http://www.publicintegrity.org/2014/04/03/14514/air-monitoring-fracking-areas-fails-detect-spikes-toxic-emissions-new-study-says

The Center for Public Integrity

Environment : Big Oil, Bad Air

Air monitoring in fracking areas fails to detect spikes in toxic emissions, new study says

By Lisa Song Jim Morris

9:24 am, April 3, 2014 Updated: 10:11 pm, April 24, 2014

A large flare at a central collection facility emits a dark smoke-like by-product in Karnes County, Texas.

Lance Rosenfield/Prime

People in natural gas drilling areas who complain about nauseating odors, nosebleeds and other symptoms they fear could be caused by shale development usually get the same response from state regulators: monitoring data show the air quality is fine.

A new study helps explain this discrepancy. The most commonly used air monitoring techniques often underestimate public health threats because they don't catch toxic emissions that spike at various points during gas production, researchers reported Tuesday in the peer-reviewed journal *Reviews on Environmental Health*. The study was conducted by the Southwest Pennsylvania Environmental Health Project, a nonprofit based near Pittsburgh.

A health survey the group released last year found that people who live near drilling sites in Washington County, Pa., in the Marcellus Shale, reported symptoms such as nausea, abdominal pain, breathing difficulties and nosebleeds, all of which could be caused by pollutants known to be emitted from gas sites. Similar problems have been reported by people who live in the Eagle Ford Shale in South Texas, the subject of a recent investigation by the Center for Public Integrity, InsideClimate News and The Weather Channel.

While residents want to know whether gas drilling is affecting the air near their homes — where emissions can vary dramatically over the course of a day — regulators generally use methods designed to assess long-term, regional air quality.

They're "misapplying the technology," said lead author David Brown, who conducted the study with three of his colleagues at the Environmental Health Project.

Stuart Batterman, an environmental health sciences professor at the University of Michigan, said the study underscores the need for specialized monitoring programs that target community health.

But creating these programs is difficult, Batterman said, because scientists don't fully understand the emissions coming from natural gas facilities. Air pollutants ebb and flow based on equipment malfunctions, maintenance activities and the weather. They're released from storage tanks, compressor stations and pipelines during every step of the process: drilling, hydraulic fracturing, production, and processing.

"Unfortunately, the states don't have much in the way of discretionary funds," to add monitors, Batterman said. "Their programs have been cut back because most legislatures are not funding their environmental agencies generously."

No easy solutions

The Pennsylvania report is the latest demonstration of how little is known about the health impacts of unconventional natural gas development, which uses hydraulic fracturing to extract tightly bound gas. In February, 190 experts from industry, government and the medical community gathered in Philadelphia to discuss major data gaps. The conclusions they reached were almost identical to those in a recent study in *Environmental Science & Technology* that cited a lack of "comprehensive" public health research.

Isobel Simpson, an atmospheric scientist at the University of California-Irvine who was not involved with the Pennsylvania study, said the group's paper shows the lack of a one-size-fits-all solution.

"Air quality monitoring is complex, so you need a range of [methods] depending on what your goal is," she said. Is the research about asthma or cancer? Overall air quality or human health? "All of those weigh into the strategy you're using."

Many federal and state-run monitors average their data over 24 hours or take samples once every few days. It's a technique that's been used for decades to assess regional compliance with the Clean Air Act. But natural gas facilities have sporadic emission spikes that last just a few hours or minutes. These fleeting events, which release particulate matter, volatile organic compounds and other harmful toxins into the air, can quickly lead to localized health effects. When averaged over 24 hours, however, the spikes can easily be ignored.

The averaging technique is "useless" for detecting pollution spikes, said Neil Carman, clean air director of the Sierra Club's Lone Star Chapter in Texas. "If the police had to use 24-hour averaging for enforcing speed limits, nobody would ever speed. It would average out."

The situation in Texas' Eagle Ford Shale, which spans an area nearly twice the size of Massachusetts, is particularly problematic because there's little monitoring of any kind. The Texas Commission on Environmental Quality (TCEQ) — the state's environmental regulator — operates just five permanent air monitors in the region, none of them located in heavily drilled areas.

Instead, most of the monitoring in the Eagle Ford is conducted through sporadic TCEQ surveys or investigations of citizen complaints.

But spot monitoring can only catch a fraction of the emission spikes.

"Attempts to capture these peaks with 24-hour [averages]; through periodic or one-time spot sampling (under 24 hours); or after a complaint has been filed, will most often miss times of peak exposure," the authors of the new study wrote.

Batterman, the University of Michigan professor, said 24-hour samples are still useful for long- term health studies, since pollutants like benzene and particulate matter can lead to chronic effects that don't show up until years or decades later.

Ideally, scientists should use a combination of methods to monitor long-term and acute impacts, he said, "but there are technology and cost issues."

The best way to analyze short-term impacts like skin rashes and headaches is to take frequent samples over a sustained period of time, said Beth Weinberger, a co-author of the new study. She and her colleagues assessed indoor air quality in 14 homes near drilling sites by taking measurements of fine particulate matter once a minute for up to 24 hours. After examining their data, they found that some homes had very high levels of particulate matter more than 30 percent of the time.

“It was alarming, because we realized if fine particulate matter was getting into the house, other things, like benzene and formaldehyde, probably were as well,” Brown said.

Weinberger said her group is now working with other organizations to find affordable monitors that would allow them to take indoor and outdoor samples so they can design better studies.

Flawed investigations

The limits of air monitoring are especially apparent when regulators respond to citizen complaints near drilling sites.

"The plume touchdowns or emission events are often quite short, and by the time anybody comes out there and sets up their monitoring [equipment], there's nothing to measure,” Batterman said. “I have some sympathies for the regulated community because it's very difficult to validate these exceedances that certainly occur."

In the Eagle Ford, the TCEQ has up to 30 days to investigate a complaint. In Pennsylvania, the deadline is usually two weeks. In Colorado, inspectors often respond within 24 hours, according to a spokesman for the state's Air Pollution Control Division. (The TCEQ refused to make any of its experts available for phone interviews.)

InsideClimate News and the Center for Public Integrity reviewed more than a dozen TCEQ investigation reports on Eagle Ford oil and gas-related complaints. In most cases, regulators responded by taking instantaneous air readings next to industrial facilities. Some inspectors conducted an initial survey by sniffing the air for detectable odors, then returned

days later with monitoring equipment. On several occasions, the instruments detected such high levels of contaminants that inspectors fled the site.

Weinberger said the TCEQ's practice of taking quick "grab samples" is "the perfect design" to miss detecting emission spikes.

"That's what you do if you're not interested in capturing episodic exposures," she said.

Weinberger said more frequent and consistent sampling is needed, such as monitoring once an hour for two weeks. Regulators can then compare the individual data points with existing health standards to see how often they're exceeded.

Even when scientists use the right monitoring techniques, it can be hard to figure out what the numbers mean.

Federal air quality standards exist for only six chemicals: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. All other pollutants, including dozens of volatile organic compounds, are managed by a patchwork of occupational standards and state guidelines.

Texas, for instance, uses short-term exposure guidelines of 180 parts per billion for benzene and 4,000 parts per billion for toluene to determine whether a situation requires further investigation.

Other states have different guidelines, and some chemicals have none at all because little is known about their health impacts. The guidelines have another flaw: They don't fully consider what happens when people are exposed to many chemicals at once, as is common near gas and oil production sites.

This report is part of a joint project by the Center for Public Integrity, InsideClimate News and The Weather Channel. Lisa Song is with InsideClimate News and Jim Morris is with the Center for Public Integrity. InsideClimate News reporter Zahra Hirji contributed to this article.