Expert Says DEC Must Address Radioactivity in Drilling Wastes
by Sue Smith-Heavenrich
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Nearly one year ago the NYS Department of Environmental Conservation (DEC) released the draft Supplemental Generic Environmental Impact Statement (SGEIS) concerning horizontal drilling and high volume hydraulic fracturing in Marcellus and other tight shales. Tucked within the 800-plus page document were recommendations for dealing with naturally occurring radioactive materials (NORM).

According to Jeff Leavey, a certified health physicist, the DEC needs to do more studies on NORM. "They need to do a much better job than they did in their draft study," he told members of the Tioga County Landowners Group last week. "The DEC needs to collect more data."

Background Radiation
Leavey, a member of Cornell's Department of Environmental Health and Safety has spent 30 years working in the field of radiation safety. On August 18 he presented an informational program about Naturally Occurring Radioactivity. Radiation, he explained, is energy emitted by something; and it's all around us, from naturally occurring cosmic rays and salt substitute to man-made products such as radio waves and glow-in-the-dark exit signs.

Holding up a brilliant orange-red Fiestaware plate in one hand and a Geiger counter in the other, Leavey brought them together in front of the microphone. The air was filled with a smattering of clicks, each click a measure of radioactive decay. Background radiation surrounds us but, Leavey pointed out, in the past couple of decades there has been a shift towards more medical exposure with increased use of CAT scans.

There are different types of radiation, Leavey explained. Alpha radiation is caused by large positively charged particles, beta radiation by zippy lightweight electrons, and gamma rays, or X-rays, which is like light but more energetic than ultraviolet light. "The harm," Leavey emphasized, "depends on the dose". A high dose would result in immediate effects. But for environmental exposures, people need to be aware of delayed impacts from long-term exposures.

Radioactive Shale
Marcellus Shale contains higher concentrations of NORM – especially uranium-238 and radium-226 – than surrounding rock formations. Radium, a breakdown product of uranium, is the primary concern because it is soluble in water, said Leavey. That means that it can dissolve in the water used to frack wells. It also means that radium continues to evolve in the brine effluent over the life of the well.

Recent tests of brine from Marcellus wells contain higher levels of NORM than expected. DEC samples of brine from 12 active Marcellus wells showed radium-226 levels 250 times the allowable level for discharge into the environment and thousands of times higher than the maximum level EPA allows drinking water.

Because of its solubility, radium can go everywhere frack and flowback water goes, Leavey said. Because of its chemical similarity to calcium, radium-226 is particularly hazardous if it gets inside the body, he added. Once ingested, radium is integrated into

bone tissue, emitting alpha particles over the lifetime of that person and increasing the chances for cancers of the bone and blood tissues.

“DEC needs to look more closely at all of the potential pathways for waste disposal,” Leavey said. Gas industry representatives have suggested a beneficial-use designation for brine, which would allow them to spread it on roads to help keep the dust down. The problem, Leavey points out, is that water-soluble radium could wash off the road during a storm and contaminate surface water, or percolate through the soil and make its way into groundwater. There is also a small chance that radium in brine could, once the water evaporates, become part of the dust on the road.

The 1999 study didn’t consider the potential contamination pathway through landfill disposal. Waste haulers are bringing drill cuttings from Pennsylvania Marcellus wells to the Chemung County landfill. While the cuttings themselves present minimal hazard, the radium present in residual water contained in those solids may leach into the ground and find a way into the groundwater below the landfill.

Radium may also show up as part of the scale that lines the insides of pipes and valves at a well site. For example, radium could end up in scale lining the valve of a brine tank.

“And it doesn’t take much radium to contaminate water,” Leavey said. The EPA set 5 picocuries as the limit for radium in drinking water, and 60 picocuries for effluent released into a river. That gives one more reason for DEC to conduct a more complete environmental pathway analysis.

Leavey’s presentation is available at the Tioga County Landowners website (http://www.tiogagaslease.org/radiation.html)

You can read an earlier article about Radioactivity present in Marcellus Waste at http://www.tiogagaslease.org/images/BVW_11_26_09_2.pdf

SIDEBAR:

A Radioactive Cheat-Sheet

Alpha radiation

- high-energy particle from heavy elements (2 neutrons and 2 protons)
- positively charged
- heavy – travels short distances (1 – 2 inches in air)
- dissipates energy quickly (high dose)

Beta radiation

- small particle from lighter elements (electron)
- negatively charged
- lightweight – can travel from 2 inches to 10 feet through air

Gamma radiation (X-ray)

- high energy light wave beyond UV
- can travel hundreds of feet

As radioactive materials decay, they send out a unit of radioactivity. Scientists measure radioactivity in Curies. One Curie (Ci) is the amount of a radioactive isotope that decays

at the rate of 37 billion (37,000,000,000) disintegrations per second. A picocurie (pCi) is one trillionth of a curie, equivalent to 0.04 disintegrations/second.

Half-life is the time it takes for one half of the amount of radioactivity to disappear by decay. It takes 1600 years for Radium-226 to lose half of its radioactivity.