Leaks Can Make Natural Gas as Bad for the Climate as Coal, a Study Says

The findings cast doubt on the idea that natural gas can serve as a transitional fuel to a future powered entirely by renewables like solar and wind.

By Hiroko Tabuchi

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Natural gas, long seen as a cleaner alternative to coal and an important tool in the fight to slow global warming, can be just as harmful to the climate, a new study has concluded, unless companies can all but eliminate the leaks that plague its use.

It takes as little as 0.2 percent of gas to leak to make natural gas as big a driver of climate change as coal, the study found. That's a tiny margin of error for a gas that is notorious for leaking from drill sites, processing plants and the pipes that transport it into power stations or homes and kitchens.

The bottom line: If gas leaks, even a little, "it's as bad as coal," said Deborah Gordon, the lead researcher and an environmental policy expert at Brown University and at the Rocky Mountain Institute, a nonprofit research organization focused on clean energy. "It can't be considered a good bridge, or substitute."

The peer-reviewed study, which also involved researchers from Harvard and Duke Universities and NASA and is set to be published next week in the journal Environmental Research Letters, adds to a substantial body of research that has poked holes in the idea that natural gas is a suitable transitional fuel to a future powered entirely by renewables, like solar and wind.

The findings throw up difficult questions about how much more money the nations of the world should invest in gas infrastructure to ward off the worst of global warming. The $370 billion Inflation Reduction Act passed by the United States Congress last year, designed to move the country away from fossil fuels and toward renewables, includes credits that would apply to some forms of natural gas.

When power companies generate electricity by burning natural gas instead of coal, they emit only about half the amount of planet-warming carbon dioxide. In the United States, the shift from coal to gas, driven by a boom in oil and gas fracking, has helped reduce carbon emissions from power plants by nearly 40 percent since 2005.

But natural gas is made up mostly of methane, which is a far more potent planet-warming gas, in the short term, than carbon dioxide when it escapes unburned into the atmosphere. And there's mounting evidence that methane is doing just that: leaking from gas systems in far larger quantities than previously thought. Sensors and infrared cameras are helping to visualize substantial leaks of methane from oil and gas infrastructure, and increasingly powerful satellites are detecting "super-emitting" episodes from space.

A technician searching for methane leaks with an infrared camera in Damascus, Ark.
Andrea Morales for The New York Times

The latest study advances that science in several ways. It considered and compared the entire “life cycle” emissions of natural gas and coal, from drilling and mining the fuel to distributing and burning it. The researchers also looked at natural gas and coal in all of their energy uses, beyond generating electricity. Gas, in particular, is used broadly as an industrial, commercial and residential energy source for fuel, steam, heat and power.

The study also took into account one peculiar effect of emissions from burning coal: Some of the emissions can actually have a short-term effect that offsets some of the warming.

That’s because, in addition to carbon dioxide, coal emits sulfur dioxide, which forms sulfate aerosols in the atmosphere. Those aerosols reflect incoming sunlight back to space, helping to cool the atmosphere.

Sulfur dioxide has other serious problems. It causes significant damage to human health and the environment. And coal-burning power plants are a major source of other toxic forms of air pollution. Past research has suggested that shifting from coal to gas is less harmful to public health.

There are other trade-offs to consider. The carbon dioxide spewed copiously by coal-burning power plants lasts far longer in the atmosphere than methane, which dissipates after a few decades. So focusing on methane leaks from gas infrastructure, at the expense of controlling carbon emissions, means the world might mitigate some shorter-term warming, but still face a dangerous rise in average temperatures many decades into the future. That said, with the consequences of climate change already wreaking havoc around the world, controlling methane would be a way to slow warming more immediately.

Under pressure over its climate footprint, the oil and gas industry has said it has made progress in detecting and plugging rogue emissions. Independent monitoring and verification of those claims will be crucial, experts say.

Robert Howarth, an earth systems scientist at Cornell University who raised the alarm about methane leaks more than a decade ago, called the analysis solid.

“Their conclusion is to once again point out that natural gas may not be any better at all for the climate than is coal, particularly when viewed through the lens of warming over the next 20 years or so, which of course is a critical time” for meeting climate goals, he said in an email.

“I do hope the policy world and the political leaders of the world pay attention to this, as I fear too many remain too fixated at simply reducing coal use, even if it results in more gas consumption,” Dr. Howarth said. “What the world requires is to move away from all fossil fuels ASAP, to a 100 percent renewable energy future.”