Canadian Association of Petroleum Producers

SUBMISSION TO THE STANDING COMMITTEE ON ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

CLEAN TECHNOLOGY IN CANADA

October 21, 2022

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Submission to the Standing Committee on Environment and Sustainable Development
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The Canadian Association of Petroleum Producers (CAPP) and its members appreciate the opportunity to participate in the Standing Committee on Environment and Sustainable Development's study on Clean Technologies in Canada.

Canada is a global leader in emissions-reducing innovations and technologies. Canadian oil and natural gas producers have been key contributors to emissions reduction progress to date and will continue to help reduce emissions in Canada and globally. CAPP and its members are committed to environmental leadership and working to be constructive and solution-oriented partners in addressing the triple challenge of emission reduction, energy security and affordability. CAPP is continuing efforts and working in earnest to further our understanding of the technologies, innovations and policy frameworks that will drive additional progress.

CAPP also notes the importance of this study on clean technology (cleantech) Investment in Canada. We recognize there remains a gap in understanding how the country's cleantech sector interacts across industries, particularly at a time when virtually every sector of the economy is investing in technology and innovation to reduce emissions and improve environmental performance. Collaboration across industries, and effective policy, can support the growth of Canada's cleantech sector and enable governments to make informed decisions to the benefit of the country's economy and environment.

CAPP presents this submission outlining the extensive development and deployment of cleantech in Canada's oil and natural gas industry aimed to reduce emissions intensity from upstream oil and natural gas production. This document highlights three main topics:

- The value of investment and collaboration by Canada's upstream energy producers and opportunities to enhance these desired outcomes.
- The array of proven and emerging technologies (Appendix 1).
- The positive impact on emissions intensity reduction arising from technologies already deployed (Appendix 2).

VALUE OF CANADIAN INVESTMENT, COLLABORATION AND OPPORTUNITIES

The most recent data on clean technology investment known to CAPP comes from a 2016 study conducted for the Clean Resource Innovation Network (CRIN) by Global Advantage Consulting Group Inc. The study found the domestic oil and natural gas industry is Canada's largest investor in cleantech, accounting for 75% of the total annual spend of $1.4 billion.

The industry spent over $3 billion on overall environmental protection in 2019.[1]

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[1] Statistics Canada, Capital and operating expenditures: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3810013001

Development and deployment of emission-reducing innovations and technology is critical to reaching Canada's climate change goals. The upstream oil and natural gas industry is poised for additional cleantech investment, driven by the shared consensus that oil and natural gas produced with lower emissions will provide Canadian resources with a competitive advantage in global markets, and supported by growing global energy demand.

Canadian oil and natural gas producers are cleantech experts, with decades of investing in emissions reduction, water protection and other environmental innovations. The industry's expertise and technology is transferrable to other large-emitting industries from mining to cement manufacture, plus downstream oil and natural gas activities such as petrochemicals and refining. With a supportive investment environment, Canada can build from the foundation of innovation and investment established by the oil and natural gas industry and help achieve better global outcomes.

Across the upstream industry, proven technologies have already been developed and deployed in addition to ongoing research and development of new technologies (Appendix 1) and technologies deployed to date have already achieved results (Appendix 2). Canada's upstream industry supports the creation of an innovative knowledge-sharing ecosystem, through collaboration-based organizations such as:

- Petroleum Technology Alliance Canada (PTAC)
- Clean Resource Innovation Network (CRIN)
- Natural Gas Innovation Fund (NGIF)
- Petroleum Research Newfoundland and Labrador (PRNL)
- Pathways Alliance (now incorporating the former Canada's Oil Sands Innovation Alliance - COSIA)
- Government-based initiatives such as Alberta Innovates, Emissions Reduction Alberta, Saskatchewan Research Council (SRC), B.C. Innovation Council (BCIC) and the BC Oil and Gas Resource Innovation Society (OGRIS)
- Funded independent partnership organizations, post-secondary institutions, and companies' own internal research.

Through these organizations and relationships, the industry takes a collaborative, solutions-oriented approach to cleantech investment focused on achieving emission reductions. The sector is committed to playing a pivotal role in helping Canada meet its stated emissions reduction goals, while maintaining a strong economic focus that includes nationwide employment, government revenue generation, and supporting quality of life with fuels and products Canadians depend on. Canada's upstream oil and natural gas industry clearly demonstrates a commitment to investing in and advancing clean technology as well as progress toward reducing emissions across operations.

Based on CAPP's experience, below are recommendations that can facilitate opportunities for cleantech investment in Canada:

- **Foster innovation and avoid prescriptive regulations** that define which technologies the government supports to meet desired objectives. Many technologies have already been deployed and will be required to reach the stated goals and any actions that limit flexibility will limit innovation and investment in leading-edge technologies.
- **Ensure the effective deployment** of any carbon levy-related revenue collected from industry to emission reduction opportunities within the sector. CAPP believes that as the carbon price increases, it will be necessary for governments to swiftly deploy large amounts of additional dollars being collected.

- **Enable markets** and ensure that cost-effective opportunities are available for all. Emissions reduction projects compete with other investments and are global in nature. Canada's framework for decarbonization must keep pace with the global markets in which Canada competes, including improved incentives for carbon capture, utilization and storage (CCUS) projects.
- **Leverage efficiencies** across the economy, avoiding a sector-by-sector approach and consider policy alternatives focused on enabling key objectives.
- **Re-assess the current CCUS policy** in the context of international competitiveness and attaining climate goals and consider a flexible policy approach in attaining a competitive effective policy that achieves parity with the U.S. such as a production tax credit, contracts for differences, inclusion of operating costs, or other financial policy levers.
- **Ensure policy measures** enable both the investment of capital and deployment of technology.
  - Limit uncertainty in the policy environment especially for those projects or technologies expected to depend on offsets or crediting mechanisms as a revenue stream to support business cases.
  - Streamline regulatory permitting processes for projects that either improve existing infrastructure performance or new projects that improve industry performance for technology deployment.

Industry strives to play a role in improving performance and reducing emissions by being a key contributor to the cleantech ecosystem and the broader economy. We appreciate the Committee's consideration of the opportunities and of the progress the sector has made to date.

APPENDIX 1 - CURRENT AND EMERGING TECHNOLOGIES

CURRENT TECHNOLOGIES

In October 2021, CAPP released a comprehensive report detailing current and emerging emissions-reduction technologies and citing examples provided by CAPP members.

CARBON CAPTURE, UTILIZATION AND STORAGE

Carbon capture, utilization and storage (CCUS) includes several advanced technologies that capture emissions from large industrial facilities before they reach the atmosphere. Captured carbon dioxide (CO_2) can be permanently stored underground in stable geological formations, used to enhance oil production from mature reservoirs, or used to create value-added products. Notable examples include the Quest Carbon Capture facility that captures and stores CO_2 emissions from the Shell-operated Scotford Upgrader near Fort Saskatchewan, Alberta and the Aquistore CCS facility that captures emissions from SaskPower's Boundary Dam coal-fired electricity generation plant near Estevan, Sask.

The proposed federal Investment Tax Credit (ITC) for CCUS is a significant step forward in federal support for emissions-reducing technology and achieving climate goals. However, Canada is still behind competitors such as Norway and the U.S. With the advent of the recent U.S. Inflation Reduction Act, Canada's position to not only reach our climate goals but also to be a global resource supplier of choice is at risk if Canadian policies are not competitive with those in the U.S.

With the right regulatory and fiscal incentives and design, Canada's CCUS projects have the potential to contribute to the Government of Canada's climate goals, and successfully compete for capital investment. Exxon (2022) estimated global capital spending on CCUS will be about $4 trillion by 2050.

CCUS has great potential as a next-generation clean technology industry that can significantly reduce CO_2 emissions across the economy. The Province of Alberta recently approved the pore space (underground storage capacity) for 19 CCUS projects being considered by companies and consortiums, primarily from the upstream oil and natural gas industry. These small, medium and large projects represent potential investment exceeding $20 billion in the coming decades and the foundation for a world-leading CCUS industry in Canada.

FUEL GAS / ENERGY EFFICIENCY

Emissions reductions can be achieved through fuel switching (primarily from diesel to natural gas) and improved efficiency in equipment and processes at facilities of all sizes, across all upstream operations. Technologies include:

- Waste heat recovery units (WHRU) use an energy recovery heat exchanger that transfers heat from high-temperature process outputs to another part of the process, offsetting the need to burn more fuel for heat or power generation. A WHRU can reduce emissions by 2,500 to 3,000 tonnes of CO_2 equivalent (tCO_2e) per well per year, or from 30,000 to 78,000 tCO_2e per plant per year for a gas-processing plant with a capacity of 90 million cubic feet per day (MMcf/d).
- Diesel displacement for drilling, well completions and natural gas processing facilities, such as using mobile natural gas power generating / energy storage units for existing electricity-powered drilling rigs.
- Offshore flare recovery systems significantly reduce flaring of natural gas. Recovered gas can be collected and used for compression, injection / re-injection and enhanced oil recovery.

METHANE REDUCTION

In the oil and natural gas industry, methane is released when natural gas is flared or vented. Methane is also released in small leaks, called fugitive emissions, from valves and other equipment used in drilling and production. Canada has mandated a reduction in methane emissions of 40 to 45% below 2012 levels by 2025. The upstream oil and natural gas industry is actively working to achieve this target. Reduction efforts are focused on tank vents, pneumatics, pumps and similar fugitive emissions sources, plus further reductions in venting and flaring.

A report released by the Government of Alberta in January 2022 shows the industry is on track to achieve the province's methane emissions reduction target. In addition, using technologies developed through PTAC, the industry has created enough technology capacity to reduce methane emissions by more than 45%. A directory published in February 2021 by PTAC and Global Affairs Canada lists nearly 60 western Canadian companies providing a variety of methane detection and reduction products and services to oil and natural gas producers. (Source: PTAC)

COGENERATION

Upstream producers can use waste heat to generate electricity, thus reducing emissions by avoiding additional fuel combustion for electricity generation. Cogeneration systems reduce emissions associated with electricity production and steam generation by 30 to 40% compared to electricity purchased from the Alberta grid and stand-alone steam generation. Excess electricity not required for facility operation is sold to the Alberta power grid. Cogeneration offers a significant opportunity to reduce emissions, through currently installed cogeneration and potential new installations.

UPSTREAM ELECTRIFICATION

Upstream production projects located near low-emission electricity sources such as hydro can use such sources to power all or part of a facility, thus avoiding combustion of other fuels. Renewable power generation is another option. Using hydroelectricity to operate upstream natural gas production in northeastern B.C. offers significant opportunities to reduce overall emissions from production of liquefied natural gas (LNG).

OFFSHORE INITIATIVES

Canada's offshore industry has invested over $600 million in research and development, education and training, including research focused on generating knowledge about environmental conditions and reducing existing and potential environmental risks. Initiatives include:

- During maintenance programs, operators look at methods to improve efficiency of operation for power generation units and other key equipment, subsequently reducing emissions.
- Supply vessels use fuel management and monitoring systems to ensure vessels are operating as efficiently as possible and continue to consider new technology as it becomes available.
- Operators are implementing fugitive emissions monitoring systems that use optical gas imaging cameras, facilitating rapid leak detection and repair.
- Work is underway internationally in the marine transportation industry to use alternative low-carbon fuels.

EMERGING TECHNOLOGIES

OFFSHORE WIND-SOURCED ELECTRIFICATION

A scoping study to electrify offshore production facilities via development and installation of offshore wind farms is underway. This research includes recommendations for specific equipment and design criteria that could be implemented in different contexts including brownfield and greenfield developments.

ELECTRIFICATION OF FPSO VESSELS

Offshore installations are not connected to existing power grids so must generate their own electricity, which is a leading source of emissions. Preliminary research of the potential for electrifying greenfield floating production, supply and offloading (FPSO) vessels using power from shore is ongoing. Preliminary results demonstrate that electrification is possible, though not economically feasible based on current offshore activity levels.

BLUE HYDROGEN

Hydrogen is an energy-dense fuel that can be used in many ways, from industrial applications to heating, producing electricity and more. When combusted, hydrogen produces no CO_2 or other emissions — the only by-product is water. 'Blue' hydrogen is derived from natural gas, with produced CO_2 captured and injected into deep rock or saline formations for permanent storage. Understanding and piloting the technology to support the commercial advancement of blue hydrogen production is ongoing. The Alberta government's Natural Gas Vision and Strategy includes provisions for blue hydrogen technology. Several CAPP members are actively investing in and exploring commercial opportunities. Advancing blue hydrogen technology in Canada will depend on attracting investment to CCUS.

DIRECT AIR CAPTURE

This technology captures CO_2 directly from the atmosphere with an engineered, mechanical system. The CO_2 can be permanently stored in deep geological formations or used in the production of fuels, chemicals, building materials and other products.

APPENDIX 2 - DEMONSTRABLE RESULTS: EMISSIONS INTENSITY REDUCTION

The following graphs demonstrate the industry's emissions intensity reduction performance to 2019. With ongoing development and deployment of technologies and initiatives, additional significant reductions can be expected.

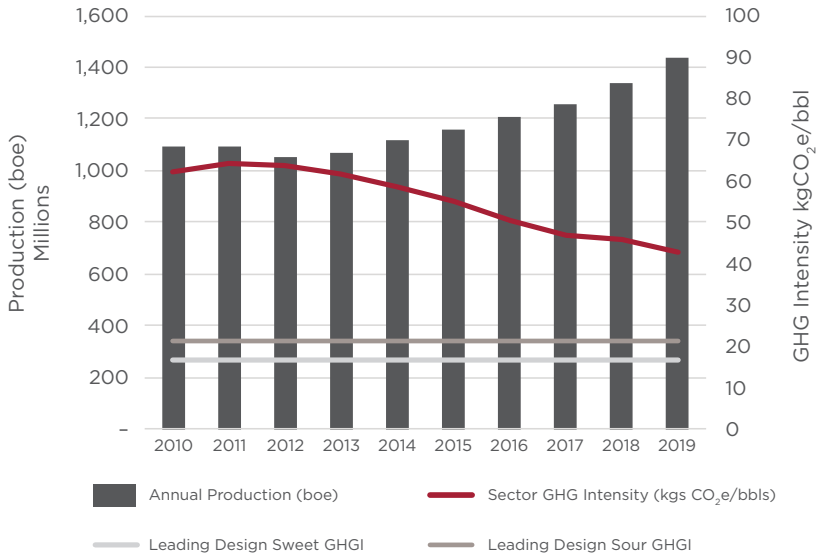
To demonstrate the ongoing emission intensity reductions across the natural gas and oil industry arising from advanced technologies and process efficiencies, CAPP developed trend graphs using a bottom-up analysis for oil sands and offshore sectors that utilizes individual facilities' emissions data to create an overview of the sector's total emissions The analysis includes both direct (Scope 1) and indirect (Scope 2) emissions. For natural gas emissions, CAPP used a top-down analysis whereby the sector is evaluated holistically. For comparison, graphs also show 'leading' performance for Canadian oil sands and natural gas production.

NATURAL GAS, NATURAL GAS LIQUIDS (NGLs) AND CONDENSATE

Data on this graph represents emissions intensity from natural gas extraction and processing, NGLs, and condensate production. From 2011 to 2019, emissions intensity decreased by 33% in this sector. During the same period, natural gas production in B.C. doubled and there was an increase in liquids-rich natural gas production in both B.C. and Alberta.

The leading performance lines are estimated from a new design gas-driven facility for both sour and sweet gas inlets. Another noteworthy performance indicator (not shown in the graph) is emissions intensity per kilowatt-hour (kWh) of electricity consumed for natural gas producing and processing. In Alberta, over the period 2010 to 2019, emissions per kWh declined from 1,100 grams of CO_2 equivalent (gCO_2e) per kWh to 670 gCO_2e / kWh. Improved emissions management, particularly actions aimed at achieving methane emissions reduction targets and multi-well drilling pad approaches, are key drivers in emissions intensity reduction in this sector.

Production and Greenhouse Gas Intensity

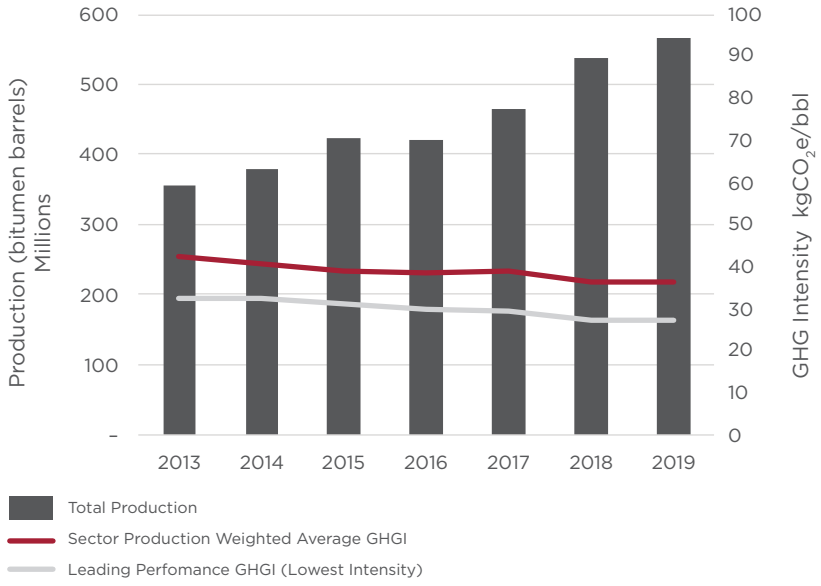


Source: Environment and Climate Change Canada (2021 NIR Report), CER, Report Envirotech Engineering.

OIL SANDS MINING

For the oil sands mining sector, data indicates an emissions intensity reduction of 14% between 2013 and 2019 while production increased 59%. There was a substantial decrease in emissions intensity for the oil sands mining sector after Suncor Energy's Fort Hills mining project started operation in 2017, as this mine utilizes paraffinic froth treatment (PFT), which has a lower emission intensity than past projects.

Oil Sands Mining Production and Emissions Intensity

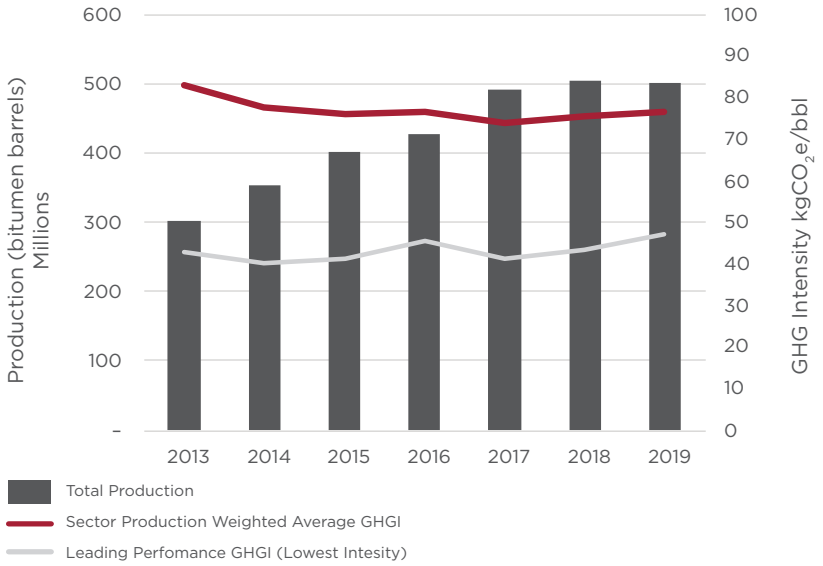


Source: Alberta Environment and Parks Alberta Oil Sands Greenhouse Gas Intensity Analysis, AER ST 39. GHGI PWA = Greenhouse Gas Intensity Production Weighted Average.

OIL SANDS IN SITU

Data on the graph includes both steam-assisted gravity drainage (SAGD) and cyclic steam stimulation (CSS) production, direct and indirect emissions. Data indicates an emissions intensity reduction of 8% between 2013 and 2019 while production increased 66%.

Oil Sands In Situ Production and Emissions Intensity



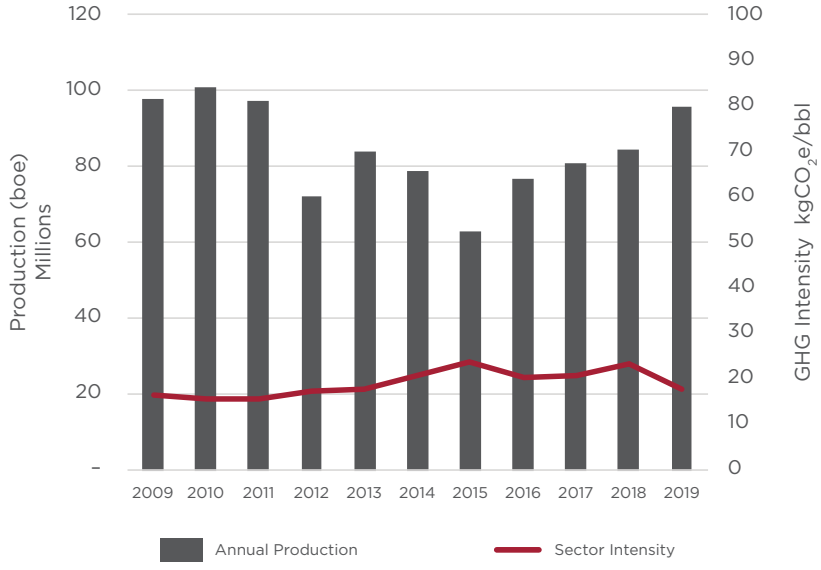
Source: Alberta Environment and Parks Alberta Oil Sands Greenhouse Gas Intensity Analysis, AER ST53, NIR 2021 Part 3. GHGI PWA = greenhouse gas intensity production weighted average.

OFFSHORE EMISSIONS INTENSITY

Overall emissions volumes from Canada's offshore operations are low. Factors affecting emissions intensity include:

- A field's age and ongoing production causes decreasing reservoir pressure, requiring additional solution gas management and higher gas injection volumes into the reservoir, which results in higher emissions intensity.
- New offshore facilities generally have higher emissions intensity for the first few years of production before achieving steady state when emissions intensity stabilizes.
- Offshore operators have reduced flaring significantly through the Global Gas Flaring Reduction Partnership.

Offshore Production and Emissions Intensity



Source: Environment and Climate Change Canada, Canada-Newfoundland and Labrador Offshore Petroleum Board

ABOUT CAPP

The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and oil throughout Canada. CAPP's member companies produce about 80 per cent of Canada's natural gas and oil. CAPP's associate members provide a wide range of services that support the upstream oil and natural gas industry. Together CAPP's members and associate members are a solution-oriented partner to the world's needs for affordable, clean, safe and secure energy, and an important part of a national industry with revenues from oil and natural gas production of about $116 billion a year. CAPP's mission, on behalf of the Canadian upstream oil and natural gas industry, is to advocate for and enable economic competitiveness, with environmentally and socially responsible performance and is dedicated to advancing reconciliation with Indigenous peoples. CAPP is committed to ensuring that Canada is positioned to help meet global climate commitments as the supplier of choice in a world that demands a lower carbon energy future.