

The Honorable Andrew M. Cuomo
Governor of New York State
NYS State Capitol Building
Albany NY 12224

May 8, 2014

Dear Governor Cuomo:

We are writing to urge your administration to conduct studies and a human health risk assessment of the occurrence of radon and radium during drilling for natural gas before deciding whether to allow drilling in New York's portion of the Marcellus shale or the distribution to New Yorkers of Marcellus shale gas containing unhealthy levels of radon. We urge your administration to make public any and all data collected about the presence of these two carcinogenic elements in Marcellus shale drilling so that the citizens of New York will have full access to the information used in your decisionmaking.

Our primary concerns are that natural gas produced from the Marcellus shale may contain levels of radon and its decay products that are significantly higher than gas currently being distributed in New York and that wastewater and other drilling wastes from Marcellus shale drilling may contain high concentrations of radium that pose health risks if disposed of improperly.

High radon levels are problematic both to potential end users and as an occupational hazard. Radon present in natural gas may have insufficient time to decay if transported through gas pipelines to homes and other buildings in the state. Therefore, indoor use of radon-containing natural gas for cooking, heating and other purposes might significantly increase cancer risk to the public, especially in New York City and other jurisdictions where homes tend to be smaller and radon could become concentrated in indoor air.

The radon exposure risk from Marcellus gas may affect not only those living in areas where the gas is distributed, but also those who work in close proximity to natural gas facilities, including personnel who maintain and repair the gas distribution system and gas-fired boilers, building maintenance staff, restaurant cooks and state oil and gas inspectors.

Similarly, radium in natural gas wastes could pose risks to drinking water, soil and aquatic life if it is disposed of improperly. Both radon and radium are classified as known human carcinogens by the International Agency for Cancer Research.¹

The New York State Department of Environmental Conservation's (DEC) draft environmental impact statement on shale gas drilling contains little analysis of radium

¹ Intl. Agency for Research on Cancer, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 43 Man-made Mineral Fibres and Radon. Accessed online February 28, 2014 at <http://monographs.iarc.fr/ENG/Monographs/vol43/volume43.pdf>. Intl. Agency for Research on Cancer, IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, Vol. 78 Ionizing Radiation, Part 2: Some Internally Deposited Radionuclides. Accessed online February 28, 2014 at <http://monographs.iarc.fr/ENG/Monographs/vol78/mono78.pdf>.

risks and only one sentence about radon.² The document's minimal attention to these issues is inadequate and should be remedied by doing a full exposure characterization and health risk assessment of radon, radium and other radioactive byproducts associated with shale gas drilling. The analysis should include a comprehensive study of the levels of radioactivity released from all stages of shale gas production and use and the potential for exposure during exploration, drilling and hydraulic fracturing, transmission to compressor stations and pipelines, delivery to consumers and disposal of drilling wastes.

According to the EPA and the Centers for Disease Control and Prevention (CDC), radon, a naturally occurring radioactive gas, is the nation's second-leading cause of lung cancer, after smoking. Radon is a radioactive decay product of radium, which, in turn, is a decay product of uranium and thorium, elements that are often located deep underground. Radon is colorless, tasteless and odorless. It is created only by radioactive decay and can be eliminated only by further radioactive decay. It has a half-life of 3.8 days and does not burn or react chemically. Radon's radioactive decay products include polonium, a radioactive solid that decays by emitting high-energy alpha particles that damage lung tissue and cause cancer. Radon can accumulate in homes and other buildings by migrating from the ground through cracks and holes in a building's foundation. However, the CDC recognizes that radon can also collect in homes through the indoor use of natural gas that was previously trapped in underground deposits of uranium- and thorium-bearing rock.³

The New York Department of Environmental Conservation and U.S. Geological Survey have previously reported that the Marcellus shale contains both uranium and thorium and the Survey has noted that "the Marcellus is readily identified on geophysical logs by its high gamma-ray signal," a form of radiation.⁴ Moreover, the Survey recently released preliminary sampling data from a limited number of natural gas wells that confirmed that natural gas from the Marcellus shale contains radon. In a report published in 2012, the USGS examined 10 samples of gas collected near the wellheads of three wells producing from Pennsylvania's Marcellus shale. It found radon levels ranging from 1-to-79 picocuries per liter, with an average of 36 and a median of 32. The Survey's scientists noted that they knew of no other published measurements of radon in natural gas from

² See, e.g., N.Y. State Dep't. Env'tl. Conservation, Supplemental Generic Env'tl Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs (2011), [hereinafter NYDEC SGEIS] at 4-35 through 4-36, 6-205 through 6-207, Appendix 13 (containing limited information and analysis about radium). The only sentence about radon appears at 6-206.

³ U.S. Env'tl. Prot. Agency. A Citizen's Guide to Radon. Accessed online February 28, 2014 at <http://www.epa.gov/radon/pubs/citguide.html>. Agency for Toxic Substances and Disease Registry, Radon Toxicity, What is Radon? Accessed online February 28, 2014 at <http://www.atsdr.cdc.gov/csem/csem.asp?csem=8&po=4>. Agency for Toxic Substances and Disease Registry, Radon Toxicity, Where is Radon Found? Accessed online February 28, 2014 at <http://www.atsdr.cdc.gov/csem/csem.asp?csem=8&po=5>. U.S. Env'tl. Prot. Agency. Radiation Protection, Radon. Accessed online February 28, 2014 at <http://www.epa.gov/rpdweb00/radionuclides/radon.html>.

⁴ N.Y. State Dep't. Env'tl. Conservation, Supplemental Generic Env'tl Impact Statement on the Oil, Gas and Solution Mining Regulatory Program, Well Permit Issuance for Horizontal Drilling and High-Volume Hydraulic fracturing to Develop the Marcellus Shale and other Low-Permeability Gas Reservoirs (2011), [hereinafter NYDEC SGEIS] at 4-35, 6-206. E.L. Rowan et al. U.S. Geological Survey, Radium Content of Oil- and Gas-Field Produced Waters in the Northern Appalachian Basin (USA): Summary and Discussion of Data, 2011, at 15. Accessed online February 28, 2014 at <http://pubs.usgs.gov/sir/2011/5135/>.

the Appalachian Basin, which contains the Marcellus shale. They concluded that the number of samples “is too small to... yield statistically valid results” and that “the key to better understanding radon, its sources, and behavior in hydrocarbon reservoirs lies with the collection and interpretation of additional data.”⁵

The EPA similarly highlighted the lack of analysis of radon and other radiation exposure in its review of the DEC’s draft plan for shale gas drilling in New York. “Who is responsible for addressing the potential health and safety issues and associated monitoring related to external radiation and the inhalation of radon and its decay products?” the EPA asked. “Such potential concerns need to be addressed.”

While radon levels in produced gas will start to decline as soon as the gas leaves the well, the short distance from Marcellus shale wells to New York’s consumers means that there will likely be little time for radon levels to decline before the gas reaches homes and buildings. The result may be exposures that are higher than current levels and an increased risk of lung cancer. We strongly encourage your administration to take a leadership role in studying radon exposure through natural gas.

With respect to radium, evidence suggests that levels in wastewater from Marcellus shale gas drilling are unusually high. Radium contaminates underground water deposits that come into contact with uranium- or thorium-bearing rock.⁶ In 2011, the U.S. Geological Survey reported that radium levels in produced water from oil and gas wells in New York and Pennsylvania, including those in the Marcellus shale, “have a distinctly higher median... than reported for other formations in the Appalachian Basin, and range to higher values than reported in other basins.” (Generally, produced water is a term for naturally occurring water that comes to the surface in the oil and gas production process; it is distinct from “flowback,” hydraulic fracturing fluid that returns to the surface after being injected during the drilling process. However, here the U.S. Geological survey defines produced water as “produced from an oil or gas well at any point during its life cycle.”) The agency also found that the range of radium levels from produced water in Pennsylvania’s Marcellus shale was similar to New York’s, although the median level was lower “due, at least in part, to dilution of formation water by formation water injected for hydraulic fracturing.”⁷ Because radon is a decay product of radium, high levels of radium suggest high levels of radon.

In 2011, The New York Times reported that drilling companies were dumping millions of gallons of wastewater from Marcellus shale gas wells in Pennsylvania into treatment plants, and that the wastewater from 42 wells studied contained radium levels up to 3,600 times EPA’s safety standard for drinking water. In some cases, the treatment plants were

⁵ E.L. Rowan and T.F. Kraemer, U.S. Geological Survey, Radon-222 Content of Natural Gas Samples from Upper and Middle Devonian Sandstone and Shale Reservoirs in Pennsylvania: Preliminary Data, 2012. Accessed online February 28, 2014 at <http://pubs.usgs.gov/of/2012/1159/>. Agency for Toxic Substances and Disease Registry, Radon Toxicity, What is Radon? Accessed online February 28, 2014 at <http://www.atsdr.cdc.gov/csem/csem.asp?csem=8&po=4>. U.S. Env’tl. Prot. Agency. A Citizen’s Guide to Radon. Accessed online February 28, 2014 at <http://www.epa.gov/radon/pubs/citguide.html>.

⁶ U.S. Env’tl. Prot. Agency. Radiation Protection, Radium. Accessed online February 28, 2014 at <http://www.epa.gov/radiation/radionuclides/radium.html#environment>.

⁷ E.L. Rowan et al., supra note 4, at 15. Accessed online February 28, 2014 at <http://pubs.usgs.gov/sir/2011/5135/>.

not equipped to treat the wastewater and discharged it into rivers just upstream from drinking water intakes.⁸ A peer-reviewed study of the impacts of drilling wastewater treated and discharged into a creek by a wastewater facility in western Pennsylvania recently documented radium levels approximately 200 times greater in sediment samples near the discharge than in sediment samples collected upstream of the plant or in other locations in western Pennsylvania. “The absolute levels that we found are much higher than what you allow in the U.S. for any place to dump radioactive material,” one of the authors told Bloomberg.⁹ The New York Department of Environmental Conservation has previously found that produced water from 11 of 13 vertical wells drilled in New York’s Marcellus shale in 2008 and 2009 contained radium levels ranging from 400 times to nearly 3,400 times EPA’s safe level. That data was included in the U.S. Geological Survey’s study of radium.¹⁰

Despite this evidence, the Department’s assessment of radium risks and how to contend with them appears lacking. Although its report stated that “there is questionable available capacity”¹¹ for New York’s public sewage treatment plants to accept drilling wastewater, it would allow those facilities to accept it if the plants meet permitting conditions.¹² The agency said that underground injection (perhaps the most common method of disposal of drilling wastewater) might be an alternative,¹³ even though the last significant government study of pollution risks from oil and gas underground injection wells took place in 1989 and found significant instances of groundwater contamination.¹⁴ In the years since, news stories and studies have continued to link underground injection of drilling wastewater to contamination as well as earthquakes.¹⁵

The DEC assessment reported that a radioactive materials license might be required for facilities that concentrate naturally occurring radioactive materials during pre-treatment or treatment of drilling wastewater.¹⁶ In its review of the Department’s analysis, the U.S. EPA noted that it was unclear who would be responsible for ultimate disposal of these concentrated radioactive materials.¹⁷

⁸ Ian Urbina, Regulation Lax as Gas Wells’ Tainted Water Hits Rivers, N. Y. Times, Feb. 27, 2011 at A1.

⁹ Nathaniel R. Warner et al. Impacts of Shale Gas Wastewater Disposal on Water Quality in Western Pennsylvania, *Envtl. Sci. & Tech.*, Oct. 2, 2013, <http://pubs.acs.org/doi/abs/10.1021/es402165b> (subscription required). Jim Efstathiou Jr. Radiation in Pennsylvania Creek Seen as Legacy of Fracking, Bloomberg, Oct. 2, 2013, <http://www.bloomberg.com/news/2013-10-02/radiation-in-pennsylvania-creek-seen-as-legacy-of-frackin.html>.

¹⁰ NYDEC SGEIS, at 5-133, 5-141, 7-60, Appendix 12, Appendix 13.

¹¹ NYDEC SGEIS, at 6-62.

¹² NYDEC SGEIS at 6-57 through 6-63.

¹³ NYDEC SGEIS, at 6-64.

¹⁴ U.S. Gov’t Accountability Office, Safeguards Are Not Preventing Contamination from Oil and Gas Wastes (1989), <http://www.gao.gov/products/RCED-89-97>.

¹⁵ See, e.g. Henry Fountain, Disposal Halted at Well After 11th Quake in Ohio, N.Y. Times, Jan. 2, 2012, at A11. Ohio Dep’t of Natural Resources, Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown, Ohio, Area, Mar. 2012, at 4.

¹⁶ NYDEC SGEIS, at 5-142.

¹⁷ U.S. Env’t. Protection Agency, Region II, Comments on Revised Draft NYSDEC Revised dSGEIS for Horizontal Drilling and High-Volume Hydraulic Fracturing to Develop the Marcellus Shale and Other Low-Permeability Gas Reservoirs, Jan. 11, 2012.

To ensure the safety of the residents of New York state, it is essential to conduct a thorough assessment of exactly how radium and other radioactive wastes from Marcellus shale drilling operations would be handled and what health risks these wastes would pose. In addition, New York should determine exactly how and whether such wastes can be disposed of safely.

Radon and radium are known human carcinogens that have been found in significant levels in natural gas and natural gas wastes in the Marcellus shale. New York must carefully assess the risks of exposure to these pollutants before making a decision about how or whether to drill for shale gas or to distribute Marcellus shale gas containing unhealthy levels of radon.

Sincerely,

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cc: Barack Obama, President, United States of America
Joe Martens, Commissioner, Department of Environmental Conservation, New York
Howard Zucker, Acting Commissioner, Department of Health, New York