

Regulating methane emissions from oil and gas operations in the U.S.

The AAAS EPI Center hosted a panel discussion on September 13, 2021 with panelists:

Howard R. Dieter, P.E., Vice President – Environmental, Health & Safety, Jonah Energy LLC

Kate Konschnik, Director, Climate & Energy Program, Nicholas Institute for Environmental Policy Solutions, Duke University; Senior Lecturing Fellow, Duke University School of Law

Uduak-Joe Ntuk, California State Oil and Gas Supervisor, California Geologic Energy Management Division (CalGEM); California Department of Conservation

Dr. Arvind Ravikumar, Research Associate Professor, Hildebrand Department of Petroleum and Geosystems Engineering, Cockrell School of Engineering, The University of Texas at Austin

Moderated by Dr. Zachary Valdez, Advanced Manufacturing Policy Fellow at the National Institute of Standards and Technology (NIST) Advanced Manufacturing National Program Office (AMNPO).

Key takeaways from the discussion

Most methane emissions come from a few “super-emitters” – sites that release a large volume of methane due to improper operation or an accident, such as a jammed valve or an unlit flare. The detection and prevention of such super-emitters is a priority for researchers, industry, and regulators.

Technology to reliably monitor and measure methane emissions already exists. Equipment upgrades and simple changes to operational practices can yield substantial economic and environmental benefits. Existing equipment can be retrofitted to

At a glance ...

Understanding the scale of methane emissions is essential to developing effective policy and meeting national climate goals. In the last five years, technology and data collection have improved significantly. Reducing emissions of this powerful greenhouse gas would have a rapid and significant effect on the rate of global temperature increase. Researchers, industry, and regulators understand where methane emissions are coming from and how to prevent them. The evidence and technology are available now for decision-makers to make evidence-informed policy choices and effectively regulate methane emissions from the oil and gas industry. Learn more and **watch a recording of the panel discussion:** aaas.org/epi-center/methane

reduce methane emissions. Altering and improving maintenance and operational procedures can significantly reduce methane emissions with relatively little cost and effort. Inspection and maintenance programs use specialized equipment, such as optical gas imaging (OGI) or other sensors, to identify and measure methane emission sources. Recently, new

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The **Center for Scientific Evidence in Public Issues (AAAS EPI Center)** is an initiative from the American Association for the Advancement of Science (AAAS) designed to provide scientific evidence to policymakers and other decision-makers in ways that are clear, concise, and actionable. The AAAS EPI Center makes it easier for people to access scientific evidence and information and then integrate that evidence into their decision-making process. AAAS is the world’s largest general scientific society with nearly 250 affiliated societies and academies of science and is the publisher of the *Science* family of journals.



The Bakken oil and gas field in North Dakota. Photo by NOAA

measurement technologies and the use of planes, drones, and satellites have improved data coverage and accuracy. Modeling tools such as the Fugitive Emissions Abatement Simulation Toolkit (FEAST),¹ developed by Dr. Arvind Ravikumar, University of Texas at Austin, make it easier to evaluate the efficacy and cost-effectiveness of different approaches.

Interest in cost-effective and innovative technology spurred the emergence and growth of a new sector. The methane mitigation industry in the U.S. has nearly doubled since 2017. Today, there are more than 200 methane mitigation companies across the country offering solutions to measure, monitor, and mitigate methane emissions.

Regulators often collaborate with researchers or industry to monitor, measure, and report methane emissions. Better understanding of methane emissions has spurred the adoption of robust policies in California, Colorado, New Mexico, Maryland, Ohio, North Dakota, Alaska, and Wyoming that exceed existing federal standards. For example, California's methane regulations cover methane emissions from oil and gas production, processing, storage, and transmission infrastructure. California's regulations require oil and gas producers to address both fugitive and vented methane emissions from new and existing oil and gas facilities and mandate compliance with control plans, leak testing, and timely repairs.²

In 2020, New Mexico banned routine venting and flaring of methane from oil and gas production facilities. Now, researchers and industry in the state are working to collect data to identify natural gas losses at every stage of the process. Once information is collected, regulators will require operators, including those that manage pipelines or wells or other infrastructure, to capture more gas each year based on these baseline measurements. The target will be to capture 98% of all

gaseous waste by the end of 2026. If operators fail to meet the state's targets, regulators can deny them drilling permits.³

However, current state and federal methane emission reporting requirements and greenhouse gas inventories do not always align with state or federal regulatory regimes. Aligning these requirements and regimes will ensure information is shared to inform compliance and enforcement of regulatory obligations. New technologies and monitoring systems can provide data to support the adoption of measurement-and performance-based regulations, similar to those applied to the oil and gas industry in other countries and in other U.S. industrial sectors.

Understanding the numbers: Methane emissions from oil and gas operations

The latest report from the Intergovernmental Panel on Climate Change (IPCC)⁴ highlights the problem and opportunity posed by methane, which has contributed as much as 0.5°C of warming since pre-industrial times, second only to carbon dioxide (CO₂). Over a 100-year period, methane is 25 times more powerful than CO₂ at trapping heat in Earth's atmosphere.⁵ It also breaks down much more quickly than CO₂, with an average lifetime of around a decade in the atmosphere. Reducing methane emissions could provide short-term relief from global temperature increases above 1.5°C.^{6,7}

Oil and gas operations release methane at every stage of production, storage, processing, transportation, and distribution, but the primary sources of methane emissions are venting, flaring, and leaks. Venting is the intentional release of natural gas directly to the atmosphere, often for safety reasons; flaring is the controlled burning of natural gas which releases carbon dioxide.

Scientific research suggests that the volume of methane released from oil and gas production, processing, and transportation activities across the United States has been significantly underestimated by the U.S. Environmental Protection Agency (EPA).⁸

New and improved, readily available technologies offer ways to monitor, measure and mitigate methane emissions, often by reducing or eliminating the need to vent or flare natural gas. Many of these measures could be implemented now at no or low cost.⁹ Sensors and monitoring technologies allow increasingly high-precision measurements of methane emissions from planes and satellites. Utilities, oil and gas companies, regulators, researchers, and others are creating and deploying sensor systems and methane detectors across a range of areas and facilities.

Interest in these technologies and solutions is spurring collaboration between industry, regulators, researchers, and other stakeholders. The deployment of solutions and continued growth of the budding methane mitigation industry can create tens of thousands of jobs in the United States. Globally, methane emission mitigation represents billions in potential revenue.

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A brief history of EPA regulations of methane from oil and gas operations

40 C.F.R. Part 60, Subpart OOOOa, also known as Quad Oa or the federal New Source Performance Standards (NSPS) first went into effect in June 2016.¹⁰ It was the first time EPA specifically regulated methane from the oil and gas sector, and the rule applied to upstream, midstream, and downstream operations, and set an important precedent for EPA's ability to regulate methane from existing oil and gas sources. Before then, EPA had only regulated VOCs from the sector. In 2020 the EPA rolled back the 2016 NSPS to no longer control methane emissions from new and modified sources from the oil and gas industry. In June 2021, a resolution under the Congressional Review Act (CRA) reversed the 2020 changes, re-instituting the regulation of methane under the NSPS.¹¹

In the fall of 2021, the EPA intends to propose methane limits for existing oil and gas infrastructure, including restricting the practices of flaring and venting at oil and natural gas facilities, in accord with the executive order, "Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis."¹² The order directs the Administrator of the EPA to propose new regulations to establish emission guidelines for methane emissions from new and existing sources within the oil and gas sector, encompassing exploration and production, transmission, processing, and storage, by September 2021.

Improved methane monitoring and assessment will speed strategic decision making and innovation to reduce methane emissions. Scientific evidence detailing how best to measure, monitor, and mitigate methane emissions from the oil and gas industry will play an important role in setting appropriate and protective limits to protect health and meet U.S. climate goals.

ADDITIONAL RESOURCES

Intergovernmental Panel on Climate Change, [Climate Change 2021: The Physical Science Basis Summary for Policymakers](#)

Environmental Protection Agency, [Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2019](#)

American Geosciences Institute, [Mitigating and Regulating Methane Emissions](#)

FOR MORE INFORMATION

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aaas.org/epi-center/methane

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3. Public rulemaking hearing under 19.15.3 NMAC on the application of the New Mexico Oil Conservation Division to consider proposed rules to regulate the venting and flaring of natural gas from oil and natural gas production and gathering facilities. State of New Mexico Oil Conservation Commission, 25 March 2021. <https://www.emnrd.nm.gov/ocd/wp-content/uploads/sites/6/03-25OCChearing.pdf>
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11. S.J.Res.14 - 117th Congress (2021-2022): A joint resolution providing for congressional disapproval under chapter 8 of title 5, United States Code, of the rule submitted by the Environmental Protection Agency relating to "Oil and Natural Gas Sector: Emission Standards for New, Reconstructed, and Modified Sources Review". Congress.gov, Library of Congress, 30 June 2021, <https://www.congress.gov/bill/117th-congress/senate-joint-resolution/14>
12. Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis. The White House, 20 January 2021. <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/>