U.S. ENVIRONMENTAL PROTECTION AGENCY

OFFICE OF INSPECTOR GENERAL

Hotline Report:
Improving air quality

EPA Did Not Use Allegedly Flawed Studies to Estimate Methane Emissions or Set New Source Performance Standards for Oil and Natural Gas Production

Report No. 18-P-0129 **March 16, 2018**

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Abbreviations

CO_2e	Carbon Dioxide Equivalent
EDF	Environmental Defense Fund
EPA	U.S. Environmental Protection Agency
IPAA	Independent Petroleum Association of America
IPCC	Intergovernmental Panel on Climate Change
OIG	Office of Inspector General
UNFCCC	United Nations Framework Convention on Climate Change
UT-Austin	University of Texas-Austin

Cover photo: An oil production site in North Dakota. (EPA photo)

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U.S. Environmental Protection Agency
Office of Inspector General

18-P-0129
March 16, 2018

At a Glance

Why We Did This Review

The U.S. Environmental Protection Agency's (EPA's) Office of the Inspector General conducted this review in response to a hotline complaint alleging that the EPA used results from two flawed studies to estimate methane emissions and make policy decisions regarding oil and natural gas production. The complaint alleged that two methane emissions studies conducted by the University of Texas-Austin (UT-Austin), and sponsored by the Environmental Defense Fund (EDF), were flawed due to a malfunction in one of the measurement devices called a Hi Flow Sampler.

Our objectives were to determine (1) how the EPA estimates methane emissions from oil and natural gas production, including whether the EPA used results from the two EDF/UT-Austin studies to estimate emissions; and (2) whether concerns about technical or other problems with the studies were identified or brought to the EPA's attention, and how the EPA addressed and resolved those concerns.

This report addresses the following:

- *Improving air quality.*

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EPA Did Not Use Allegedly Flawed Studies to Estimate Methane Emissions or Set New Source Performance Standards for Oil and Natural Gas Production

What We Found

Methane is a potent greenhouse gas emitted from natural and industrial sources, including oil and natural gas production facilities.

The Inventory of U.S. Greenhouse Gas Emissions and Sinks (Greenhouse Gas Inventory) reflects the EPA's official nationwide estimate for greenhouse gas emissions from all man-made sources, including those from oil and natural gas production. The inventory is developed using a variety of data sources and emission estimation methodologies. One source of data for the inventory is emissions and activity data reported to the EPA under its Greenhouse Gas Reporting Program. This reporting program requires large emission sources and fuel suppliers to calculate and report their greenhouse gas emissions data to the EPA.

The EPA used its Greenhouse Gas Inventory development process to consider information related to the EDF/UT-Austin studies and the Hi Flow Sampler. In memorandums issued in 2015 and 2016, inventory staff requested expert and public feedback on specific aspects of the EDF/UT-Austin studies, how data could potentially be used for the inventory, and potential problems with the Hi Flow Sampler.

The EPA ultimately did not make any methodological revisions to the Greenhouse Gas Inventory or to the Greenhouse Gas Reporting Program based on the EDF/UT-Austin studies, and data from the studies have not been incorporated into the inventory. In addition, the EPA did not use any data from the EDF/UT-Austin studies to set the final 2016 New Source Performance Standards to limit methane emissions from the oil and natural gas industry.

We make no recommendations.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

THE INSPECTOR GENERAL

March 16, 2018

MEMORANDUM

SUBJECT: EPA Did Not Use Allegedly Flawed Studies to Estimate Methane Emissions or Set New Source Performance Standards for Oil and Natural Gas Production
Report No. 18-P-0129

FROM: Arthur J. Elkins Jr.

TO: Bill Wehrum, Assistant Administrator
Office of Air and Radiation

This is our report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). The project number for this evaluation was OPE-FY17-0017. This report represents the opinion of the OIG and does not necessarily represent the final EPA position.

This report contains no recommendations, and you are not required to respond to this report. However, if you submit a response, it will be posted on the OIG's public website, along with our memorandum commenting on your response. Your response should be provided as an Adobe PDF file that complies with the accessibility requirements of Section 508 of the Rehabilitation Act of 1973, as amended. The final response should not contain data that you do not want to be released to the public; if your response contains such data, you should identify the data for redaction or removal along with corresponding justification.

We will post this report to our website at www.epa.gov/oig.

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Purpose

In response to a hotline complaint, the U.S. Environmental Protection Agency's (EPA's) Office of Inspector General (OIG) conducted this review to determine the following:

(1) How the EPA estimates methane emissions from the oil and natural gas production sector, including the extent to which the EPA has used results from the 2013 and 2014 emission studies conducted jointly by the Environmental Defense Fund (EDF) and the University of Texas-Austin (UT-Austin) to estimate those emissions.[1]

(2) Whether concerns about technical or other problems with the studies were identified or brought to the EPA's attention, and how the EPA addressed and resolved those concerns.

Background

In 2016, the OIG received a hotline complaint alleging that two methane emission studies conducted by EDF/UT-Austin in 2013 and 2014 were flawed, and that the EPA had made greenhouse gas policy and emission estimation decisions based on the studies. The complaint alleged that the results of the studies were flawed because one of the sampling devices (called a Hi Flow Sampler) used to measure emissions for some of the sources malfunctioned, particularly when measuring gas streams that contained high amounts of hydrocarbons in addition to methane.

The complaint alleged that the malfunction caused the EDF/UT-Austin studies to underestimate emissions. In addition, the complaint alleged that the Hi Flow Sampler can malfunction when measuring high methane gas streams, such as those found in the transmission segment of the industry. The Hi Flow Sampler is a high-volume sampler, which is a type of measurement device approved by the EPA for measuring and reporting methane emissions from certain sources in the transmission and processing segments, but not the production segment.

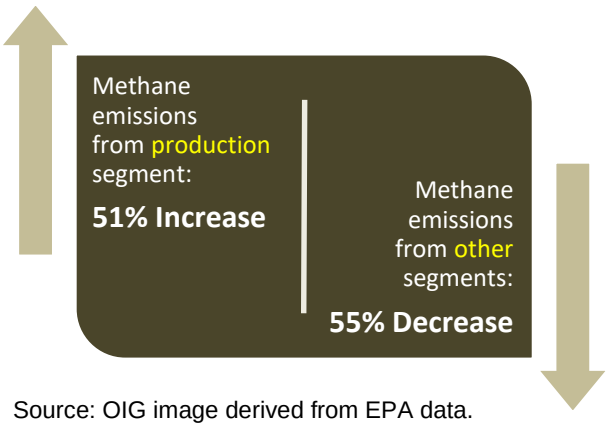
Methane Emissions From the Oil and Natural Gas Production Sector

Methane is the second-most emitted greenhouse gas and has a heat trapping potential of up to 25 times that of carbon dioxide. According to the EPA, about one-third of U.S. methane emissions come from natural gas and petroleum

[1] Allen, D.T., V.M. Torres, J. Thomas, D. Sullivan, M. Harrison, A. Hendler et al., 2013. *Measurements of Methane Emissions at Natural Gas Production Sites in the United States*. Proc. Natl. Acad. Sci. USA 110:17768–17773. Allen, D.T., A. Pacsi, D. Sullivan, D. Zavala-Araiza, M. Harrison, K. Keen et al., 2014. *Methane Emissions from Process Equipment at Natural Gas Production Sites in the United States: Pneumatic Controllers*. Environ. Sci. Technol. 49:633–640.

systems.[2] While methane emissions from other segments of the natural gas industry (e.g., distribution, transmission and storage, and processing) decreased between 1990 and 2015, the EPA estimates that emissions from the production segment increased by 51 percent (Figure 1). Oil and natural gas production in the U.S. is rapidly expanding due, in part, to exploration of large unconventional gas reserves. The Energy Information Administration at the U.S. Department of Energy projects that natural gas production in the U.S. will increase by 45 percent between 2013 and 2040.

Figure 1: EPA estimated methane emissions trends comparison for the natural gas industry (1990-2015)



Source: OIG image derived from EPA data.

The process of oil and natural gas production consists of wells used to extract oil and natural gas from underground formations. Emissions are released from the wells, and from well-site gas treatment equipment such as dehydrators and separators. In total, the Energy Information Administration estimates there were over 1 million producing oil and natural gas wells nationwide in 2016.

Published research on estimates of methane emissions from natural gas production have varied widely, and a great amount of uncertainty exists in estimating these emissions. For example, studies using top-down approaches, such as ground monitors or aircraft that measure ambient concentrations of methane, indicate that traditional approaches used to develop emission inventories may be significantly underestimating emissions.

Environmental Defense Fund Studies on Emissions From Oil and Natural Gas Production

Given the uncertainties with methane emission estimation and measurement in the natural gas industry, the EDF collaborated with about 100 research institutions, universities and companies to conduct a series of 16 emission studies covering all segments of the industry. Two of these studies focused on the production segment. Dr. David T. Allen, former chair of the EPA's Science Advisory Board, led both studies at UT–Austin.

[2] Petroleum systems, as defined by the EPA, include oil production, as well as oil transportation and petroleum refining. Approximately 98 percent of total methane emissions from petroleum systems come from oil production.

The first production segment study, which was published in 2013,[3] involved direct measurements of well-site processes and equipment using several different methods, including the Hi Flow Sampler device. The second production segment study, which was published in 2014,[4] involved direct measurements of pneumatic controllers used to regulate routine functions at well sites. This study also used a Hi Flow Sampler to measure emissions for a small percentage of the controllers in the study.

Hi Flow Sampler

The Hi Flow Sampler is a portable instrument designed to capture and quantify leaks at natural gas transmission, storage and compressor facilities, where gas streams are generally comprised almost entirely of methane. Under Subpart W of the EPA's Greenhouse Gas Reporting Program, high-volume samplers, such as the Hi Flow Sampler, are approved for directly measuring methane emissions from three sources (storage tanks, centrifugal compressor venting, and reciprocating compressor venting) in the processing and transmission segments. Direct measurement using these devices is one option, among several, that facilities can use to estimate and report emissions for these sources.

A pneumatic controller at a production site in Utah. (EPA photo)

Use of high-volume samplers is not an approved method for any source in the production segment. Further, the manufacturer of the Hi Flow Sampler did not intend for it to be used at production facilities where gas streams can include a high amount of non-methane hydrocarbons. However, researchers have begun using the Hi Flow Sampler device for studies on the production segment, such as the EDF/UT-Austin studies, because the device is the most convenient and cost-effective way to capture and quantify an entire leak.

[3] Allen, D.T., V.M. Torres, J. Thomas, D. Sullivan, M. Harrison, A. Hendler et al., 2013. *Measurements of Methane Emissions at Natural Gas Production Sites in the United States*. Proc. Natl. Acad. Sci. USA 110:17768–17773.
[4] Allen, D.T., A. Pacsi, D. Sullivan, D. Zavala-Araiza, M. Harrison, K. Keen et al., 2014. *Methane Emissions from Process Equipment at Natural Gas Production Sites in the United States: Pneumatic Controllers*. Environ. Sci. Technol. 49:633–640.

EPA's New Source Performance Standards for Oil and Gas Production

In 2016, the EPA updated its New Source Performance Standards[5] for the oil and natural gas industry to reduce methane emissions. These were the first standards to specifically regulate methane emissions from the industry. The prior standards issued in 2012 were expected to result in methane reductions as a co-benefit of reducing other pollutants, but they did not set specific standards for methane emissions. The 2016 standards have built on the 2012 standards to set specific standards to reduce methane emissions from the oil and natural gas industry, including production sources such as well completions, pneumatic controllers, and fugitive emissions.

Responsible Office

The EPA's Office of Air and Radiation, Office of Atmospheric Programs, is responsible for estimating methane emissions from oil and natural gas production.

Scope and Methodology

We conducted our review from July 2017 to January 2018. We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our objectives.

To address our objectives, we reviewed regulations, policies, procedures and guidance related to evaluating methane emissions from oil and natural gas production. We placed particular emphasis on criteria and quality assurance processes for greenhouse gas reporting, the development of the Inventory of U.S. Greenhouse Gas Emissions and Sinks, and procedures for revising methods to estimate emissions in the inventory and under Subpart W of the Greenhouse Gas Reporting Program.

[5] Section 111 of the Clean Air Act authorizes the EPA to develop technology-based air emission standards for specific categories of stationary sources. These standards apply to newly constructed, modified and reconstructed sources, and are referred to as the New Source Performance Standards. The EPA can delegate implementation and enforcement of the standards to the states. However, even when delegated to the states, the EPA retains authority to enforce the standards.

We reviewed the 2013 and 2014 EDF/UT-Austin studies, as well as critiques of the studies published by engineer Touché Howard.[6] We also reviewed published articles by Mr. Howard regarding the potential failure of the Hi Flow Sampler under certain circumstances. We interviewed Dr. David Allen and the researcher who oversaw the measurements for the studies, Mr. Howard, and representatives from the manufacturer and distributor of the Hi Flow Sampler.

To determine whether the EPA used data from the 2013 and 2014 EDF/UT-Austin studies to develop methane emissions estimates, we reviewed recent Greenhouse Gas Inventory reports and supporting documentation, including memorandums that inventory staff issued soliciting feedback on new data and methods for the inventory. In addition, we reviewed supporting documentation for the EPA's 2016 oil and natural gas New Source Performance Standards. We also reviewed internal EPA communications about the 2013 and 2014 studies, and the potential problems with the Hi Flow Sampler.

We interviewed staff from two Office of Air and Radiation offices: the Office of Atmospheric Programs, and the Office of Air Quality Planning and Standards. Staff from the EPA's Office of Research and Development and EPA Region 8 were also interviewed.

We also met with representatives from the Independent Petroleum Association of America (IPAA) after receiving written concerns from that organization about the EPA's development of emission estimates. The IPAA expressed concerns that the EPA was overestimating methane emissions in its Greenhouse Gas Inventory, and had overestimated emissions for certain types of facilities when developing the 2016 New Source Performance Standards for oil and natural gas production sites. Since the EPA plans to reconsider these standards for oil and natural gas production, we did not review IPAA's concern about the New Source Performance Standards.

We conducted limited work to assess the topic areas of IPAA's concerns about overestimation of methane emissions in the Greenhouse Gas Inventory,[7] since those concerns were not within our scope. Based on our review of inventory documents, we concluded that the EPA followed its normal development process in relation to those topic areas. As a result, we did not review them further.

[6] Touché Howard is an engineer who developed a high-flow sampling device in the early 1990s. In the early 2000s, Mr. Howard's concept was commercialized by a private company with different hardware and components and named the Hi Flow Sampler.

[7] IPAA's concerns involved the revised methods that the EPA used in the 1990–2014 Greenhouse Gas Inventory to (1) extrapolate, or scale, data from facilities that reported to the Greenhouse Gas Reporting Program to facilities that are not required to report to the program; and (2) estimate the number of gathering and boosting facilities and associated emissions.

Results

The EPA has two established programs that estimate U.S. greenhouse gas emissions, including methane emissions from oil and natural gas production:

- The Greenhouse Gas Reporting Program.
- The Inventory of U.S. Greenhouse Gas Emissions and Sinks.

We found that the EPA used the Greenhouse Gas Inventory development process to consider and solicit feedback on the EDF/UT-Austin studies and the Hi Flow Sampler. However, the EPA has not used data or conclusions from the studies to revise its methane emission estimates for oil and gas production, or to set New Source Performance Standards to limit methane emissions from the industry.

Greenhouse Gas Reporting Program

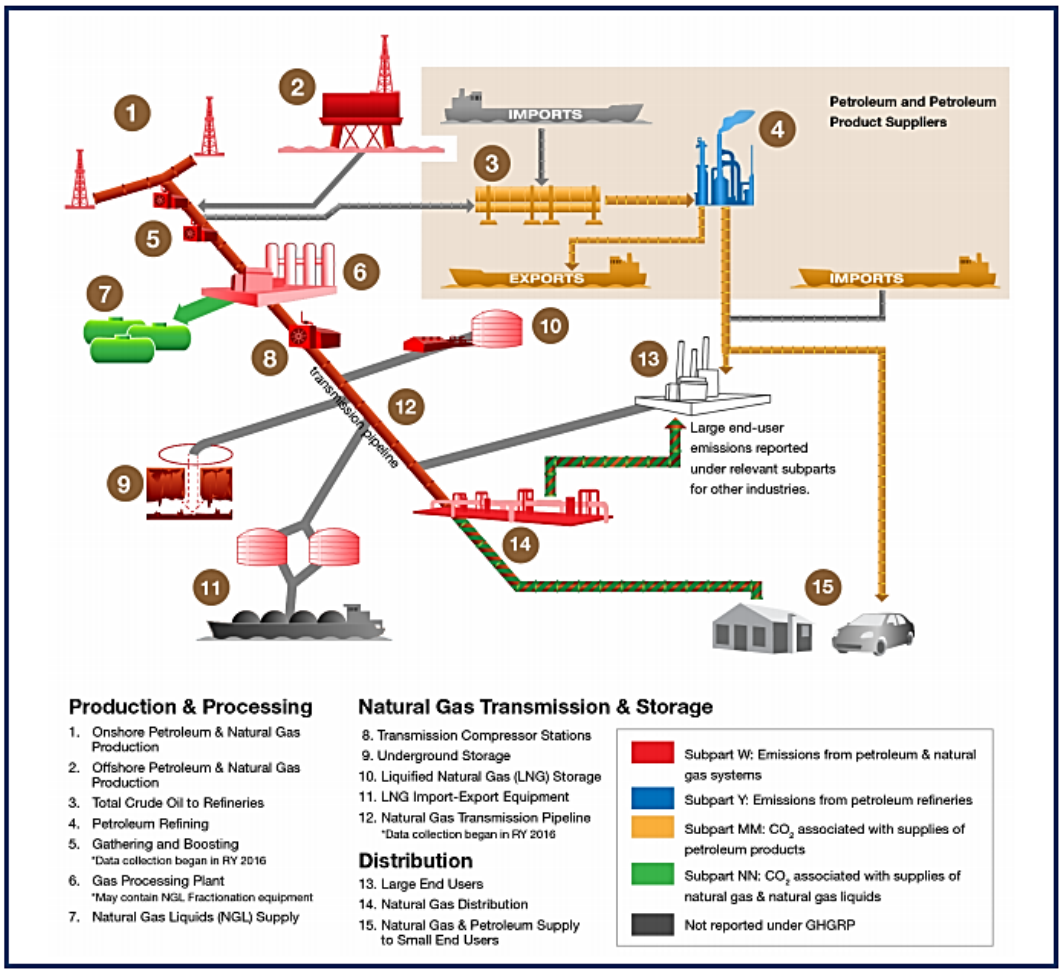
The 2008 Consolidated Appropriations Act required the EPA to develop a rule that mandates the reporting of greenhouse gases. The implementation of this rule is referred to as the Greenhouse Gas Reporting Program, which requires large emission sources and fuel suppliers to report their greenhouse gas emissions data to the EPA. The program has a reporting threshold of 25,000 metric tons of carbon dioxide equivalent (CO_2e) per year, so only those oil and natural gas production facilities exceeding that threshold are required to report emissions under the program.[8]

The Greenhouse Gas Reporting Program does not reflect all emissions from the industry. Subpart W of the program contains specific reporting requirements for oil and natural gas production sources, including methods to be used by facilities to estimate emissions from specific sources. For production, many of the methods are engineering calculations that incorporate "emission factors."[9] Figure 2 provides an overview of the petroleum and natural gas industry, and the operations covered by the Greenhouse Gas Reporting Program.

[8] In general, a "facility" for purposes of the Greenhouse Gas Reporting Program means all co-located emission sources that are commonly owned or operated. However, the program has developed a specialized facility definition for certain segments, including onshore production. For onshore production, a "facility" includes all emissions associated with wells owned or operated by a single company in a specific hydrocarbon producing basin (as defined by the geologic provinces published by the American Association of Petroleum Geologists).

[9] The EPA defines an emission factor as a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.

Figure 2: Oil and natural gas operations covered by the Greenhouse Gas Reporting Program



Source: The EPA.

Greenhouse Gas Inventory

The Greenhouse Gas Inventory is an annual report that provides a comprehensive accounting of total greenhouse gas emissions for all man-made sources in the U.S., including oil and natural gas production. The inventory also calculates carbon dioxide emissions that are removed from the atmosphere by "sinks" (i.e., through the uptake of carbon and storage in forests, vegetation and soils).

The EPA compiles the Greenhouse Gas Inventory on an annual basis to meet commitments under the United Nations Framework Convention on Climate Change (UNFCCC). The estimates in the inventory are calculated consistent with recommendations in the *2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories*, which allows the inventory to be compared to those developed by other UNFCCC parties. The EPA collaborates with other U.S. government agencies, academic institutions, industry

associations, consultants and environmental organizations in preparing the inventory.

The Greenhouse Gas Inventory represents the EPA's official nationwide estimate for oil and natural gas production methane emissions. The inventory provides an estimate of emissions for the entire universe of U.S. sources for every year since 1990. The most recent inventory was published in 2017 and covers 1990–2015. For 2015, the Greenhouse Gas Inventory estimated that oil and natural gas production emitted 145.6 million metric tons CO_2e of methane. This accounted for 22.2 percent of all methane emissions and 2.5 percent of all greenhouse gas emissions in the inventory.

Greenhouse Gas Inventory Development Process

The EPA updates the Greenhouse Gas Inventory each year. For most oil and natural gas production sources, the EPA develops estimates based on the number of wells for a given year, as reported in an industry database called DrillingInfo.

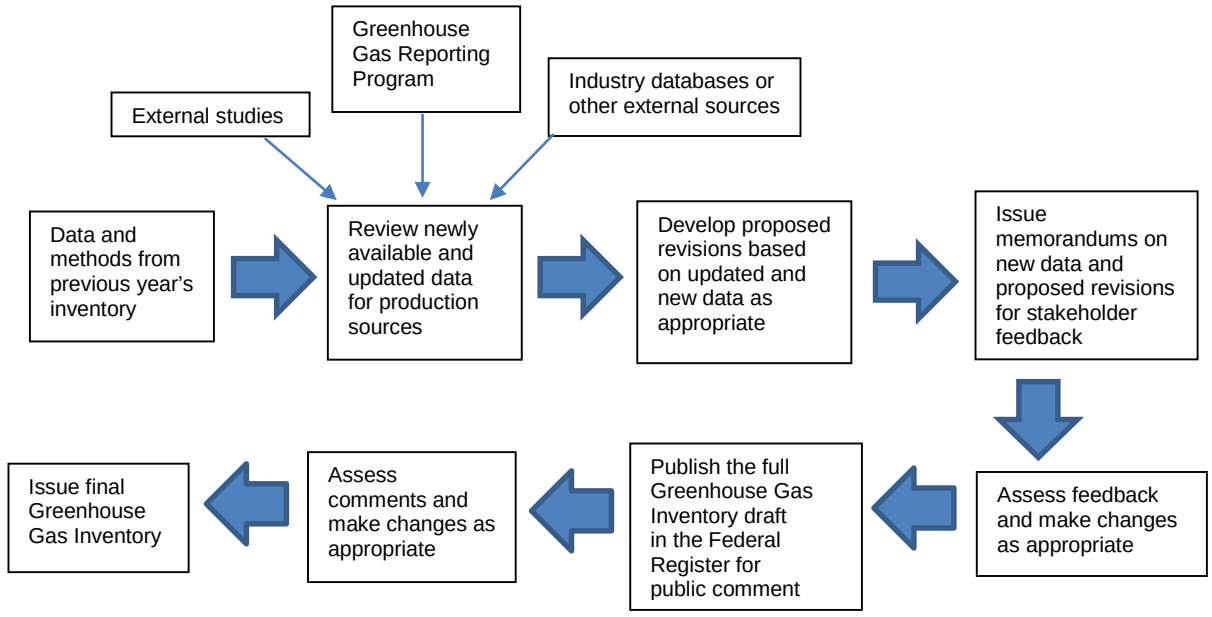
The EPA generally develops estimates for specific types of equipment (e.g., separators, pneumatic controllers) by determining the average number of that type of equipment located at a well. This is referred to as activity data or an activity factor. The per-well activity factors are applied to national well counts to calculate total national activity data. The EPA then applies an emission factor to the national activity data to estimate emissions. The Greenhouse Gas Inventory draws from a number of information sources for emission factors and activity data, including a 1996 study conducted by the EPA and the Gas Research Institute, other federal agencies, and industry research. As data from the Greenhouse Gas Reporting Program have become available in recent years, that data have been incorporated into the inventory as appropriate.

In accordance with the 2006 IPCC guidelines, the EPA attempts each year to improve the analyses in the Greenhouse Gas Inventory through better data and methods. In addition, inventory staff revise production emission estimates as new data become available. To do so, Greenhouse Gas Inventory staff follow a process for updating new versions of the inventory, which involves evaluating newly available or updated data, and seeking expert and public feedback on proposed methodological revisions.

Each year, inventory staff identify new or updated data made available through the Greenhouse Gas Reporting Program, external studies and updates to existing external information sources, such as DrillingInfo, and assess whether information or methods in the inventory should be revised. Inventory staff request feedback from industry experts and the public on potential new data sources and methods, through memorandums issued to a listserv of experts and posted on the EPA's website. Before finalizing the inventory report, the EPA also seeks public comment on the entire draft inventory by publishing it in the Federal Register.

Figure 3 depicts the process used to incorporate new data and methodological changes into the Greenhouse Gas Inventory.

Figure 3: Process for considering new data and revising the Greenhouse Gas Inventory



Source: OIG analysis based on Greenhouse Gas Inventory documentation.

EPA Considered Information Related to the EDF/UT-Austin Studies as Part of Its Inventory Development Process

As part of its efforts to review newly available data for oil and natural gas production sources, the EPA invited the EDF/UT-Austin study teams to present the results of their 2013 and 2014 studies. Presentations for the two studies occurred in September 2013 and December 2014, respectively.

Also in 2014, staff from the EPA's Office of Atmospheric Programs received a briefing from the agency's Office of Research and Development staff, who had experience using a Hi Flow Sampler similar to the one used in the EDF/UT-Austin studies. Office of Research and Development staff had observed problems with the Hi Flow Sampler in 2011, when using the device in a study to measure leaks at condensate tanks at oil and gas production facilities.[10] Emissions from those tanks were high in hydrocarbons, and Office of Research and Development staff theorized that the hydrocarbons overwhelmed the Hi Flow Sampler's sensors, causing the device to malfunction.

[10] This study used the Hi Flow Sampler to measure emissions from multiple sources at oil and natural gas production facilities. The research team observed problems with the device only when measuring large emissions from condensate tanks. In 2012, an EPA contractor presented a paper on the experiences with the Hi Flow Sampler in this study at an Air and Waste Management Association meeting.

Office of Research and Development staff told us that during the 2014 briefing to the Office of Atmospheric Programs, they notified them about forthcoming concerns from Mr. Howard about the Hi Flow Sampler.

In 2015, a journal article and formal comments by Mr. Howard were published critiquing the measurements made with the Hi Flow Sampler in the EDF/UT-Austin studies. He also expressed his concerns to EPA staff via email. In February 2016, Mr. Howard formally presented his concerns to EPA staff and others, including members of the press, via a teleconference/internet presentation.

The EPA formally requested comment on the EDF/UT-Austin studies and the Hi Flow Sampler in memorandums for the 1990–2013 and 1990–2014 Greenhouse Gas Inventories. Specifically, in memorandums issued in 2015 and 2016, inventory staff requested stakeholder feedback on the following:

- Specific aspects of the EDF/UT-Austin studies related to pneumatic controllers and how data could potentially be used for the Greenhouse Gas Inventory.

- Whether potential problems with Hi Flow Sampler measurements may have affected new studies of emissions from transmission and distribution segments, and whether methods exist for recalculating some of the data points to correct for potential Hi Flow Sampler problems.

In the years since publication of the EDF/UT-Austin studies, EPA staff have also attended events where Mr. Howard presented his concerns, and used the occasions to engage stakeholders on potential problems with the Hi Flow Sampler.

Extent and Significance of Device Malfunction in Production Measurements Have Not Been Established

While there is evidence that some Hi Flow Samplers have failed under certain conditions, the extent and significance of these failures have not been established in studies. Researchers in the EPA's Office of Research and Development encountered a malfunction when using the device to measure tank emissions in the production sector in 2011, and the researcher who oversaw the measurements for the EDF/UT-Austin production segment studies told us Mr. Howard is correct that the Hi Flow Sampler can fail under certain circumstances. However, the researcher does not believe these failures occur as frequently as Mr. Howard claims.

Further, Dr. Allen, the lead researcher of the EDF/UT-Austin production segment studies, said he has seen no evidence of the sensor failures described by Mr. Howard, though one of his Hi Flow Samplers shut down during field testing that was conducted after the 2013 study. We found that there has not been sufficient

testing to determine specific conditions in which the device might malfunction, how prevalent the problem might be (i.e., are only some devices faulty or is it a systemic problem), or whether there are operational best practices that could mitigate the problem.

To date, field testing has been conducted with only several devices, and results have been inconclusive. The researcher who oversaw the measurements for the 2013 and 2014 EDF/UT-Austin studies views Mr. Howard's concerns as a valuable part of the scientific process for assessing measurements taken with the Hi Flow Sampler. Use of the Hi Flow Sampler to measure gas streams for which it was not specifically designed led the manufacturer of the Hi Flow Sampler to update its user manual to caution against the device being used to measure high hydrocarbon gas streams.

Claim That the Device Can Malfunction in Other Segments Is Unproven

In two journal articles, Mr. Howard concluded that the Hi Flow Sampler can also malfunction when measuring gas streams with very high methane content and low hydrocarbons, such as those found in the transmission and processing segments where the device is approved for measurement of some sources under Subpart W. Mr. Howard based his conclusions on analyses of measurements taken in other studies, including the 2013 EDF/UT-Austin study. Mr. Howard did not conduct any direct testing where he encountered and/or documented a failure when measuring very high methane content gas streams.

EPA staff we spoke with are not aware of any data that indicate the Hi Flow Sampler malfunctions in high methane content gas streams. Thus, the EPA has not made any revisions to the approved methods for high-volume samplers (including the Hi Flow Sampler) in the Greenhouse Gas Reporting Program for certain sources in the transmission and processing segments. We believe this is appropriate for the following reasons:

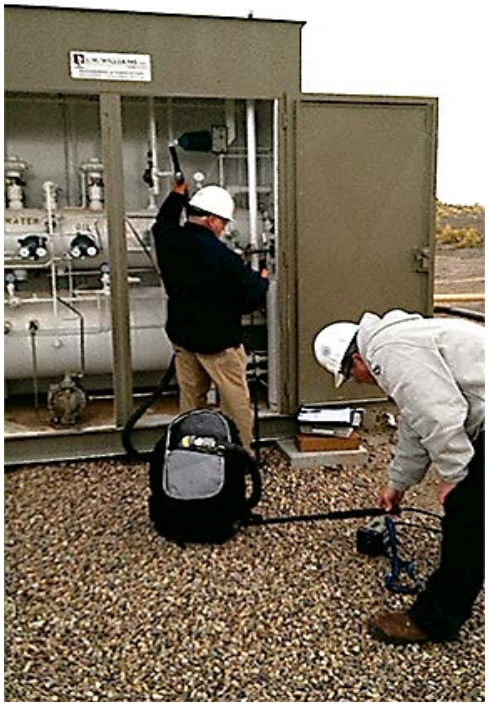
- Malfunction of the device in these segments is unproven.
- The EPA approved these methods for use as intended by the manufacturer.
- EPA staff are aware of the concerns and are tracking the issue.
- The Greenhouse Gas Reporting Program is not intended to assess compliance with any particular standard, and thus some degree of uncertainty is tolerable.
- EPA staff sought feedback on the issue through Greenhouse Gas Inventory memorandums issued in 2015 and 2016.

EPA Has Not Used EDF/UT-Austin Studies for Official Emission Estimation or Rulemaking Purposes

As stated above, Greenhouse Gas Inventory staff considered and requested comment on various aspects of the EDF/UT-Austin studies. However, the EPA ultimately did not make any methodological revisions to the inventory based on the EDF/UT-Austin studies, and data from the studies have not been incorporated into the inventory. The EPA also has not made any revisions to the emission factors or calculations for production sources in Subpart W of the Greenhouse Gas Reporting Program based on these studies. In addition, while the EPA consulted the studies, along with a number of other information sources during the rulemaking process to set New Source Performance Standards to limit methane emissions from the oil and natural gas industry, the EPA did not use any data from the studies to set the final standards issued in 2016.

EPA Researchers Developed an Augmented Protocol for Hi Flow Sampler Use

After experiencing Hi Flow Sampler malfunctioning in its earlier research, the EPA's Office of Research and Development developed an augmented (work-around) approach for using the device for field measurements. In a 2015 study at production sites, staff from EPA Region 8 and the Office of Research and Development measured and analyzed the hydrocarbon content of the gas stream with a probe as an additional quality assurance step for each measurement it took with the Hi Flow Sampler. In addition, the Office of Research and Development is currently attempting to develop a new high-volume sampler for internal agency use.



Researchers using a Hi Flow Sampler, and a hand-held probe for quality assurance, at a production site in Utah. (EPA photo)

In October 2017, Office of Research and Development staff, in conjunction with staff from EPA Region 8, were awarded funding of $100,000 through the EPA Regional Applied Research Effort program to develop and test a new high-volume sampler prototype.[11] The main impetus for this development is that the manufacturer is no longer producing the Hi Flow Sampler, and there are currently

[11] Office of Research and Development staff told us they may receive an additional $25,000 in funding for the project in fiscal year 2019.

no high-volume samplers commercially available, although an Office of Research and Development researcher told us they also hope to improve on the design of the Hi Flow Sampler to eliminate any potential malfunction problems. The researcher told us this undertaking is complicated by safety considerations, and they are determining whether additional funding will be needed to complete the project.

Conclusion

EPA staff were aware of potential concerns raised about the EDF/UT-Austin studies and used the agency's internal review processes to evaluate data and solicit stakeholder feedback. Specifically, the EPA used its annual Greenhouse Gas Inventory development process to consider data from the studies, and sought stakeholder feedback on aspects of the studies through memorandums when developing the 1990–2013 and 1990–2014 inventories. The EPA ultimately did not make any changes to the inventory or to the Greenhouse Gas Reporting Program based on data from the studies. In addition, the EPA did not use data from the studies to set the 2016 New Source Performance Standards to limit methane emissions from the oil and natural gas industry.

The EPA also used the Greenhouse Gas Inventory development process to solicit expert feedback on the Hi Flow Sampler. High-volume samplers, such as the Hi Flow Sampler, remain approved reporting tools under the Greenhouse Gas Reporting Program for certain large sources in the oil and natural gas transmission and processing segments. We did not find any conclusive evidence indicating device malfunctions in those segments.

Agency Response and OIG Evaluation

The agency provided technical comments on the draft version of this report. We have made changes as appropriate based on those comments.

Appendix A

Distribution

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