PEMBINA institute

Limiting methane pollution from B.C.'s gas sector

A prime opportunity for stronger action on upstream emissions

by Maximilian Kniewasser | May 2018

Summary

Stronger action to reduce methane pollution from British Columbia's natural gas sector and prospective liquefied natural gas (LNG) industry is essential to meeting B.C.'s climate targets.

Methane emissions represent one of the most effective and cost-efficient opportunities to reduce carbon pollution in support of meeting climate targets for B.C.'s industrial sector. Current regulations to reduce methane emissions by 45% are estimated to cost just $1.70/t-$CO_2$e. This suggests more cost-effective opportunities remain.

More ambitious regulations are already in place in several U.S. states that essentially eliminate venting from routine operations across the gas supply chain.

Fulfilling the B.C. government's commitment to balance LNG development with B.C.'s climate targets will require increasing ambition on methane emissions. Ambition should reflect best practices and the government's commitment to price fugitive emissions.

Context

The British Columbia government has made strong commitments with respect to getting B.C. back on track to meeting our climate targets, establishing sectoral goals, and developing an energy road map to transition B.C. to low-carbon industries.

While the government has signalled support for developing a liquefied natural gas (LNG) industry, it has also pledged to ensure LNG development is consistent with B.C.'s climate targets. B.C.'s current climate plan does not achieve this, and the recently announced LNG framework does not include any new measures to reduce emissions.

Additional measures to lower carbon pollution across the LNG supply chain are necessary. Upstream development offers a particularly impactful opportunity to reduce carbon pollution in the form of methane.

Considerations

Methane is one of the lowest-cost emissions reduction opportunities in the entire economy because:

- Leaked methane is a powerful greenhouse gas and reducing this pollutant has an outsized impact.
- Conserving methane eliminates waste of a sale product and therefore increases the amount of commercial product available for sale.

Maximizing the reductions from this low-cost opportunity will ensure cost impacts to industry are limited, and B.C. achieves its emissions targets at the lowest overall cost. Reducing methane emissions by 45% costs just $1.70/t-$CO_2$e in B.C., according to research by the Pembina Institute.[1] For comparison, the costs of electrifying power processes either upstream or at terminals — the other most significant opportunity to reduce emissions — is estimated to cost around $100/t-$CO_2$e.[2]

There is an expectation the carbon tax will be applied to methane emissions from B.C. gas operations, based on the government's commitment to expand the carbon tax to cover fugitive emissions. As such, the $50/t-$CO_2$e level announced for 2021 should be seen as a common baseline for pricing and regulation applied to these emissions. This will ensure the gas sector faces the same stringency as other businesses and all British Columbians.

The recent *World Energy Outlook* by the International Energy Agency (IEA) shows that, in a 2°C world, we need to reduce methane emissions from oil and gas operations by 70% to 75%. In practice, according to the IEA, this means implementing "essentially all technically feasible solutions." Considering the technologies available across the supply chain today, this can be interpreted as achieving *no routine venting* from operations.

Current measures to reduce methane emissions by 45% in B.C., Canada, and across most of the United States fall short of the level identified by the IEA. The Pembina Institute estimates the costs of achieving a 45% reduction in B.C. is just $1.70/t-$CO_2$e, substantially below the $50/t-$CO_2$e price committed to by the government. For comparison, the cost of achieving a 70% to 75% methane reduction, as per IEA findings,[3] is estimated at $20/t-$CO_2$e, also well below the $50/t-$CO_2$e level.[4]

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[1] ICF International, *Economic Analysis of Methane Emission Reduction Opportunities in the Canadian Oil and Natural Gas Industries* (Environmental Defense Fund and Pembina Institute, 2016). http://www.pembina.org/pub/economic-analysis-of-methane-emission-reduction-opportunities-canadian-oil-and-natural-gas

[2] This considers fuel costs and carbon costs, and assumes equipment and other operating costs are generally comparable between natural gas and electric power equipment.

[3] International Energy Agency, *World Energy Outlook 2017* (2017).

[4] Based on preliminary analysis by the Pembina Institute, assuming a gas price in B.C. of $2.50 per Mcf.

More ambitious methane control is already viable, both financially and technologically. Best practices are already happening in several U.S. states; B.C. has an opportunity to build on this leadership. For example, California mandates no venting from pneumatic pumps and devices, Colorado requires implementation of no-bleed pneumatic controllers if electricity is available, Colorado also requires controlling wet seal emissions from compressors by 95%, and several states require more frequent leak detection and repair (quarterly inspections). In fact, while spread across several jurisdictions, the regulations already in place today essentially eliminate routine venting from production, processing, and transportation. California is a leading jurisdiction that requires elimination of most venting emissions from new and existing sources and requires more ambitious leak detection and repair (LDAR), with costs estimated at $40/t-$CO_2$e or below[5] (with significant reduction opportunity well below this[6]).

Innovation of new technologies for detecting and reducing methane emissions is occurring at a rapid pace, and will continue to drive costs even lower. For example, a paradigm shift is occurring in the availability of low-cost sensors capable of detecting methane concentration in ambient air. [7] Coupled with the availability of inexpensive wireless communication and networking capabilities, this now allows for continuous monitoring at a fraction of the price of traditional infrared surveys. This will help identify leaks in a more timely manner at a lower cost. This is just one example of how technology and innovation is driving cost reductions and increasing the potential to reduce methane emissions from oil and gas operations.

Current industry practices are inconsistent with B.C.'s climate targets. Oil and gas operations in Canada often use out-dated equipment that results in much higher emissions than necessary. For example, a recent survey in Alberta found 95% of pneumatic equipment is leaking methane into the air, even though clean alternatives are readily available. (See Appendix 2; similar data is not available for B.C.)

The opportunity to reduce B.C.'s methane emissions is greater than realized. According to official reporting, methane accounts for about 20% of total gas sector emissions. However, data about methane emissions is poor, and emissions are likely much higher in total. For example, research shows that methane emissions in the Montney Formation are at least 2.5 times higher

[5] The Pembina Institute's analysis does not include measures that reduce emissions by less than 1% of total expected reductions, which are outliers at the top and bottom of the cost spectrum. Source: California Air Resources Board, *Public hearing to consider the proposed regulation for greenhouse gas emission standards for crude oil and natural gas facilities* (2016).

[6] For example, switching to no bleed pneumatic devices and pumps for new and existing facilities achieves almost a quarter of total reductions at a cost estimated at just $3/t-$CO_2$e.

[7] Ramboll Environ, *Technology Assessment Report: Air Monitoring Technology Near Upstream Oil and Gas Operations* (Environmental Defense Fund, 2017). https://www.edf.org/sites/default/files/Ramboll-report.pdf

than reported.[8] Recent findings in Alberta are even worse (see Appendix 2). Through stronger action on methane, more can be achieved to get B.C. back on track to its climate targets.

While much focus is on the opportunity to reduce emissions from LNG and associated upstream development,[9] reducing methane is important for the broader natural gas sector. Natural gas is already B.C.'s biggest source of industrial emissions, and it will continue to play an outsized role in B.C.'s emissions profile in the long term. As such, effectively reducing methane is critical to achieving the government's commitment to move industry to zero-carbon energy, whether LNG proceeds or not.

Fugitive emissions are tough to measure accurately, and we currently do not have the necessary reporting infrastructure in place. This will prevent us from broadening the carbon tax to apply to fugitives across the natural gas supply chain in the short-term. As such, we will remain in a regulatory environment for at least the short to medium term.

Recommendations

Based on our analysis, we believe the B.C. government should:

1. Convene key stakeholders in the short term to identify the right level of ambition on methane reductions needed to fulfill the government's commitment to balance LNG development with its climate targets. Subsequently, convene a multi-sector technical working group to help in the design and implementation of the recommendations.
2. Move quickly to implement up-to-date measurement and reporting infrastructure to be able to put a price on fugitives as per government's commitment. In the meantime, regulate methane emissions to a level in-line with the stringency of \$50/t-CO_2e and/or best practices.
3. Set the baseline for reductions as *no routine venting* from new operations in the short term. Increase ambition on existing operations to reflect best practices and/or current best regulations, with a particular focus on providing facilities with electricity to enable transition to no routine venting.
4. Implement quarterly LDAR along all facilities. Require continuous monitoring for all new facilities and implement continuous monitoring for already existing facilities that are potential high-emissions sources, such as processing plants and pipeline compressor stations.

[8] Atherton et al., *Mobile measurement of methane emissions from natural gas developments in northeastern British Columbia, Canada,* (2017). https://doi.org/10.5194/acp-17-12405-2017

[9] See: Dylan Heerema and Maximilian Kniewasser, *Liquefied Natural Gas, Carbon Pollution, and British Columbia in 2017* (Pacific Institute for Climate Solutions and Pembina Institute, 2017). http://www.pembina.org/pub/lng-carbon-pollution-bc

Conclusion

Any significant LNG development will put material upward pressure on B.C.'s carbon pollution and make meeting our climate targets increasingly challenging. Therefore, achieving the above should be seen as a prerequisite to making good on the government's promise to ensure LNG development is consistent with B.C.'s climate commitments.

Appendix 1. Reasons to take strong action on methane emissions

Highly effective: Tackling methane is one of the most effective ways to reduce carbon pollution from the natural gas sector.

Economically efficient: As one of the lowest-cost opportunities, methane emissions reductions will limit cost impacts to producers and ensure that B.C. achieves its climate targets at the lowest cost.

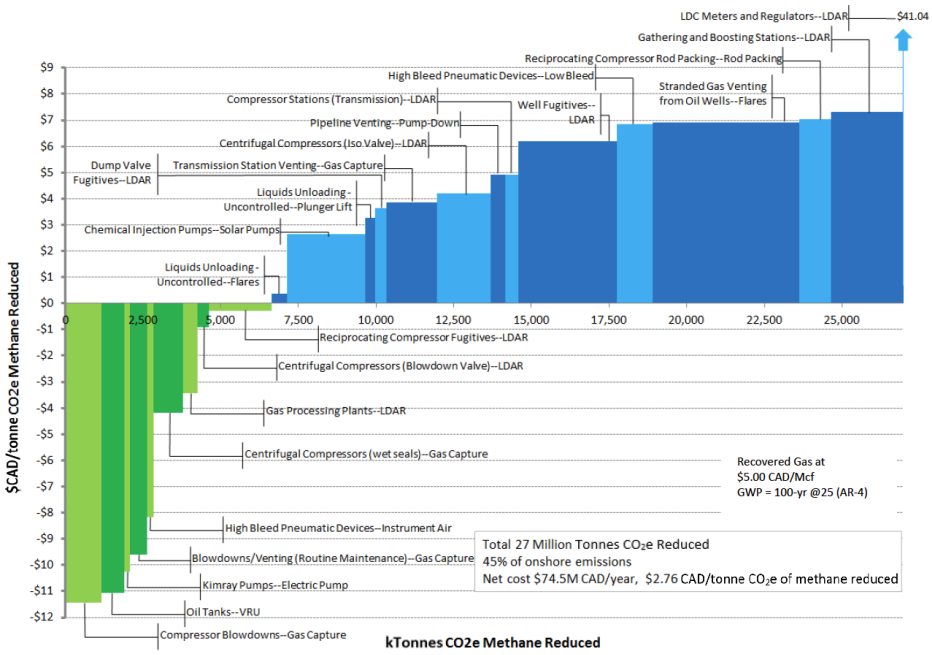
Equitable: Methane action ensures the gas sector does its fair share to reduce carbon pollution. Currently, approximately 40% of gas sector emissions are not priced, while other businesses and ordinary British Columbians pay for all of their carbon emissions.

Achievable: Leading U.S. states are already requiring the implementation of technologies that essentially eliminate routine methane venting across the supply chain, showing that stronger methane action is already technologically and financially feasible.

Promoting resiliency: Addressing methane emissions will future-proof investments, so B.C.'s gas sector will be able to compete as the world transitions to low-carbon energy sources.

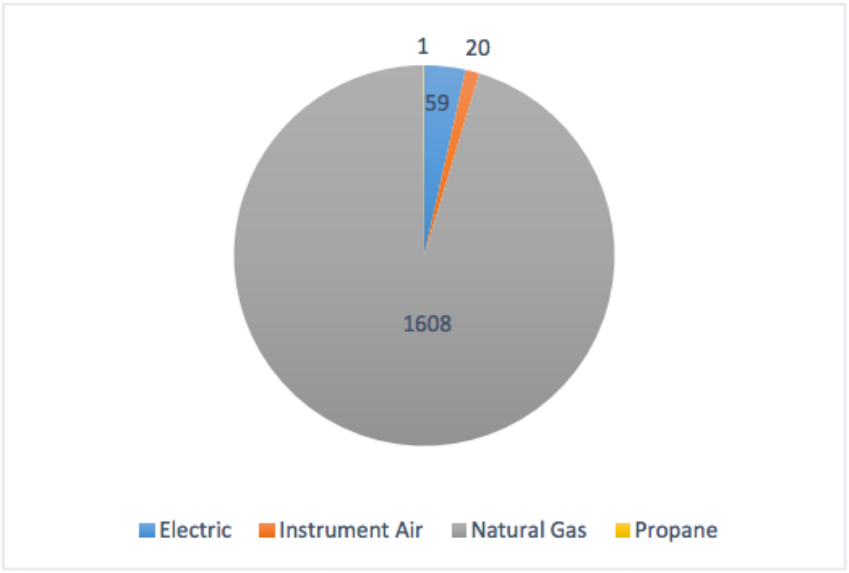
Appendix 2. Charts

Figure 1. Marginal abatement cost for methane reductions in Canada



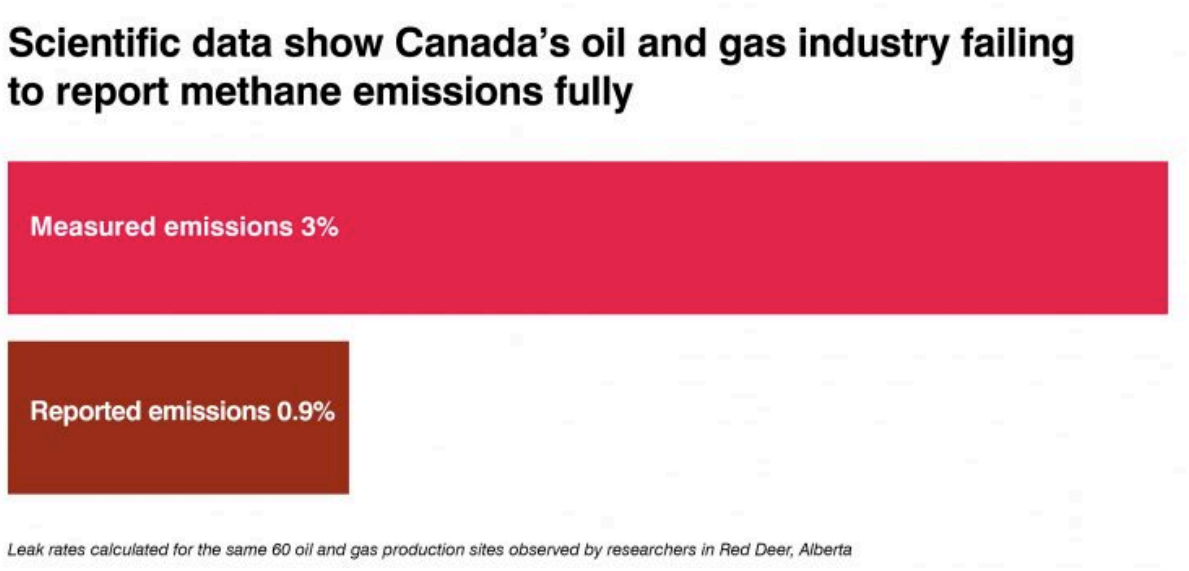
Source: ICF International, *Economic Analysis of Methane Emission Reduction Opportunities in the Canadian Oil and Natural Gas Industries* (Environmental Defense Fund and Pembina Institute, 2016). http://www.pembina.org/pub/economic-analysis-of-methane-emission-reduction-opportunities-canadian-oil-and-natural-gas

Figure 2. Types of pneumatic device drivers in Alberta



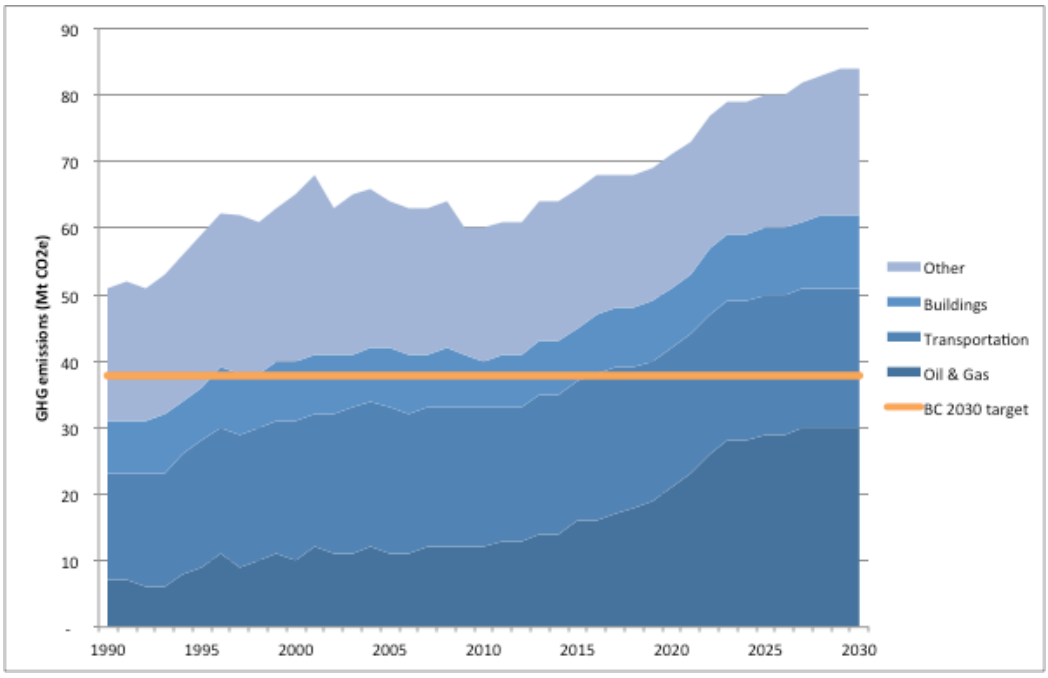
Source: Greenpath Energy Ltd., *Greenpath 2016 Alberta Fugitive and Vented Emissions Inventory Study* (2016). http://www.greenpathenergy.com/wp-content/uploads/2017/03/GreenPath-AER-Field-Survey-Results_March8_Final_JG.pdf

Figure 3. Methane emissions from wellheads in Red Deer, Alberta



Source: Environmental Defence, "New study finds methane gas emissions are 15 times higher than reported by industry" (March 22, 2018). https://environmentaldefence.ca/2018/03/22/study-finds-methane-emissions-15-times-higher-reported/

Figure 4: B.C. emissions forecast by sector



Source: Government of Canada, *Canada's Second Biennial Report on Climate Change* (2018). Note: The report assumes 19 Mtpa of LNG, with an emissions intensity of 0.19t-CO_2e/t-LNG. Oil and gas sector emissions in 2030 are forecasted at 30 Mt, or 79% of B.C.'s 2030 target.