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Learnings from the Alberta Methane Emissions Program (AMEP)

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Summary

In 2015, the Government of Alberta directed the Alberta Energy Regulator (AER) to develop requirements to reduce methane emissions from upstream oil & gas operations by 45%, relative to 2014 levels, by 2025. This led to the development of Directive 060: Upstream Petroleum Industry Flaring, Incinerating, and Venting, which came into effect on January 1, 2020. Directive 060 requires an operator to develop a Fugitive Emissions Management Program (FEMP), including implementing a Leak Detection and Repair (LDAR) program.

Regulatory compliance of FEMPs requires using approved methods and technologies, typically United States Environmental Protection Agency (EPA) Method 21 or optical gas imaging (OGI) cameras.[1] The last decade has seen explosive growth in the number of available methane detection technologies and solutions. Many of these new solutions have the potential of achieving equivalent or better emission reductions, but demonstrating equivalency remains a challenge.[2,3]

Several studies have evaluated the detection capabilities of these new technologies.[2–5] Although the majority of these technologies can detect the presence of an emission event, localization and quantification remain a challenge[2].

The Alberta Methane Emissions Program (AMEP) is a three-year $17.6 million funding program designed to enable diverse stakeholders to participate in a comprehensive, collaborative, and multi-faceted effort to deliver cost-effective and credible methane emissions reductions from Alberta's oil and gas industry. The AMEP will support government regulatory revisions and assure best practices regarding methane detection and management. There are three key components to the AMEP:

- Alternative Fugitive Emissions Management Programs (Alt-FEMPs)
- Technology Development Trials
- Data Management and Analytics

This presentation will discuss some of the key learnings and challenges from the AMEP and where the program is focused for 2023.

Workflow - Data

It is not an overstatement to say the data management and analytics component of the AMEP underpins the entire program. As such, a significant amount of effort has been spent on stakeholder engagement and alignment with existing methane data standards and protocols. Figure 1 below provides an overview of the AMEP data architecture.

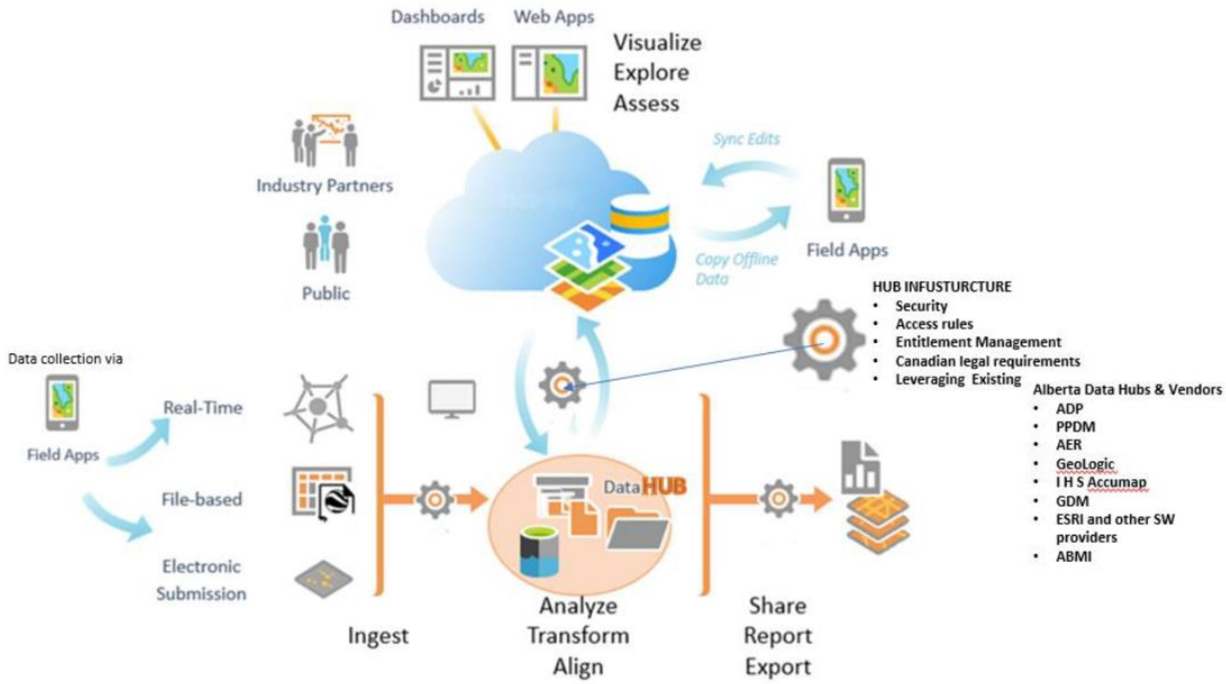


Figure 1: High-level data architecture for the AMEP

Observations – Alt-FEMPs

As part of the AMEP, prospective participants can apply for retroactive Alt-FEMP funding, covering up to 50% of eligible Alt-FEMP costs. This has provided the AMEP with critical insights into real-world Alt-FEMP performance and challenges, which will be used to inform regulations and best practices.

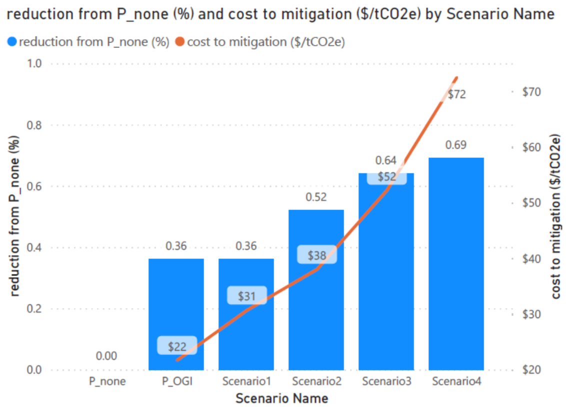
One of the challenges has been that of unstandardized data formats and reporting methods. Data on methane emissions comes in various forms, covering large spatial and temporal ranges and diverse data products. There are currently many commercially available technologies for measuring methane emissions. Since there is no standardized method for collecting and reporting data, each of these technologies results in unique data that makes it challenging to compare and interpret data collected from different regions, scales, times, or technologies.

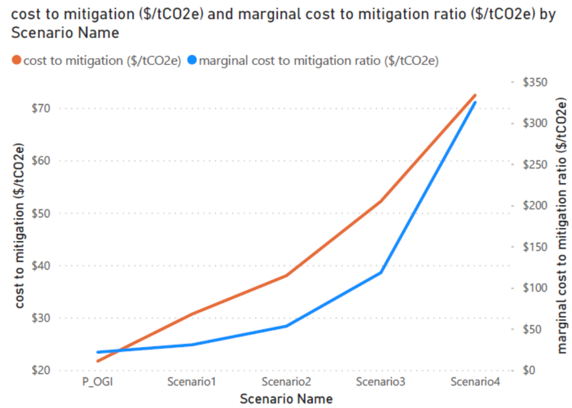
To address this challenge, the AMEP team consulted with regulators, industry, non-profits, innovators, solution providers, and researchers to find the common threads and themes for an efficient data collection and dissemination program. These consultations led to the development of several data tables related to the Alt-FEMP activity lifecycle.

Another challenge that emerged was the lack of an evaluation framework – how do we measure Alt-FEMP performance? AMEP utilizes in-house expertise in simulation modelling, specifically LDAR-Sim, to compare program performance to predicted performance. As operators and regulators commonly use simulation models to determine which technologies to use, optimize work practices, demonstrate equivalency, and forecast program costs, assessing a model's validity is imperative. To address this, the AMEP team, in consultation with third parties, is developing an LDAR-Sim validation framework to guide future validation of emissions forecasts and Alt-FEMP performance.

Novel/Additive Information

Currently, the Alberta Energy Regulator (AER) is in the process of reviewing its existing methane regulations in light of the newly proposed federal target of reducing methane emissions by 75%.[6] The AMEP used LDAR-Sim to simulate several policy scenarios and methane technology work practices to inform policy-makers.





Scenario Name	mean daily emissions (kg/day/site)	reduction from P_none (%)	cost/site/year	cost to mitigation ($/tCO2e)	marginal cost to mitigation ratio ($/tCO2e)	value of natural gas sold ($7 CDN/GJ)
Scenario4	3.11	0.69	$5,100	$72.48	$325.34	$3,430,469
Scenario3	3.66	0.64	$3,400	$52.19	$118.24	$3,175,737
Scenario2	4.85	0.52	$2,038	$38.01	$53.29	$2,614,404
Scenario1	6.50	0.36	$1,111	$30.67	$30.67	$1,766,057
P_OGI	6.51	0.36	$784	$21.68	$21.68	$1,763,590
P_none	10.11	0.00	$0			

<u>**Scenarios:**</u>
P_none (baseline): no LDAR
P_OGI (reference): current regulations (80% internal LDAR)
Scenario 1: Appendix K training required. No change to survey frequency (30% internal LDAR)
Scenario 2: Appendix K training required. Minimum 2x/year for annual. Quarterly for triannual (30% internal LDAR)
Scenario 3: Appendix K training required. Quarterly for all licensed facilities (30% internal LDAR)
Scenario 4: Appendix K training required. Bi-monthly for all licensed facilities (30% internal LDAR)

References

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3. Ravikumar, A. P., Singh, D., Barlow, B., Robinson, C. & Funk, W. Alberta Methane Field Challenge. 63 (2020).
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5. Zimmerle, D. *et al.* Detection Limits of Optical Gas Imaging for Natural Gas Leak Detection in Realistic Controlled Conditions. *Environ. Sci. Technol.* **54**, 11506–11514 (2020).
6. Canada, E. and C. C. Canada confirms its support for the Global Methane Pledge and announces ambitious domestic actions to slash methane emissions. https://www.canada.ca/en/environment-climate-

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