

ENERGY MATTERS Canada's options for the 2020s

RBC Economics

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CANADA'S CHOICES

Our country is blessed with abundant and enviable energy resources, including the world's third-largest proven oil reserves. And for generations, the energy sector has benefited the Canadian economy in terms of jobs, investment and national wealth, representing about 10% of GDP. But as we prepare to enter the 2020s, we're still struggling with some fundamental choices about how best to harness those resources and sell them to the world - a world in which demand for oil and gas very likely will continue to grow. To better inform those choices, RBC Economics looked at where we're heading, in both our production and consumption of energy, while considering the emissions impact. We explored three scenarios for Canada's oil and gas sector — one in which emissions are held flat, one in which production expands as planned, and one in which the sector follows a more ambitious growth scenario. Each scenario comes with projected benefits to the country, and consequences, that will require thoughtful policy choices around infrastructure, taxation, regulation, permitting and pricing. Hopefully, those choices can be made with clear thinking and objective data. Because whichever way you look at it, energy matters.

A growing global economy means energy demand is on the rise.

According to the EIA, by 2030 the world will need:



more nuclear and renewable power

more natural gas

more petroleum

The energy mix is becoming cleaner, but fossil fuels will still provide more than three-quarters of the world's energy.

Energy demand growth will be concentrated in fast-growing Asian economies. Led by China and India, Asia will account for two-thirds of the increase in global demand.

Nuclear and renewables will play a growing role in those countries' energy mix. But they'll also need:

60% more natural gas

(twice Canada's current production)

7.4 million more barrels of oil per day

(more than 1.5 times Canada's current production)





Source: US Energy Information Administration, RBC Economic Research



While global energy demand is on the rise, Canadian energy use is set to flatline.

The country's energy mix will shift over the next decade, with more natural gas and renewables replacing coal. But moderate economic growth and improving efficiency mean Canada won't need much more energy than it consumes today.

If Canada is to maintain or expand our 4% share of global energy production, we have to focus on expanding foreign markets for our oil and natural gas exports. Canadian primary energy demand by fuel type quadrillion Btu



Source: EIA, NEB, RBC Economics calculations

Canada is well positioned to meet growing global energy demand.



Canada can maintain its place as a global energy supplier. We looked at three scenarios for oil and gas production.

See Appendix A

In our limited growth scenario, crude oil production increases slightly and Canada remains a major producer. In our base case, stronger production growth allows Canada to increase its share of global production. With additional export infrastructure in the ambitious growth scenario, Canada will play a larger role in meeting rising global crude oil demand.



Potec United states Brazil Canada Razakristan Kest of World *Potential upside from tight oil production in Central & South America Source: US Energy Information Administration, RBC Economic Research

The limited growth scenario assumes no increase in natural gas production. In our base case, rising production allows Canada to meet growing domestic and foreign demand. Additional LNG infrastructure in the ambitious growth scenario results in even stronger growth in natural gas production and exports.





billions of cubic feet per day, 2017 vs. 2030

Source: US Energy Information Administration, RBC Economic Research



THE POWERHOUSE NEXT DOOR

Canada's largest export market is becoming energy independent. The shale oil boom vaulted US production to more than 10 million barrels per day. The US is now the world's leading crude oil producer, and tight oil will remain a force to be reckoned with over the next decade.



The country is also now a net exporter of natural gas. And thanks to LNG investments, the US will be a growing source of global natural gas.



The energy sector is an important contributor to Canada's economy, accounting for 10% of GDP.

Under our limited growth scenario, the energy sector is likely to eke out small gains. In our base case, energy GDP grows at a rate similar to the past decade, while the ambitious growth scenario envisions energy output rising by nearly 30%. That would make Canada's economy 1.1% larger by 2030 relative to the limited growth scenario. That's more than the size of the country's auto sector.

The energy industry directly employs 275,000 Canadians, and indirect employment accounts for another 625,000 jobs (Natural Resources Canada). Stronger production growth in the ambitious growth scenario will mean thousands more jobs in energy, and even more indirect employment in related industries like construction.





The industry has contributed \$200 billion to federal and provincial coffers since 2008. That's about 10% of what Canada spent on health care over that period.

billions of C\$ 40 Provincial oil & gas royalties Land sales Provincial income taxes Federal income taxes Indirect taxes 30 20 10 0 2008 2009 2010 2011 2012 2013 2014 2015 2016 Source: CAPP. Statistics Canada, RBC Economic Research

Government revenues from the energy sector

Oil & gas royalty comparison



Infrastructure investment is needed to alleviate capacity constraints for oil exports and reduce reliance on more costly rail transport. Those constraints have led to substantial discounts on Canadian oil production. Recent discounts of as much as US\$50 per barrel on Western Canadian heavy oil are well above equilibrium levels around US\$15. That means millions of dollars are being left on the table every day.



Provincial royalties represent the largest share of revenue, and are expected to increase even in a limited growth scenario. But with stronger production growth, annual royalty revenues are expected to surpass highs seen over the past decade. The ambitious scenario adds \$44 billion in cumulative royalty revenues to what would be collected under the limited growth scenario. That's more than the provinces collected over the past four years.

Higher production levels also raise environmental considerations.

GHG emissions from Canada's oil and gas sector have increased 70% since 1990. The industry now accounts for one-quarter of the country's emissions. Canada's oil sector is emissions intensive relative to its peers.



The industry has invested in improving efficiency. GHG emissions per barrel of oilsands production have fallen 35% since 1990. Some projects that have adopted new technologies have achieved even lower emissions per barrel. As additional projects adopt those technologies, average emissions intensity in the oil sands should continue to decline.

Canadian oil production, GHG emissions per barrel kg CO2 equivalent per barrel



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Ongoing efficiency gains will be crucial in limiting the emissions impact of further production growth. In our base case production forecast, emissions from the oil and gas sector would increase by more than 45 Mt by 2030 under current efficiency rates. But with further declines in emissions per barrel, that increase can be cut by more than one-third.

The oil sands has attracted \$300 billion in capital spending to date (NRCan). It will take further investment in R&D by industry and government to achieve ongoing efficiency gains.



In a global context, Canada's oil and gas sector accounted for 0.4% of total GHG emissions in 2013. A share that hasn't increased since 2005.

Canada is currently challenged to meet our commitments under the Paris Agreement to reduce emissions to 30% below 2005 levels by 2030.

The government has introduced policies, including the Pan-Canadian Framework on Clean Growth and Climate change, to reduce emissions. But even with those changes, Canada is expected to fall short of its 2030 goal. To meet that commitment, it will take additional market interventions that support investment in clean tech and innovation across a wide range of sectors, not just oil and gas. Canada needs to find the lowest-cost ways to reduce emissions, and create opportunities for other heavy-emitting sectors like transportation and buildings to cut their levels.





Without recent policies Including recent/planned policy changes Canada's 2030 target Source: Environment and Climate Change Canada, RBC Economic Research

Canada is at a crossroads.

A fast-growing world will demand more oil and gas in the decade ahead. Canada is well positioned to serve it. As this report lays out, the impact on Canada's economy, and government revenue, would be significant. The impact on Canada's emissions and the ability to meet our global commitments is also evident, as is the need to continue to advance technologies to further reduce the carbon intensity of Canadian production. Those forces could go hand in hand, with the resources of greater production helping to finance the innovation of more efficient production. But neither will happen without more informed policy discussions. There is much at stake. Energy matters.



Appendix A

Limited growth scenario

This scenario assumes GHG emissions from the oil and gas sector are capped at 2017 levels (192 Mt per year). That would still allow for some increase in crude oil production, since we assume further reductions in emissions per barrel based on historical trends. Natural gas production is held flat, as no change in emissions intensity is assumed (in line with historical trends). No additional export infrastructure (pipelines or LNG terminal) is completed, and higher-than-normal discounts on Canadian heavy oil persist.

In the limited growth production scenario, energy-sector GDP (which also includes refining, energy services and electricity) grows by 8% by 2030. That is less than half the rate of increase seen over the past decade. Royalty revenues from oil and gas still increase, thanks to higher global crude oil prices and a number of oil-sands projects reaching post-payout status. By 2030, annual royalty revenues remain below pre-2014 highs.

Base case

This scenario assumes Canada's oil-sands production continues to grow into the early part of the next decade and plateaus thereafter. This scenario is based on projects that are online and ramping up, or where construction of an expansionary phase is underway. This assumes delays in building additional crude oil pipelines (Keystone XL and the Trans Mountain Pipeline expansion), which discourages additional projects. Higher-than-normal discounts on Canadian heavy crude persist as producers continue to rely on higher-cost methods of transportation. Natural-gas production is expected to grow in the base case, particularly in the Montney region of British Columbia and Alberta. It assumes completion of LNG Canada's export facility, which recently received a positive final investment decision.

Growing oil-and-gas output helps energy sector GDP rise by 22% by 2030. That's close to the rate of increase seen over the past decade. As a result, Canada's annual GDP is 0.8% higher by 2030 than in the limited growth scenario. Higher output raises cumulative royalty revenues by \$31 billion relative to the limited growth scenario. But annual GHG emissions from the oil-and-gas sector are expected to be 28 Mt higher in 2030. That leaves Canada further from meeting its international emissions-reduction commitments.

Ambitious growth scenario

On top of production growth in the base case, this scenario assumes a number of additional oil-sands projects. We assume some of these additional projects will be undertaken if producers have clarity that at least one major export pipeline will be completed (Keystone XL or the Trans Mountain Pipeline expansion), in addition to Enbridge Line 3 replacement. Greater export capacity results in historically more normal discounts on Canadian heavy oil production. This scenario also assumes stronger growth in natural gas production and additional LNG exports from completion of another LNG facility.

Higher production allows energy-sector GDP to grow at a faster rate than over the past decade, increasing by 28% by 2030. Relative to the limited growth scenario, economy-wide GDP is 1.1% higher in 2030. Cumulative royalties are \$44 billion higher, as stronger production and less discounting on heavy oil boost revenue. Annual GHG emissions from the oil and gas sector are 42 Mt higher than in the limited growth scenario. That's more than half of current emissions from the oil sands.

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