



# Methane Emissions and Canada's Oil and Gas Sector

The start of a good news story

**CANADAWEST  
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There's a success story quietly unfolding in Canada's upstream oil and gas sector – one that is worth better understanding as we drive towards a decarbonized energy future.

Over the past five years, methane emissions from the upstream oil and gas sector in Western Canada have decreased by around 44% – ahead of schedule and with further decreases projected by 2025.

## This is a big deal.

This impressive outcome is the result of commitments set by provincial and federal governments along with a strong but achievable suite of regulations, buy-in from industry, and a collaborative focus (and substantial government funding spent) on solving thorny technical challenges in methane detection, measurement and management.

Substantial emissions reductions have been achieved successfully and rapidly. And while more remains to be done, impressions of Canada's oil and gas sector need to keep pace with reality.

	Target reduction for 2025	% reduction achieved as of 2020	
		Federal data	Provincial data
AB	45%	47%	33%
SK	40-45%	49%	60%*
B.C.	45%	22%	22%
Canada-wide	40-45%	44%	

\* Saskatchewan data is for 2021

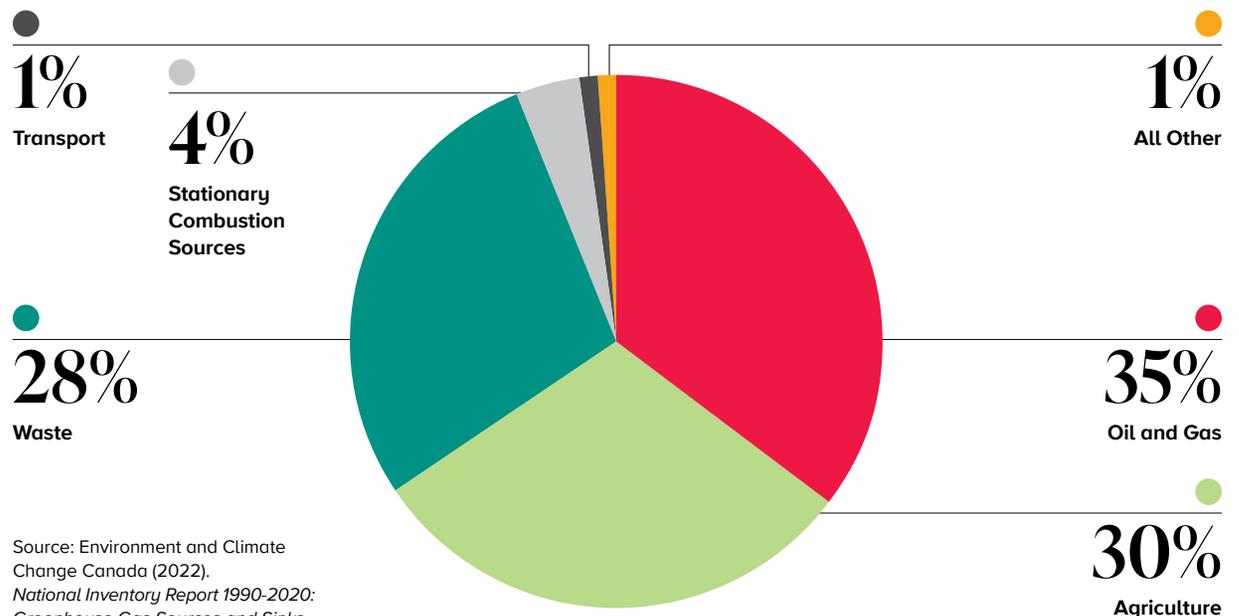
# 1.0

## Methane: What's the big deal?

Greenhouse gases (GHGs) are not all created equal. While carbon dioxide (CO<sub>2</sub>) has the largest emissions and has attracted most attention, methane (CH<sub>4</sub>) is more “dangerous” in that it traps more heat in the atmosphere. Methane has somewhere between 25 and 34 times<sup>i</sup> the global warming potential of CO<sub>2</sub> for the same volume of gas emitted. This means that eliminating methane has a relatively large impact in terms of minimizing climate change.

About 3,700 kilotonnes of methane were emitted across Canada in 2020. This is equivalent to around 92,000 kilotonnes of carbon dioxide<sup>ii</sup> (written as 92,000 kt CO<sub>2</sub>e), and represents about 14% of total GHG emissions. As shown in **Figure 1**, Canada's anthropogenic<sup>iii</sup> methane emissions primarily come from three sources: agriculture (mostly from animals' digestive processes); decomposition of matter in landfills and wastewater treatment facilities; and releases from oil and gas production, which includes both intentional and unintentional emissions from venting, flaring, process emissions and leaks (together, referred to as “fugitive emissions”).

**Figure 1: Sources of methane in Canada in 2020**



Source: Environment and Climate Change Canada (2022).  
*National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada.*

<sup>i</sup> Because methane decays in the atmosphere at a different rate than carbon dioxide, the warming potential differs depending on the time scale under consideration – 10 years vs. 25 years vs. 100 years, etc.

<sup>ii</sup> To help with comparability, emissions of different GHG gases are converted to an equivalent amount of carbon dioxide (CO<sub>2</sub>) – written as CO<sub>2</sub>e, or CO<sub>2</sub> equivalent.

<sup>iii</sup> Anthropogenic emissions are those produced by humans. Methane is also released from forest fires and from ecosystems such as wetlands – these sources are not counted in the chart.



# 2.0

## What methane reduction commitments did governments make?

Over the last few years, provincial and federal governments in Canada have introduced policy and regulations to reduce methane emissions, particularly from the upstream oil and gas sector.

The wave started in Alberta in 2015, when the provincial government introduced a commitment to reduce upstream oil and gas methane emissions 45% by the year 2025, compared to a baseline of 2014. This was quickly followed by similar commitments federally and from the provinces of Saskatchewan and British Columbia ([Table 1](#)).

The “hows” were established by each province in a series of industry-specific regulations that detailed requirements for methane detection, measurement and reporting, as well as operating specifications for certain types of equipment such as pneumatic devices and compressors. Across the jurisdictions, the regulations are broadly similar although not identical because the context of oil and gas development is different in each province.

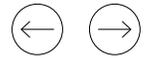
More recently, some targets have become more stringent. In October 2021, both the B.C. and federal governments published new commitments to reduce methane emissions from upstream oil and gas by 75% by the year 2030.

**Table 1: Methane pledges by the federal and provincial governments that apply to upstream oil and gas production**

Govt	Pledge	% Reduction (for oil & gas)	Baseline Year	Target Date	Relevant Regulations**
AB	Alberta methane reduction target (2015)	45%	2014	2025	<ul style="list-style-type: none"> <li>• Methane Emission Reductions Regulation (2018)</li> <li>• Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting (2018)</li> <li>• Directive 017: Measurement Requirements for Oil and Gas Operations (2018)</li> </ul>
SK	Saskatchewan's Climate Change Strategy (2017)	40 to 45%*	2015	2025	<ul style="list-style-type: none"> <li>• The Oil and Gas Emissions Management Regulations (2019)</li> <li>• Directive PNG036: Venting and Flaring Requirements (2019)</li> <li>• Directive PNG017: Measurement Requirements for Oil and Gas Operations (2019)</li> </ul>
B.C.	Clean BC (2018)	45%	2014	2025	<ul style="list-style-type: none"> <li>• Drilling and Production Regulation (2018)</li> </ul>
	Roadmap to 2030 (2021)	75%	2014	2030	
	Roadmap to 2030 (2021)	~100%	2014	2035	
Federal	Pan-Canadian Framework on Clean Growth and Climate Change (2016)	40-45%	2012	2025	<ul style="list-style-type: none"> <li>• Regulations Respecting Reduction in the Release of Methane and Certain Volatile Organic Compounds (Upstream Oil and Gas Sector) (2018)</li> </ul>
	Global methane pledge (2021)	75%	2012	2030	<ul style="list-style-type: none"> <li>• <i>Draft regulations to be produced in 2023</i></li> </ul>

\* The Government of Saskatchewan frames the commitment as an absolute number (4.0-4.5 megatonnes of CO<sub>2</sub>e) and the per cent is an approximation of that figure.

\*\* In some provinces, there are also site-specific regulations for some regions



# 3.0

## So, how's it going?

Now for the good news story.

**Figures 2 through 4** show fugitive methane emissions over time in Alberta, Saskatchewan and B.C. Each graph shows estimates from two sources: the federal government's National Inventory Report (NIR)<sup>iv</sup>, and the provincial governments' own estimates. For both Alberta and Saskatchewan, the NIR emissions estimates are higher than those of the provinces; however, both sets of estimates demonstrate that there have been major declines in oil and gas fugitive methane emissions over the past few years and the estimates appear to be converging.

- Alberta's latest estimates were published January 2022.<sup>1</sup> The province reported decreases in methane emissions from 24,800 kt in 2014 (the baseline year) to 16,500 in 2020, a reduction of about 33% (**Figure 2** and **Table 2**) – at the same time that overall oil production increased by about 28%. Although provincial data show Alberta's methane emissions flatlining since 2018, the provincial government forecasts that emissions will start decreasing again in 2021 as more regulations kick in, and by 2025 will have dropped to 11 million tons – a 56% decrease, exceeding the 45% target.

The NIR data paints a rosier picture in terms of reductions, although a higher absolute emissions level. NIR estimates place Alberta's methane decrease at 47% since 2014, already exceeding the target for 2025.

The difference between the federal and provincial estimates stems from substantive differences in the methodology used. For example, the province of Alberta excludes oil sands mining – which comprises about half of oil sands production – from its provincial methane estimates as they are regulated under a different system (TIER).

- The Government of Saskatchewan publishes its estimates annually in its Climate Resilience Reports.<sup>2</sup> As shown in **Figure 3**, Saskatchewan reports substantial decreases in emissions from the upstream oil and gas sector over the last few years. A 60% decrease from the 2015 baseline was achieved by 2021, meaning that Saskatchewan has already well exceeded its target of 40-45% (assuming emissions don't rise before 2025). Some of this decrease is likely due to COVID-related production decreases. However, the decrease in production between 2015 and 2021 is about 8.7%, whereas the corresponding decrease in emissions is 60%.

As with Alberta, the federal estimates are consistently higher, but also show a large decrease in emissions (49% from baseline by 2020) that already exceed the 2025 target, as well as a convergence between the federal and provincial estimates.

- In B.C., emissions decreased by 22% between 2014 and 2020 (**Figure 4**). However, parts of B.C.'s regulations come online at different times, and the regulations will not be in full effect until January 2023, after which time substantial additional decreases are expected.

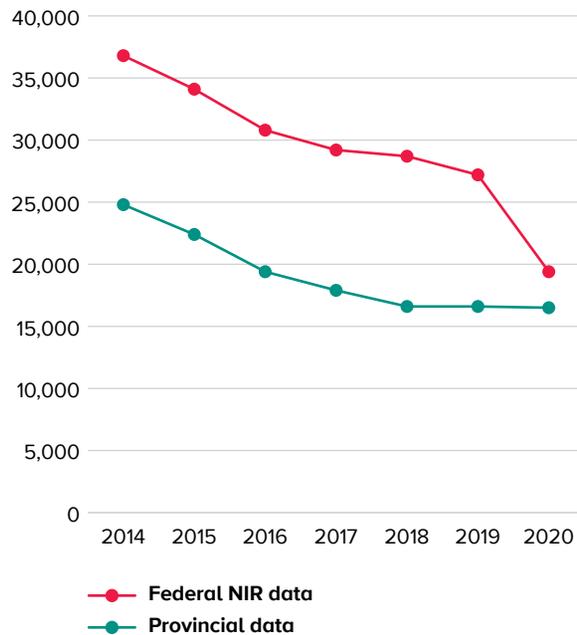
B.C. is the only province in which provincial and federal estimates concur. This is a recent development. In 2022, the B.C. government adjusted its methodology for methane estimation to match the federal government and retroactively changed emissions estimates for all prior years. Previous provincial estimates had shown a lower total emissions volume, but no decrease over time.

<sup>iv</sup> The figures are from 2022 National Inventory Report, which uses a different methodology for estimating fugitive oil and gas emissions than did previous versions of the NIR. However, methane emission estimates for prior years were also revised by ECCC and the graphs show the most current estimates for all years.



**Figure 2: Fugitive methane emissions from oil and gas production in Alberta**

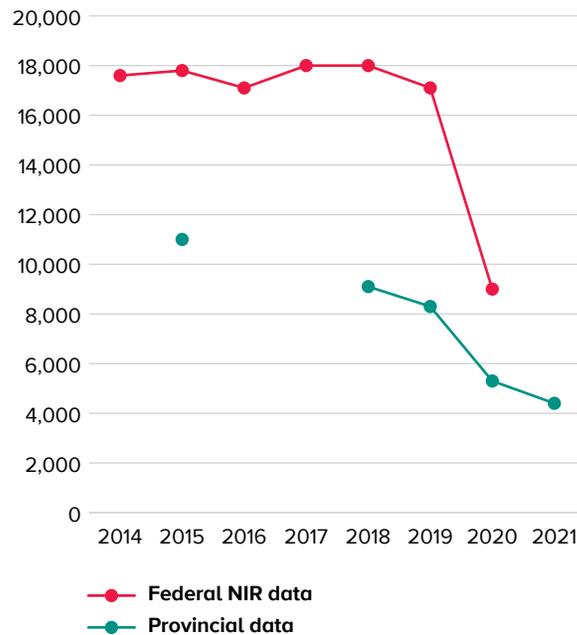
### Alberta



Source: Alberta Environment and Parks (2022). *2020 Methane Emissions Management from the Upstream Oil and Gas Sector in Alberta*.

**Figure 3: Fugitive methane emissions from oil and gas production in Saskatchewan**

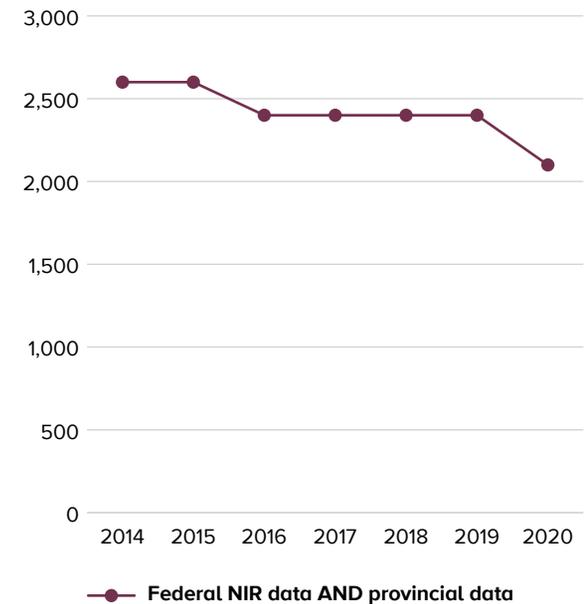
### Saskatchewan



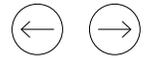
Source: Government of Saskatchewan (2022). *Climate Resilience in Saskatchewan: 2021 Report*.

**Figure 4: Fugitive methane emissions from oil and gas production in British Columbia**

### British Columbia



Sources: Government of British Columbia (2022). *1990-2019 B.C. Provincial GHG Inventory*.  
Environment and Climate Change Canada (2022). *National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada*.



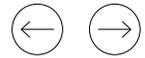
**Table 2: Reductions achieved to date for fugitive methane emissions from oil and gas**

PER CENT REDUCTION ACHIEVED FROM BASELINE				
	Baseline year	Target reduction for 2025	NIR data (to 2020)	Provincial data (to 2020 for AB and B.C.; to 2021 for SK)
Alberta	2014	45%	47%	33%
Saskatchewan	2015	40-45%	49%	60%
British Columbia	2014	45%	22%	22%
Canada-wide	2012	40-45%	44%	n/a

Although both provincial and federal estimates are trending in the same direction, they remain stubbornly different. This doesn't necessarily make one more "truthful" than the other; they were developed for different reasons, which has resulted in differences in methodology and outputs. The NIR's estimates are part of the federal government's commitment to report on Canada's GHG emissions for the United Nations Framework Convention on Climate Change (UNFCCC). As a result, its approach is designed to align with UNFCCC reporting standards. The provinces, on the other hand, produce their estimates for the purpose of identifying the impact of provincial methane regulations.

It should also be noted that there have been claims by some groups that methane emissions from the oil and gas sector are sharply underestimated by all parties, by a factor of 1.5.<sup>3</sup> Improvements in methane detection and measurement (such as through satellites with infrared sensors and drone-mounted spectrometers) are likely to resolve these issues in the very near future.



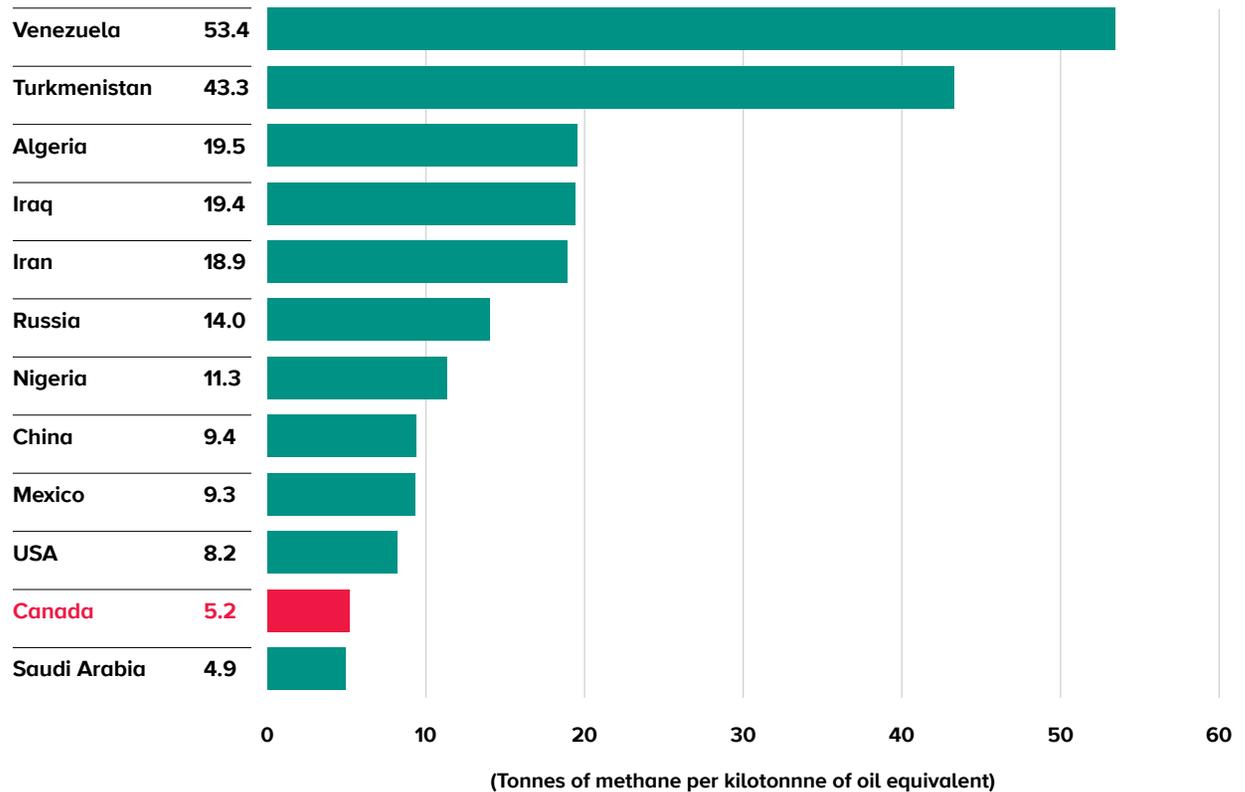


# 4.0

## How does this compare to other countries?

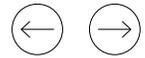
These reductions are a real accomplishment – and are not yet the global norm. In the United States, for example, the methane reduction from oil and gas between 2016 to 2020 was less than six per cent.<sup>4</sup> And as shown in **Figure 5**, Canada now has extremely low methane emissions intensity from oil and gas production, just above Saudi Arabia, and over one-third lower than the U.S.<sup>5</sup> (The International Energy Agency states that Norway's emissions from oil and gas production are the lowest globally, but don't provide an intensity figure.)

**Figure 5: Methane intensity of selected oil and gas producers in 2020**



Canada now has extremely low methane emissions intensity from oil and gas production, just above Saudi Arabia, and over one-third lower than the U.S.

Source: International Energy Agency, 2022



# 5.0

## What made this work?

The point of this briefing is not merely to highlight an important success story underway – but also to look at what caused these reductions to happen.

Clearly, the provincial and federal regulations played a large part. The regulations set specific targets, defined some of the “how”, and provided a set of teeth that made change happen.

But in addition to regulations, the provincial and federal governments established a series of complementary programs and strategies that directed an enormous amount of funding support at the problem of methane detection, measurement and management – and this support continues. In 2016, Emissions Reduction Alberta plowed almost \$40 million into their “methane challenge” and another \$58.4 million in 2020 into their “natural gas challenge” – funding competitions to stimulate development of technologies that address methane detection, quantification or reduction.<sup>6</sup> In 2021, Alberta also launched the \$17.6 million Alberta Methane Emissions Program to support technology testing, data sharing and other processes to support methane reduction. In March 2022, Saskatchewan launched the Saskatchewan Emissions Inventory to further expand methane modelling and measurement in the province. The Natural Gas Innovation Fund (NGIF), funded by industry, has partnered with NRCan to develop an Emissions Testing Centre in Alberta that will create a plug-and-play testing platform for simulated and real-world emissions testing. And NRCan, following a federal mandate letter commitment, is developing a “global centre for excellence on methane detection and elimination.” These programs have been complemented by others that focus on technology implementation, such as the federal government’s Emissions Reduction Program (ERF), B.C.’s Clean Growth Infrastructure Royalty Program (CGIRP) and Saskatchewan’s Oil and Gas Processing Investment Incentive

(OGPII). These supports have been critical in developing the technologies that underpin successful methane reduction. The carrots have been at least as important as the sticks.

External, non-government pressures have also played a part. In particular, the rise of ESG-directed investment provided a separate impetus for oil and gas producers to look for ways to substantially reduce emissions.

And it should be remembered that some industry members took initiative before and beyond regulatory requirements. Firms such as CNRL and Modern Resources adopted solar panels, electric pumps, and carbon capture to reduce methane emissions, with CNRL, for example, reducing their venting volumes by 71% between 2013 and 2017.<sup>7</sup>

As we move into the future, the rapid and sharp methane reductions that have been achieved in Saskatchewan and Alberta over the past few years are important to note because they show commitment and achievement. They also raise questions such as:

- Are the same factors that got us the 40-45% methane reduction sufficient to get us to reductions of 75% or greater?
- How much of what helped achieve methane reduction can be duplicated for carbon dioxide and other greenhouse gases, or were these factors specific to this gas?
- How can we leverage the knowledge, technologies, etc. that have helped reduce methane emissions in Canada and use those to help drive global methane reduction – an even bigger prize?



# 6.0

## Conclusion

There is good reason for the world to focus on reducing methane emissions as it is one of the most potent greenhouse gases. And Canada is moving in the right direction with sharp decreases in methane emissions from the oil and gas sector over the past five years. This sort of decrease is not yet the global norm.

Both the provinces and the federal government have established methane reduction targets and have put in regulations that, over time, are intended to drive toward those outcomes. These regulations are key but they are also only one piece of the puzzle. Other factors that have helped drive methane reductions include:

- Other policy instruments, including funding and technical guidance and standards.
- Improvements in detecting and measuring methane emissions.

- External pressure from the financial sector and other ESG-interested audiences.

Reduction commitments for the upstream oil and gas sector – a 45% reduction by 2025 and the more recent pledge of a 75% reduction by 2030 – clearly depend on the ability of the western provinces to meet their own initial commitments and then to keep going. As shown in this briefing, we appear to be on track although the last mile will be considerably more difficult than the first.

And as targets continue to rise, it will be critical for the federal government to establish a true partnership with the oil and gas producing provinces – one that achieves methane reduction objectives, but also addresses differences in context across the different jurisdictions and reduces overlap and double reporting for industry.

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## Endnotes

<sup>1</sup> Alberta Environment and Parks. (2022). *2020 Methane Emissions Management from the Upstream Oil and Gas Sector in Alberta*.

<sup>2</sup> Government of Saskatchewan. [Climate Resilience in Saskatchewan: 2021 Report](#).

<sup>3</sup> MacKay K, Lavoie M, Bourlon E et al. (2021). Methane emissions from upstream oil and gas production in Canada are underestimated. *Scientific Reports* 11(1). <https://www.nature.com/articles/s41598-021-87610-3>

<sup>4</sup> United States Environmental Protection Agency. (2022). Inventory of Greenhouse Gas Emissions and Sinks, 1990-2020. <https://www.epa.gov/system/files/documents/2022-04/us-ghg-inventory-2022-main-text.pdf>

<sup>5</sup> International Energy Agency (IEA) (2022). Methane Emissions from Oil and Gas. <https://www.iea.org/data-and-statistics/charts/total-methane-emissions-and-methane-intensity-of-production-in-selected-oil-and-gas-producers-in-2020>

<sup>6</sup> Emission Reduction Alberta. Natural Gas Challenge. <https://eralberta.ca/funding-technology/natural-gas-challenge-unlocking-innovation-across-albertas-value-chain/>

<sup>7</sup> Stastny RP. (2019). Energy Excellence Awards: The Best In Oil And Gas Operational Excellence. Daily Oil Bulletin, April 16, 2019. <https://www.dailyoilbulletin.com/article/2019/4/16/energy-excellence-awards-the-best-in-oil-and-gas-o/>