Alberta
Upstream Petroleum Research

PTAC PETROLEUM TECHNOLOGY ALLIANCE CANADA

Project Summary, Milestones, Payment Schedule and Quarterly Update Reports

Report Date (Q4, January 1 – March 31st, 2024)

Project Summary

Project Title:	Verified Methane Reductions: Leveraging Measurement-Based Methane Inventories to Quantify Reductions Trends and Prove Methane Intensities
Lead Investigator:	Matthew Johnson, Carleton University
AUPRF Managed Funds Award Amount:	$150,000
PTAC Technical Champion:	
GL #:	
Project Total Cost (all years)	$3,230,000
Leveraged Cash Funding (all years)	
Leveraged In-Kind Funding (all years)	$3,080,000
Start Date:	July 1st, 2023
Completion Date:	December 30th, 2024
Final Report Due Date:	December 30th, 2024

Provide a brief description of the challenges this project aims to address and how industry and others will benefit including what the anticipated impact is. (i.e., cost reductions, improved environmental performance, impact on regulation, enhanced access to resources). (Maximum 150 words or less)

This project addresses critical gaps in current federal methane emission inventories, that rely on broad estimates rather than direct measurements and consistently underestimate methane emissions, impeding mitigation efforts. Leveraging primary funding from NRCan, BC Government, and

UNEP IMEO, this project will provide unprecedented insight into the major methane emissions sources, inventories, and up-to-date methane emission intensities. Results will deliver the best possible information on methane emissions to drive cost-effective mitigation and evidence-based decisions. This work is expected to help define more efficient and informed regulatory strategies to reduce oil and gas sector methane emissions as required to meet 2030 targets. Most notably, the type of independent measurement, reporting and verification (MRV) developed in this project is increasingly a requirement for accessing international markets and the approaches and technical capacity developed in this work are essential for maintaining the continued competitiveness of Canada's oil and natural gas sectors.

The anticipated benefits of this project include economic benefits of potential cost savings and environmental benefits stemming from achieving emissions reductions and Canada's climate goals. Operationally, the project will offer clear mitigation opportunities, position industry plan for and pursue international standards like OGMP2.0, and subsequently, enhance competitiveness in global markets.

List key milestones with invoicing schedule. Include quarterly estimates.

	Milestone	Expenditures[1]	Fiscal Quarter[2]
1	Aerial GML Surveys in BC, AB, SK and Ground-based measurements in BC	Leveraged in-kind	Q3 2023-24
2	Aerial Source Attributions	Leveraged in-kind	Q3 and Q4 2023-24
3	Synthesis of results to produce a comprehensive source-resolved, measurement-based methane inventory with robustly defined uncertainties	$75,000	Q1 2024-25
4	Source-level Analysis and Comparison with Federal Inventories	$25,000	Q2 2024-25
5	Updated Methane Emissions Intensities and Trends in Western Canada	$50,000	Q2 2024-25
6	Reporting and Dissemination	Leveraged in-kind	Q3 2024-25
	Total	$150,000	

[1] All expenditures in Canadian dollars and must exclude GST and other applicable taxes

[2] Quarters are based on fiscal calendar e.g., Q1 Apr 1 – Jun 30, Q2 Jul 1 – Sept 30, Q3 Oct 1 – Dec 31, Q4 Jan 1 – Mar 31.

Quarterly Update

Exception Highlight for the Quarter:
(any exceptions to the original project scope, timelines, payment schedule OR early significant findings) – this can be left blank if no changes are needed, and do not include exceptions already reported

1.
2.

Update on scope, key questions, gap analysis and work performed this quarter (include any requests for assistance to PTAC or the committees)

Updates for this Quarter

The project remains nearly on schedule despite forest fire related delays in completing flights during fall of 2023 and subsequent delays in receiving initial processed data to start our analysis. Manual source attribution analysis has now been completed of all flights and reflights in Saskatchewan and British Columbia. Final aerial data for Alberta was received on February 14, 2024, and manual attribution work is currently underway and expected to continue through Q1 (June 2024).

Saskatchewan

A preliminary measurement-based, 2023 upstream oil and gas methane inventory for Saskatchewan has now been completed as summarized in Figure 1 and Figure 2. In 2023, measurements were completed at 4100 distinct sites, which comprised 5126 active facilities, 6525 active wells, 250 inactive facilities, and 399 inactive wells (based on Petrinex reporting data at the time of the flights or active facility lists for non-reporting entities cross-checked with aerial imagery). This was a substantial increase over the 2538 and 2384 sampled sites in 2021 and 2020 respectively. Notably, as indicated in Figure 1, the 2023 survey included coverage of gas wells in the southwest of Saskatchewan that were not previously surveyed due to budget constraints. These facilities were conservatively assumed to be zero emitting in 2020 and 2021, but contributed approximately 4% to the total Saskatchewan inventory in 2023.

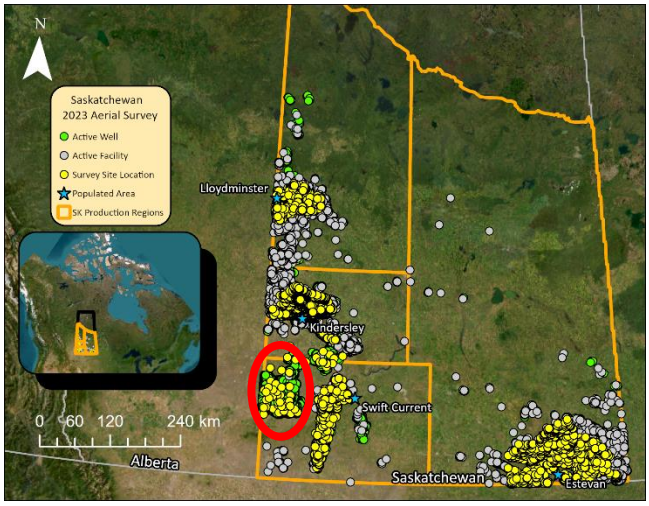

Figure 1: Map of Saskatchewan 2023 surveyed sites (yellow) overlaid on acitive facilities and wells. Red circled region indicates region of predominantly gas wells not included in prior 2021 and 2020 surveys due to budget constraints.

The preliminary methane inventory total for 2023 is 431 kt_{CH4}. Note however that this total could yet vary slightly as final uncertainty analysis is completed in the coming months, including specific work to better constrain the influence of wind uncertainty on the calculations. Correcting the previous inventory totals to include scaled contributions from gas wells, results in the higher past totals shown in the figure. With these updated past totals, methane emissions have nominally decreased by 17% since 2020 although this difference is still within the overlapping error bars. However, while encouraging, preliminary methane intensity calculations also show that although Saskatchewan intensities are similarly improving, they remain well above international standards.

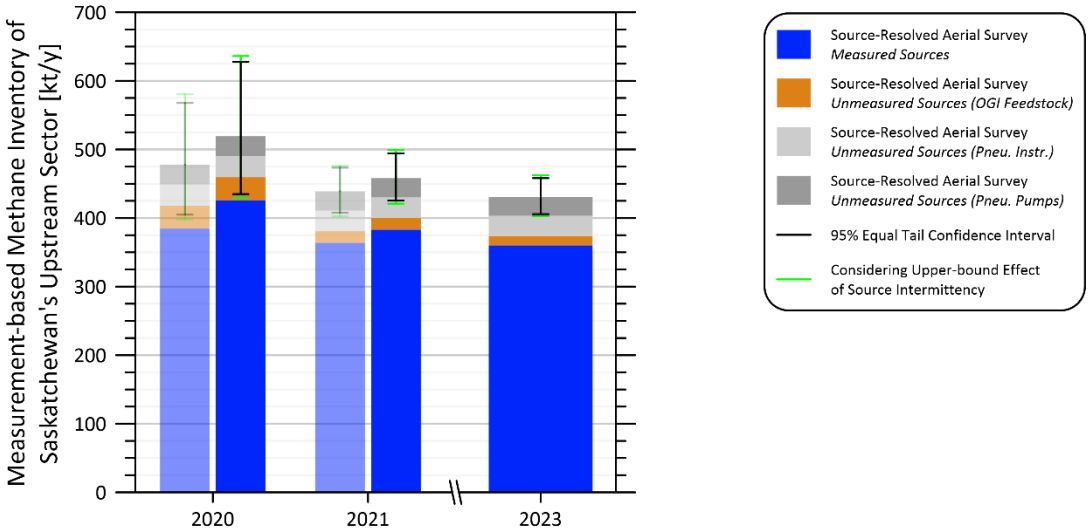

Figure 2: Comparison of preliminary Saskatchewan 2023 measurement-based upstream oil and gas methane inventory results with published and updated inventory results for 2020 and 2021 where the latter are updated to include scaled contributions from gas wells in the region indicated in Figure 1 that were previously conservatively assumed to be zero emitting.

Alberta

As noted above, final aerial data for Alberta was received on February 14, 2024, and manual attribution work is currently underway and expected to continue through Q1 (June 2024).

British Columbia

Preliminary inventory calculations for BC are nearly complete and are tracking to show substantial achieved reductions since 2021. Further analysis will continue through the next quarter as scheduled.

Direct and Indirect Reporting and Dissemination

A detailed presentation of progress was made to the PTAC ARPC on January 25, 2024 with further presentations to the BC Government on January 31, 2024, the Saskatchewan Government on April 10, 2024, and the Alberta Government on April 15, 2024. A listing of notable direct and indirectly related dissemination activities is as follows:

- M.R. Johnson (2024) Collaborative Measurement Reporting & Verification (MRV) to Drive Mitigation, *Invited presentation to PTAC Methane Leadership Summit*, Banff, Alberta, April 17–18.
- M.R. Johnson (2024) Methane from oil and gas - improving reporting using atmospheric data,

World Meteorological Organization (WMO) Integrated Global Greenhouse Gas Information System (IG3IS) Spring Webinar Series (Invited), April 24.

- M.R. Johnson (2024) Measurement-Based Methane Inventories & Intensities Using Source-Resolved Aerial Data & Robust Analytics, *Invited presentation at Global Methane Forum*, Geneva, Switzerland, March 18–21.
- M.R. Johnson (2024) Measurement-Based Methane Inventories & Intensities Using Source-Resolved Aerial Data & Robust Analytics, *Invited presentation at United Nations Environment Programme International Methane Emissions Observatory (UNEP IMEO) Oil & Gas Methane Partnership (OGMP 2.0) Workshop*, Madrid, Spain, February 28–March1.
- M.R. Johnson (2024) Measurement-Based Oil and Gas Methane Inventory Updates, *Invited Presentation to Alberta Government / Alberta Environment and Protected Areas/ Alberta Energy Regulator*, April 15.
- M.R. Johnson (2024) Measurement-Based Oil and Gas Methane Inventories for Saskatchewan, *Invited Presentation to Saskatchewan Government / Saskatchewan Ministry of Energy and Resources*, April 10.
- M.R. Johnson (2024) British Columbia 2023 Methane Census: Creating Measurement-Based Methane Inventories: Combining Aerial and Ground Measurements to Determine Origins, Occurrence Rates, and Sampling Protocols for of Oil and Gas Sector Methane Sources, *Invited Presentation British Columbia Energy Regulator (BCER)*, January 31.
- M.R. Johnson (2024) A National, Measurement-Based, Upstream Oil and Gas Methane Census, *Invited Presentation to PTAC Air Research Planning Committee (ARPC)*, January 25.

Planned next steps:

Despite the challenges and delays in completing the aerial surveys near the end of 2023 and subsequent late receipt of initial data for processing, the Project is still currently on track to complete provincial methane inventories for all three Western provinces. The key next steps include:

- Manual source attribution analysis for all completed flights in Alberta
- Synthesis of results to produce a comprehensive source-resolved, measurement-based methane inventory with robustly defined uncertainties for each province
- Convergence analyses to test the sufficiencies of sample sizes in defining uncertainties
- Source-level analysis and comparison with federal inventories
- Updated methane emissions intensities and trends in Western Canada
- Continued reporting and further real-time dissemination of results as available.

Budget Summary Update

Revenues and Expenditures	Total Budget	Budget to date	Project charges this quarter	Project charges to date	Variance of budget to actuals to date	Forecasted Total Project (no. of quarters of actual plus	Variance of total budget to forecast
Funds received And from whom							
Expenses							

Please refer to the financial quarterly report signed by Nada Haralovich and submitted by Melanie Thompson for a complete Budget Summary.

Variance analysis (includes changes to invoicing schedule)
1.
2.

TOTAL PROJECT VALUE $3,230,000
(Value equals the total funds committed to date for all years)

1st Year Funding $

Confirmed Funders:					
NRCan	$2,000,000	AEP	$	CanERIC	$
NSERC	$	ADOE	$	ERA	$
TIER	$	CRIN	$	AUPRF	$150,000
MITAC	$	AMEP	$	Other (BC, UNEP IMEO)	$1,080,000 (all years)

2nd Year Funding $

Confirmed Funders:					
NRCan	$	AEP	$	CanERIC	$
NSERC	$	ADOE	$	ERA	$
TIER	$	CRIN	$	AUPRF	$
MITAC	$	AMEP	$	Other (BC, UNEP IMEO	$

3rd Year Funding $

Confirmed Funders:					
NRCan	$	AEP	$	CanERIC	$
NSERC	$	ADOE	$	ERA	$
TIER	$	CRIN	$	AUPRF	$
MITAC	$	AMEP	$	Other	$

4th Year Funding $

Confirmed Funders:					
NRCan	$	AEP	$	CanERIC	$
NSERC	$	ADOE	$	ERA	$
TIER	$	CRIN	$	AUPRF	$
MITAC	$	AMEP	$	Other	$

5th Year Funding $

Confirmed Funders:					
NRCan	$	AEP	$	CanERIC	$
NSERC	$	ADOE	$	ERA	$
TIER	$	CRIN	$	AUPRF	$
MITAC	$	AMEP	$	Other	$