

Canada's New Energy Economy: Energy Industry towards Net-Zero 2050

<p>Kenryo Mizutani Senior Researcher Vancouver Office Japan Oil, Gas and Metals National Corporation (JOGMEC) Email: mizutani-kenryo(at)jogmec.go.jp</p>	<p>Gregory Whiteside Lawyer Environmental & Regulatory Bennett Jones LLP Email: whitesideg(at)bennettjones.com</p>
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Abstract: Canada is a major global energy exporter of oil and natural gas. However, recent developments in Canadian policies and laws will encourage new developments in alternative energy sources, adding to this energy mix. These new sources will provide support for Canada's commitments for achieving net-zero greenhouse gas emissions by 2050. This article will provide an overview of key Canadian greenhouse gas emission reduction initiatives and how they support new energy developments related to existing and proposed industries, such as carbon capture, storage, and utilization, hydrogen, geothermal, and ammonia.

INTRODUCTION

Canada is one of the world's largest energy producers. For example, Canada is the fourth largest producer and third largest exporter of crude oil in the world.¹ On an international scale, Canada's proven crude oil reserves rank third, after Venezuela and Saudi Arabia.² 97% of Canada's crude oil is bitumen from oil sands, mostly from Alberta in Western Canada.³ With respect to natural gas, Canada is the fourth largest producer and sixth largest exporter and ranks 17th in the world for its proven natural gas reserves.⁴ In addition to its rich natural resources, Canada has well-developed regulatory regimes and energy infrastructures. Over 840,000 kilometres of various transmission, gathering, and distribution pipelines exist in Canada, of which over 117,000 kilometres are large-diameter transmission lines.⁵

More recently, Canada has implemented several policies to transition to a low-carbon future, which will increasingly diversify its energy mix. These new policies will encourage further development in alternative energy sources, adding to the existing energy mix. This trajectory means that Canada will remain an important player in the global energy market, while becoming increasingly competitive in the new energy economy in the coming years.

This article provides an overview of these emerging trends in the Canadian energy industry. In Part I, we contextualize Canadian climate change policy in the international framework. We also outline the legislative initiatives for climate change introduced in Canada. These initiatives are directly related to Canada's commitment to realizing carbon neutrality by 2050. In Part II, we discuss some of the recent developments in Canada, linking the global climate change initiatives to the oil and gas industry. In particular, we discuss Canada's leading role in carbon capture, utilization, and storage ("**CCUS**") and emerging forms of energy markets developing alongside oil and gas, such as hydrogen, geothermal, and ammonia. Finally, in Part III, we consider the possible future developments.

I. CANADA AND CLIMATE CHANGE

Canada in the International Climate Change Regime

¹ Natural Resources Canada, "Crude Oil Facts" (October 6, 2020), online: *Government of Canada* <<https://www.nrcan.gc.ca/science-data/data-analysis/energy-data-analysis/energy-facts/crude-oil-facts/20064>>.

² *Ibid.*

³ *Ibid.*

⁴ Natural Resources Canada, "Natural Gas Facts" (October 6, 2020), online: *Government of Canada* <<https://www.nrcan.gc.ca/science-data/data-analysis/energy-data-analysis/energy-facts/natural-gas-facts/20067>>.

⁵ Natural Resources Canada, "Pipelines across Canada" (September 14, 2020), online: *Government of Canada* <<https://www.nrcan.gc.ca/our-natural-resources/energy-sources-distribution/clean-fossil-fuels/pipelines/pipelines-across-canada/18856>>.

Canada has been an active member in the international climate change regime, and it is a party to the *Paris Agreement* that was concluded in 2015. The *Paris Agreement* strengthens the international efforts to limit the global average temperature rise to well below 2 degrees Celsius and pursue efforts to limit the increase to 1.5 degrees Celsius. Under the *Paris Agreement*, Canada has committed to reducing its share of greenhouse gas ("GHG") emissions through its nationally determined contributions. Canada has also been an active member of the United Nations Climate Change Conference ("COP") and the Intergovernmental Panel on Climate Change ("IPCC").

Federal-Provincial Cooperation in Canada

Through these international efforts to coordinate mitigation and adaptation measures to climate change, Canada has made a framework that seeks to implement these international commitments on the domestic level. Unlike Japan that is a unitary state, Canada is a federation. Therefore, in Canada, while the federal government is responsible for international affairs including negotiations of international environmental matters, the actual implementation will typically occur through individual efforts by each provincial government.

To coordinate the policies of each provincial government, the federal and provincial governments agreed to the Pan-Canadian Framework on Clean Growth and Climate Change ("**Pan-Canadian Framework**"), released in 2017. To date, most Canadian provinces have adopted the Pan-Canadian Framework, and it remains a key national document. The Pan-Canadian Framework has four main pillars: (1) carbon pricing; (2) complementary climate actions across the Canadian provinces; (3) implementation of climate change adaptation measures; and (4) acceleration of innovation, support of clean technology, and creation of jobs related to clean energy transition.

Recent Developments in Canadian Policy and Law

In an effort to foster proactive change in energy development and begin a transition to a lower carbon economy, the Canadian federal government has pursued several policy and legislative actions. These actions include a spectrum of developments that incentivize energy transition in both the short and long terms. Immediate actions have come in the form of carbon pricing regimes and surcharges on liquid hydrocarbon fuels. Specifically, the Canadian federal government has enacted legislation requiring that each province design its own regime to appropriately price carbon. Where a province cannot meet a certain benchmark status, federal legislation will act as a backstop to ensure that carbon emissions are appropriately priced to incentivize reduction.

Furthermore, additional legislation has been implemented that will set a standard on the carbon intensity of certain liquid fuels imported and used in Canada.⁶ Under the draft *Clean Fuel Standard*, which will be a federal regulation once in force, credits can be created by using less liquid fossil fuels. Mechanisms for generating credits include: 1) increasing the volume of low carbon intensity fuels such as ethanol and biodiesel, and 2) switching to less carbon intensive means of energy use including electrification. Various activities that reduce GHG emissions generate credits under this proposed *Clean Fuel Standard*, and as these credits can be traded, it is expected to create a nation-wide carbon credits market. After the draft *Clean Fuel Standard* enters into force in December 2022, it is expected that activities related to the oil and gas industry, such as CCUS, enhanced oil recovery ("EOR"), and electrification processes may qualify as credit-generating activities under this regime.

In the long-term, the Canadian federal government has also implemented legislative requirements to ensure consistent planning mechanism in order to meet its emission targets. For instance, the *Canadian Net Zero Emissions Accountability Act*, currently a bill in the federal Parliament, requires the Canadian federal government to regularly develop climate targets in line with meeting its overall 2050 goals and accountability criteria for progress in achieving these climate goals. These developments in Canadian law will continue to encourage energy transition in coming years, spurring significant investment opportunities in alternative energies and emission reduction technology.

II. LINKING LOW-CARBON FUTURES TO OIL AND GAS INDUSTRY AND ALTERNATIVE ENERGIES

⁶ Environmental and Climate Change Canada, "Clean Fuel Standard" (December 18, 2020), online: *Government of Canada* <<https://www.canada.ca/en/environment-climate-change/services/managing-pollution/energy-production/fuel-regulations/clean-fuel-standard.html>>.

Alberta's Initiatives as a Leading Canadian Energy Province

Alberta, as the centre of the energy industry in Canada, is at the forefront of these trends in GHG emission reduction and alternative energy development. Many of ongoing initiatives merit attention. Alberta, located in Western Canada, is the leading producer of crude oil and natural gas. In fact, the majority of Canada's proven crude oil reserves are located in Alberta. With 165.4 billion barrels of proven crude oil reserves, Alberta ranks third after Venezuela and Saudi Arabia.⁷ Alberta also has natural gas and coal, and its abundant natural resources and well-developed energy infrastructure have attracted Japanese investments.

While oil and gas remains Alberta's primary industry, changes are occurring quickly. Given Alberta's mature regulatory regime, well-developed energy infrastructure, and expertise from the oil and gas industry, Alberta has accelerated adoption of emission reduction technologies and embraced alternative energy opportunities.

CCUS Projects linked to Oil and Gas Industry

Canada is home to several leading CCUS projects in the world. According to the federal energy regulatory body, the Canadian Energy Regulator, Canada has seven CCUS projects, all of which are located in Alberta and its neighboring province of Saskatchewan.⁸ Given that there are 18 large-scale CCUS projects in operation around the globe, Canada is a leader in innovation linked to CCUS projects using existing expertise of subsurface knowledge.

As an example, Saskatchewan's Boundary Dam Project is a CCUS project that captures CO₂ from a coal-fired power plant in Estevan, Saskatchewan to be used for an EOR project by Cenovus at its Weyburn oil field. Further, Alberta is home to two leading CCUS projects, which are both fully operational: Quest and Alberta Carbon Trunk Line ("**ACTL**"). Shell has operated Quest since 2015, which captures 1.2 million tonnes of CO₂ annually from oil sands upgrading processes and stores CO₂ in deep saline aquifers. ACTL is another example of a CCUS project linked to the oil and gas industry. ACTL became fully operational in 2020, and it is operated by multiple partners to capture industrial CO₂, transport it via pipeline, and inject it into mature oil and gas reservoirs. ACTL has a capacity to transport up to 14.6 million tonnes of CO₂ per year.

Western Canada's experiences in CCUS projects demonstrate that the subsurface technical expertise from the oil and gas industry can be applied to realize innovative projects that contribute to climate change actions, and other jurisdictions seeking to explore opportunities for low-carbon futures are focusing on Canada's experiences.

Emerging Alternative Energy Industries

While Canada, and in particular Alberta, has a proven track record of successful and operational CCUS projects, in the recent months, there have been additional developments in alternative energies.

Hydrogen

Hydrogen came to the forefront of clean energy after Canada hosted the 10th Clean Energy Ministerial ("**CEM10**") meeting in Vancouver, British Columbia, in May 2019. During the meeting, the ministers from Japan, Canada, the United States, the Netherlands, and the European Commission led a new international hydrogen partnership with the support of other participating CEM 10 member states. Since then, these countries have unveiled their national hydrogen strategies.

Subsequently, in December 2020, the Canadian federal government unveiled the *Hydrogen Strategy for Canada*.⁹ According to this national hydrogen strategy, Canada aims to create domestic regional hydrogen hubs, by using

⁷ Government of Alberta, "Oil sands facts and statistics", online: <<https://www.alberta.ca/oil-sands-facts-and-statistics.aspx>>.

⁸ Canadian Energy Regulator, "Market Snapshot: Carbon Capture, Utilization, and Storage Market Developments" (January 29, 2021), online: <<https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2019/market-snapshot-carbon-capture-utilization-storage-market-developments.html>>.

⁹ Natural Resources Canada, *Hydrogen Strategy for Canada: Seizing the Opportunities for Hydrogen* (2020), online: *Government of Canada* <<https://www.nrcan.gc.ca/climate-change/the-hydrogen-strategy/23080>>.

the different strengths of each province, some of which are considering "blue hydrogen", while others are considering "green hydrogen." The Canadian national hydrogen strategy estimates that hydrogen could deliver up to 30% of Canada's end-use energy by 2050 and could reduce up to 190 megatonnes of CO₂ equivalent per year. In addition, Canada is aiming to be one of the top three global exporters of hydrogen by 2050. Canada aims to develop regional and provincial hydrogen plans in the next five years, and between 2025 and 2030, aims to create a national hydrogen network, which will be further scaled up between 2030 and 2050 to enable national and international transportation of hydrogen.

In addition, various Canadian provinces have unveiled provincial hydrogen strategies. British Columbia conducted a government-sponsored hydrogen study in 2019, in which it discusses potential hydrogen exports to Asian markets including Japan.¹⁰ British Columbia is expected to release its provincial hydrogen strategy sometime in 2021. Further, Alberta has released its hydrogen strategy as part of its new natural gas policy and aims to establish a concrete hydrogen roadmap in the coming years.¹¹ Industry associations in Alberta have also advocated the use of existing natural gas pipelines in Alberta to transport hydrogen,¹² and there are various proposed projects in Canada to transport hydrogen by using existing natural gas pipelines. It is likely that different provinces will engage in different opportunities, and Canada's future hydrogen strategy is likely to be a mix of both "green hydrogen" and "blue hydrogen."

Geothermal

While Canada may not give the impression that it is a country with geothermal potential, Geological Survey Canada notes that parts of Western Canada - such as northwestern Alberta, northeastern British Columbia, southwestern Northwest Territories, and southern Yukon - have potential for geothermal energy.¹³

Currently, Canada does not produce any electricity from geothermal, yet there are several projects underway, in particular in British Columbia and Alberta. Geothermal projects can be combined with various other existing or emerging technologies to provide innovative solutions. Given that both Alberta and British Columbia now have stand-alone geothermal legislation, the establishment of clear legal structures in Western Canada may further encourage this industry. In addition, where heat or electricity is needed for mining operations in remote areas, geothermal provides a potential way to provide clean power or heat to these operations.

Until 2020, British Columbia was the only Canadian jurisdiction with a stand-alone geothermal act. In 2020, Alberta implemented the *Geothermal Resources Act* to provide regulatory clarity and became the second Canadian province to have a stand-alone geothermal act. Under this act, Alberta Energy Regulator ("AER"), which has a long and rich experience in Alberta's oil and gas industry, will regulate geothermal projects. Alberta's geothermal industry may develop in the coming years, since Alberta's geology is well known and there is existing expertise.

Ammonia

Ammonia fuel is a topic that has suddenly gained attention in Japan after the announcement in October 2020 that Japan will achieve carbon neutrality by 2050. As part of this net-zero 2050 policy, Japan aims to replace fossil fuels for its power plants with ammonia fuel. As part of this plan, Japan aims to increase its demand for ammonia fuel to 3 million tonnes by 2030, ultimately to 30 million tonnes by 2050.¹⁴ Japan also set up the Public-Private Council for Ammonia Fuel to promote the use of ammonia fuel instead of conventional fossil fuels such as coal.

¹⁰ Government of British Columbia, *British Columbia Hydrogen Study* (2019), online: *Government of British Columbia* <https://www2.gov.bc.ca/assets/gov/government/ministries-organizations/ministries/zen-bcbn-hydrogen-study-final-v5_executivesummary.pdf>.

¹¹ Government of Alberta, *Natural Gas Vision and Strategy* (2020), online: *Government of Alberta* <<https://www.alberta.ca/release.cfm?xID=73409F78B78DF-F073-FF1A-3153D455F03F9BE1>>.

¹² Alberta Industrial Heartland and Transition Accelerator, *Building a Transition Pathway to a Vibrant Hydrogen Economy in the Alberta Industrial Heartland* (2020), online: *Transition Accelerator* <<https://transitionaccelerator.ca/building-a-transition-pathway-to-a-vibrant-hydrogen-economy/>>.

¹³ Grasby, S.E., et al., *Geothermal energy resource potential of Canada* (Geological Survey of Canada: 2012), online: *Natural Resources Canada* <https://geoscan.nrcan.gc.ca/starweb/geoscan/servlet_starweb?path=geoscan/fulle_web&search1=R=291488>.

¹⁴ Reuters, "Japan aims to boost ammonia fuel demand to 3 million tonnes a year by 2030" (February 8, 2021), online: *Reuters* <<https://www.reuters.com/article/japan-energy-ammonia-idCNL4N2KE2HE>>.

Japan also sees ammonia as a potential hydrogen carrier. In fact, Japanese companies have initiated ammonia fuel projects in Australia,¹⁵ Saudi Arabia,¹⁶ and most recently in Russia.¹⁷ While this is still an emerging area in Canada, Canada is well situated to attract international investment in ammonia fuel, given its existing ammonia industry, availability of hydrocarbons and clean energy sources, and existing energy infrastructure.

Climate Change Policy & Law in Canada

- Pan-Canadian Framework on Clean Growth and Climate Change: federal and provincial coordination.
- *Clean Fuel Standard*: market incentives to reduce carbon intensity of liquid fossil fuels; future national credit trading market.
- *Canadian Net Zero Emissions Accountability Act*: implementation of concrete plans to achieve climate change targets.

Oil & Gas Industry Knowledge for Low-Carbon Futures

- CCUS: major CCUS projects in Western Canada (Alberta and Saskatchewan).
- Geothermal: emerging legal framework and industry in Western Canada (Alberta and British Columbia).
- Hydrogen & Ammonia: use of existing oil and gas industry knowledge and energy infrastructure for project development and transportation.

Hydrogen & Ammonia

- Hydrogen: "blue hydrogen" and "green hydrogen"; Canada aims to become one of the top 3 global hydrogen exporters by 2050.
- Ammonia: future potential, given Canada's rich natural resources and energy infrastructure.

Diagram 1: Summary of Canada's New Energy Economy

III: CONCLUSION

For many years, Japanese investors have engaged with the Canadian oil and gas industry. The recent developments in both law and policy have shifted the landscape for new projects, and these developments will provide new opportunities to utilize existing investments, technologies, and expertise in the oil and gas industry to create a further value-add as the global initiatives towards low-carbon futures accelerate. As we noted in this article, Canada has developed legislative initiatives related to climate change, while also strengthening its current advantages in the oil and gas industry. These initiatives will continue create new opportunities for combining existing oil and gas infrastructure and expertise with emergent technologies to create innovative projects in the coming years.

This article was co-authored with a lawyer from Bennett Jones LLP, an internationally recognized Canadian law firm. The authors can be reached at their indicated email addresses.

¹⁵ Australian Trade and Investment Commission, "Australian green hydrogen attracts major investment from Japanese giants" (December 8, 2020), online: *Government of Australia* <<https://www.austrade.gov.au/international/invest/investor-updates/2020/australian-green-hydrogen-attracts-major-investment-from-japanese-giants>>.

¹⁶ Verity Ratcliffe, "Saudi Arabia Sends Blue Ammonia to Japan in World-First Shipment" (September 27, 2020), online: *Bloomberg* <<https://www.bloomberg.com/news/articles/2020-09-27/saudi-arabia-sends-blue-ammonia-to-japan-in-world-first-shipment>>.

¹⁷ Tom Whipple, "Japanese, Russian companies partner on feasibility study of blue ammonia value chain between eastern Siberia and Japan" (January 1, 2021), online: *The Energy Bulletin* <<https://daily.energybulletin.org/2021/01/japanese-russian-companies-partner-on-feasibility-study-of-blue-ammonia-value-chain-between-eastern-siberia-japan/>>.