



# Best Practices on Oil and Gas Methane Emissions Regulations

## A FACTSHEET FOR POLICY-MAKERS

“Canada’s three major oil and gas provinces — Alberta, Saskatchewan and B.C. — have all written their own rules. The federal government must now stand its ground and ensure the provincial rules are as effective as the federal ones.”

Addressing methane is one of the most cost-effective ways to reduce greenhouse gas pollution from the oil and gas sector. The Government of Canada reaffirmed its commitment to reduce methane emissions from the oil and gas sector by 40-45% below 2012 levels by 2025 as part of the Pan-Canadian Framework. In April 2018, the Canadian federal government published robust and comprehensive regulations intended to achieve their commitment.

The provinces can introduce their own regulations if they achieve equivalent emissions reductions as the federal ones. Canada’s three major oil and gas provinces — Alberta, Saskatchewan and B.C. — have all written their own rules. The federal government must now stand its ground and ensure the provincial rules are as effective as the federal ones.

### Why Methane?

Methane is a potent greenhouse gas with more

than 80 times the climate warming impact of carbon dioxide over a 20-year timespan. Methane is responsible for approximately 25% of the warming we feel today<sup>1</sup>. These facts make near-term methane reductions a necessary element of international efforts to battle climate change.

Methane is also the primary constituent of natural gas — a valuable product. Actions that eliminate or reduce methane losses to the atmosphere therefore are highly cost-effective as fewer methane emissions translate to more product in the pipeline. The International Energy Agency says globally the oil and gas industry can cost-effectively reduce up to 75% of its methane emissions and 50% of global methane reductions can be realized at zero net cost. This level of reduction delivers the same long-term climate benefit as immediately closing all the coal plants in China<sup>2</sup>. That’s a huge win for both the climate and the economy.

Reducing methane emissions can also have significant air quality benefits. Actions that

<sup>1</sup>Data is from IPCC AR5 WGI 2013 Chapter 8 SM, Table 8.SM.6’

<sup>2</sup><https://www.iea.org/newsroom/news/2017/october/commentary-the-environmental-case-for-natural-gas.html>

release methane emissions, such as unintentional leaking and intentional venting and flaring also emit harmful air toxics and smog-forming volatile organic compounds (VOCs). Therefore, actions to reduce methane emissions also lead to improved public health protections as a co-benefit. Reduced flaring can also reduce black carbon emissions to achieve simultaneous air quality and climate mitigation objectives.

### Why Canada?

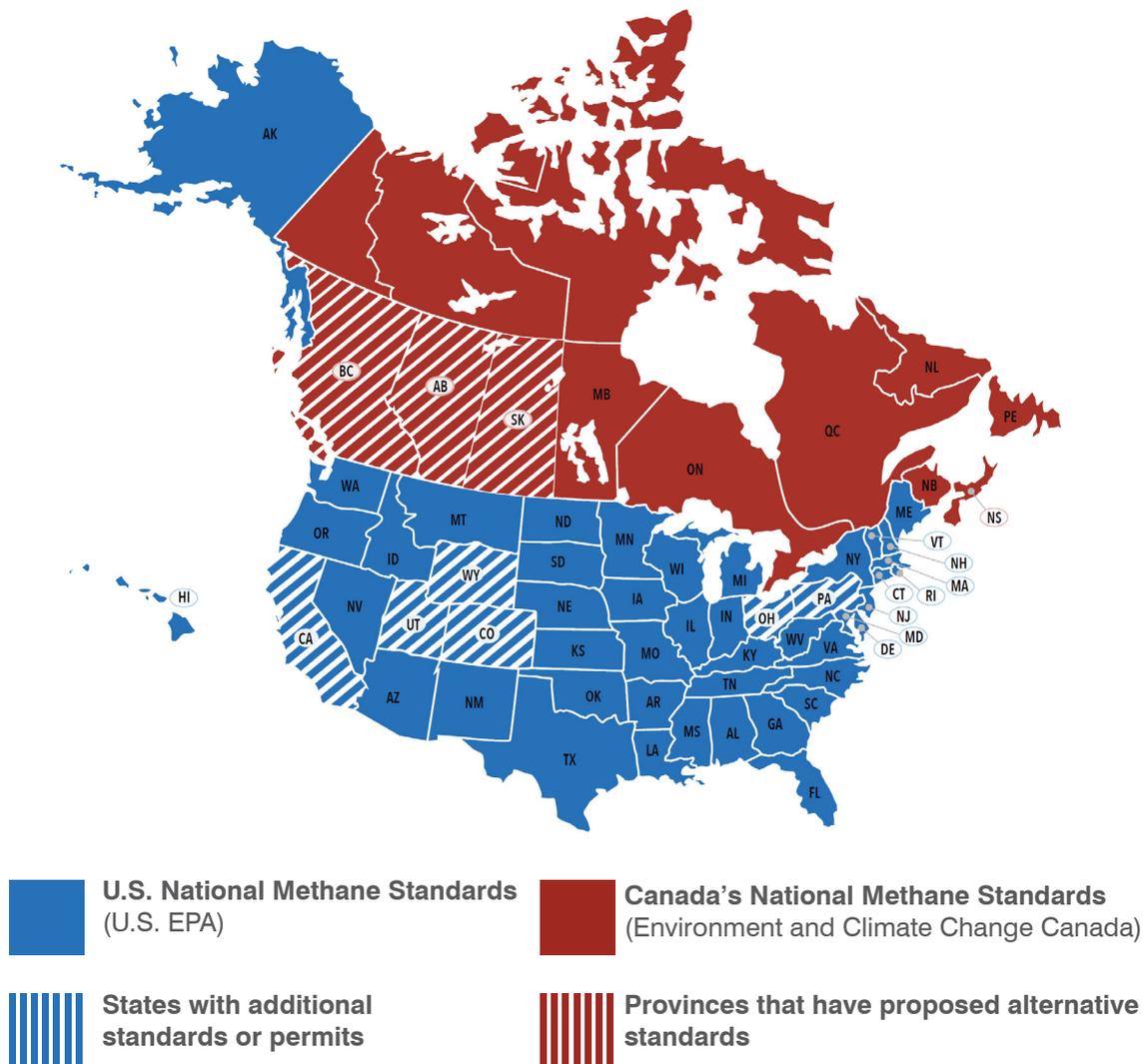
Under the Pan-Canadian Framework, Canada has implemented a plan to reduce greenhouse gas emissions in line with their Paris Agreement commitments. Part of this plan is to reduce methane emissions by 40-45%, a commitment that was made alongside the U.S. and Mexico. The federal government took a strong first step in April 2018 by finalizing regulations on methane. If implemented across Canada, these regulations can reduce greenhouse gas emissions in Canada by 15 Mt CO<sub>2</sub>e each year starting in 2023. Moreover, since methane is the major component of natural gas, abating these emissions is also key for avoiding the waste of a precious resource.

Given the significant opportunity to reduce greenhouse gases and achieve the committed 45% methane reduction, the federal government should not grant equivalence to any of the provincial methane regulations in Alberta, BC or Saskatchewan unless they achieve methane emission reductions at least equivalent to the federal regulations.

### Mapping Methane Action

National and subnational jurisdictions across the U.S. and Canada have issued regulations or committed to do so to meet oil and gas methane reduction goals, as shown in the map below.

In August 2019, the EPA introduced proposed changes to the US federal methane rules which are not yet reflected below. The proposal must undergo consultation before a final action is issued. Industry players, environmental groups and states will argue against rolling back federal methane rules, with a challenge likely in federal court. Regardless, state regulations will remain in place and active campaigns are underway in additional states so the EPA proposal does not reflect a wholesale shift away from oil and gas methane reductions in the U.S.



## How Do the Federal and Provincial Regulations Measure Up?

Increasingly, countries, provinces and states are implementing regulations to reduce methane emissions. The strength of regulations varies from one jurisdiction to the next. Some regulate methane directly, while others address VOCs, which reduces methane as a co-benefit. Key aspects that should be addressed by effective regulations include:

1. Achieving ambitious methane emission reductions across multiple segments of the oil and gas sector and from all significant emission sources, new and existing;
2. Reducing designed and intentional equipment venting from pneumatics and compressors;
3. Reducing venting and flaring from storage tanks and oil well-heads;
4. Requiring leak detection and repair (LDAR); and
5. Establishing reliable record-keeping, reporting and measurement procedures.

In these five key areas, we compare the methane regulations from the federal government and provinces of Alberta, Saskatchewan and B.C. with best practices.

## How does the Federal Regulation Measure Up?

The federal regulations include broad coverage and tackle all major sources of emissions effective across the oil and natural gas supply chain from new and existing sources. Federal regulations will result in reduced leaks and venting due to comprehensive, frequent leak inspections coupled with robust venting limits for compressors, pneumatic devices, pumps and storage tanks. Federal regulations allow operators to use emerging leak detection methods to conduct leak inspections, thereby encouraging innovation that could enhance the effectiveness and reduce the cost of inspections.

## Comparative Analysis

■ Follows best practices      ■ Needs minor improvements      ■ Needs major improvements

Key Aspects	Best Practices	Federal	Alberta	British Columbia	Saskatchewan
1. Achieve ambitious methane emission reductions across multiple segments of the oil and gas sector and from all significant emission sources, new and existing.	1.1 Mandatory, performance-based standards				
	1.2 Effectively targets largest emissions sources				
	1.3 Limited, and clearly circumscribed, exceptions				
2. Reduce designed and intentional equipment venting from pneumatics and compressors.	2.1 Engineer and design new pneumatic devices and pumps to be zero or near zero emitting (e.g. use electricity or instrument air in lieu of natural gas as power source)				
	2.2 Retrofit existing pneumatic devices and pumps to be zero or near zero emitting (e.g. replace high-bleed pneumatic devices with low or zero-bleeds)				
	2.3 Reduce intentional venting from compressors				
3. Reduce flaring and gas venting from storage tanks and oil well-heads.	3.1 Reduce venting of gas from tanks				
	3.2 Reduce venting of gas from oil well-heads				
	3.3. Limit flaring of gas; only allow where capture isn't feasible				
	3.4 Require use of high efficiency flares and combustors				
4. Regular leak detection and repair (LDAR).	4.1 Quarterly/triannual inspections of well sites, gas processing plants, compressor stations, tank batteries				
	4.2 Comprehensive inspections that apply to all sources with the potential to leak, unintentionally vent or abnormally operate				
	4.3 Include robust alternative compliance pathway that allows for the use of emerging technologies that are as effective in reducing emissions as allowable instruments and is subject to public input and regulatory review				
5. Record-keeping, reporting and measurement.	5.1 Include robust, detailed, site-specific record-keeping provisions, demonstrating compliance with each of the mandatory methane reduction measures				
	5.2 Require annual public reporting demonstrating compliance				
	5.3 Reliable measurement requirements				

<sup>1</sup> Includes solution and associated gas



# Comparing British Columbia and Federal Oil and Gas Methane Emissions Regulations

## A FACT SHEET FOR POLICY-MAKERS

“BC regulations have strong elements, representing best practices and in some cases exceeding the federal rules.”

This fact sheet presents the results of a comprehensive review comparing British Columbia’s methane emissions rules to the federal regulations. BC finalized their methane regulations in early 2019.

BC regulations have strong elements, representing best practices and in some cases exceeding the federal rules. In particular, BC rules require new pneumatic devices and some existing ones to be zero emitting. BC also include a three times per year inspection requirement for gas processing plants, compressor stations, and some batteries. However, there is room for improvement on tank venting limits

and leak detection and repair. Comprehensive leak detection should be required in the regulations, not guidance documents which don’t have strong enforcement requirements. Storage tank venting limits are also much higher than the federal rule.

Using five key areas of methane oil and gas regulation best practices, we compared BC rules to best practices. This comparison identifies improvement opportunities that could be implemented to align with such practices in order to achieve the same or better emissions reductions as the federal regulation.

Key Aspects	Best Practices	Federal Regulation	Provincial Regulation	How it Compares	Improvement Opportunity
1. Achieves ambitious methane emission reductions across multiple segments of the oil and gas sector and from all significant emission sources, new and existing.	1.1. Mandatory, performance-based standards.	Federal regulation establishes mandatory performance-based standards.	Regulation establishes mandatory performance-based standards (Sections 44 and 52).	Meets best practices	
	1.2. Effectively targets largest emissions sources.	Federal regulation effectively targets largest emission sources.	Regulation targets largest emission sources but venting limits, LDAR survey requirements need improvement.	Needs minor improvement	Set lower tank venting limits and require frequent LDAR at conventional facilities.
	1.3. Limited, and clearly circumscribed, exceptions.	Federal regulation establishes limited and clearly circumscribed exceptions maintaining strict limits for the largest emissions sources.	Regulation establishes limited and clearly circumscribed exceptions.	Meets best practices	

2. Reduce designed and intentional venting from pneumatics and compressors.	2.1. Engineer and design new pneumatic devices and pumps to be zero or near zero emitting. (e.g. use electricity or instrument air in lieu of natural gas as power source)	Federal regulation sets venting limits for new devices. (Section 37.1) No emissions are allowed from new pneumatic pumps (Section 39.1) with exceptions for infrequently used pumps.	Regulation requires new pneumatic devices and pumps to be zero emitting (Sections 52.05, 52.06, 52.07).	Meets best practices	
	2.2. Retrofit existing pneumatic devices and pumps to be zero or near zero emitting (e.g. replace high-bleed pneumatic devices with low or zero-bleeds).	Federal regulation sets a venting limit for existing pneumatic devices (Section 37.1) and requires no emissions from existing pneumatic pumps with exceptions for infrequently used pumps (Section 39.1).	Regulation requires some existing pneumatic devices to be non-emitting, and sets a venting limit on others. No rules for existing pneumatic pumps.	Needs minor improvement	Require existing pumps to be low or non-emitting.
	2.3. Reduce intentional venting from compressors.	Federal regulation establishes a venting limit for compressors that is ambitious and aims to reduce intentional venting. (Section 18 and Section 50)	Regulation sets limits on venting from compressors (Section 52.04).	Meets best practices	
3. Reduce venting and flaring from storage tanks and oil well-heads.	3.1. Reduces venting of gas from tanks.	Federal regulation establishes an annual venting limit for facility that is ambitious and aims to reduce venting of gas from major sources including tanks.	Regulation establishes a venting limit for tanks but it is not ambitious in comparison with best practices.	Needs minor improvement	Reduce venting limit for tanks to align with best practices such as in the federal rule.
	3.2 Reduce venting of gas from oil wellheads (Includes solution and associated gas).	Federal regulation sets an annual venting limit for facility that is ambitious and aims to reduce venting of gas from major sources including solution gas venting.	Regulation doesn't establish venting limits aiming to reduce emissions from well-heads.	Needs minor improvement	While establishing a limit is best practice, based on current inventory, well-heads not a significant source of emissions in BC due to low oil production.
	3.3. Limit flaring of gas; only allow where capture is infeasible.	Federal regulation doesn't establish a requirement limiting flaring of gas.	BC flaring and venting reduction guidelines only allow flaring when capture is not economic.	Meets best practices	
	3.4. Require use of high efficiency flares and combustors.	Federal regulation doesn't establish a requirement to use high efficiency flares but advises following provincial rules (Section 9) which don't require the use of high efficiency flares.	Regulation includes flare performance requirements but doesn't establish a minimum flare efficiency.	Needs major improvement	Require a 98% destruction efficiency for flares and combustors.
4. Regular leak detection and repair (LDAR).	4.1. Quarterly inspections of well sites, gas processing plants, compressor stations, tank batteries.	Federal regulation requires inspections three times per year for all but single well heads (Sections 30 (3); 52).	Regulation requires 3 times/year surveys at gas plants, compressor stations, multowell batteries and single well batteries with controlled tanks. Most single well batteries and tight gas wells only require 1 time/year LDAR, while conventional wells only require screening.	Needs minor improvement	Include inspection requirements for co-located facilities in regulation, not just guidance materials.
	4.2. Comprehensive inspections that apply to all sources with the potential to leak, unintentionally vent or abnormally operate.	Federal regulation requires LDAR inspections on all sources including thief hatches and pneumatic devices.	Regulation requires LDAR for all sources with potential to leak including pneumatics.	Meets best practices	
	4.3. Include robust alternative compliance pathway that allows for the use of emerging technologies that are as effective in reducing emissions as allowable instruments and that is subject to public input and regulatory review.	Federal regulation establishes robust alternative compliance pathway (Sections ; 29; 35; 50).	Regulation does not include robust alternative compliance pathway.	Needs major improvement	Include alternate compliance pathways in the regulations.
5. Record keeping, reporting and measurement	5.1 Include robust, detailed, site-specific record keeping provisions, demonstrating compliance with each of the mandatory methane reduction measures.	Federal regulation requires comprehensive site level record keeping by source type (Sections 6; 7; 10; 12; 19; 25; 27; 36; 38; 45; 48; 51; 53; 56).	Regulation and guidance materials establish comprehensive requirements for record keeping.	Meets best practices	
	5.2. Require annual public reporting demonstrating compliance.	Federal regulation doesn't require annual public reporting demonstrating compliance.	Regulation doesn't commit to a comprehensive annual report or public reporting.	Needs major improvement	Include a commitment to comprehensive and public annual reporting.
	5.3. Reliable measurement requirements.	Federal regulation establishes reliable measurement requirements. (Section 15, 16 and 17).	Comprehensive measurement requirements for fugitive sources. Venting measurement requirements not yet released.	Needs minor improvement	Publish comprehensive measurement requirements for venting.



# Comparing Alberta and Federal Oil and Gas Methane Emissions Regulations

## A FACT SHEET FOR POLICY-MAKERS

“Alberta’s rules will fail to meet the province’s 45% oil and gas methane reduction target.”

This fact sheet presents the results of a comprehensive review comparing Alberta’s methane regulations to those of the federal government. Alberta’s methane regulations were finalized in late 2018 in Directive 060 and Directive 017 by the Alberta Energy Regulator. Analysis from the Clean Air Task Force shows that Alberta’s rules will fail to meet the province’s 45% oil and gas methane reduction target<sup>1</sup>. Alberta’s rules also fall short of the federal standard, achieving only a 32% reduction from 2012 baseline emissions compared to the federal rules which achieve a 43% reduction. Alberta’s rules are weaker than the federal rules in several key areas:

1. inadequate leak detection and repair (LDAR) requirements and venting limits that are higher than the federal limits;
2. no controls on existing pneumatic pumps;
3. inaccurate and outdated measurement and reporting requirements, especially for solution gas venting, which has shown to be significantly underestimated.

Alberta is also relying on achieving reductions through its carbon pricing system. However this system is not designed for methane and does not have the strong measurement and reporting requirements for methane emissions which are necessary to succeed.

Using five key areas of methane oil and gas regulation best practices, we compared Alberta’s rules to best practices. This comparison identifies improvement opportunities that could be implemented to align with such practices in order for Alberta to achieve the same or better emissions reductions as the federal regulation.

<sup>1</sup> CATF, 2018. A Comparative Assessment of Alberta’s Oil and Gas Methane Emissions Under the ECCC rules and AER’S Draft Directive 060. Available online at: <https://www.catf.us/resource/albertas-oil-gas-methane-emissions-eccc-aers/> Consulted March 22nd, 2019.

Key Aspects	Best Practices	Federal Regulation	Provincial Regulation	How it Compares	Improvement Opportunity
1. Achieves ambitious methane emission reductions across multiple segments of the oil and gas sector and from all significant emission sources, new and existing.	1.1. Mandatory, performance-based standards.	Federal regulation establishes mandatory performance-based standards.	Regulation establishes mandatory performance-based standards and relies on reductions from carbon pricing.	Needs minor improvement	Carbon pricing system not designed to adequately address methane. Performance based regulations are best practice until better measurement and reporting systems are in place.
	1.2. Effectively targets largest emissions sources.	Federal regulation effectively targets largest emission sources.	Regulation fails to effectively reduce venting or leaks.	Needs major improvement	Rules and limits on pneumatics, venting, and LDAR are weaker than federal requirements.
	1.3. Limited, and clearly circumscribed, exceptions.	Federal regulation establishes limited and clearly circumscribed exceptions maintaining strict limits for the largest emissions sources.	Regulations have two critical exceptions: a) 10% of pneumatic devices installed in a year can emit gas(Section 8.6.1) and b) the use of fleet averaged vent gas rate for the crude bitumen fleet (Section 8.4.2).	Needs minor improvement	Pneumatic exception should be issued on a case by case basis. The fleet averaged vent limit must be reduced significantly to be effective.

2. Reduce designed and intentional venting from pneumatics and compressors.	2.1. Engineer and design new pneumatic devices and pumps to be zero or near zero emitting (e.g. use electricity or instrument air in lieu of natural gas as power source).	Federal regulation sets venting limits for new devices. (Section 37.1) No emissions are allowed from new pneumatic pumps (Section 39.1) with exceptions for infrequently used pumps.	Regulation requires 90% of new pneumatic devices to be non-emitting and sets limit for existing devices. No emissions are allowed for new pumps.	Needs minor improvement	Remove the 10% exception for pneumatic devices and require controls for existing pumps.
	2.2. Retrofit existing pneumatic devices and pumps to be zero or near zero emitting (e.g. replace high-bleed pneumatic devices with low or zero-bleeds).	Federal regulation sets a venting limit for existing pneumatic devices (Section 37.1) and requires no emissions from existing pneumatic pumps with exceptions for infrequently used pumps (Section 39.1).	Regulation sets a venting limit for existing pneumatic devices but does not have any rules for existing pumps.	Needs minor improvement	Require existing pneumatic pumps to be low or non-emitting.
	2.3. Reduce intentional venting from compressors.	Federal regulation establishes a venting limit for compressors that is ambitious and aims to reduce intentional venting (Section 18 and Section 50).	Regulation sets limits for venting from compressors (Section 8.6.2).	Follows best practices	
3. Reduce venting and flaring from storage tanks and oil well-heads.	3.1. Reduces venting of gas from tanks.	Federal regulation sets an annual venting limit for facility that is ambitious and aims to reduce venting of gas from major sources including tanks.	Section 8.5 establishes several venting limits for different facilities but those limits are not ambitious in comparison with best practices.	Needs major improvement	Establish a venting limit matching best practices such as in the federal rule.
	3.2 Reduce venting of gas from oil wellheads.	Federal regulation sets an annual venting limit for facility that is ambitious and aims to reduce venting of gas from major sources including solution gas venting.	Regulation sets a fleet average venting limit for crude bitumen, which is the major source of solution gas venting, but it is not ambitious in comparison with best practices.	Needs major improvement	Set a venting limit for crude bitumen batteries that aligns with best practices such as in the the federal rule. Fleet averaging can provide operator with flexibility, but the limit must then be lower as a result.
	3.3. Limit flaring of gas; only allow where capture is infeasible.	Federal regulation doesn't establish a requirement limiting flaring of gas.	Flaring is allowed. Section 1.3 includes a consideration to eliminate or reduce flaring when possible. Section 5.2. establishes a limit for disposed gas at gas processing plants. If an annual provincial limit is exceeded (Section 2.1) a stricter limit can apply.	Needs minor improvement	Establish an explicit requirement to limit flaring of gas; only allow where capture is infeasible.
	3.4. Require use of high efficiency flares and combusters.	Federal regulation doesn't establish a requirement to use high efficiency flares but advises following provincial rules (Section 9). Such rules don't require the use of high efficiency flares.	Section 7 establishes performance requirements for flaring, but it doesn't establish a minimum for flare efficiency.	Needs major improvement	Require a 98% destruction removal efficiency for flares and combustion.
4. Regular leak detection and repair (LDAR).	4.1. Quarterly inspections of well sites, gas processing plants, compressor stations, tank batteries.	Federal regulation requires inspections three times per year for all but single well heads (Sections 30 (3); 52).	Regulation requires 3 times/ year inspections at some gas plants, compressor stations and controlled tanks once per year at other sites, and no inspections at wells.	Needs major improvement	Increasing the inspection frequency at all facilities except for single well-head sites to three times per year.
	4.2. Comprehensive inspections that apply to all sources with the potential to leak, unintentionally vent or abnormally operate.	Federal regulation requires LDAR inspections on all sources including thief hatches and pneumatic devices.	Regulation requires LDAR inspections on all sources including thief hatches and pneumatic devices.	Follows best practices	
	4.3. Include robust alternative compliance pathway that allows for the use of emerging technologies that are as effective in reducing emissions as allowable instruments and subject to public input and regulatory review.	Federal regulation establishes robust alternative compliance pathway (Sections; 29; 35; 50).	Regulation includes an Alternative Fugitive Emissions Management (Section 8.10.6).	Follows best practices	
5. Record keeping, reporting and measurement.	5.1 Include robust, detailed, site-specific record keeping provisions, demonstrating compliance with each of the mandatory methane reduction measures.	Federal regulation requires comprehensive site level record keeping by source type (Sections 6; 7; 10; 12; 19; 25; 27; 36; 38; 45; 48; 51; 53; 56).	Regulation requires site level records and calculations by source type but doesn't require records from individual venting sources.	Needs minor improvement	Require records from venting by detailed source category.
	5.2. Require annual public reporting demonstrating compliance.	Federal regulation doesn't require annual public reporting demonstrating compliance.	Regulation requires reporting for venting and fugitives, but no comprehensive report and no commitment to making reports public.	Needs major improvement	Include comprehensive reporting and a requirement to make reports public.
	5.3. Reliable measurement requirements.	Federal regulation establishes reliable measurement requirements (Section 15, 16 and 17).	Regulations set measurement requirements but have not addressed known flaws in estimation of solution gas venting.	Needs major improvement	Improve protocols for measurement of solution gas venting.



# Comparing Saskatchewan and Federal Oil and Gas Methane Emissions Regulations

## A FACT SHEET FOR POLICY-MAKERS

“Saskatchewan has chosen an outcome-based regulatory approach that doesn’t follow best practices for managing methane emissions.”

This fact sheet presents the results of a comprehensive review comparing Saskatchewan rules to federal regulations. Saskatchewan finalized their methane regulations in late 2018.

Saskatchewan has chosen an outcome-based regulatory approach that doesn’t follow best practices for managing methane emissions. It ignores sources accounting for 40% of the province’s methane emissions including pneumatics, compressors, and leaks. However, they have targeted their largest source of emissions – venting and flaring from oil facilities. Saskatchewan’s outcome-based approach gives

operators flexibility in finding the most cost-effective reductions. For this approach to succeed, the province needs to implement accurate and detailed measurement and reporting along with strong enforcement.

Using five key areas of methane oil and gas regulation best practices, we compared Saskatchewan’s rules to best practices. This comparison identifies improvement opportunities that could be implemented to align with such practices in order to meet the level of ambition set out by the federal regulation.

Key Aspects	Best Practices	Federal Regulation	Provincial Regulation	How it Compares	Improvement Opportunity
1. Achieves ambitious methane emission reductions across multiple segments of the oil and gas sector and from all significant emission sources, new and existing.	1.1. Mandatory, performance-based standards.	Federal regulation establishes mandatory performance-based standards.	Outcome based regulation sets gas conservation limit by for oil facilities by region but doesn’t update outdated measurement and reporting systems.	Needs major improvement	Strong measurement and reporting standards are required for outcome-based regulations to succeed. Known flaws in measurement of solution gas venting have not been addressed.
	1.2. Effectively targets largest emissions sources.	Federal regulation effectively targets largest emission sources.	Regulations target venting from oil production, which is Saskatchewan’s largest source of methane emissions.	Needs minor improvement	Include rules on pneumatics for new facilities.
	1.3. Limited, and clearly circumscribed, exceptions.	Federal regulation establishes limited and clearly circumscribed exceptions maintaining strict limits for the largest emissions sources.	SK regulation includes exceptions allowing the government to set emission factors, waive payments, and allow business associates to merge.	Needs major improvement	These exceptions will have a large impact on the effectiveness of the regulation that are difficult to quantify.

2. Reduce designed and intentional venting from pneumatics and compressors.	2.1. Engineer and design new pneumatic devices and pumps to be zero or near zero emitting (e.g. use electricity or instrument air in lieu of natural gas as power source).	Federal regulation sets venting limits for new devices. (Section 37.1) No emissions are allowed from new pneumatic pumps (Section 39.1) with exceptions for infrequently used pumps.	Regulation doesn't set rules for new pneumatic devices or pumps.	Needs major improvement	Require new pneumatic pumps and devices to be non-emitting or controlled.
	2.2. Retrofit existing pneumatic devices and pumps to be zero or near zero emitting (e.g. replace high-bleed pneumatic devices with low or zero-bleeds).	Federal regulation sets a venting limit for existing pneumatic devices (Section 37.1) and requires no emissions from existing pneumatic pumps with exceptions for infrequently used pumps (Section 39.1).	Regulation doesn't set rules for existing pneumatic devices or pumps.	Needs major improvement	Set venting limits for existing pneumatic devices and pumps.
	2.3. Reduce intentional venting from compressors.	Federal regulation establishes a venting limit for compressors that is ambitious and aims to reduce intentional venting (Section 18 and Section 50).	Regulation doesn't set rules for venting from compressors.	Needs major improvement	Set venting limits for new and existing compressors.
3. Reduce venting and flaring from storage tanks and oil wellheads.	3.1. Reduces venting of gas from tanks.	Federal regulation establishes an annual venting limit for facility that is ambitious and aims to reduce venting of gas from major sources including tanks.	Regulation sets a limit on the percentage of vented gas that must be conserved or destroyed by region.	Needs minor improvement	A site venting limit is more efficient than a conservation requirement because it doesn't target the smallest emitters.
	3.2 Reduce venting of gas from oil wellheads <sup>1</sup> .	Federal regulation sets an annual venting limit for facility that is ambitious and aims to reduce venting of gas from major sources including solution gas venting.			
	3.3. Limit flaring of gas; only allow where capture is infeasible.	Federal regulation doesn't establish a requirement limiting flaring of gas	Regulation promotes conservation of gas and doesn't consider flaring as an acceptable alternative (Directive S-10. Section 3 and 4).	Follows best practices	
	3.4. Require use of high efficiency flares and combusters.	Federal regulation doesn't establish a requirement to use high efficiency flares but points out to follow provincial rules (Section 9) which don't require the use of high efficiency flares.	Regulation makes mandatory that all allowed flaring should be conducted with efficient flares encouraging the use of incinerators with a conversion efficiency of more than 99% (Directive S-20. Section 3.3).	Needs major improvement	Require a 98% destruction and reduction efficiency of flare and combustion.
4. Regular leak detection and repair (LDAR).	4.1. Quarterly inspections of well sites, gas processing plants, compressor stations, tank batteries.	Federal regulation requires inspections three times per year for all but single well heads (Sections 30 (3); 52).	The regulation doesn't have any leak detection and repair requirements.	Needs major improvement	Require comprehensive leak surveys at all facilities three times per year.
	4.2. Comprehensive inspections that apply to all sources with the potential to leak, unintentionally vent or abnormally operate.	Federal regulation requires LDAR inspections on all sources including thief hatches and pneumatic devices.	The regulation doesn't have any leak detection and repair requirements.	Needs major improvement	Require comprehensive inspections that apply to all sources.
	4.3. Include robust alternative compliance pathway that allows for the use of emerging technologies that are as effective in reducing emissions as allowable instruments and that is subject to public input and regulatory review.	Federal regulation establishes robust alternative compliance pathway (Sections ; 29; 35; 50).	The regulation doesn't have any leak detection and repair requirements.	Needs major improvement	Include alternate compliance pathways.
5. Record keeping, reporting and measurement	5.1 Include robust, detailed, site-specific record keeping provisions, demonstrating compliance with each of the mandatory methane reduction measures.	Federal regulation requires comprehensive site level record keeping by source type (Sections 6; 7; 10; 12; 19; 25; 27; 36; 38; 45; 48; 51; 53; 56).	Regulation does not require any record keeping on methane emissions from venting or other sources.	Needs major improvement	Require detailed record keeping for all sources of methane emissions.
	5.2. Require annual public reporting demonstrating compliance.	Federal regulation doesn't require annual public reporting demonstrating compliance.	Regulation requires no public reporting of methane emissions.	Needs major improvement	Include comprehensive reporting and a requirement to make reports public.
	5.3. Reliable measurement requirements.	Federal regulation establishes reliable measurement requirements (Section 15, 16 and 17).	Regulations set measurement requirements but have not addressed known flaws in estimation of solution gas venting.	Needs major improvement	Improve requirements for measurement of solution gas venting.