

Methane research provides key data for new EPA greenhouse gas inventory

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Colorado State University methane research has been directly incorporated into a major annual Environmental Protection Agency report that keeps a finger on the pulse of U.S. greenhouse gas emissions.

EPA Greenhouse Gas Inventory

The recently released [2016 EPA Greenhouse Gas Inventory](#) ranks the

[natural gas](#) industry as the No. 1 emitter of methane, a [greenhouse gas](#) that's less prevalent but more potent than carbon dioxide. This ranking is based on methane emissions over the period of 1990-2014. The report cites studies led by CSU faculty members Anthony Marchese and Daniel Zimmerle, researchers at CSU's Energy Institute, as pivotal to the most accurate accounting to date of methane emissions from various sectors of the natural gas industry.

The CSU data were collected in 2012-14 in collaboration with industry operators and Environmental Defense Fund (EDF). EDF facilitated and helped fund 16 studies – three at CSU – to capture data around methane emissions from a variety of sources.

"The scientifically rigorous and peer-reviewed work that methane researchers at CSU and elsewhere have provided a strong basis for the revisions the EPA made to its latest greenhouse gas inventory," said Mark Brownstein, vice president of EDF's Climate and Energy Program. "Researchers were held to the highest of scientific standards, and the results of the CSU studies were made possible only by close collaboration with industry."

[Published in 2015](#), the studies have been incorporated quickly – in less than a year – into the EPA's latest accounting of methane and other [greenhouse gas emissions](#). The studies from CSU also will likely influence proposed federal rules to further increase regulation of methane emissions from natural gas operations.

Gathering and processing study

The study led by Marchese, a professor in the Department of Mechanical Engineering, was published in the journal *Environmental Science and Technology* on Aug. 18, 2015. Done in partnership with Carnegie Mellon University and Aerodyne Research Inc., the study focused on natural gas

gathering and processing plants. Combining fieldwork and computer modeling, the researchers found that 0.47 percent of methane produced domestically is lost during gathering and processing operations.

It was the first-ever national study on methane emissions from natural gas gathering facilities, which are typically located early in the supply chain, directly downstream of production facilities. Methane emissions from gathering facilities were found to be nearly 8 times higher than estimated in previous versions of the EPA Greenhouse Gas Inventory. The researchers also looked further downstream, at processing plants, and found that methane emissions from processing plants were 40 percent lower than previous EPA inventory estimates.

"By using the estimates from our gathering study, the EPA added nearly 1,500 kilotons per year of methane emissions to the inventory, which accounts for over 20 percent of the total methane emitted from all natural gas operations in the greenhouse gas inventory," Marchese said.

Transmission and storage

The updated EPA Greenhouse Gas Inventory also cited an EDF-supported study led by Zimmerle, a senior research associate at the CSU Energy Institute. Like Marchese's study, that work was also done in collaboration with natural gas industry partners. Zimmerle's team took a comprehensive look at fugitive emissions from transmission and storage facilities, the large interstate system that transports gas from gathering and processing facilities to end users.

The team took 1,398 on-site and 344 downwind plume measurements at 45 transmission and storage facilities through the U.S. – the first time on-site and downwind methods were paired at major natural gas facilities. They used that data to model emissions from 2,000 compressor stations distributed along 300,000 miles of pipeline and underground storage

facilities.

According to their study published in *Environmental Science and Technology* on July 21, 2015, total methane emissions weren't statistically different from previous EPA estimates. But the drivers of those emissions differed significantly from prior estimates: They reported that a small number of sources were responsible for a relatively large portion of the emissions – 4 percent of facilities were emitting a third of total methane from the transmission and storage sectors.

Zimmerle said the EPA's fast adoption of the studies was a testament to the CSU and EDF teams' dedication to well-grounded science around [methane emissions](#).

"We're very pleased to see that the work we're doing is having a presence in national policy discussions," Zimmerle said.

Collaboration with industry

In both the gathering and processing and transmission and storage studies, the results were as accurate as they were because of close collaboration with industry partners, which allowed the researchers to make on-site measurements at facilities.

"It improved the accuracy and increased the numbers of samples we could take," Zimmerle said. "It was key to the success of the efforts."

CSU is currently involved in several other major studies on emissions of methane and other hydrocarbons from oil and gas operations, the results of which will be published later this year.

More information: Anthony J. Marchese et al. Methane Emissions from United States Natural Gas Gathering and Processing,

Environmental Science & Technology (2015). [DOI: 10.1021/acs.est.5b02275](https://doi.org/10.1021/acs.est.5b02275)

Provided by Colorado State University

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