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Decarbonizing British Columbia's Upstream Gas

Potential pathways for facilities in the Montney formation

February 2025

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ISBN 1-897390-71-8

Recommended citation: Dreis, Matt. Decarbonizing British Columbia's Upstream Gas: Potential pathways for facilities in the Montney formation. The Pembina Institute, 2025.

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Acknowledgements

The Pembina Institute recognizes that the work we steward and those we serve span the lands of many Indigenous Peoples. We respectfully acknowledge that our organization is headquartered in the traditional territories of Treaty 7, comprising the Blackfoot Confederacy (Siksika, Piikani and Kainai Nations); the Stoney Nakoda Nations (Goodstoney, Chiniki and Bearspaw First Nations); and the Tsuut'ina Nation. These lands are also home to the Otipemisiwak Métis Government (Districts 5 and 6).

These acknowledgements are part of the start of a journey of several generations. We share them in the spirit of truth, justice and reconciliation, and to contribute to a more equitable and inclusive future for all.

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Executive summary

This report is a follow-up to our 2023 report, *Squaring the Circle*, in which we concluded that the scale of proposed liquefied natural gas (LNG) export development in British Columbia would either see the province far exceed its 2030 oil and gas sector emissions reduction targets, or would put significant strain on the province's supply of clean electricity, due to substantial electrification of both the terminals and upstream gas production.

Since *Squaring the Circle* was published, LNG development in B.C. has continued apace. In the last few weeks in particular, due to significant trade uncertainty with the United States, all governments across Canada have been seeking opportunities to strengthen their economies and diversify their trading partners, including the B.C. government. As such, further work is urgently needed to consider how the province might reconcile the LNG sector with its emissions targets, in order to achieve sustainable economic growth for British Columbians, now and into the future.

While *Squaring the Circle* looked at potential pathways for emissions reductions across the upstream, midstream, and the terminals, this report more closely examines the feasibility of emissions reductions in the upstream, considering factors such as geography, maturity of technologies, and existing infrastructure.

We also suggest that upstream oil and gas companies should focus decarbonization efforts on assets that are anticipated to have the longest lifespan and resiliency to the energy transition. In doing so, they can ensure that such investments, which are likely to be funded through a mixture of public and private capital, will realize emissions reductions over the longest possible period. Based on this criterion, the Montney formation is a prime candidate.[1]

This report examines two decarbonization pathways for emissions reductions from combustion sources in the B.C. Montney: the electrification of industrial facilities, and the large-scale deployment of carbon capture and storage technology (CCS). While methane emissions are a critical part of meeting emission reduction targets, and some of the lowest-cost emissions reductions available for many facilities, they are left out of the scope of this report and should be studied separately once the BC methane regulations are finalized this year.

We separate emissions clusters into two areas and find that the Heritage Montney has favourable existing access to electricity transmission infrastructure, indicating a high potential for electrifying these operations. For the North Montney, we find that its lack of electricity infrastructure, combined with its geographic location overlying saline aquifers with significant storage potential, makes it a better candidate for carbon capture and storage deployment.

Through a combination of CCS and electrification, we conclude that upstream gas emissions could potentially be reduced between 2–3 Mt CO_2e per year. To see these pathways to reducing emissions in the B.C. Montney realized, we also recommend areas where further policy certainty is needed.

1. Introduction

This report is a follow-up to the Pembina Institute's 2023 *Squaring the Circle* report, where we identified that British Columbia's oil and gas emissions targets were likely to be exceeded if liquefied natural gas (LNG) terminals proceed.[1] LNG exports result in increased upstream production and transportation of natural gas. The base case examined in *Squaring the Circle* (where the only two projects on track to proceed, LNG Canada Phase 1 and Woodfibre LNG, are considered) results in emissions from B.C.'s oil and gas sector almost doubling the Government of B.C.'s 2030 oil and gas emissions target.

Since *Squaring the Circle* was released, Woodfibre LNG began construction in the fall of 2023, Cedar LNG reached a positive final investment decision in June 2024, and LNG Canada Phase 1 introduced the first gas to its facility in August 2024. In addition, in February 2025, in response to the considerable uncertainty posed by potential tariffs on Canada's exports to the United States, the Government of British Columbia announced[2] that it would expedite approvals on a range of energy and resource projects, including Cedar LNG.

While these projects are moving forward, an oversupply of LNG from globally sanctioned projects is likely if the energy transition continues to gain momentum. The 2024 *Turning Tides* report, authored by Carbon Tracker, investigated global LNG supply and demand trajectories under different energy transition scenarios, concluding that British Columbia's LNG projects will face stiff competition from cheaper sources of LNG globally.[3]

In this analysis, we consider the potential (and constraints) to reduce emissions from natural gas production in British Columbia via carbon capture and storage (CCS) and the electrification of upstream processes. While further methane abatement represents some of the largest opportunities and lowest-cost options to reduce emissions, and should be pursued, this report aims to examine the emissions reductions opportunities from CCS and electrification from a technical and geographical perspective.

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[1] Jan Gorski and Jason Lam, *Squaring the Circle: Reconciling LNG expansion with B.C.'s climate goals* (Pembina Institute, 2023). https://www.pembina.org/pub/squaring-circle

[2] Andrew Kurjata, 'B.C. fast-tracking 18 resource projects to reduce reliance on United States', *CBC News*, February 4, 2025. https://www.cbc.ca/news/canada/british-columbia/davd-eby-resource-projects-fast-tracked-united-states-1.7450160

[3] Maeve O'Connor, *Turning Tides* (Carbon Tracker, 2024). https://www.pembina.org/pub/turning-tides

1.1 Natural gas production in the Montney formation

The heart of Canada's natural gas production comes from the Montney formation, stretching from northwest Alberta and into northeast British Columbia. Under a Canada net-zero scenario developed by the Canada Energy Regulator (CER) in 2023, which assesses what Canadian energy production will look like in the future under the assumption that Canada meets its stated target of economy-wide net-zero emissions by 2050, the Montney formation is expected to produce 59% of the country's cumulative natural gas in the years 2022–2050, a total of 95,000 billion cubic feet (Bcf).[4] In this scenario, the CER anticipates that natural gas production in B.C. will increase from 6.4 Bcf/d in 2023 to 8.6 Bcf/d in 2030. Production in B.C. is also expected to remain above 2023 levels until 2046, even as the country's total production falls (Figure 1).

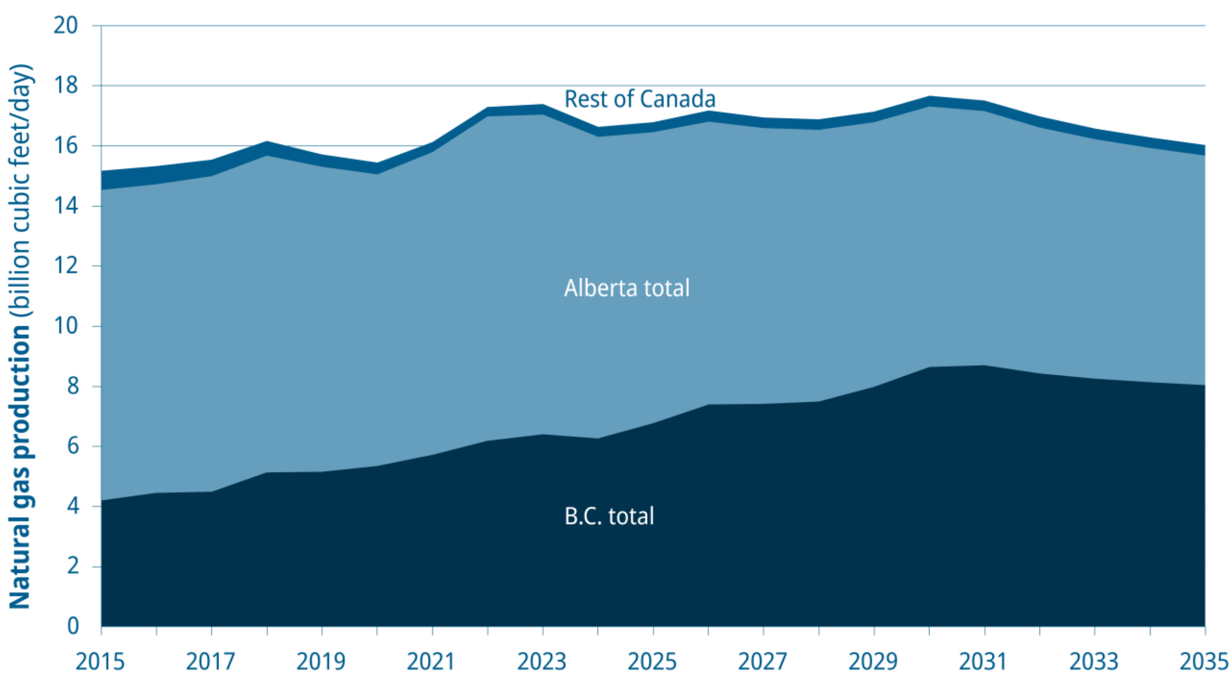

Figure 1. Natural gas production by region under Canada net-zero scenarios

Data source: Canada Energy Regulator[5]

The share of Canada's natural gas production coming from B.C. has gradually increased since 2010, with the Montney formation accounting for 89.2% of B.C.'s annual raw gas production in in 2022 (Figure 2). By 2031, B.C. is expected to surpass Alberta as the country's largest natural

[4] Canada Energy Regulator, *Canada's Energy Future 2023* (2023). https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA

[5] Canada Energy Regulator, *Canada's Energy Future Data Appendices* (2023). https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA

gas producer. The majority of that production is likely to be sourced from the Montney formation as it holds 93.2% of B.C.'s gas reserves. Furthermore, the Montney formation is economically competitive based on relatively low breakeven costs of production of US$1.49 per million cubic feet (mcf), compared to the Canadian average of US$2.31 per mcf.[6] Due to its large reserves, significant production potential, and favorable economics, the Montney formation is also expected to be the main supplier for LNG export capacity in the province.[7] This shows that the Montney may have strengthened resiliency to the energy transition — and justifies why we are focusing this report on pathways to decarbonize production in this region, because there is good reason to believe that whatever the actual pace and scale of the transition, gas will be being produced in the Montney for decades to come.

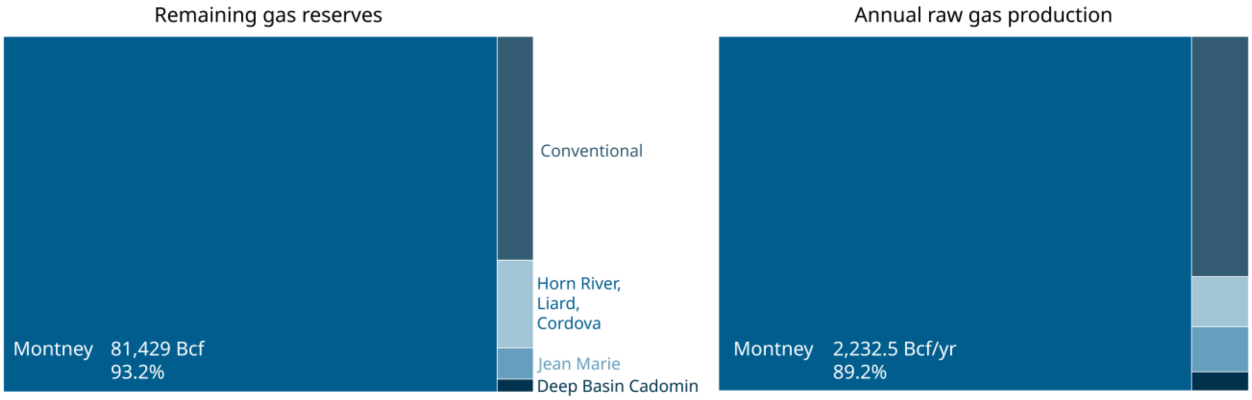

Figure 2. B.C. reserves and annual raw gas production by resource in 2022

Data source: British Columbia Energy Regulator[8]

1.2 Upstream oil and gas emissions in northeast B.C.

Two dominant emissions clusters from upstream oil and gas are geographically distinguishable in northeast B.C., as shown in Figure 3. Both are located within the Montney formation and are known as the Heritage Montney and North Montney areas. The Heritage area extends from the

[6] Lennie Kaplan, "Canadian natural gas sector breakeven costs among the lowest of top 10 major natural gas producing countries," *Canadian Energy Centre*, February 21, 2023. https://www.canadianenergycentre.ca/canadian-natural-gas-sector-breakeven-costs-among-the-lowest-of-top-10-major-natural-gas-producing-countries/

[7] Deborah Jaremko, "Massive Montney play ramping up with Canadian LNG exports on the horizon," *Canadian Energy Centre*, November 17, 2023. https://www.canadianenergycentre.ca/massive-montney-play-ramping-up-with-canadian-lng-exports-on-the-horizon/

[8] British Columbia Energy Regulator, *British Columbia's 2022 Oil and Gas Reserves and Production Report* (2023), 13. https://www.bc-er.ca/files/reports/Reserves-and-Production-Reports/2022-Oil-and-Gas-Reserves-and-Production-Report_Jan-31-2024-revision.pdf

Fort St. John area to Dawson Creek along the Alberta border; the North Montney area extends northwest of Fort St. John.

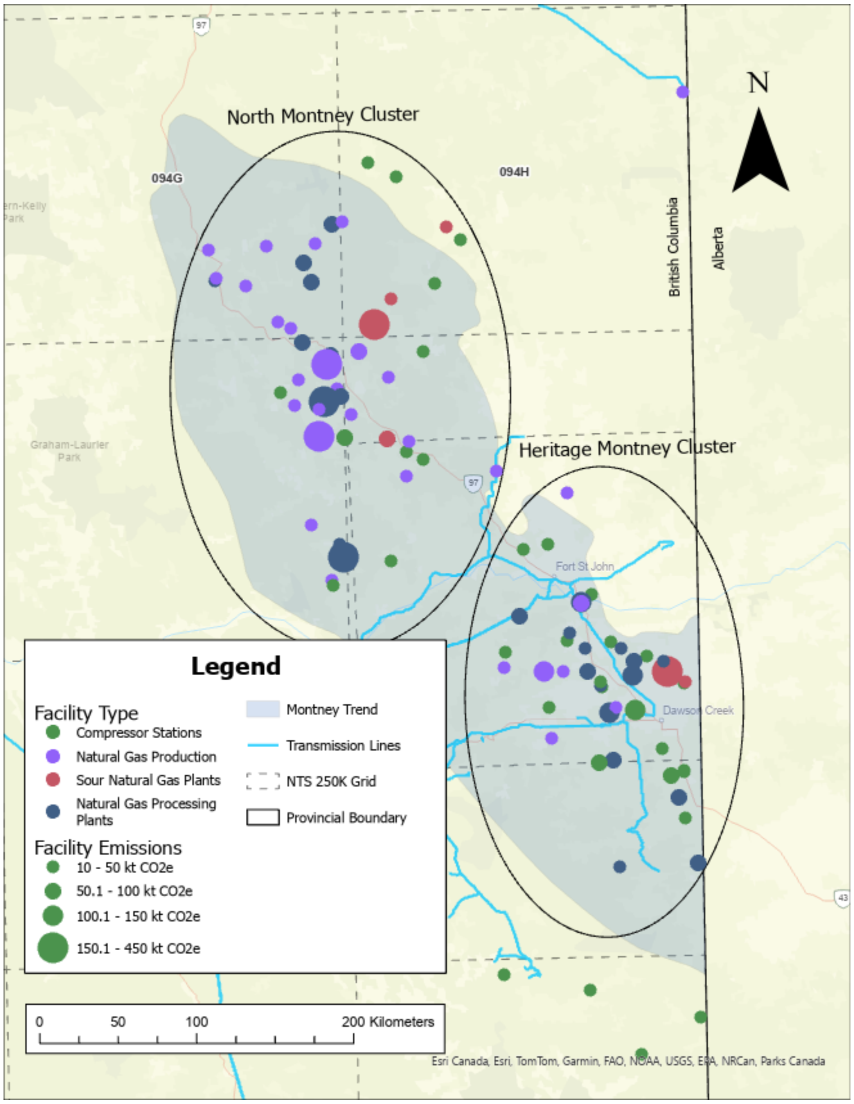

Figure 3. Location of B.C. upstream oil and gas emissions areas

Data source: Government of British Columbia[9]

Within these two areas there are 95 oil and gas facilities that report emissions greater than 10 kt CO_2e per year. These facilities produce approximately 49% of the province's upstream and pipeline oil and gas emissions. We have chosen to focus on the emissions reduction potential of these facilities as their emissions data is publicly available and reported on an individual facility basis.

[9] Government of British Columbia, "Industrial facility greenhouse gas reporting." https://www2.gov.bc.ca/gov/content/environment/climate-change/data/industrial-facility-ghg

A further 22% of B.C.'s upstream oil and gas emissions also come from the Montney formation, from aggregated facilities that report emissions greater than 10 kt CO_2e per year. These were not considered in this report as their emissions data is not broken down by individual facility, making it impossible to distinguish the volume of emissions coming from a single location and what the operations of that location are.

The remaining 30% of B.C.'s reported upstream oil and gas emissions originate outside of the Montney area and were therefore not considered in this report.

The 95 facilities examined in this report — those located in the Montney and with emissions higher than 10 kt CO_2e per year reported on an individual basis — include compressor stations, natural gas production facilities including batteries, and natural gas plants (Table 1). Of the facilities in the study area the emissions by gas were reported as 89% fossil carbon dioxide, 10% methane, and the remaining 1% nitrous oxide.

Table 1. Distribution of large emitting facilities in the study areas

Facility	Number of facilities	Total emissions (kt CO_2e/year)
Compressor stations	30	965
Natural gas production facilities	31	1,020
Natural gas processing plants	27	2,010
Sour natural gas plants	7	615
Total	**95**	**4,610**

2. Opportunities for emissions reductions

For these 95 facilities, we consider two main pathways for decarbonization: electrification and carbon capture and storage (CCS). It's important to note that decisions need to be made regarding which industries should be prioritized for access to clean electricity when competition for electrons is high. As noted earlier, B.C. LNG faces competition from low-cost incumbent producers, increasing the risk that those assets may become stranded, whereas emerging clean economy sectors may be more likely to thrive in the low-carbon economy of the future. And in the case of CCS, concerns from Indigenous Nations and environmental groups around gas migration and induced seismicity need to be considered in the regulatory process. Although these are not within the scope of the study it is important that these are not overlooked in the regulatory process.

Regardless, both electrification and CCS are referenced by the Government of British Columbia in its CleanBC: Roadmap to 2030 report, which encourages facilities to connect to clean electricity and explore how to best capture and safely store carbon.[10] This includes oil and gas facilities, which have a sector target to reduce emissions by 33-38% by 2030. However, both electrification and CCS deployment require a degree of infrastructure and geologic availability to be successful, which we consider below.

2.1 Electrification

The B.C. Industrial Facility GHG reporting reports emissions by facility from combustion (a combination of stationary, mobile, and flaring) by the respective gas (CO_2, CH_4, and N_2O). Electrification of industrial facilities will only impact the emissions from stationary combustion. To estimate the share of emissions from each of stationary, transport (mobile) and flaring sources, the percentage breakdown was calculated for Canada's overall natural gas production and processing in 2021 and applied to the facility-level emissions data in the North and Heritage Montney study areas (Table 2).[11] This data does not differentiate between gases.

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[10] Government of British Columbia, *CleanBC Roadmap to 2030* (2021), 48-52. https://www2.gov.bc.ca/assets/gov/environment/climate-change/action/cleanbc/cleanbc_roadmap_2030.pdf

[11] Government of Canada, *2024 National Inventory Report* (2024), Annex 10: Canada's Greenhouse Gas Emission Tables by Canadian Economic Sector, 1990–2022, Table A10-3. Available at Environment and Climate Change Canada Data Catalogue, "Canada's Official Greenhouse Gas Inventory." https://data-donnees.az.ec.gc.ca/data/substances/monitor/canada-s-official-greenhouse-gas-inventory/B-Economic-Sector/?lang=en

Table 2. Estimated breakdown of combustion emissions in the study areas

Natural gas production and processing emission source	Percentage	2021 emissions (kt CO_2e)
Total	100%	31,200
Stationary	91%	28,400
Transport	2%	600
Flaring	7%	2,200

Facilities were sorted based on the listed description into four categories, and for each the fraction of fuel burned contributed by engines, turbines, and heater/boilers, was sourced from the 2014 Clearstone Engineering Ltd inventory of emissions from the upstream oil and gas industry as shown in Table 3.[12] To estimate the emissions reductions from converting natural gas-powered equipment to electric-driven the following factors were assumed:

- Natural gas combustion emission factor: 58 kg CO_2e/GJ[13]
- Combustion and turbine engine thermal efficiency: 35%[14]
- Electrical grid emissions factor (B.C.): 11.3 t CO_2e/GWh[15]
- Assumed transmission losses: 6%

Table 3. Fraction of fuel burned by facility type

Facility type	Fraction of fuel burned		
	Engines	Turbines	Heaters/boilers
Compressor stations	100%	0%	0%
Natural gas production	79%	4%	16%
Natural gas processing plants	85%	0%	15%
Sour natural gas plants	16%	10%	74%

Oil and gas facilities that are not connected to the electricity grid often rely on natural gas as a fuel source for compressors, engines, and generators. It is assumed all combustion sources are

[12] Clearstone Engineering Ltd., UOG Emissions Inventory Methodology Manual, Volume 3 (2014), 36.

[13] Government of Canada, "Emission factors and reference values," May 2024. https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/federal-greenhouse-gas-offset-system/emission-factors-reference-values.html

[14] UOG Emissions Inventory Methodology Manual, Volume 3, 38.

[15] Government of British Columbia, "Electricity emission intensity factors for grid-connected entities." https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/reporting/quantify/electricity

powered by natural gas in this study. We assumed it would be technically feasible to convert reciprocating engines and gas turbines currently in use to electric drives, based on previously funded electrification projects in the province.[16]

Given the relatively low carbon intensity of British Columbia's power generation (11.3 t CO_2e/GWh, compared to a Canadian average of 110 t CO_2e/GWh), connecting these facilities to B.C.'s electricity grid and then switching natural gas-driven equipment for alternatives powered by low-carbon electricity would in theory present significant scope to reduce upstream oil and gas emissions.[17]

Table 4 presents the estimated breakdown of such stationary combustion emissions sources, and the potential annual reduction from electrification. Our analysis finds that a total of 3,100 kt CO_2e of emissions per year could be mitigated if every facility were electrified.

Table 4. Potential for annual emissions reductions through electrification, by area

Area	Number of facilities	Stationary combustion emissions (kt CO_2e)	Engine & gas turbine emissions (kt CO_2e)	Potential emissions reduction from electrification (kt CO_2e)
Heritage	44	1,800	1,490	1,460
North	51	2,220	1,680	1,640
Total	**95**	**4,000**	**3,170**	**3,100**

Based on these numbers, it would also appear that the North Montney has a greater potential for emissions reductions via electrification (by approximately 180 kt CO_2e), compared to the Heritage Montney. However, facility electrification will be most successful in areas where transmission infrastructure is already in place. As shown in Figure 3, there is a notable lack of transmission infrastructure north of Fort St. John, including the North Montney area. We assume then it is in fact the Heritage Montney area that has the highest short-term geographical potential for electrification based on existing infrastructure.

Based on this, our analysis is that extensive electrification in the Heritage Montney area only could result in emissions reductions of 1,460 kt CO_2e per year. While electrification opportunities exist in the North Montney, the absence of

[16] Government of British Columbia, "Funded projects." https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/cleanbc-industry-fund/funded-projects

[17] Canada Energy Regulator, "Provincial and Territorial Energy Profiles – Canada," Figure 8 Emissions Intensity of Electricity Generation. https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-canada.html

transmission infrastructure make those opportunities much less viable than the Heritage Montney.

2.2 Carbon capture and storage

2.2.1 Carbon storage

Successful CCS projects require both a capturable point source of emissions and suitable geology for the storage of captured carbon. In 2023, Geoscience BC identified areas with the best potential for carbon storage.[18] This provides insight into emission reduction opportunities where electrification may not be favourable.

Overall, the study concluded that northeast B.C. has a combined storage potential of 4,200,000 kt of CO_2 between depleted oil and gas pools and saline aquifers. Of this, the median storage potential in saline aquifers is estimated to be 3,030,000 kt CO_2. In this study we assume that storage in saline aquifers will be sufficient to sequester emissions capturable from oil and gas operations in the area, and do not assess whether additional storage of CO_2 is required in depleted oil and gas pools.

In Figure 4, we overlay the extent of saline aquifers with carbon storage potential and the emissions sources from oil and gas facilities to determine the cumulative storage potential for the specific emissions cluster. The Heritage Montney area, which includes the area around Dawson Creek and primarily south of Fort St. John, overlays saline aquifers with a cumulative effective storage potential of 1,270,000 kt CO_2. The North Montney area overlays saline aquifers with a cumulative storage potential of 1,300,000 kt CO_2. Some facilities in the most northern portion of the North Montney do not overlay directly with any saline aquifer storage. For this report, we assume the emissions from these facilities can be pipelined to disposal wells with appropriate storage capacity.

However, the Geoscience BC report also indicates that the ability to permanently store CO_2 has not been tested in practice for this area, and that further work needs to be undertaken to understand the effect natural faulting will have on carbon storage in the area. Additionally, the potential for carbon storage may be constrained by competition with existing wastewater disposal rights in disposal aquifers, which was not considered in the scope of this study but is an area for further research.

[18] GeoscienceBC, *Northeast BC Geological Carbon Capture and Storage Atlas* (2023). https://www.geosciencebc.com/projects/2022-001/

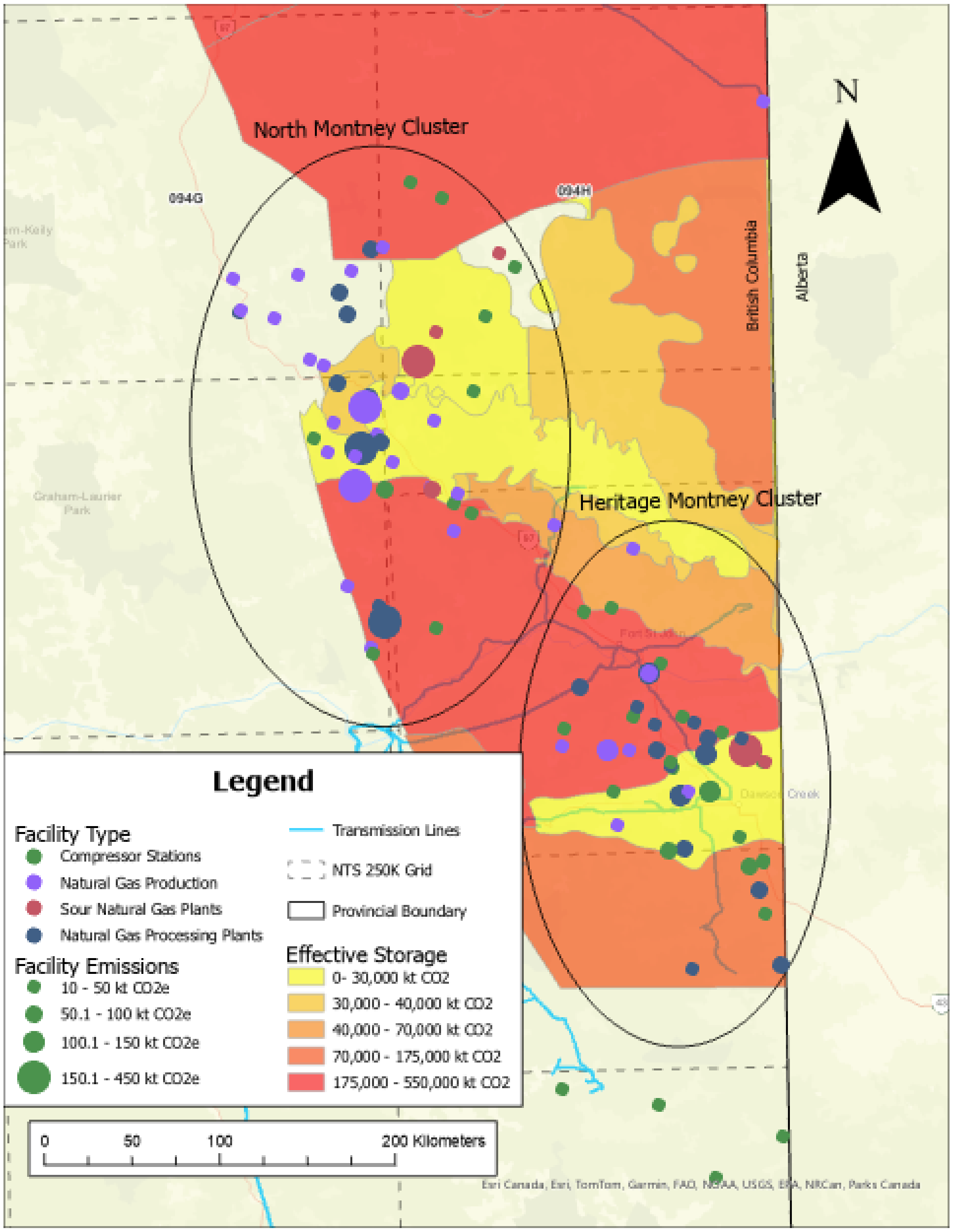

Figure 4. Carbon storage potential in northeast B.C.

Data source: Geoscience BC[19] and Government of British Columbia[20]

2.2.2 Carbon capture

Opportunities for carbon capture in the B.C. upstream oil and gas industry come from two sources: stationary combustion and vented CO_2 emissions. Data from both sources was obtained from the 2022 B.C. Industrial Emissions reports. Again, mobile and flaring emissions were excluded, using the values in Table 2.

[19] *Northeast BC Geological Carbon Capture and Storage Atlas*, Appendix E.

[20] "Industrial facility greenhouse gas reporting."

The first opportunity comes in capturing emissions from the stationary combustion of fuel at compressor stations, gas plants, and gas batteries with low to medium CO_2 concentrations as low as 3–4% in flue gas/exhaust streams of gas turbines.[21] Canadian companies like Entropy Inc. are demonstrating solvent-based pre- and post-combustion CCS technologies across the border in Alberta at a similar scale and CO_2 concentrations to those that would be encountered in the B.C. Montney. The company has received the first carbon contract in the country through the Canada Growth Fund and avoids 54 kt CO_2e per year from the exhaust streams of natural gas-fired compressor engines.[22] The process claims to reduce emissions more than 80% net of the carbon generated in the process and is the most similar technology demonstration with application to industrial facilities in the B.C. Montney region.[23] Modular carbon capture designs, which can reportedly be deployed on emissions sources as low as 8,000 tonnes per year, have the most direct applicability to emissions sources in the B.C. Montney.[24] Based on these results, we use an 80% capture efficiency for stationary CO_2 combustion emissions in our calculations. Emissions reduction estimates include the additional emissions required to operate the carbon capture equipment.

The second opportunity lies in capture and sequestration of formation CO_2. Removing formation CO_2 from raw natural gas streams is required at the natural gas processing facilities to meet the specifications for saleable natural gas and pipeline transport. The CO_2 may be vented to the atmosphere, or removed from the raw production gas stream (along with hydrogen sulfide gas, H_2S) using an amine treating unit followed by acid gas deep disposal, which makes up a smaller portion of overall emissions.[25] The Global CCS Institute states that gas processing is one of the lowest-cost CCS opportunities in the oil and gas industry. As of December 2022, 2,700 kt of CO_2 have been sequestered in the province since acid gas disposal began in 1996.[26] The Montney typically produces low concentrations of formation CO_2, approximately 1%, although some areas have recorded concentrations of CO_2 up to 18%.[27] We assume currently vented CO_2 can also be captured at an 80% efficiency.

[21] Xiaoxing Wang and Chunshan Song, "Carbon Capture from Flue Gas and the Atmosphere: A Perspective," *Frontiers in Energy Research.* 8, no. 560849 (2020), 6. https://doi.org/10.3389/fenrg.2020.560849

[22] Entropy Inc., "Glacier." https://www.entropyinc.com/glacier

[23] Global CCS Institute, "State of the Art CCS Technologies," 2022. https://www.globalccsinstitute.com/wp-content/uploads/2022/05/State-of-the-Art-CCS-Technologies-2022.pdf

[24] Entropy Inc., "Technology." https://www.entropyinc.com/technology

[25] British Columbia Energy Regulator, "Acid gas disposal well summary," 2020. https://www.bc-er.ca/files/operations-documentation/Reservoir-Management/Subsurface-Disposal/Acid-Gas-Disposal-Well-Summary.pdf

[26] *British Columbia's 2022 Oil and Gas Reserves and Production Report.*

[27] GeoscienceBC, *Distribution, origin, and implications of hydrogen sulphide in unconventional reservoir rocks in Western Canada with insights into the stratigraphic zonation and lateral variability of producible hydrocarbon liquids* (2021), 94. https://cdn.geosciencebc.com/project_data/GBCReport2022-06/GBCR2022-06.pdf

Table 5 shows the potential from capturing emissions from stationary combustion and venting. The Heritage area has 44 facilities with 1,390 kt of capturable CO_2, while the North Montney area has 51 facilities with 1,630 kt of capturable CO_2. Combined, extensive CCS deployed in both Montney areas has the potential therefore to result in total emissions reductions of 3,020 kt CO_2. This also indicates that the storage capacity in the area is theoretically adequate to store carbon for approximately 500 years at the current capturable rate, with flexibility for future production increases.

However, given our earlier assessment that the Heritage area has adequate electricity infrastructure to achieve significant emissions reductions through electrification, **we assume only the North Montney deploys extensive CCS technologies, with emissions reductions of 1,630 kt CO_2 per year.**

Table 5. Potential for annual emissions reductions through carbon capture, by area

Area	Number of facilities	Stationary combustion and venting CO_2 emissions (kt CO_2e)	Potential emissions reduction from CCS (kt CO_2e)
Heritage	44	1,740	1,390
North	51	2,030	1,630
Total	**95**	**3,770**	**3,020**

We consider this to be the most optimistic case for CCS adoption in North Montney region. A less optimistic deployment of CCS would see the technology used only by natural gas processing plants, and not sour natural gas processing plants, as natural gas processing plants are the only facilities currently utilizing CCS. These plants also make up the largest portion of high-emitting facilities in the area: a total of eleven natural gas processing plants emit more than 10 kt of CO_2e in the North Montney, nine of which emit greater than 50 kt CO_2e. **This less optimistic approach reduces the capturable emissions from CCS in the North Montney to 680 kt CO_2 per year.**

3. Decarbonization support to date

The CleanBC Industry Fund (CIF) supports the development, trial and deployment of projects that reduce emissions from large industrial operations. In 2021 and 2022, CIF invested in 31 oil and gas related decarbonization projects in northeast B.C through its Emissions Performance funding stream. Many of these were to electrify operations, though CIF also invested $7.42 million in 2022 for ARC Resources to install carbon capture and storage equipment in the Dawson Creek area.[28] However, no such investments were made by the CIF in 2023. While the CIF will continue to support emissions reduction projects in 2024 through a call for proposals in the spring, it would be beneficial to see the CIF support more projects soon and prioritize oil and gas allocations to decarbonize the Montney, which is Canada's most productive natural gas formation.

For CCS specifically, in 2024 the province published an application guide to support potential proposals.[29] This is in addition to its already published Guidance for Obtaining and Utilizing Subsurface Tenure for Carbon Dioxide Storage, which outlines how a holder of a petroleum and natural gas lease in B.C. may utilize the lease to store or dispose of carbon dioxide produced from a well or captured at a petroleum or natural gas facility.[30] This is particularly beneficial for oil and gas operations that wish to capture emissions at their own facilities and do not wish to sequester carbon from other sources, which would require a storage reservoir license.

While these measures are a good start, we note that other jurisdictions have made more headway on CCS with regards to developing policy and associated regulatory mechanisms. This includes Alberta, who in 2015, published their first *Quantification Protocol for CO_2 Capture and Permanent Storage in Deep Saline Aquifers*[31], with amendments made in 2025 to accommodate a growing carbon dioxide removal industry.[32] Alberta has offered further financial support to the CCS industry through the Alberta Carbon Capture Incentive Program, which will cover an

[28] Government of British Columbia, "Funded projects." https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/cleanbc-industry-fund/funded-projects

[29] British Columbia Energy Regulator, *Carbon Dioxide Storage Application Guide* (2024). https://bc-er.ca/files/operations-documentation/Reservoir-Management/Subsurface-Disposal/Carbon-Dioxide-Storage-Application-Guideline.pdf

[30] British Columbia Ministry of Energy, Mines and Low Carbon Innovation, *Guidance for Obtaining and Utilizing Subsurface Tenure for Carbon Dioxide Storage* (2022). https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/natural-gas-oil/png-crown-sale/publications/guidetosubsurfacetenureforcarbondioxidestorage.pdf

[31] Government of Alberta. *Quantification Protocol for CO_2 Capture and Permanent Storage in Deep Saline Aquifers* (2015). https://open.alberta.ca/publications/9780778572213

[32] Matt Dreis and Carson Fong, *Growing Carbon Storage in Alberta* (Pembina Institute, 2024). https://www.pembina.org/pub/growing-carbon-storage-alberta

additional 12% of eligible capital costs of CCS infrastructure in the province (on top of the 50% offered under the federal Carbon Capture, Utilization, and Storage Investment Tax Credit). Alberta already has operating CCS projects,[33] and has seen further project funding announcements in recent months, such as those involving Entropy[34] and Strathcona Resources.[35]

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[33] Shell Canada, "Quest Carbon Capture and Storage." https://www.shell.ca/en_ca/about-us/projects-and-sites/quest-carbon-capture-and-storage-project.html

[34] The Canada Growth Fund (CGF) signed its first carbon contract with Entropy Inc. in December 2023. Entropy reached a final investment decision on their Glacier Phase 2 project in July 2024, which will capture emissions from natural gas processing in the Alberta Montney. The CGF directly invested $200 million and agreed to purchase up to 185,000 tonnes per year of carbon credits per year for 15 years. Department of Finance Canada, "Deputy Prime Minister welcomes the Canada Growth Fund's first carbon contract for difference," news release, December 20, 2023. https://www.canada.ca/en/department-finance/news/2023/12/deputy-prime-minister-welcomes-the-canada-growth-funds-first-carbon-contract-for-difference.html; Entropy Inc., "Entropy Inc. Announces Glacier Phase 2 Final Investment Details, First Clean Power Investment, and Corporate Update," news release, July 9, 2024. https://cdn.prod.website-files.com/64e61c8741db7617c22cc2eb/668d1a5509e3ecb0c4143798_2024_07_09%20Entropy%20Q2%20Update.pdf

[35] In July 2024, the CGF signed a deal with Strathcona Resources to contribute up to $1 billion in project funding for their CCS projects in development. Canada Growth Fund "Canada Growth Fund Announces up to $2 Billion Carbon Capture and Sequestration Partnership with Strathcona Resources," news release, July 10, 2024. https://www.cgf-fcc.ca/content/documents/Project-Trailblazer-PR-final-for-distribution-EN.pdf

4. Recommendations

This report looks at pathways for emissions reductions at a high level but does not assess the cost of abatement. To add to understanding of the potential for emissions reductions in the northeast B.C. Montney, a marginal cost of abatement study comparing electrification and CCS in the North and Heritage Montney areas would be beneficial.

Furthermore, policy certainty is now needed to support decarbonizing gas production in the Montney formation. Our specific policy recommendations are as follows:

- The lack of transmission infrastructure in the North Montney Region hinders the ability to electrify operations. The feasibility of extending transmission infrastructure to these areas is still under investigation, as indicated by BC Hydro in its January 2024 Power Pathway report.[36] A **definite decision from the province on whether and how it intends to extend transmission infrastructure in the region** would give operators more clarity on where to begin investing in emissions reductions through electrification.
- B.C. has not yet established a CCS offset protocol for projects to quantify greenhouse gas emissions reductions from what would be considered a qualified project, although the protocol is under development. Given that CCS may be a decarbonization solution for several high-emitting sectors in B.C., **the establishment of an offset protocol is imperative to reducing uncertainty around CCS development** in the province and how generated credits will interact with the provincial output-based pricing system in the future.
- The long-term monitoring requirements related to the storage of CO_2 in the subsurface in B.C. remains in the balance.[37] **Increased clarity on the assumption of long-term monitoring may give additional certainty to operators interested in pursuing CCS.** Potential amendments to the previously proposed 100-year monitoring period should reflect the British Columbia Energy Regulator's determination that stored CO_2 is expected to be permanently sequestered for that duration at the end of the stabilization period. Post-injection monitoring and maintenance requirements leading up to site closure and the determination of permanent sequestration should be project specific and reflect the unique project risks prior to the cessation of monitoring activities.

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[36] BC Hydro, *Power Pathway: Building B.C.'s energy future* (2024). https://www.bchydro.com/content/dam/BCHydro/customer-portal/documents/corporate/capital-plan/capital-plan-2024.pdf

[37] Government of British Columbia, *Carbon Capture and Sequestration Offset Protocol Technical Discussion Paper* (2025). https://www2.gov.bc.ca/assets/gov/environment/climate-change/offsets/offsets-portfolio/ccsp_technical_discussion_paper.pdf

- Other jurisdictions, such as Alberta and more recently proposed in Ontario[38], have developed provisions that transfer the liability of the sequestered CO_2 to the province once a site closure certificate is issued. To fund this long-term liability work, a Post-Closure or Carbon Storage Stewardship Fund is paid into by CCS operators and used in part for costs incurred by the Crown to monitor the behaviour of captured CO_2 in the subsurface. Conversely, Manitoba and Saskatchewan do not have a mechanism to shift liability.[39] **We recommend the implementation of a carbon capture stewardship fund to address measurement and mitigation costs that may fall to the Crown.**

[38] Environmental Registry of Ontario, *Enabling the Development of Commercial-Scale Geologic Carbon Storage in Ontario: The Geologic Carbon Storage Act* (Ministry of Natural Resources and Forestry, 2024). https://ero.ontario.ca/notice/019-9299

[39] MLT Aikens, "Manitoba's Captured Carbon Storage Act receives royal assent," June 11, 2024. https://www.mltaikins.com/energy/manitobas-captured-carbon-storage-act-receives-royal-assent/

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