



HIGHWOOD
EMISSIONS MANAGEMENT

The Role of Methane Measurement Technology in a Low-Carbon World

October 12th, 2021

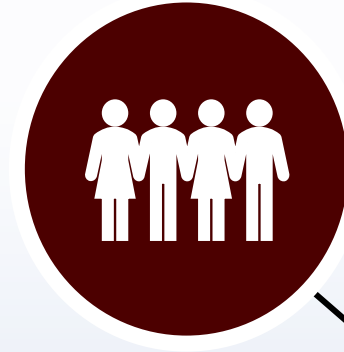
Thomas Fox, PhD
President

Mission Statement

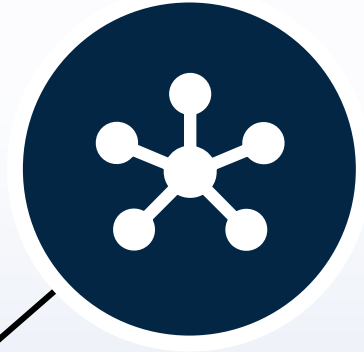
Working with industry, government, and innovators around the world, we leverage data, analytics, knowledge, and experience to optimize emissions management.

Our mission is to **collaborate**, **innovate**, and **educate** our way to a world with effective and affordable emissions reduction solutions.

Collaborate



Innovate



Educate

How can industry demonstrate excellence?

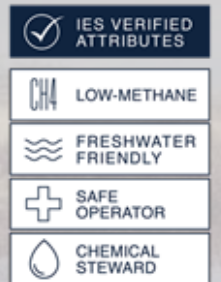




CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS



EQUITABLE ORIGIN



OIL AND GAS CLIMATE INITIATIVE



Certifications

Commitments

Guidelines for Emissions Reduction Initiatives

ESG ratings

for Responsibly Sourced Oil and Gas

Collaborative effort!



Highwood Emissions Management is pleased to present the first comprehensive effort to systematically compile and evaluate a broad range of voluntary emissions reduction initiatives for the oil and gas industry

We describe and compare 20 voluntary initiatives, introduce new concepts and categories, establish a glossary, and report on a range of important key findings, knowledge gaps, and recommendations. Our analysis seeks to include all voluntary initiatives in the oil and gas industry that relate to emissions management performance. Unintentional omissions are possible. Legal requirements and carbon markets are out of scope.

We anticipate that this report will contribute to growing efforts to enable the production and sale of responsibly sourced oil and natural gas.

Please reach out with your feedback, thoughts, or suggestions – we will listen earnestly as we continue to build and evaluate the systems that reward industry for strong emissions performance.



Thomas Fox, President Highwood Emissions Management



Key Knowledge Gaps

The Highwood Emissions Management 2021 voluntary initiatives report for the oil and gas sector has revealed a number of important knowledge gaps.

These unknowns, listed below, present industry, researchers, governments, and other stakeholders with opportunities to improve understanding of voluntary initiatives to improve their effectiveness, credibility, and uptake.

- 1 Voluntary initiative selection**
Given the number and diversity of voluntary initiatives, prospective participants must decide which ones to adopt. However, it remains unclear how to navigate the decision-making process of which voluntary initiative(s) to pursue and which ones to avoid.
- 2 Quantifying benefits of participation**
Most voluntary initiatives claim to "boost investor confidence" but do not provide details. An understanding of the precise value that these programs bring to participants, relative to their costs, would help to inform the decision-making process described above. To date, a robust comparison of the benefits of participation has not been performed. Furthermore, how to compare value remains elusive, as investor confidence and other benefits are difficult to measure. Quantifying benefits could be easier for voluntary initiatives that allow participants to sell differentiated products at a premium.
- 3 Defining transparency and impartiality**
Transparency, impartiality, disclosure, and independence are central themes for many of these initiatives. These concepts are difficult to define, measure, and report, but have important implications for understanding the credibility of different initiatives and to communicate the value they bring.

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Summary of Results

Our comprehensive review and analysis revealed 20 distinct voluntary emissions reduction initiatives that are currently available to the O&G industry.

A broad overview of these initiatives is presented in a series of tables, followed by a set of detailed descriptions of each voluntary initiative. The tables and subsequent descriptions are categorized according to common sets of characteristics that emerged during our research.

Four non-exclusive categories of voluntary initiatives were identified:

- 1. Certifications** hold participants to binding standards and entail an explicit declaration of achievement by an administering organization.
- 2. Commitments** look to the future, requiring participants to pledge towards a goal.
- 3. Guidelines** are a set of frameworks, standards, principles, and/or tools set forth by an organization that can be followed by participants.
- 4. ESG ratings**, like certifications, look at the current state of an organization, but differ because they do not provide a declaration of achievement. Instead, ESG ratings provide rankings or scores, typically based on self-reported performance in a questionnaire.

Existing voluntary initiatives were found to differ markedly in how data are acquired, reported, and verified. To better communicate these differences, we developed a novel rating system comprised of 6 disclosure levels.

Key Findings

The Highwood Emissions Management 2021 voluntary initiatives report for the oil and gas sector has revealed a number of important findings.

The key results, listed below, will guide industry, government, investors, and the organizations that administer voluntary initiatives as they work to understand, regulate, participate in, and improve upon these programs.

- 1 Verification via independent auditing is the exception, not the norm**
Only two initiatives – EO100 and MOC – require the use of third-party auditors to verify participant activities and/or performance, through independent on-site measurements. Although additional expense must be incurred to independently audit practices and validate reported data, doing so builds credibility and confidence in the initiative. In other industries (e.g., organic agriculture, fair trade), use of independent audits for certification programs is the norm.
- 2 Voluntary initiatives tend to be broad in geographical and sectoral scope**
Most voluntary initiatives welcome participation from anywhere in the world and cover all stages of the O&G supply chain, including production, gathering, processing, transmission, storage, and distribution. Adopting a broad scope is sensible as it enables widespread participation, diverse membership, and standardization of emissions reduction efforts across dissimilar jurisdictions and sectors.
- 3 Most initiatives are non-prescriptive in terms of technology use**
Most initiatives do not require the use of specific technologies for measurement (e.g., optical gas imaging for methane leak detection and repair) or abatement (e.g., replacing gas-driven pneumatic equipment with electric or air-powered instruments). This gives companies the freedom to reduce emissions in the ways that make the most sense to them, but could make verification more challenging.

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Moving Forward

1. Embrace transparency and disclosure
2. Harmonization of data collection and reporting
3. Quantify and communicate the value proposition
4. Understand investor and end user demands
- 5. Understand role of measurement and technology**

There now exist

100+

methane measurement solutions



KAIROS AEROSPACE



100+



Measurement is the future!

Fugitive emissions

LDAR, FEMP, Alt approvals

Next-gen data analytics

Preventative & predictive strategies

Synergies with abatement

Cost optimization, project identification

Emissions reporting/disclosure

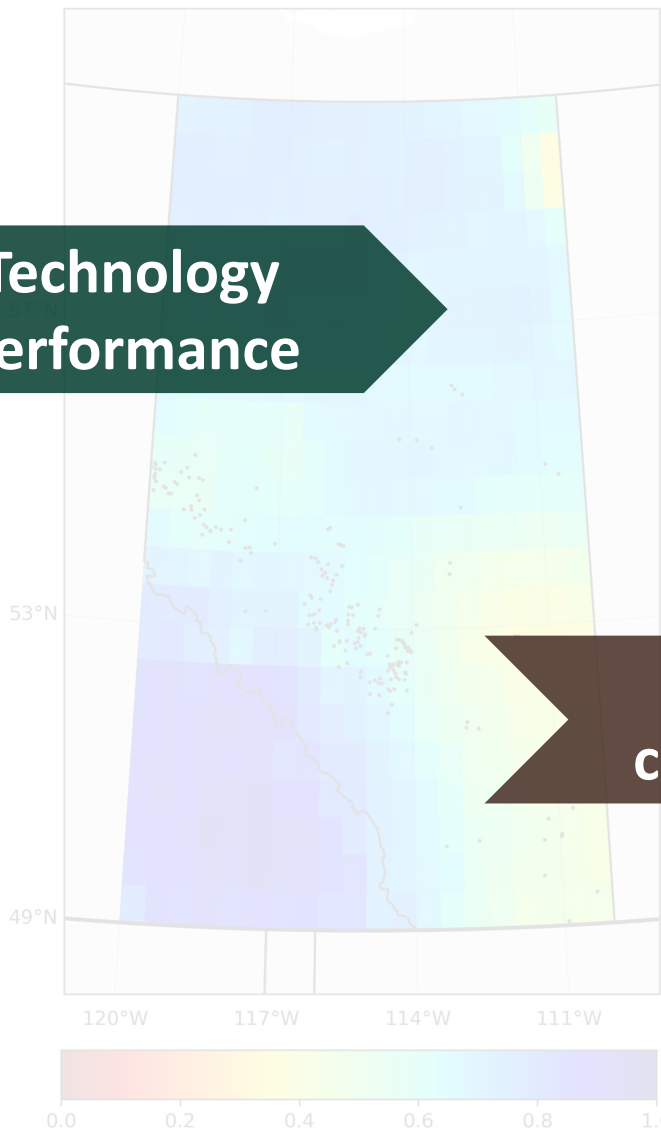
ESG reporting, OGMP 2.0, regulatory reporting

Future carbon markets and taxes

Carbon tax mitigation, fugitive emissions offsets(?)

LDARSIM

Technology Performance



Cost comparisons

