FAQ About the NOAA-CIRES Colorado Methane Study

Study released May 7, 2014

What are the main takeaways of this study?

Methane emissions from the oil and gas industry are a problem that requires action now. The NOAA-CIRES study, part of the larger methane research series funded by EDF, is another important contribution to the mounting scientific evidence that underscores oil and gas methane emissions are too high.

The study gives a basin-wide snapshot of emissions over two days in Colorado's most active oil and gas region, which contains infrastructure ranging from production to distribution. The data shows that state inventories underestimate hydrocarbon emissions in the basin by a factor of 2 or more. Estimated methane emissions are reported to be almost three times higher than those derived from estimates using EPA's 2012 greenhouse gas reporting data. The authors also suggest this corresponds to a 2.6 – 5.6% leak rate of total natural gas production from oil and gas wells. Emissions of smog-forming VOCs are twice as high as state estimates and seven times higher for emissions of benzene, a known carcinogen.

This study also confirms a trend we have seen in many recent academic studies – that methane emissions are higher than they should be, and there are clear and cost-effective paths to reducing these emissions.

What is the methodology of the NOAA-CIRES study?

The NOAA-CIRES team flew 12 flights around and through the Denver Julesburg Basin. During these flights they collected real-time methane data and up to 12 flask samples of whole air which were analyzed in the lab for hydrocarbons. By flying a box around the basin to quantify methane concentrations at the upwind and downwind edges of the box, the scientists were able to determine how much methane was emitted within the box flown.

To determine how much of the total methane flux was due to oil and gas sources, the scientists subtracted from the total their best estimates of emissions from all the non-oil and gas sources. No direct bottom-up measurements were made for this study, so they had to use several assumptions and data sets to determine how much each source type contributed to the overall methane levels measured in the study.

Is this study a complete picture of methane emissions from the natural gas system across the country?

No. The NOAA-CIRES study fills in another important data point in our ever-increasing knowledge of methane emissions from oil and gas operations, but it is not meant to be a stand-alone, particularly because measurements were made in one only basin.

What are the differences between the NOAA-CIRES study and the UT study released last September?

The two studies are not an apple-to-apple comparison and are not meant to be. The NOAA-CIRES study is measuring all methane emissions within the Denver Julesburg Basin and then subtracting out the non-oil and gas emissions. What's left is the emissions from oil and gas from all segments, production, gathering, transmission and distribution. The UT study only studied production, specifically hydraulically fractured well sites. The NOAA-CIRES study used aircraft overflight measurements while the UT study used on-the-ground data collection – two distinct methods.
EDF has undertaken an overall series of studies for this very reason – because the natural gas supply chain is diverse and cannot be measured by any one method or in any one study.

What are the differences between aircraft overflight measurements and on-the-ground data collection?

The two methods are complementary. On-the-ground measurements, also known as "bottom-up", are essential to identifying specific sources of emissions, but there is a limitation in that this form of measurement is difficult to canvas all potential sources at any particular site. This means some emission sources can be missed. There are millions of potential sources of methane emissions ranging from well pads to storage facilities to miles of pipelines across the country and it is not possible to measure every source directly. This inherent challenge could lead to bottom-up techniques missing the "fat tail" or the small percentage of sources that are responsible for the largest percentage of emissions. Some recent studies have suggested bottom-up measurements may be underrepresenting emissions for this reason but additional work is needed to better understand this.

Conversely, aircraft overflight readings (or "top-down" studies) are effective in measuring total methane fluxes in a given area, which promises the ability to capture methane emissions that an on-the-ground approach alone might miss, but this method also has its limitations. Assumptions are required to apportion overflight results between multiple sources (i.e. landfills, agriculture, oil and gas production, gathering systems, processing and pipelines). If the assumptions about non-oil and gas sources are wrong, that may lead to over reporting of emissions with this methodology.

Together, these two methods can complement each other and provide greater insight and certainty than either method alone. EDF is working with a variety of academics and scientists in its methane research series to further explore how these two methods, deployed in concert, can further our understanding of the magnitude and sources of methane emissions across the natural gas supply chain.

Why is there so much disparity in published U.S. methane leakage rates?

No one study is the answer to methane emissions. Each one adds new insights. Regional and site specific differences can be also large. Things like the basin's geology (porosity and permeability of the rock), whether oil or gas dominates production and if the basin produces wet or dry gas, which is primarily made up of methane, whereas wet gas also includes ethane, butane, propane and pentane.

That doesn't mean that we don't know anything. We know plenty – methane rates are too high and can and should be reduced. But it's important that we further our understanding to improve

our accuracy in pinpointing emissions to keep up with evolving field practices and ensure that we are truly effective in fixing this problem.

Does this study show that EPA estimates are three times too low?

No. The authors developed an inventory of oil and gas emissions derived from data reported to EPA as part of the Greenhouse Gas reporting rule. This is not data from the US EPA Greenhouse Gas Inventory nor is it a national estimate. Rather it is a list of sources reporting their data to EPA and suggests that emissions estimates derived from that reporting may be underestimating emissions in Colorado.