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Methane Madness: Science Does Not Support White House Policy

By [S. Fred Singer](#)

The US Environmental Protection Agency (EPA) on 18 August 2015 proposed regulations to reduce emissions of methane. These regulations would be the first to directly restrict methane emissions by the oil and gas industry; they build on a 2012 rule that sought to curb volatile organic compounds (VOCs) from hydraulic fracturing (fracking) to extract natural gas. Combined, the two regulations could reduce the oil and gas sector's methane emissions by up to 30% by 2025, compared with 2012 levels, EPA says.

The proposed EPA regs are part of a larger effort by the White House to reduce national methane emissions by 40–45% by 2025. [See go.nature.com/o6uzlj for more detail.] But methane has only negligible influence on climate -- contrary to popular belief and contrary to the claims of the IPCC, the UN's climate science panel. Basic physics does not support White House policies to control methane emissions.

The Science

Methane occurs naturally as a trace gas in the earth's atmosphere. Its chemical formula is CH₄, one atom of carbon surrounded by four atoms of hydrogen. It forms the most important constituent of natural gas, an excellent fuel for generating heat and electricity. When burnt (oxidized), its products are carbon dioxide (CO₂) and water vapor (WV). It is also a greenhouse (GH) gas, which by definition means it absorbs radiation at certain wavelengths in the infrared (IR) part of the electromagnetic spectrum. But contrary to UN-IPCC claims, basic physics reveals that its influence on climate is insignificant.

Methane has many sources, both natural (about half) and anthropogenic. The major natural sources are wetlands, swampy areas and bogs; the human-related sources are traditional agricultural ones, related to the growth of world population: rice paddies and cattle raising (flatulence from ruminants). More recent sources also include landfills and leaks from oil and gas operations. Coalmines also emit some methane that occasionally cause explosions there.

There are also many natural sinks of methane, including ozone and hydroxyl (OH) radicals in the troposphere (lower atmosphere). The combination of sources and sinks leads to an atmospheric lifetime of approximately 10 years.

Actual measurements show that methane concentration drops sharply as it enters the very dry stratosphere; as predicted, it is rapidly oxidized there into water vapor and carbon dioxide and thereby forms one of the important sources of stratospheric water vapor.

Global methane levels have risen to 1800 parts per billion (ppb) in 2011, an increase by a factor of 2.5 since pre-industrial times. Its rate of growth decreased sharply around 2000, for reasons not well understood. [Its concentration is higher in the Northern Hemisphere since most sources (both natural and human) are located on land and the Northern Hemisphere has more land mass. The concentrations vary seasonally, with a minimum in the late summer -- mainly due to methane removal by the [hydroxyl radical](#).]

In contrast to CH₄, the atmospheric concentration of CO₂ is hundreds of times greater, about 400 ppm (400,000 ppb); water vapor is quite variable and often reaches 1 -2 % (10,000 – 20,000 ppm). Methane's lack of importance for climate change is partly due to its low abundance, but mostly because of spectroscopic reasons.

A word of explanation may be in order here. Judging the climate effects of CO₂ is difficult because of uncertainties about the amount, and even the sign, of likely atmospheric feedback – esp. from water vapor and from clouds. With the tiny level of methane, there is no uncertainty from meteorology; simple physics gives the answer.

Methane is an Ineffective Greenhouse Gas

The IPCC claim that methane is roughly 30 times more important per molecule than CO₂ is largely irrelevant. My colleague Thomas Sheahen (PhD in physics, MIT) has pointed out that the much more abundant atmospheric water vapor absorbs radiation in many of the same parts of the infrared spectrum. As a result, the global warming effectiveness of CH₄ is much reduced, since the Earth's radiation can only be absorbed once.

A further reduction in its effectiveness comes from the fact that there's just very little radiation energy in the part of the infrared spectrum where methane absorbs. The earth's surface emits as a so-called "black body," with a peak in wavelength that varies inversely with temperature. [An interesting example is the Antarctic continent; it is very dry and extremely cold. On the one hand, the scarcity of water vapor should make methane a slightly more effective greenhouse gas; but on the other hand, Antarctic's infrared emission is mostly at longer wavelengths, far removed from the region where methane absorbs.]

Policy considerations

The EPA's proposed new regulations to reduce anthropogenic methane emissions into the atmosphere will raise greatly the cost of oil and gas production. Perhaps that is the real purpose of the EPA regs. But since the climate effects of methane are insignificant, EPA regs lack a science base and may simply be part of a scheme to phase out all fossil fuels, including natural gas.

The production of natural gas from shale through a combination of horizontal drilling and fracking has been a real economic boon to the US. For example, it reduced the price of natural gas from \$13 a few years ago to about \$4 per MCF [1000 cubic feet]. The price even fell briefly to \$2 per MCF. As a result, the cost of electric power in the US is only a fraction of the European cost, giving a great advantage to US industry and benefiting US consumers.

In 2008, candidate Obama promised us that electricity prices would "sky-rocket." The proposed EPA regs will raise electricity prices and the cost of living for US consumers. Industries may move to countries where natural gas and electricity is cheaper; jobs will follow industry.

To sum up: Though technically a GH gas, methane (CH₄) has only negligible influence on climate; however it does affect the chemistry of the stratosphere -- as was predicted nearly 50 years ago.

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