Some Scientific Failings with the Draft Supplemental Generic Environmental Statement

Statement Submitted to the NYS Dept. of Environmental Conservation

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Governor Cuomo has stressed the importance of using science to inform the decision by New York on the future of shale gas development in our State.Unfortunately, the draft sGEIS released on September 7, 2011 fails to use the best available science. As a result, the document is inadequate as one to inform the Governor and Commissioner Martens in their decision making.
My comments focus on two areas: the greenhouse gas footprint of shale gas, and the water quality problems associated with shale gas. I have extensive professional expertise and experience in both these areas. And in both, the sGEIS has completely ignored or misinterpreted critically important science. As a result, the sGEIS severely underestimates the potential environmental harm from shale gas, and fails to provide an adequate basis for the development of appropriate regulation for high-volume slick-water hydraulic fracturing.

In August of 2011, Prof. Tony Ingraffea and I published an invited commentary in Nature on problems with shale gas. I am submitting a copy of this paper as part of my comment on the sGEIS. In our paper (which is not mentioned in the sGEIS), we highlight how new the process of developing shale gas is. In Texas, industry started developing shale gas only in the last decade or so. Outside of Texas, only in the past 3 to 4 years has there been significant experience with shale gas development. As a result, objective scientific information is also quite new. In fact, most of the information published on the environmental consequences of shale gas in peer-reviewed scientific journals has only been published in 2011. Further, the U.S. EPA has substantially revised their analysis of emissions and other greenhouse gases over the past year (EPA 2011), and the U.S. Geological Survey in the summer of 2011 reduced their estimate for the size of the gas resource in the Marcellus shale formation by 5-fold (Coleman et al. 2011). The sGEIS fails to reflect this new science and updated analysis. At the end of my comment, I provide a list of recent, critically important papers and reports that were ignored by the sGEIS. In all cases, the papers and reports are readily available on line, or I am submitting copies as part of this statement.

With regard to the new report from the U.S. Geological Survey, Coleman et al.(2011) give estimates for the technically recoverable resource of natural gas from the Marcellus shale that are 5-fold less than the estimates from the Energy Information Agency (EIA) that the sGEIS relied on. In response, the EIA publicly stated that the U.S. Geological Survey staff were the true experts in this area, and that the EIA was therefore withdrawing their estimates. The NYS DEC simply must do so as well, if they are to have any scientific credibility.

Greenhouse gas footprint of shale gas:

In the analysis of the greenhouse gas impacts of shale gas beginning on page 6186, the sGEIS provides very little reference to the scientific literature, and uses out-ofdate information. For the comparison of methane with carbon dioxide, the sGEIS relies on a 2009 fact sheet from Chesapeake Energy Corporation (page 6-201). The information in that fact sheet is out-of-date, and does not reflect the latest information on the relative global warming potential of methane (Shindell et al. 2009; Howarth et al. 2011; Howarth & Ingraffea 2011). This is one of many reasons that the sGEIS understates the greenhouse gas

footprint of shale gas.
Through the spring of 2010, the U.S. EPA relied on methane emission factors from a 1996 report to estimate the greenhouse gas emissions from natural gas systems.However, they in November of 2010, EPA (2010) issued a new report, with very much higher emission estimates. This report and several follow up reports by EPA in 2011 (listed below) stress that shale gas has far greater emissions than does conventional natural gas. With the new information, EPA now concludes that natural gas systems are the single largest source of methane pollution in the U.S., contributing 39% of all methane. The sGEIS does not reflect this new science from EPA.

In April of 2011, we published the first scientific analysis of the greenhouse gas footprint of shale gas that included methane emissions (Howarth et al. 2011). Subsequent analyses were published by Hughes (2011) and Wigley (2011), both well before the final version of the draft sGEIS was released. All three studies show that the greenhouse gas footprint of shale gas is worse than that for coal and oil, at time scales of at least 40 years following emission (Wigley 2011) and perhaps a century or longer (Howarth et al. 2011; Hughes 2011). See also Howarth & Ingraffea (2011) and Santoro et al. (2011). The sGEIS makes no mention whatsoever of these studies.

The sGEIS fails to convey the urgency of methane emissions as a pollution problem. Hansen et al. (2007) pointed out that if the average global temperature rises above 1.8o C, the planet well pass a tipping point, and the climate system may rapidly change into a totally new and undesirable state. They note that methane emissions must be controlled, if this tipping point is to be avoided. In July of 2011, the United Nations issued a new report that further amplified the urgency of controlling methane (UNEP/WMO 2011). According to this report, the Earth is in danger of passing an irreversible climate-tipping point if the average temperature rises between 1.5 and 2o C. At current rate of global methane releases, this temperature change will be reached within 15 to 35 years (UNEP/WMO 2011). Only immediate reductions in methane emissions can advert such a warming and the attendant risk, according to the United Nations. Yet using shale gas as a replacement for conventional gas will increase methane emissions from the U.S. (Howarth et al. 2011).

The DEC needs to completely re-write the section of the sGEIS that deals with global warming. I urge that they reach out to those of us in the state of New York who are experts on this issue (including for example Shindell a the NASA Goddard Institute, in addition to Prof. Ingraffea and me at Cornell), and not rely solely on input from industry.

The failure of the sGEIS to adequately consider methane emissions and their consequences on the greenhouse gas footprint of shale gas also has ramifications on the proposed regulations. The proposed regulations indicate that while it would be desirable to capture the large amount of methane vented at the time of well completion and flow-back, this would not be required of industry. Given the urgent need to reduce methane emissions, the DEC should require absolutely no venting of methane, whether at the time of well completion or later, and whether for exploratory or production wells.

Some water quality issues:
The sGEIS incorrectly makes a distinction between drinking water systems that are filtered and those that are not filtered with regard to public health risks from fracreturn wastes. The DEC is proposing that shale-gas development not be allowed in the watersheds for the cities of New York and Syracuse, in part based on risk to chemical exposure. For instance, on page 6-48, the sGEIS states:

“Toxic Compounds: Unfiltered drinking water supplies have a heightened sensitivity to chemical discharges as there is no immediately available method to remove contaminants from the drinking water

source waters. Well pad containment practices and setbacks are likely to effectively contain most spills at those locations. There is a continuing risk, however, of releases from chemicals, petroleum products and drilling fluids from the well pad as a result of tank ruptures, equipment or surface impoundment failures, overfills, vandalism, accidents (including vehicle collisions), ground fires, or improper operations. Spilled, leaked or released fluids could flow to a surface water body. The intensive level of trucking activity associated with high-volume hydraulic fracturing, including the transport of chemical and petroleum products, presents an additional risk of surface water contamination due to truck accidents and associated releases. “

The sGEIS implies that the filtration systems employed by other municipal water authorities in the State would provide some protection against the risk of contamination by toxic (and radioactive) compounds. They provide no scientific or engineering support for this assumption, and the assumption is wrong. In a letter to Governor Cuomo on September 15, 2011, I and 58 other scientists wrote:

“We the undersigned scientists write to you regarding the ability of municipal drinking water filtration systems to adequately remove contaminants of the sort found in return fluids from hydraulic fracturing, should they somehow enter the water system. The State has proposed that hydraulic fracturing not be allowed in the watersheds of the New York City and Syracuse water systems (where no filtration occurs), but be allowed in watersheds where drinking water is filtered before use. The presumption appears to be that municipal water filtration plants provide protection from potential contaminants.

The best available scientific information does not support this presumption**.**

Most municipal water filtration systems are designed to remove potentially dangerous microorganisms from water, which they do efficiently. The typical filtration system would also remove some hazardous substances. However, there simply is not an adequate knowledge base to conclude that filtering would remove all, or even most, of the hazardous substances found in flow-back fluids from hydraulic fracturing. Potential contaminants of concern known to be in some flow-back fluids include benzene and other volatile aromatic hydrocarbons, surfactants and organic biocides, barium and other toxic metals, and soluble radioactive compounds containing thorium, radium, and uranium.

Municipal filtration systems were not designed with such hazards in mind, and the ability of the filtration systems to remove such hazardous substances has received little, if any, study. We believe, however, the best available science suggests that some of these substances would pass through the typical municipal filtration system.

We urge the State to reconsider its position that existing water filtration systems provide adequate protection against the risk of hydraulic fracturing, should materials from flow-back fluids migrate to lakes, reservoirs, or groundwaters used for municipal water supplies.

Each signatory of this letter has significant professional experience with water treatment systems, with aquatic chemistry or biogeochemistry, and/or with the movement and fate of toxic or radioactive materials. We write as individuals and our professional affiliations are listed for your information. You should not infer any endorsement of our viewpoint by our affiliated institutions.”

A copy of the letter and the list of signatories, including 5 members of the National Academy of Sciences, is available at

http://www.psehealthyenergy.org/data/Sign_on_letter_Final.pdf

I reiterate here that the best scientific information indicates that at least some substances would pass through municipal drinking water filtration systems, should surface waters become contaminated. The sGEIS agrees that there is a risk of such contamination, and provides no scientific support for their assumption that filtration would be protective.

Before the sGEIS is accepted, several other water quality issues need to be addressed:

New data from the EPA show very high levels of contamination of drinking water wells in Pavillon, WY, as indicated in a PowerPoint presentation by EPA on November 9, 2011:

http://www.epa.gov/region8/superfund/wy/pavillion/PavillionCommunityPresenta
tion09Nov2011.pdf EPA has indicated they will release a report on these data, with interpretation, very soon. DEC should seek out this report.

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Entrekin et al. (2011) have demonstrated that turbidity in streams increases with density of gas wells, with elevated turbidity beginning at densities as low as 4 wells per thousand hectare. These authors also documented that for unconventional wells drilled since 2005, a higher proportion were drilled within 100 m of streams than in other states (35% of wells in NY, vs. only 4% in PA, for example). This suggests a strong need for more protective regulation of well
placement in New York.

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Osborn et al. (2011) demonstrated that drinking water wells within 1 km of gas wells in the Marcellus shale area have a high probability of being contaminated with elevated levels of methane, sometimes at dangerous levels, and with clear evidence that the methane contamination resulted from the gas-well development. This calls for a much larger set-back between gas wells and drinking water wells than the sGEIS proposes.

Critically important papers and reports not included in the sGEIS:

Coleman J., Milici RC, Cook TA, Charpentier RR, Kirschbaum M, Klett,TR, Pollastro RM, and Schenk CJ (2011), Assessment of undiscovered oil and gas resources of the Devonian Marcellus Shale of the Appalachian Basin Province, 2011: U.S.
Geological Survey Fact Sheet 2011–3092. http://pubs.usgs.gov/fs/2011/3092/.

EPA (2010). Greenhouse Gas Emissions Reporting from the Petroleum and Natural Gas Industry. Background Technical Support Document. U.S. Environmental Protection Agency, Washington DC. Available at \
http://www.epa.gov/climatechange/emissions/downloads10/Subpart-W_TSD.pdf
EPA (2011). Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2009. April 14, 2011. U.S. Environmental Protection Agency, Washington DC. Available at
http://epa.gov/climatechange/emissions/usinventoryreport.html

EPA (2011). Regulatory Impact Analysis: Proposed New Source Performance Standards and Amendments to the National Emissions Standards for Hazardous Air Pollutants for the Oil and Gas Industry. July 2011. U.S. Environmental Protection Agency, Office of Air and Radiation. Washington DC.

EPA (2011). Climate Change – Regulatory Initiatives. U.S. Environmental Protection Agency, Washington DC. Available at http://www.epa.gov/climatechange/emissions/ghgrulemaking.html

EPA (2011). Oil and natural gas sector: standards of performance for crude oil and natural gas production, transmission, and distribution. EPA-453/R-11-002. Prepared for U.S. EPA Office of Air Quality Planning and Standards by EC/R Incorporated. U.S. Environmental Protection Agency, Washington DC.

EPA (2011). Proposed Amendments to Air Regulations for the Oil and Gas Industry Fact Sheet. U.S. Environmental Protection Agency, Washington DC. Available at http://www.epa.gov/airquality/oilandgas/pdfs/20110728factsheet.pdf

Entrekin, S., M Evans-White, B. Johnston, and E. Hagenbuch. 2011. Rapid expansion of natural gas development poses a threat to surface waters. Frontiers in Ecology & Environment. 9: 503-511.

Hansen J, Sato M, Kharecha P, Russell G, Lea DW, and Siddall M. (2007). Climate change and trace gases. Phil. Trans. R. Soc. A 365: 1925–1954.

Howarth, R., W., and A. Ingraffea. 2011. Should fracking stop? Yes, it is too high risk. Nature 477: 271-273.

Howarth, R. W., R. Santoro, and A. Ingraffea. 2011. Methane and the greenhouse gas footprint of natural gas from shale formations. Climatic Change Letters, doi: 10.1007/s10584-011-0061-5 Available at http://www.springerlink.com/content/e384226wr4160653/fulltext.pdf

Hughes D (2011) Will Natural Gas Fuel America in the 21st Century? Post Carbon Institute, Santa Rosa, CA. Avaiilable at http://www.postcarbon.org/report/331901-will-natural-gas-fuel-america-in

Hughes D (2011). Lifecycle Greenhouse Gas Emissions from Shale Gas Compared to Coal: An Analysis of Two Conflicting Studies. Post Carbon Institute, Santa Rosa, CA. Available at http://www.postcarbon.org/reports/PCI-Hughes-NETL-Cornell-Comparison.pdf

Osborn S.G, Vengosh A, Warner NR, and Jackson.RB (2011). Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing. Proc. Natl. Acad. Sci. USA 108: 8172–8176.

Santoro, R., R. W. Howarth, and A. Ingraffea. 2011. Indirect emissions of carbon dioxides from Marcellus shale gas development. A technical report of the Agriculture, Energy, & Environment Program at Cornell University. Available at http://www.eeb.cornell.edu/howarth/IndirectEmissionsofCarbonDioxidefromMar cellusShaleGasDevelopment_June302011%20.pdf

Shindell DT, Faluvegi G, Koch DM, Schmidt GA, Unger N, and Bauer SE (2009). Improved attribution of climate forcing to emissions. Science 326: 716-718.

UNEP/WMO (2011). Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers. United Nations Environment Programme and the World Meteorological Organization. Nairobi, Kenya.

Wigley TML (2011). Coal to gas: The influence of methane leakage. Climatic Change Letters DOI 10.1007/s10584-011-0217-3