Researchers challenge study on hydrofracking's gas footprint

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(PhysOrg.com) -- A Cornell study's contention that hydraulic fracturing would be worse for climate change than burning coal is being challenged by another study, also by Cornell researchers.

In April 2011, Robert Howarth, the David R. Atkinson Professor of Ecology and Evolutionary Biology, and colleagues published a study in Climatic Change *Letters* concluding that methane leakage from hydraulic fracturing would outweigh any benefits of natural gas as a transition fuel to greener technologies.

In the spirit of academic discourse, a commentary on that study, published Jan. 3 by the same journal, challenged these claims. Lawrence Cathles, professor of earth and atmospheric studies, and his co-authors took issue with Howarth's analysis and sources of data, which they called "seriously flawed," and made the case that natural gas is a greener fuel than coal.

Howarth's group then wrote a response to the Cathles rebuttal, published Feb. 1 in the same journal, in which they stood by their previous findings that the greenhouse gas footprint of shale gas is greater than other fossil fuels.

Howarth's April 2011 study -- co-authored by Tony Ingraffea, the Dwight C. Baum Professor of Engineering, and Renee Santoro, a research technician in ecology and evolutionary biology -- warned that methane, a greenhouse gas with 100 times more warming impact than

carbon dioxide, leaks or is purposely vented into the atmosphere over the life cycle of shale gas production. Part of that life cycle is the hydraulic fracturing process, which, in "unconventional" horizontal shale wells, involves pressurized injection of millions of gallons of water and chemicals to break open paths for the natural gas to flow from the well.

The researchers estimated that as much as 7.9 percent of the methane in shale gas leaks enters the atmosphere during the lifetime of unconventional natural gas extraction -- 40 percent to 60 percent more than for conventional gas wells. Because of this methane leakage, they also contend that over a span of 20 years, shale gas is worse even than burning coal in terms of climate change.

Cathles and colleagues, including Larry Brown, professor and chair of the Department of Earth and Atmospheric Sciences, argued against the claims, saying that the leakage rate at which gas would be worse than coal, although closest for a 20-year transition, is far from the current leakage rate.

A methane leakage of 7.9 percent and a 20-year transition are both needed to make gas worse than coal from a greenhouse perspective, Cathles said. The leakage rate of the crossover would be much higher, about 17 percent, if the transition period were 100 years.

Methane leakage today is probably less than 2 percent, they said, and there is no evidence that shale gas wells leak more than conventional wells.

The greenhouse benefit of gas doubles when it replaces coal in electrical generation -- essentially coal's only use, Cathles asserted -- because gas can generate electricity twice as efficiently as coal. Furthermore methane's short lifetime in the atmosphere means that any leakage is quickly dissipated, whereas the extra CO2 that would be generated by

coal would remain in the atmosphere for a very long time.

These points were established in the Jan. 3 commentary by Cathles and his co-authors, which also include Milton Taam, president of Electric Software Inc., and Andrew Hunter, lecturer in the School of Chemical and Biomolecular Engineering. They concluded that natural gas remains an attractive transition fuel with half to a third of the greenhouse impact of coal.

Howarth et. al's Feb. 1 response to the Cathles rebuttal stated that the latest EPA estimate for methane emission from shale gas falls within the range of their independent estimates, but not those of Cathles, et al., which are much lower.

They stood by their approach and findings, pointing out that their original analysis covered both electricity and heat generation. They evaluated both a 20-year and 100-year time frame for methane leakage from shale gas, and they contended that "both time frames are important, but the decadal scale is critical, given the urgent need to avoid climate-system tipping points."

Howarth and an expanded group of colleagues led by Jed Sparks, associate professor of ecology and evolutionary biology, plan further study into the greenhouse gas footprint of shale-derived gas, supported by a $74,200 grant from Cornell's Atkinson Center for a Sustainable Future.

Provided by Cornell University