FIRST ANNUAL RESPONSIBLE GAS SYMPOSIUM:
MAJOR THEMES, LESSONS LEARNED AND AREAS FOR FUTURE COLLABORATION

EXECUTIVE SUMMARY:

In early March 2023, the Payne Institute for Public Policy convened the inaugural Responsible Gas Symposium in Golden, Colorado. More than 100 experts and stakeholders from across the spectrum participated in the two-day event, which was held on the campus of the Colorado School of Mines, where the Payne Institute is based.

This report summarizes some of the major themes of discussion and lessons learned during and after the symposium, amid increasingly urgent domestic and international efforts to reduce methane emissions from all sectors of the economy, including the oil and natural gas industry.

Methane, the primary constituent of natural gas, is a powerful greenhouse gas which traps 80 times as much heat as carbon dioxide over a 20-year timeframe. However, methane’s high global warming potential also means that targeted short-term reductions of this greenhouse gas can deliver major environmental benefits at a minimal cost.

Colorado is uniquely positioned to inform and influence these efforts, because it was the first U.S. state to directly regulate methane emissions from the oil and natural gas industry. These regulatory efforts, which started almost a decade ago and have grown more comprehensive and stringent since then, have contributed to the Biden Administration’s domestic and international agenda for aggressively reducing methane emissions between now and 2030.

As recognized by both U.S. and European Union officials, short-term methane reductions are “the fastest way to reduce near-term warming and is necessary to keep a 1.5°C temperature limit within reach,” while at the same time delivering “significant energy security, food security, health, and development gains.”

To inform the policy debate over reducing U.S. and global methane emissions, and to foster continued collaboration between stakeholders on this critical subject, the Payne Institute has produced a summary of the discussions held at the first annual Responsible Gas Symposium. Among the major themes that emerged over the course of the two-day event:

I. Colorado is both a national and a global leader on the responsible production of natural gas. It has an almost 10-year head start on other U.S. states and even the federal Environmental Protection Agency, which has used Colorado’s regulations on methane reduction as the blueprint for federal action and a foundation for international engagement on this pressing environmental challenge.

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II. If regulations similar to those implemented in Colorado are broadly adopted across other oil and gas producing states, the U.S. has an opportunity to make a meaningful impact on climate change and become the European Union's long-term preferred supplier of natural gas. Beyond the economic and environmental opportunities this presents, the U.S. energy sector can also support the EU’s long-term security and climate change goals in the aftermath of Russia's invasion of Ukraine.

III. Colorado’s process for developing new oil and gas regulations – which has emphasized collaboration among government, industry, regulators, environmental and other stakeholders – may be a useful model for federal and state regulatory proceedings that will allow the U.S. oil and gas sector to maintain long-term access to Europe and other export markets.

IV. Scaled-up research efforts to improve measurement and accounting of methane emissions from the oil and gas sector are urgently needed. In particular, modeling and data science solutions can remove much of the complexity and potential confusion around how to track progress towards methane and other greenhouse gas reduction goals.

To this end, the Energy Emissions Modeling and Data Lab (EEMDL) – a partnership between the University of Texas at Austin, the Colorado School of Mines and Colorado State University – is developing tools to convert real-time monitoring data, aerial surveys, satellite imagery and other measurements into useful information such as measurement-informed inventory estimates or emissions intensities.

V. Private market solutions for responsibly produced and certified natural gas are providing a valuable economic and reputational incentive for oil and gas producers to go further than regulations require, now and in the future. However, the lack of standards and variability of these different programs is creating confusion among markets, buyers, producers, government, and non-government stakeholders.

Therefore, to eliminate potential disruption and enable further growth, there is an urgent need to establish clear standards and transparency across these increasingly discriminant markets. This is increasingly clear given emerging technological capabilities and the introduction of new local, state, federal and international regulatory requirements. To enable the development of performance benchmarks that will provide differentiated products the basis from which to compete, the Payne Institute will advance a separate stakeholder initiative to promote standards for responsibly produced natural gas markets in the coming months.
INTRODUCTION:

In early March 2023, the Payne Institute for Public Policy convened the first annual Responsible Gas Symposium on the campus of the Colorado School of Mines in Golden, Colorado. The two-day event brought together academic, industry, government, and non-profit leaders to discuss the rapidly evolving set of technologies, practices and standards which are being used to reduce emissions in the energy sector, and in particular, methane emissions. In total, 111 experts and stakeholders gathered in person to participate in the event.

While the volume of methane released every year is much lower than the volume of carbon dioxide, methane traps about 80 times more heat over a 20-year period. Therefore, national and international efforts to curb methane emissions from oil and gas production, agriculture, landfills, coal mines and other sources are ramping up.

For example: In 2021, the United States and the European Union launched the Global Methane Pledge, which aims to cut methane emissions 30% by 2030. Today, 150 nations have endorsed this goal, which U.S. and EU officials have said “is the fastest way to reduce near-term warming and is necessary to keep a 1.5°C temperature limit within reach,” while at the same time delivering “significant energy security, food security, health, and development gains.”

The symposium was a project of the Responsible Gas Initiative at Mines, which is focused on the challenges and opportunities related to natural gas in a low-carbon economy. The initiative is led by an interdisciplinary team of experts from across Colorado School of Mines, with expertise in public policy, engineering, environmental protection, economics, statistics, and computer science.

In order to promote an open dialogue and collaboration, the symposium was organized under the Chatham House Rule, which prohibits the direct attribution of comments to any individual participant. This report provides a high-level synthesis of the major themes of discussion and lessons learned, both during the symposium and in follow-up communications with participants, as prepared by the staff of the Payne Institute.

Therefore, this report is not presented as a consensus document or an exhaustive account of all the individual views offered during and after the two-day symposium. Rather, the report reflects the observations of Payne Institute staff who facilitated these discussions and continue to engage with stakeholders across the spectrum. New developments that have occurred since the in-person symposium have also been included where relevant. Overall, the objective of this report is to inform continued dialogue and collaboration on the topic of responsible natural gas production on state, national and international levels.

I. Colorado’s Global Leadership on Responsible Gas Production

The Responsible Gas Symposium devoted significant time to the regulatory framework and industry practices that apply to oil and natural gas development in Colorado, and the influence they have on national and international efforts to reduce methane and other greenhouse gas emissions from the energy sector.

Colorado is widely viewed as the leader in oil and gas regulation, industry best practices and the technologies that support those regulations and practices. Almost a decade ago, Colorado became the first U.S. state to regulate methane emissions from oil and gas production, and since then, new state laws and regulations have provided additional protections and oversight in many other areas, including public health and safety, water quality, local air quality, wildlife protection and community engagement.
In large measure, this comprehensive regulatory framework can be explained by a convergence of factors over the past 10 to 15 years that are unique to Colorado. Those factors include: Rapid population growth in the vicinity of the state’s largest oil and gas producing basin; federal ozone nonattainment in the Denver metropolitan area, public concern over climate change and its impact on the state’s snowpack and other water resources, the work of sovereign Native American tribes in the energy sector; and a citizen-initiated ballot measure process that allows voters to bypass state lawmakers and regulatory agencies to directly impose new mandates on many industries, including oil and gas.

The pressure created by these converging factors has arguably forced Colorado to move further and faster to regulate the environmental and social impacts of oil and gas development than other major oil and gas producing states.

Colorado’s oil and gas regulations and industry practices have proved to be highly influential in other jurisdictions. The most visible example is the Biden administration’s decision to put forward an ambitious set of federal regulations on oil and gas methane emissions.

The Biden administration, through the U.S. Environmental Protection Agency, has proposed methane regulations that it projects will reduce methane emissions from covered oil and gas sources 87% below 2005 levels by 2030. By the middle of next decade, EPA estimates this methane reduction to be the equivalent of reducing U.S. carbon dioxide emissions by 810 million metric tons – or roughly the same amount of CO₂ released by all the nation’s coal-fired power plants in 2020.

The EPA regulations are designed to work in tandem with a new federal fee on methane emissions, which was authorized by the Inflation Reduction Act of 2022. For covered oil and gas production facilities, the new law requires that methane emissions remain below 0.2% of the total natural gas volume sold in order to avoid the fees. The fees can also be avoided when states implement methane regulations that are equally stringent or more stringent than the proposed EPA methane regulation, which is based on requirements that already exist in Colorado.

On its own, the connection between Colorado methane regulations and federal methane regulations is nationally significant in the field of responsible natural gas production. However, this connection has recently taken on global significance as Europe rapidly shift away from Russian natural gas in response to Russia’s invasion of Ukraine.
II. Supported by Colorado Practices, U.S. Natural Gas Can Support Europe’s Long-Term Security and Climate Goals

U.S. exports of liquefied natural gas (LNG) to Europe surged more than 140% in 2022 as a result of the shift away from Russian natural gas. The U.S. is now the top supplier of LNG to the European Union, but continued access to this market will require assurances that stringent methane controls are in place across the entire supply chain.

The European Union is currently setting methane intensity targets for natural gas imports, starting at 0.2% for upstream production. The proposed 0.2% target not only aligns with the benchmark set by U.S. lawmakers and President Biden in the Inflation Reduction Act – it also matches the initial goal of a global industry effort to reduce methane emissions called the Oil and Gas Climate Initiative (OGCI).

OGCI’s members – which include oil and gas producers with an active presence in Colorado – have already reported an average methane intensity of 0.17% on their way to a 2025 goal of being “well below” 0.2%. Likewise, the EU’s proposed methane intensity standard for natural gas imports may also tighten further over time, with the feasibility of such a move to be formally evaluated within six months of the 0.2% standard becoming effective.

On a parallel track, EU officials and the Biden administration are actively exploring actions to limit methane emissions in oil and gas value chains, “including through innovative purchasing frameworks to incentivize the capture of this gas to bring to market,” according to a November 2022 joint statement issued by the Biden White House.

Taken together, these developments put Colorado on the leading edge of methane regulation and responsible natural gas production. The innovations in responsible gas production that started a decade ago in Colorado are both nationally and internationally significant – not just in terms of climate policy, but also in terms of geopolitical and global security.

III. The Role of Collaboration vs. Conflict in the Regulatory Process

Participants at the Responsible Gas Symposium devoted considerable time to the process used to develop oil and gas regulations in Colorado and not just the substantive requirements of those regulations. Overall, the
regulatory process was characterized as primarily collaborative, which helped keep conflict between various stakeholders to a minimum.

Industry organizations and environmental groups have actively been involved in the development of new regulatory requirements for the Colorado oil and gas industry, which has helped to resolve many disagreements over oil and gas development before they escalate. In this manner, Colorado has avoided the kind of statewide ban on natural gas development that was implemented in New York state in 2014, and Colorado continues to be a top-10 oil and gas producing state.

To be sure, there is a diversity of opinion within environmental and industry stakeholders about the Colorado regulatory framework. Some environmental groups continue to push for much more restrictive regulations, while some voices from the oil and gas industry blame the regulations partially or fully for a reduction in state natural gas output of 8.6% between 2020 and 2022. However, for context, 2020 was a record year for Colorado natural gas production and production levels in 2022 were still 7.8% higher than their 2015 level and 13.3% higher than their 2010 level, according to data from the U.S. Energy Information Administration.

For the most part, however, the industry has accepted the stricter regulations and gone further by using Colorado’s regulatory framework as a point of differentiation. State industry representatives routinely refer to Colorado-produced oil and natural gas as “the cleanest molecules in the world.”

The level of collaboration between oil and gas stakeholders in Colorado, however, can be overlooked by external audiences who have not followed the process as closely as those directly involved. Oftentimes, the voices of groups that are not involved in negotiating new regulatory requirements can be amplified over all others, fueling a perception that oil and gas development in Colorado is more controversial than it really is, and that the state is much closer to a New York-style policy outcome than it really is.

IV. An Urgent Need for Standardization and Transparency in Methane Measurement and Accounting

Participants in the international LNG trade told the symposium that characterizing the intensity of methane and other greenhouse gases across the oil and gas supply chain is critically important. However, as of this moment, significant gaps exist in the fields of emissions measurement and accounting due to complexity of these tasks along with the complexity of oil and gas supply chains themselves.

The development of a standard focused on measurement, accuracy, and granularity of emissions monitoring technologies will be of critical importance.

For this reason, the symposium was briefed on a new initiative called the Energy Emissions Modeling and Data Lab (EEMDL) – a cross-institutional partnership between the University of Texas at Austin, the Colorado School of Mines and Colorado State University, which was founded in January 2023.
EEMDL was created to develop user-friendly tools that oil and gas producers, regulators and other stakeholders can use to interpret monitoring data and other real-world measurements into reliable, transparent, timely and decision-useful emissions information, such as measurement-informed emissions inventories that can be used to track progress towards greenhouse gas reduction goals.

Gas buyers will also have perspectives to offer, which will include benchmarks and methodologies for methane intensity, carbon intensity and other environmental attributes.

Historically, emissions inventories have been based largely on assumptions derived from a relatively small number of real-world measurements. These assumptions often take the form of emissions factors, which are applied broadly to estimate the emissions from oil and gas activities at a corporate or industry level, or by geography (i.e., state, national or international).

Recent advances in technology allow for much greater monitoring and measurement of emissions in real time. Measurements done using satellites, aircraft surveys, drone surveys, truck-based surveys, and continuous monitoring systems provide high resolution data that were not available even five years ago. However, with greater monitoring and measurements comes a massive increase in the amount of data collected.

Modeling and other data science solutions are required to convert raw measurements from on-site sensors, drones, aircraft, satellites and other technologies into useful information such as measurement-informed inventory estimates or emissions intensities.

For example: EEMDL will provide standardized tools to interpret measurement data. Thus, irrespective of which technology an operator or a regulator chooses to use, EEMDL’s tools can interpret measurement data to help develop emissions inventories and intensity estimates that are standardized and trusted by the broader universe of stakeholders.

In the future, users will be able to feed raw measurements into generally accepted models which will generate high-quality estimates of how many tons of methane or other greenhouse gases are being emitted.

The use of models to convert raw measurements into emissions inventories is well established in the field of environmental regulation. The EPA, for example, routinely deploys models to prepare inventories for emissions that impact local and regional air quality, such as nitrogen oxides and particulate matter. An example is the Fugitive Emissions Abatement Simulation Testbed (FEAST) model that EPA incorporated into its proposed federal methane regulation.

EEMDL and others will build on these foundations of modeling for methane and other energy sector emissions to help inform industry practices and policy responses to methane mitigation in the oil and gas sector.

The symposium was also briefed on the use of satellites by the Payne Institute’s Earth Observation Group (EOG), which specializes in nighttime observations of lights and combustion sources worldwide, to track gas flaring across the globe.

EOG’s current focus is on deriving products from nighttime Visible Infrared Imaging Radiometer Suite (VIIRS) data from U.S. government weather satellites. It is a member of, and provides data to, the World Bank Global Gas Flaring Reduction Partnership (GGFR). Working with GGFR and OGCI, Payne Institute researchers with the EOG are developing an online platform – the Global Gas Flaring Explorer – to increase transparency and assist the World Bank in demonstrating progress towards its Zero Routine Flaring by 2030 initiative.
While EOG’s current focus in the oil and gas industry is on real-time detection of gas flaring – in which methane is burned to release carbon dioxide – the symposium was told that researchers are exploring how this capability can be used to improve the detection and monitoring of methane emissions as well. For example, when flaring “gaps” are identified, this can indicate a potential change of emissions from carbon dioxide to methane.

As real-time monitors, satellites and other technologies become more commonly used across the oil and gas sector, making sense of the massive amounts of data that are being collected is a major challenge. In addition to university-based research efforts, collaborative discussions convened by the Responsible Gas Initiative and others are critically important.

When leaders in this rapidly evolving field can sit down together and compare notes on the different approaches they are using, it will be easier to track progress towards methane reduction goals at the micro and macro scales – from individual well sites all the way up to the international level.

V. Certified Natural Gas Markets Are Expanding, But Continued Growth May Require Coordination Around Standards

Regulations developed at the state, federal and international level have established the baseline for oil and gas industry actions to control methane emissions. These regulatory requirements are often viewed as generally accepted industry practices. Differentiated markets will require the establishment of a series of benchmarks, above regulatory requirements, that will serve as the baselines from which producers can differentiate their performance.

With this in mind, a number of private entities – anticipating buy-side demand for natural gas that is produced with minimal environmental impacts – have developed responsible gas certification programs. Certification entities such as Project Canary and MiQ provide third-party assessments of natural gas production methods across a range of environmental and social criteria, including methane monitoring and control technologies. If those criteria are met, then natural gas produced from these locations receives Responsibly Sourced Gas (RSG) certification, Independently Certified Gas (ICG) certification or a similar designation depending on the certification entity.

As explained by analysts with Wood Mackenzie: “RSG differs from normally produced natural gas in that producers take extra steps to reduce their carbon footprint, mitigate emissions, and [minimize] environmental and social impacts.”

Entities like Project Canary and MiQ have effectively pioneered a market for differentiated gas, which allows utility companies, LNG buyers and other bulk purchasers of natural gas to procure these differentiated products, sometimes at a premium.

This has provided a mechanism for willing natural gas buyers to move ahead of regulations and align their purchases with private sustainability commitments or other environmental, social and governance initiatives. For example: Utility companies such as Xcel Energy and Tennessee Gas have pursued RSG supply agreements, as have U.S. LNG exporters such as NextDecade.

The market for responsibly produced natural gas is growing rapidly, and its current size is difficult to assess. For context, in early 2022, analysts with Enverus Intelligence Research estimated that 20 billion cubic feet per

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day (Bcf/d) of natural gas – or 18% of the North American gas market – carried an RSG certification of one kind or another.

Later in 2022, S&P Global estimated the size of the RSG market had grown to 26 Bcf/d:

The rapid growth of the responsible gas market has spurred discussion about avoiding the pitfalls of other environmental markets, such as voluntary carbon markets, where a proliferation of different standards and certification entities has arguably undermined consumer and investor confidence.

Based on discussions at the Responsible Gas Symposium, similar concerns about the private market for responsibly sourced gas may be limiting investments in this sector and, by extension, near-term methane emission reductions that go beyond the generally accepted standards set by state, federal and international regulators.

There are open questions about standards and consistency between the protocols used by different certification entities. Similarly, as regulatory standards “catch up” with the criteria established by private certifiers of responsibly produced gas, it is unclear what impact this will have on the voluntary markets that pioneered some of the practices that state, federal and international regulators are now moving to codify.

Private markets for certified natural gas provide a valuable economic and reputational incentive for oil and gas producers to go further than regulations require across a range of environmental and social factors. Given the potential for disruption to those markets, due to inconsistencies between private certification standards or the introduction of stringent new regulatory requirements, the symposium made clear that it is necessary to bring together different stakeholders across the responsible gas producer and buyer sectors to examine what should be the generally accepted benchmarks. The establishment of such benchmarks from which market participants will compete will go a long way toward addressing the identified risks and expand opportunities for these markets to proliferate.

Working as a group, these stakeholders can take proactive steps to minimize the potential for confusion between different certification standards and help ensure that new regulations and benchmarks can work
hand in hand to help grow markets and accelerate methane reduction efforts across global oil and natural gas supply chains.

Finally, we would like to thank all the participants for their time, enthusiasm, and insights. Any errors or misinterpretations of the discussions are solely ours. We welcome comments and edits on this brief synthesis piece. We hope this meeting is the start of a multi-year collaboration and research initiative at the Payne Institute.