

Success in Eliminating Methane in Alberta's Peace River Region

Case study: Strong rules can bring methane emissions from venting to near-zero, without impacting levels of oil production

by Jared Connoy, Janetta McKenzie, and Jan Gorski | 25 August 2022

Summary

A significant portion of greenhouse gas emissions associated with oil and gas production can be reduced through addressing methane. In addition to helping ensure that the oil and gas sector does its fair share in meeting Canada's climate commitments, rapidly tackling methane — which has almost 100 times the warming impact of carbon dioxide — will be crucial to staving off serious near-term impacts of warming. Further, methane abatement is low-cost, and much can be done using existing technologies.

The Government of Canada has committed to capping and reducing overall greenhouse gas emissions from the oil and gas sector. Part of this commitment includes reducing methane by at least 75% from 2012 levels by 2030. The Pembina Institute has recommended¹ that commitment be upgraded to achieving near-zero methane emissions by 2030. This study, based on a real-world example of methane policy in one specific region of Alberta, shows that strong regulations can achieve that target in a relatively short amount of time, and without having any negative impact on levels of production in the industry.

As new federal methane regulations are being drafted, this case study from the Peace River region in Alberta offers valuable lessons for policymakers:

- Alberta implemented strict rules to limit methane emissions from heavy oil production facilities in the Peace River region in 2014, in order to address odour issues experienced by local communities.
- The rules included requirements to eliminate routine venting, limit non-routine flaring, and conduct monthly leak detection surveys at high-risk sources.

¹ Pembina Institute, *Reducing methane emissions from Canada's oil and gas sector: Submission to Environment and Climate Change Canada* (2022). <https://www.pembina.org/pub/reducing-methane-emissions-canadas-oil-and-gas-sector>

- Our research demonstrates that these regulations resulted in a near elimination of methane emissions from these sources in the region, without having any impact on oil production.
- The success in Peace River shows that Canada can raise its ambition on methane abatement, and design strong regulations to achieve that ambition, without negatively impacting production.
- The Peace River regulations are in line with best practices from regulations in Colorado, New Mexico and draft regulations from the U.S. Environmental Protection Agency.

Context

Last year, Canada committed to reducing methane emissions in the oil and gas sector by at least 75% below 2012 levels by 2030. The federal government is currently drafting regulations to achieve this goal.

Canada has also committed to implementing a cap on overall greenhouse gas emissions from the oil and gas sector, in order to ensure that the industry does its fair share in reaching a net-zero Canadian economy by 2050. Key to achieving this goal will be raising the level of ambition on methane, and aiming for deeper cuts to methane emissions than the 75% currently targeted. Studies indicate that the near-elimination of methane emissions from oil and gas production is both possible and largely cost-effective. For example, our analysis of a 2019 study from the Canadian Energy Research Institute shows that, at forecast natural gas prices for the near future, oil and gas methane emissions can be reduced by 88% for only \$20 per tonne of carbon dioxide equivalent (compared to the current carbon price of \$50 per tonne).^{2, 3}

Major industry players like the Oil and Gas Climate Initiative, a group of twelve major global oil and gas companies including Saudi Aramco and Shell, have already pledged to **achieve near-zero methane emissions by 2030**.⁴ As outlined in our recommendations to the federal government on its forthcoming methane regulations earlier this year, Canada needs to move faster and further on reducing methane emissions, and upgrade its target to achieving near-zero methane emissions by 2030.

² Canadian Energy Research Institute, *Economic and Environmental Impacts of Methane Emissions Reduction in the Natural Gas Supply Chain* (2019). <https://ceri.ca/assets/files/CERI%20Study%20177A%20-%20Methane%20Emissions%20Reduction%20in%20the%20Natural%20Gas%20Supply%20Chain%20-%20February%202019.pdf>

³ Gas Alberta Inc, “AECO C Futures Pricing”, <https://www.gasalberta.com/gas-market/market-prices>

⁴ Oil and Gas Climate Initiative, “OGCI members aim for zero methane emissions from oil and gas operations by 2030,” March 8, 2022. <https://www.ogci.com/ogci-members-aim-to-eliminate-methane-emissions-from-oil-and-gas-operations-around-2030/>

This case study provides an example of ambitious methane reduction policy that is already in operation in one region of Alberta. Crucially, our research shows that these regulations have had no adverse impact on oil production, and that the necessary process changes and technological improvements are straightforward for industry to implement both quickly and cost-effectively.

Emissions regulations in the Peace River region

In 2014, the Alberta Energy Regulator started implementing strict emissions regulations (Directive 084) in the Peace River area to combat emissions of sour gas, a natural gas high in hydrogen sulphide that was causing discomfort to communities located near oil and gas production facilities, due to its strong odour.⁵ Since methane is the main component of natural gas, a secondary impact of the rules was a significant reduction in methane emissions.

By September of 2018, **Directive 084 applied to all AER-regulated wells and facilities associated with heavy oil and bitumen operations in the Peace River area.** Key measures in Directive 084 include:

- Routine venting of solution gas is prohibited.⁶
- Non-routine flaring is limited to 3% of total annual gas production volumes.
- Gas conservation at heavy oil and bitumen wells and facilities must exceed 95%.⁷
- Operators are required to conduct monthly leak detection surveys at high-risk sources (which include storage tanks, flare ignitors/pilots, and compressor seals), as well as annual third-party surveys.
- Operators must start addressing leaks upon detection and quantify all leaks not repaired within 24 hours. Detailed reports are required for all leaks, inspections, surveys, detections, and repairs.

Over the implementation period, these facilities' emissions from venting **decreased from a high of nearly three million cubic metres in 2014 to near-zero in 2019.**⁸ This dramatic reduction shows what is possible when government ambition levels for what can be achieved are set high and strong corresponding rules are implemented, and offers a pathway for oil and gas companies throughout Alberta and Canada to seriously tackle methane emissions.

⁵ Government of Alberta, *Directive 084: Requirements for Hydrocarbon Emission Controls and Gas Conservation in the Peace River Area* (2018). <https://www.aer.ca/regulating-development/rules-and-directives/directives/directive-084>

⁶ Solution gas is all gas that is separated from oil, condensate, or bitumen production. This gas includes casing gas (gas produced from well casing) and tank-top gas (gas given off from the heavy oil while in production tanks).

⁷ For comparison, the average conservation rate at all non-thermal operations in Alberta in 2020 was 89%.

⁸ Data received from Alberta Energy Regulator for 2013-2019. Received August 2022.

Stringent emissions regulations had no impact on production

Some industry figures argued at the time of implementation that such a stringent provincial methane policy would have a detrimental effect on production levels.⁹ However, our analysis shows that this was not the case in practice.

We compared oil production and venting in the Peace River region with the province of Alberta as a whole, over a period of publicly available data (2013-2019), and found that, for crude bitumen facilities (the main source of production in Peace River, see appendix 1), **strict emissions regulations did not have a significant impact on oil production**. From peak production and venting in 2014 to the full implementation of Directive 084 in 2019, oil production from crude bitumen facilities declined by a similar amount in both the province and Peace River (41% versus 45%, respectively; see Figure 1), while venting in Peace River decreased by 100% (see Figure 2). Tens of millions of cubic metres of natural gas are being vented annually in Alberta, but Peace River and Directive 084 demonstrates that these venting emissions can be reduced to near-zero, through strong regulations and industry efforts.

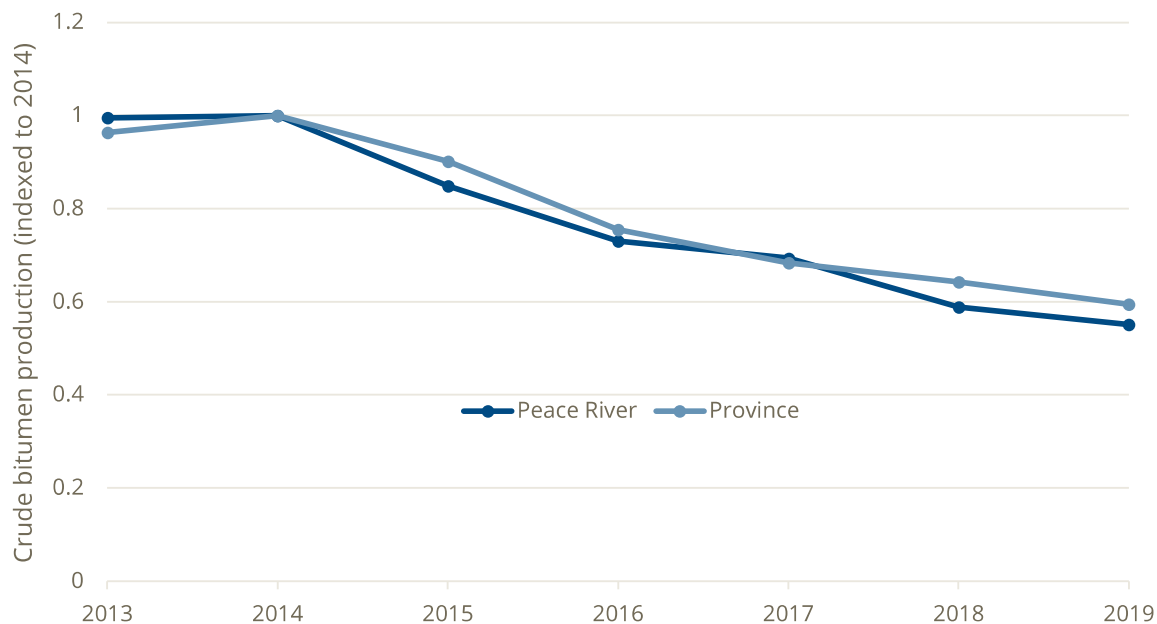


Figure 1. Annual oil production by crude bitumen facilities in the Peace River region and province (indexed to 2014)

Data source: Supplied by AER

Note: Crude bitumen facilities constitute the majority of oil production in the Peace River region. Public data for the region is only available for 2013-2019.

⁹ Carl Meyer, “How oil lobbyists persuaded Alberta to weaken rules for dirty facilities,” *The Narwhal*, June 22, 2022. <https://thenarwhal.ca/alberta-climate-methane-cnrl/>

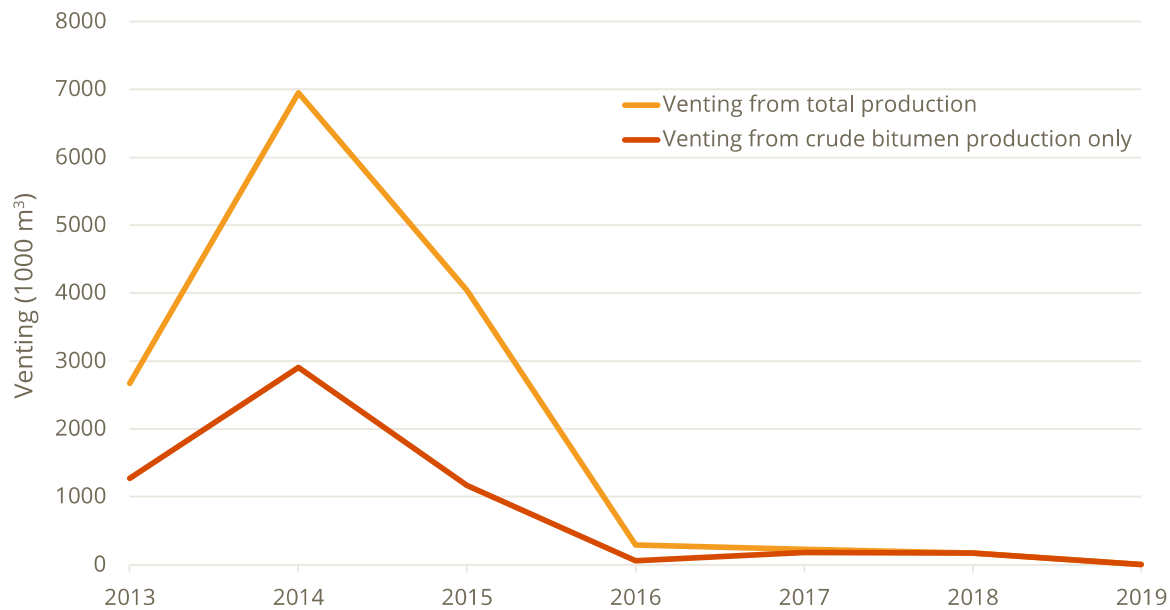


Figure 2. Venting from facilities in the Peace River Region (from total production and from crude bitumen production)

Data source: Crude bitumen values supplied by AER. Total values sourced from AER dashboard (see appendix):

Note: Crude bitumen facilities constitute the majority of oil production in the Peace River region. Public data for the region is only available for 2013-2019, and reporting standards for the province changed in 2020. Total values include venting from crude oil and crude bitumen production (these are the production types in the Peace River Region).

An independent study from 2019 (with 2016 data) also demonstrated the effectiveness of policy in Peace River, with relatively few hydrocarbon plumes detected compared to other producing regions, even before the policy’s full implementation.¹⁰

Currently, many facilities in Alberta with high emissions intensities — those producing heavy oil and crude bitumen — are subject to much weaker methane rules than those in the Peace River region.¹¹ If Directive 084 were applied province-wide, we could expect similar emissions reductions.

Better measurement and reporting needed

An independent field measurement study recently determined that methane emissions in Peace River were higher than reported by industry, although still significantly lower than other

¹⁰ Elizabeth O’Connell et al. “Methane emissions from contrasting production regions within Alberta, Canada: Implications under incoming federal methane regulations,” *Elementa: Science of the Anthropocene* 7, no. 3 (2019). <https://doi.org/10.1525/elementa.341>

¹¹ O’Connell, “Methane emissions from contrasting production regions within Alberta, Canada.”

regions with similar production levels (such as Lloydminster).¹² This is consistent with numerous studies of methane emissions across various jurisdictions, which show that actual methane emissions tend to far exceed records or estimates, often due to leaks and other fugitive sources that go unnoticed. For example, studies across Canada based on measurements conducted from airplanes have shown that methane emissions are 1.5 to 2 times higher than reported.¹³ This shows that there is room for improvement in methane measurement and reporting, even in Peace River.

Conclusion

The lesson from the Peace River region is that federal and provincial governments in Canada can and should be more ambitious with methane reduction targets and associated regulations. Regulations should be designed with the objective of cutting methane emissions from oil and gas production to near-zero, of which venting and leaks are a critical piece.

Alberta's rules in Peace River are aligned with best international practices. For instance, New Mexico¹⁴ and Colorado¹⁵ prohibit routine venting and flaring from all wells. The U.S. Environmental Protection Agency has proposed a similar rule.¹⁶ In Colorado, all new sites are required to conduct monthly leak detection and repair (LDAR) inspections, to mitigate against fugitive emissions.¹⁷

¹² Martin Lavoie et al., "Sweet and sour: A quantitative analysis of methane emissions in contrasting Alberta, Canada, heavy oil developments," *Science of The Total Environment*, 807, Part 2 (2022).

https://www.sciencedirect.com/science/article/abs/pii/S0048969721059143?dgcid=rss_sd_all

¹³ Matthew R. Johnson et al. "Comparisons of Airborne Measurements and Inventory Estimates of Methane Emissions in the Alberta Upstream Oil and Gas Sector," *Environmental Science & Technology*, 51, no. 21 (2017).

<https://doi.org/10.1021/acs.est.7b03525>

¹⁴ New Mexico Energy, Minerals and Natural Resources Department, "Oil Conservation Commission Approves EMNRD's Final Natural Gas Waste Reduction Rules," media release, March 25, 2021. <https://www.emnrd.nm.gov/wp-content/uploads/sites/6/OCDMethaneRuleReleaseMarch252021.pdf>

¹⁵ Colorado Oil and Gas Conservation Commission, *Oil and Gas Conservation Act, Rule 912*. Available at <https://cogcc.state.co.us/reg.html#/rules>

¹⁶ U.S. Environmental Protection Agency, "Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review," November 15, 2021.

<https://www.federalregister.gov/documents/2021/11/15/2021-24202/standards-of-performance-for-new-reconstructed-and-modified-sources-and-emissions-guidelines-for>

¹⁷ Colorado Air Quality Control Commission, *Regulation Number 7: Control of Ozone via Ozone Precursors and Control of Hydrocarbons via Oil and Gas Emissions (Emissions of Volatile Organic Compounds and Nitrogen Oxides)*.

<https://cdphe.colorado.gov/aqcc-regulations>

New methane regulations are currently being drafted by the Government of Canada. Peace River offers insights on how these policies should take shape. Specific practices that can be implemented include:

- **Eliminating routine venting.**
- **Limiting non-routine flaring.**
- **Achieving high rates of gas conservation.**
- **Requiring monthly LDAR surveys at high-risk sources, as well as thorough reporting and rapid repair of leaks.**

These policies should be applied across the board in order to hold heavy emitters to their fair share of emissions reductions.

Appendix: Methodology

Data was supplied directly from by AER for crude bitumen facilities, which constitute the majority of oil production in the Peace River region (Figure 3). Data was filtered to only include facilities in the following AER categories: Crude Bitumen/Heavy Oil Administrative Grouping, Crude Bitumen Multiwell Proration Battery, Crude Bitumen Single-Well Battery, and Crude Bitumen Multiwell Group Battery. This filtering was performed to capture almost all of the oil production and venting in Peace River while allowing a comparison with the same facilities and production types throughout Alberta.

Values for total oil production in Peace River and venting from total oil production in Peace River was extracted from AER Peace River dashboard data.¹⁸

Data used is listed in Table 1.

All data was received from AER in August 2022. Note that public data is only available for 2013-2019 for the Peace River Region, and reporting standards for the province changed after 2020.

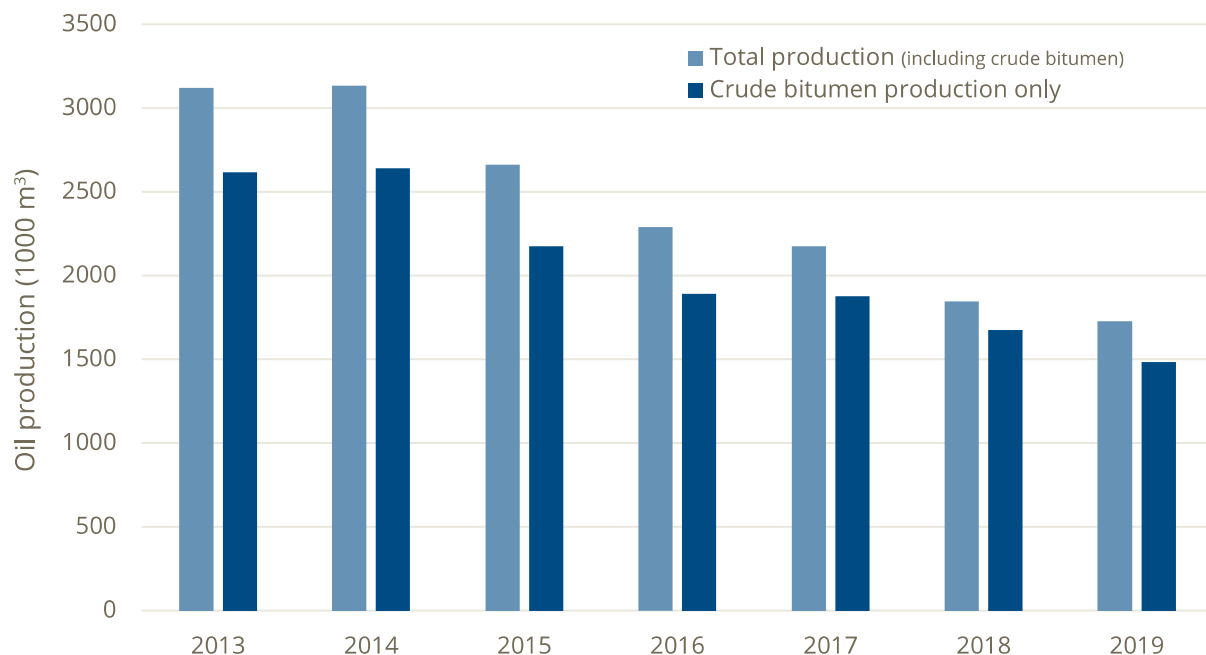


Figure 3. Annual oil production from crude bitumen only versus total production in the Peace River region

¹⁸ Alberta Energy Regulator, *Figure 1 – Vented Gas and Oil Production Reported to Petrinex from Oil and Bitumen Batteries in the Peace River Area (2020)*, https://static.aer.ca/prd/documents/about-us/Peace-River/PR_Dashboard_Figure1.pdf

Note: Crude bitumen facilities constitute the majority of oil production in the Peace River region. Public data for the region is only available for 2013-2019. Total values include production from crude oil and crude bitumen production. Which are the main production types in the Peace River region.

Data source: Crude bitumen values supplied by AER. Total values sourced from AER dashboard

Table 1. Annual oil production and associated venting in Alberta and the Peace River Region

Year	Oil Production (1000 m ³)			Venting (1000 m ³)		
	Alberta (crude bitumen)	Peace River (crude bitumen)	Peace River (total)	Alberta (crude bitumen)	Peace River (crude bitumen)	Peace River (total)
2013	16,632	2615	3118	244,720	1272	2669
2014	17,257	2639	3133	250,900	2903	6951
2015	15,557	2173	2660	183,194	1164	4037
2016	13,032	1890	2288	106,351	59	287
2017	11,797	1875	2173	79,211	182	228
2018	11,094	1674	1845	71,327	166	169
2019	10,253	1484	1727	57,322	0	0

Note: Total values include production/venting from crude oil and from crude bitumen which are the main production types in the Peace River region).

Data source: Crude bitumen values supplied by AER. Total values sourced from AER dashboard