How Green is Natural Gas?

Natural gas is widely touted as a "green" source of energy because it releases fewer greenhouse gases (GHG) than does coal *when it is burned*. Obtaining natural gas, however, causes the emission of significant amounts of heat-trapping GHG during exploration, extraction, processing, and transmission. As detailed below, compared to conventional extraction, even more GHG are emitted when gas is obtained by intense horizontal drilling and high-volume hydraulic fracturing (HVHF). Initial analyses by the National Research Council and the EPA indicate that the ecological costs of unconventional drilling will be higher than they are for conventional gas drilling.[1] (HVHF is one form of unconventional drilling and is the process that will be used in the Marcellus Shale.)

Drilling the Marcellus Shale may actually **increase** New York's carbon footprint, not reduce it.

No one knows if the gas obtained by HVHF is cleaner than coal, because no one has done a full life cycle analysis of the GHG emissions produced during this process, nor has anyone done a full accounting of other external costs to drilling in the Marcellus Shale.

With 2% fugitive emissions (a low-end estimate), peak GHG emissions from *conventional* gas *equal those from coal* over 20 years.[3,4]

Sources of Higher GHG from Unconventional Drilling:[2]

1) Upstream Combustion of Fossil Fuels (emits various GHGs, including CO_2, SOx and NOx):

-- **Transportation** uses large amounts of fuel to move equipment, to bring workers to the area and then to work sites, and especially to truck millions of gallons of water to and from each well, every time the well is fracked.

-- **Operating drilling, processing and transmission equipment** (especially diesel-powered compressors, drills, pumps, separators, and dehydrators) is fuel-intensive.

-- **Flaring of methane** (intentional burning of produced gas) is carried out until a well is capped.

-- **Storage and/or treatment of produced water** can only be done at specialized (and thus usually distant) locations. The only thorough method of removing certain toxic chemicals from used frack water is distillation (AKA crystallization of the chemicals), which uses very large amounts of energy.

Using the figures in the draft SGEIS, the number of wells allowed in Tompkins County would generate the equivalent of *516 years of emissions,* at current levels, from *all* other locally-generated sources.[5]

2) Releases of Unburned Methane (which traps 62 times as much heat as does CO_2[6])

-- **Leaks** can begin during exploration if methane is released from overlying formations; leaks can also result from improper casings, or from migration of produced gas during fracking.

-- **Fugitive GHG emissions** are released during capping, processing, compression, transmission, and venting and volatilize from the flowback and produced water.

3) Destruction of Carbon Sinks[7]

-- **Trees and fields are cleared** from thousands of acres for drill pads, holding ponds, gathering lines, treatment and compressor stations, and transmission lines, plus access roads to all of the above.

Ozone levels have gotten so high in the Pinedale, Wyoming area (home of the Pinedale Anticline gas field), that in recent winters they have rivaled the worst bad-ozone days in major cities such as Los Angeles.[8]

-- **Air pollution, especially ozone,** from compressors and truck traffic slows growth of plants.

-- **Soil compacted** by heavy equipment retains less carbon due to the death of plant roots and microorganisms.

-- **Water contaminated** by spills of fuel, chemicals, drilling mud, and/or produced water no longer supports plants.

(OVER)

Developed by Margaret McCasland and Ellen Harrison

References and More Information:

1. *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*, National Research Council, The National Academies Press, October 2009.

   "[Unconventional] processes have a considerably greater potential for causing air-quality degradation than do conventional recovery technologies. . . ." p. 84

   "Beyond emissions from engines, there are also significant GHG emissions of methane . . . from fugitive emissions. . . ." p.86.

   "The prospect of this [Marcellus Shale] gas, however, is balanced against the deeper drilling and more complicated extraction, which would increase the life-cycle energy use and associated emissions of using this resource." p.91

2. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2007*, U.S. EPA, April 15, 2009.

   "Over the last two hundred and fifty years, the concentration of CH_4 in the atmosphere increased by 148 percent (IPCC 2007)." p. 20, Executive Summary.

   See also Key Categories [of GHG Emissions] Figure ES-16, p. 20, Executive Summary.

3. EPA estimates of the amount of methane leaked in US production is reported by Revkin, A. and Krauss, C. October 14, 2009. "Curbing Emissions by Sealing Gas Leaks." *New York Times.* http://www.nytimes.com/2009/10/15/business/energy-environment/15degrees.html

4. Lovelock, J. 2007. *Revenge of Gaia.* Basic Books. See pp. 74–76 for the discussion of effective warming from methane.

5. Tompkins County Planning Department comments to NYSDEC, Dec. 2009 accessed on 1/20/2010 at http://www.tompkins-co.org/planning/energyclimate/documents/PlanningDeptcommentsfinal12_30.pdf

6. According to the latest report from the Intergovernmental Panel on Climate Change (IPCC 2007), methane's effect on global warming is 62 times greater than that of CO_2 (the difference in absorption of infrared radiation in the atmosphere).

7. See, for example "Land Use and Habitat Fragmentation of Oil Sands Production: A Life cycle Perspective," Jordaan, S., et al. University of Calgary/Institute for Sustainable Energy Environment and Economy, September 2009.

   "Methods for the inclusion of landscape fragmentation in life cycle assessment are not well established. . . . The results suggest that land disturbance due to natural gas production can be relatively large per unit energy." (from abstract)

8. Hargreaves, Steve, Small Town, Big Changes, CNNMoney.com, October 20, 2008.

****

One notable recent report on global warming emissions from natural gas production is *Emissions from Natural Gas Production in the Barnett Shale Area and Opportunities for Cost-Effective Improvements*, Al Armendariz, Ph.D., Southern Methodist University, 2009. In the Barnett Shale in Texas, where high-volume hydrofracking and horizontal drilling are already in use, emissions of carbon dioxide and methane are roughly equal, every day, to the greenhouse gas emissions from two 750 MW coal-fired power plants.

Infrared camera video footage showing hydrocarbon leaks from many different parts of natural gas production can be seen at http://un-naturalgas.org/weblog/2009/09/782/.

The Draft SGEIS from NYS DEC contains some estimates of greenhouse gas emissions for Marcellus Shale production (see Chapter 6), but does not use the estimates to make any recommendations.