta, where it would join existing pipeline networks. However, the outlook for the pipeline is uncertain, as more permits are required, it is competing with the Alaska Gas Pipeline, and natural gas prices and import needs are projected to remain low due to shale gas and other developments.

Liquefied natural gas (LNG)

Import terminals

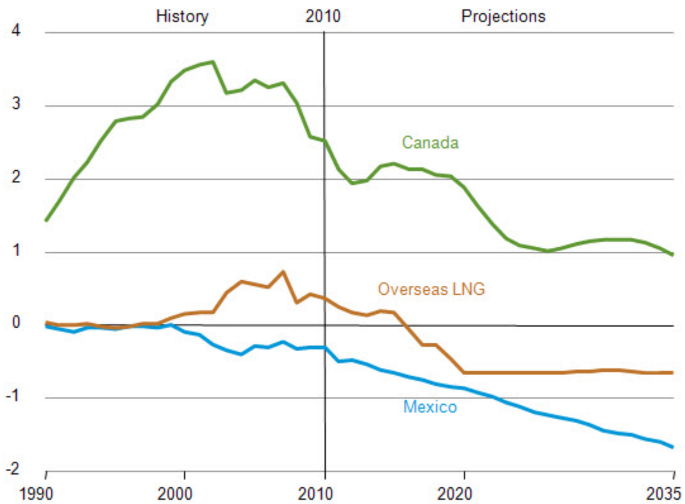
Changes to North American natural gas supply fundamentals have diminished Canada's appetite for imported liquefied natural gas (LNG). As such, seven LNG terminal plans have either been cancelled or suspended. One exception is Canaport, Canada's first and heretofore only operational regasification terminal, which began importing LNG in June 2009. The Canaport terminal is operated by Repsol, in partnership with Irving Oil, and has a nameplate processing capacity of 1.2 Bcf/d. Most LNG cargoes delivered to Canaport had been supplied by Trinidad and Tobago until the last year, when they were replaced by LNG from Qatar due to a new long-term supply agreement.

Export terminals

Further proof of the changing outlook for North American natural gas is provided by Kitimat LNG, a facility that was originally proposed as an import terminal but is now being developed as an export terminal. Kitimat would initially process 5 million tons of LNG per year (mmtpa). Apache owns 40 percent of the project, while EOG and Encana each have 30-percent stakes. The LNG terminal in Kitimat would be fed by shale gas produced in British Columbia. The partners have announced a target start date of 2015 for the first of two potential trains, but this could be optimistic given the upstream and downstream developments that need to occur before operations can commence.

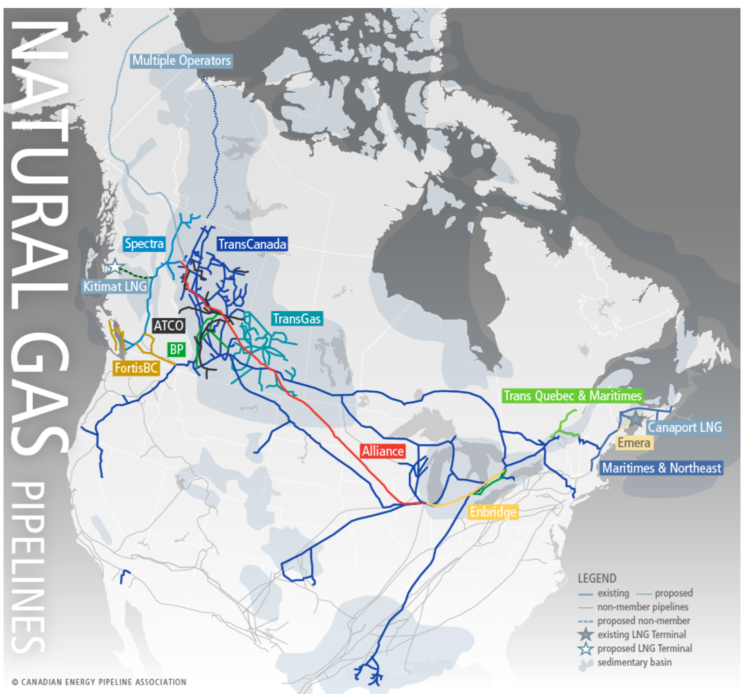
Other LNG export terminals have been proposed to harness western Canada's unconventional natural gas potential. Shell, in cooperation with Mitsubishi, KoGas, and PetroChina, is pursuing a two-train, 12-mmtpa export terminal near Kitimat that would come online in 2020. Petronas has proposed a two-train, 7.4-mmtpa export terminal in Prince Rupert, British Columbia that would tentatively come online in 2018 and be fed by the upstream acreage it acquired from Progress Energy. A smaller proposal is for BC LNG, a floating liquefaction terminal in Douglas Channel.

U.S. net imports of natural gas by source, 2010-2035
(trillion cubic feet)



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2012*

Canada's natural gas pipelines



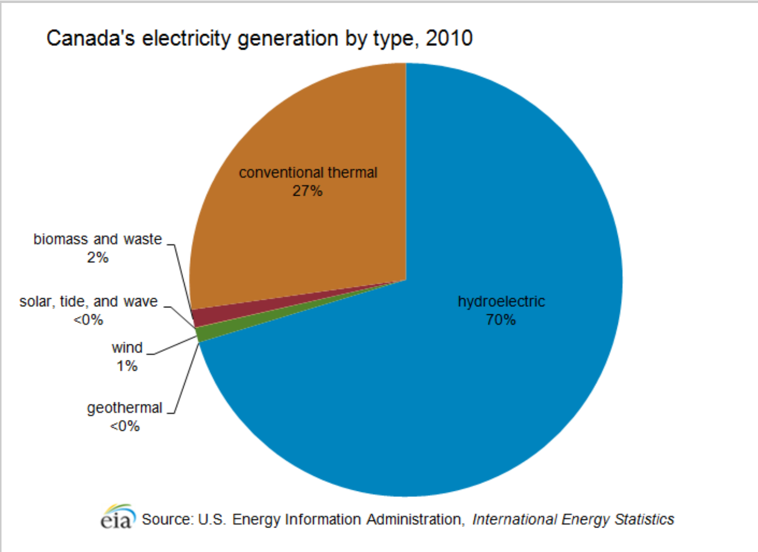
Source: Canadian Energy Pipeline Association

Electricity

Canada is a net exporter of electricity to the United States, and most of its power needs are met by hydroelectricity.

Generation

Canada generated an estimated 580 billion kilowatthours (kWh) of electricity in 2010, of which sixty percent was hydroelectric. Only China and Brazil produce more hydroelectricity than Canada. Conventional thermal power plants satisfy most of Canada's electricity needs not met by hydroelectricity. According to International Energy Agency statistics, approximately two-thirds of Canada's conventional thermoelectric generation is fueled by coal, with most of the remainder attributable to natural gas and a small amount of oil.



Capacity

Canada had an estimated 132 gigawatts (GW) of installed electricity generation capacity in 2009. Hydroelectric dams accounted for approximately 75 GW of that total, including one of the largest hydroelectric complexes in the world, the James Bay Project on Quebec's La Grande River. Canada is also a large and growing producer of wind energy, due in part to supportive policies at the federal and provincial levels. According to the Canadian Wind Energy Association, Canada's wind capacity was 5.5 GW as of mid-2012, including 2.0 GW in Ontario alone.

Trade

The electricity networks of Canada and the United States are highly integrated, and the United States is a net importer of electricity from Canada. In 2010, Canada exported 43.8 billion kWh of electricity to the United States, while importing 18.5 billion kWh. The major electricity trade flows from Canada to the United States occur from Manitoba to the Midwest and from eastern Canada into the New England, New York, and Midwest Regional Transmission Organizations. On the other hand, the Pacific Northwest is a net electricity exporter to Canada because its sizeable hydro capacity generates large amounts of electricity in excess of the region's need, particularly when river flows are highest in spring and early summer.

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