BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	
AMEREN ASH POND CLOSURE RULES	)	R09-21
(HUTSONVILLE POWER STATION) :	)	(Rulemaking – Land)
PROPOSED 35 ILL. ADM. CODE 840.101	)	
THROUGH 840.144	)	

NOTICE

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Attached Service List

PLEASE TAKE NOTICE that I have today filed with the Office of the Clerk of the Illinois Pollution Control Board the Illinois Environmental Protection Agency's Pre-Filed Answers to Pre-Filed Questions of Prairie Rivers Network, copies of which are herewith served upon you.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

By: Mark Wight
Mark Wight
Assistant Counsel
Division of Legal Counsel

DATE: September 22, 2009

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ILLINOIS ENVIRONMENTAL PROTECTION AGENCY'S PRE-FILED ANSWERS TO PRE-FILED QUESTIONS OF PRAIRIE RIVERS NETWORK

Pursuant to the Hearing Officer Order entered June 30, 2009, the Illinois Environmental Protection Agency ("Illinois EPA" or "Agency") submits the following answers to the pre-filed questions submitted on behalf of Prairie Rivers Network ("PRN") by Traci L. Barkley, Water Resources Scientist. PRN's questions 11 through 15 are directed to the Agency. The questions and the Agency's answers are as follows:

11. **Section 840.114 Groundwater Monitoring Program. (a) "The owner and operator of Ash Pond D must monitor....: 35 Ill. Adm. Code 620.410(a) and (d) except radium-226 and radium-228." Why are these two constituents excluded?**

Based on research conducted by the United States Geological Survey ("USGS"), radium and other radioactive elements in coal ash are not significantly elevated above concentrations that occur in materials found naturally in the environment. The USGS also found that dissolved concentrations of these radioactive elements are below levels of health concern. Therefore, the inclusion of Radium 226 and Radium 228 is not warranted. This information can be found in USGS Fact Sheet FS-163-97, October 1997, provided as Attachment 1 to this document.

12. **Per Section 3.135 (a)(9)(B), "CCB shall not exceed Class I Groundwater Standards for metals when tested utilizing test method ASTM D3987-85. The sample or samples tested shall be representative of the CCB being considered for use." Why isn't this requirement referenced under Section 840.124?**

Section 3.135(b) of the Act (415 ILCS 5/3.135(b)) allows coal combustion waste

("CCW") to be used beneficially without meeting the metals standards established in Section 3.135(a-5)(B), if the applicant demonstrates to the Agency that three criteria will be met: 1) The use of the CCW will not cause, threaten or allow the discharge of any contaminant into the environment; 2) the use will otherwise protect human health and safety and the environment; and 3) the use constitutes a legitimate use of the CCW as a raw material that is an effective substitute for an analogous raw material. Ameren originally proposed, in effect, that the CCB determination may be made in this site-specific context, and the Agency has concurred with this approach. Ameren's Original Proposal at § 840.124(c); Agency's Proposed Amendments at § 840.124(d)(4).

The Agency believes the use of CCW to create the slope for the final cover system constitutes a legitimate use as an effective substitute for other fill material. The slope itself is subject to the stability criteria of 35 Ill. Adm. Code 811.304. The use will not result in discharge of contaminants to the environment and will otherwise protect human health and safety because the material will be used in an engineered application in which it will be placed above the water table and beneath the final cover system consisting of a geosynthetic membrane and at least three feet of soil material. This exceeds the standard for CCB used as structural fill set forth in Section 3.135(a)(8) of the Act. Once construction is complete, vegetation must be established to stabilize the soil layer. The final cover system is subject to the inspection and maintenance requirements set forth in Section 840.136. Therefore, the three statutory criteria will be satisfied. The Agency believes this approach is in substantial compliance with the requirements of the Act.

13. **Why doesn't the additional use of coal combustion byproduct require an independent approval pursuant to Section 3.135 of the Act, according to IEPA's suggested edits to Section 840.124?**

Please see the response to Question 12.

14. **We appreciate [Mr. Nightingale's] request on behalf of the Agency for a moratorium on additional site-specific rules for closure of coal combustion**

waste surface impoundments. Can you tell us why, given the fact that new federal rules regarding the management of coal combustion wastes are likely forthcoming, the Agency is not requesting that Ameren's Hutsonville Pond D activities also be placed on hold?

As stated in Mr. Nightingale's testimony, the Agency has requested that the Pollution Control Board ("Board") consider a moratorium on proceeding with additional proposals for site-specific closures of CCW surface impoundments pending clarification of widely anticipated federal rules for the management of CCW and their effect, if any, on the closure of existing CCW impoundments. If federal rules do not address the closure of existing ash ponds, it may be appropriate to proceed with a generally applicable rule for ash ponds in Illinois. The reason the Agency has not requested that Ameren's proposal be included within a moratorium is that Ameren filed its proposal with the Board and it was accepted for hearing before the Agency clarified its own position on the matter. The Agency's position initially arose out of its difficulties in finding the resources to assemble a workgroup to respond to Ameren's proposal.

Ameren took Ash Pond D out of service in 2000 and has pursued closure intermittently since that time. The absence of clearly applicable closure requirements along with disagreements between Ameren and the Agency concerning the proper approach have been the causes of significant delays. The interaction between Ameren and the Agency ultimately resulted in the adjusted standard proceeding filed by Ameren in August 2008. *In the Matter of: Petition of Ameren Energy Generating Company for Adjusted Standards from 35 Ill. Adm. Code Parts 811, 814, 815*, PCB AS 09-1 (March 5, 2009). The Board found the landfill rules inapplicable to surface impoundments and dismissed the adjusted standard proceeding. It directed Ameren to file a site-specific rule if it wished to pursue the matter.

After the dismissal of its proposed adjusted standard, Ameren moved very quickly to prepare and file its proposal in this proceeding because of its stated desire to sell the facility.

During this short interval, the Agency did not fully consider the implications of the site-specific approach as complicated by the number of similar sites needing closure, the uncertain impacts of state budget/resource issues, and the additional uncertainty of the outcome of the federal review of CCW management. The Agency's decision to request the moratorium did not come until well after the proposal had been filed with the Board and accepted. While the policy reasons for the moratorium are compelling, the legal grounds for taking such action with regard to future filings are uncertain. Requesting that a moratorium apply so that a previously docketed proceeding would be delayed indefinitely or dismissed would raise additional legal issues of retroactivity and was never seriously considered by the Agency.

To be clear, the Agency does not object to the site-specific approach itself as a mechanism for developing acceptable closure requirements for individual ash ponds. The Agency believes that will be accomplished in this proceeding with appropriate amendments to Ameren's original proposal. Rather, the request for a moratorium is driven by the prospect of 70 or more of these proceedings, especially in light of the resource issues and the potential for conflicts with decisions to be made at the federal level. Moreover, devoting scarce resources to the task of developing and promulgating a statewide rule would be wasteful if the proposal expected later this fall makes clear the U.S. EPA intends to regulate this activity pursuant to federal law.

15. If USEPA redetermines coal combustion waste to be "hazardous" in nature per RCRA, would Subchapter c, Part 724 regulations governing standards for hazardous waste treatment, storage and disposal facilities be sufficient to govern the closure of Ameren's Hutsonville Pond D?

With all due respect, the federal approach suggested by the question is beyond the scope of this proceeding, and the Agency workgroup has not evaluated its sufficiency. Further, the Agency has no knowledge of the U.S. EPA's intentions beyond published

speculation and has made no formal evaluation of such an approach. The Agency expects that any federal proposal will be published for comment in the *Federal Register*. If so, the Agency will very likely perform an evaluation of the proposal at that time and submit comments in that forum.

ATTACHMENT 1

Central Region Energy Resources Team

Fact Sheet FS-163-97
October, 1997

Radioactive Elements in Coal and Fly Ash: Abundance, Forms, and Environmental Significance

The entire **Fact Sheet FS-163-97** *can be downloaded and viewed with Adobe Acrobat Reader. If you do not already have Acrobat Reader, you may download Adobe Acrobat Reader from this site.*

Introduction

Coal is largely composed of organic matter, but it is the inorganic matter in coal—minerals and trace elements— that have been cited as possible causes of health, environmental, and technological problems associated with the use of coal. Some trace elements in coal are naturally radioactive. These radioactive elements include uranium (U), thorium (Th), and their numerous decay products, including radium (Ra) and radon (Rn). Although these elements are less chemically toxic than other coal constituents such as arsenic, selenium, or mercury, questions have been raised concerning possible risk from radiation. In order to accurately address these questions and to predict the mobility of radioactive elements during the coal fuel-cycle, it is important to determine the concentration, distribution, and form of radioactive elements in coal and fly ash.

Abundance of Radioactive Elements in Coal and Fly Ash

Assessment of the radiation exposure from coal burning is critically dependent on the concentration of radioactive elements in coal and in the fly ash that remains after combustion. Data for uranium and thorium content in coal is available from the U.S. Geological Survey (USGS), which maintains the largest database of infor-mation on the chemical composition of U.S. coal. This database is searchable on the World Wide Web at: **http://energy.er.usgs.gov/products/databases/ CoalQual/intro.htm**. Figure 1 displays the frequency distribution of uranium concentration for approximately 2,000 coal samples from the Western United States and approximately 300 coals from the Illinois Basin. In the majority of samples, concentrations of uranium fall in the range from slightly below 1 to 4 parts per million (ppm). Similar uranium concentrations are found in a variety of common rocks and soils, as indicated in figure 2. Coals with more than 20 ppm uranium are rare in the United States. Thorium concentrations in coal fall within a similar 1–4 ppm range, compared to an average crustal abundance of approximately 10 ppm. Coals with more than 20 ppm thorium are extremely rare.

During coal combustion most of the uranium, thorium, and their decay products are released from the original coal matrix and are distributed between the gas phase and solid combustion products.

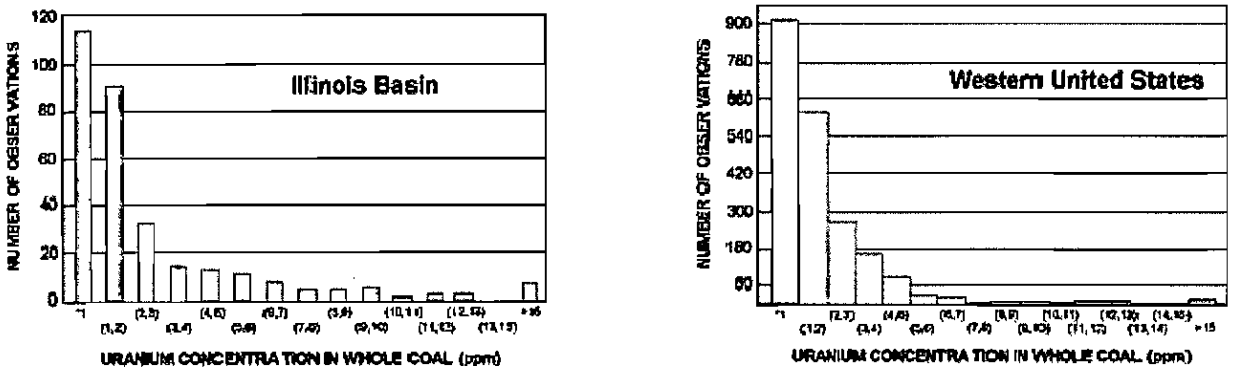

Figure 1. Distribution of uranium concentration in coal from two areas of the United States.

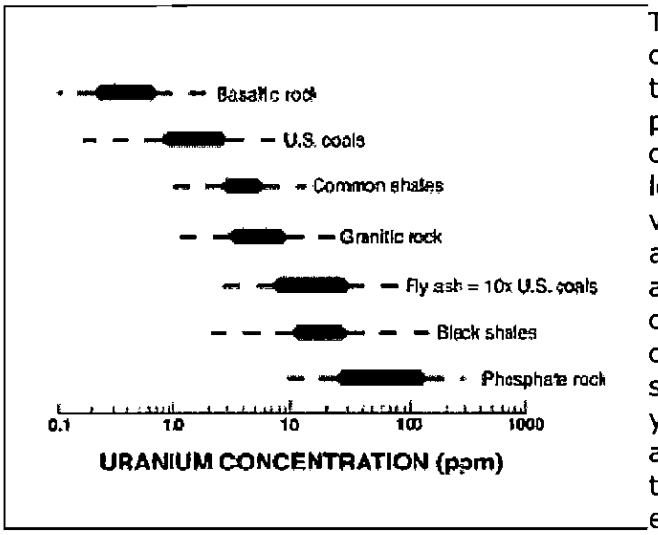

Figure 2. Typical range of uranium concentration in coal, fly ash, and a variety of common rocks.

The partitioning between gas and solid is controlled by the volatility and chemistry of the individual elements. Virtually 100 percent of the radon gas present in feed coal is transferred to the gas phase and is lost in stack emissions. In con-trast, less volatile elements such as thorium, uranium, and the majority of their decay products are almost entirely retained in the solid combustion wastes. Modern power plants can recover greater than 99.5 percent of the solid combustion wastes. The average ash yield of coal burned in the United States is approximately 10 weight percent. Therefore, the concentration of most radioactive elements in solid combustion wastes will be approximately 10 times the concentration in the original coal. Figure 2 illustrates that the uranium concentration of most fly ash (10 to 30 ppm) is still in the range found in some granitic rocks, phosphate rocks, and shales. For example, the Chattanooga Shale that occurs in a large portion of the Southeastern United States contains between 10 and 85 ppm U.

Forms of Occurrence of Radioactive Elements in Coal and Fly Ash

The USGS has a current research project to investigate the distribution and modes of occurrence (chemical form) of trace elements in coal and coal combustion products. The approach typically involves (1) ultra sensitive chemical or radiometric analyses of particles separated on the basis of size, density, mineral or magnetic properties, (2) analysis of chemical extracts that selectively attack certain components of coal or fly ash, (3) direct observation and microbeam analysis of very small areas or grains, and (4) radiographic techniques that identify the location and abundance of radioactive elements.

Most thorium in coal is contained in common phosphate minerals such as monazite or apatite. In contrast, uranium is found in both the mineral and organic fractions of coal. Some uranium may be added slowly over geologic time because organic matter can extract dissolved uranium from ground water. In fly ash, the uranium is more concentrated in the finer sized particles. If during coal combustion some uranium is concentrated on ash surfaces as a condensate, then this surface-bound uranium is potentially more susceptible

to leaching. However, no obvious evidence of surface enrichment of uranium has been found in the hundreds of fly ash particles examined by USGS researchers.

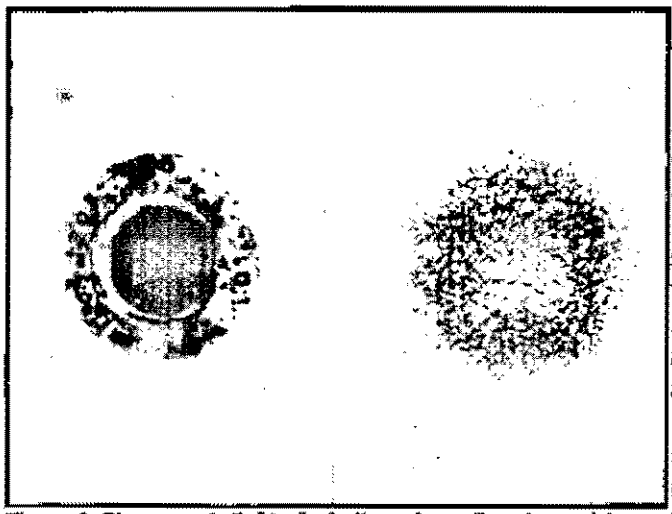

Figure 3. Photograph (left) of a hollow glassy fly ash particle (0.01 cm diameter) and its fission track radiograph (right). Uranium distribution and concentration are indicated by the location and density of dark linear fission tracks in the radiograph.

The above observation is based on the use of fission-track radiography, a sophisticated technique for observing the distribution of uranium in particles as small as 0.001 centimeter in diameter. Figure 3 includes a photograph of a hollow glassy sphere of fly ash and its corresponding fission track image. The diameter of this relatively large glassy sphere is approximately 0.01 cm. The distribution and concentration of uranium are indicated by fission tracks, which appear as dark linear features in the radiograph. Additional images produced by USGS researchers from a variety of fly ash particles confirm the preferential location of uranium within the glassy component of fly ash particles.

Health and Environmental Impact of Radioactive Elements Associated With Coal Utilization

Radioactive elements from coal and fly ash may come in contact with the general public when they are dispersed in air and water or are included in commercial products that contain fly ash.

The radiation hazard from airborne emissions of coal-fired power plants was evaluated in a series of studies conducted from 1975–1985. These studies concluded that the maximum radiation dose to an individual living within 1 km of a modern power plant is equivalent to a minor, perhaps 1 to 5 percent, increase above the radiation from the natural environment. For the average citizen, the radiation dose from coal burning is considerably less. Components of the radiation environment that impact the U.S. population are illustrated in figure 4. Natural sources account for the majority (82 percent) of radiation. Man-made sources of radiation are dominated by medical X-rays (11 percent). On this plot, the average population dose attributed to coal burning is included under the consumer products category and is much less than 1 percent of the total dose.

Fly ash is commonly used as an additive to concrete building products, but the radioactivity of typical fly ash is not significantly different from that of more conventional concrete additives or other build-ing materials such as granite or red brick. One extreme calculation that assumed high proportions of fly-ash-rich concrete in a residence suggested a dose enhancement, compared to normal concrete, of 3 percent of the natural environmental radiation.

Another consideration is that low-density, fly-ash-rich concrete products may be a source of radon gas. Direct measurement of this contribution to indoor radon is complicated by the much larger contribution from underlying soil and rock (see fig. 4). The emanation of radon gas from fly ash is less than from natural soil of similar uranium content. Present calculations indicate that concrete building products of all types contribute less than 10 percent of the total indoor radon.

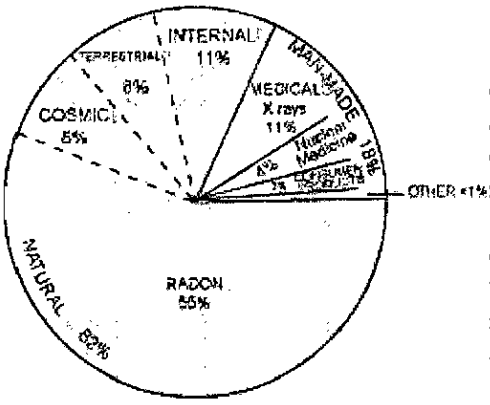

Figure 4. Percentage contribution of various radiation sources to the total average radiation dose to the U.S. population.

Approximately three-fourths of the annual production of fly ash is destined for disposal in engineered surface impoundments and landfills, or in abandoned mines and quarries. The primary environmental concern associated with these disposal sites is the potential for groundwater contamination. Standardized tests of the leachability of toxic trace elements such as arsenic, selenium, lead, and mercury from fly ash show that the amounts dissolved are sufficiently low to justify regulatory classification of fly ash as nonhazardous solid waste. Maximum allowable concentrations under these standardized tests are 100 times drinking water standards, but these concentration limits are rarely approached in leachates of fly ash.

The leachability of radioactive elements from fly ash has relevance in view of the U.S. Environmental Protection Agency (USEPA) drinking water standard for dissolved radium (5 picocuries per liter) and the proposed addition of drinking water standards for uranium and radon by the year 2000. Previous studies of radioelement mobility in the enviroment, and in particular, in the vicinity of uranium mines and mills, provide a basis for predicting which chemical conditions are likely to influence leachability of uranium, barium (a chemical analog for radium), and thorium from fly ash. For example, leachability of radioactive elements is critically influenced by the pH that results from reaction of water with fly ash. Extremes of either acidity (pH<4) or alkalinity (pH>8) can enhance solubility of radioactive elements. Acidic solutions attack a variety of mineral phases that are found in fly ash. However, neutralization of acid solutions by subsequent reaction with natural rock or soil promotes precipitation or sorption of many dissolved elements including uranium, thorium, and many of their decay products. Highly alkaline solutions promote dissolution of the glassy components of fly ash that are an identified host of uranium; this can, in particular, increase uranium solubility as uranium-carbonate species. Fortunately, most leachates of fly ash are rich in dissolved sulfate, and this minimizes the solubility of barium (and radium), which form highly insoluble sulfates.

Direct measurements of dissolved uranium and radium in water that has contacted fly ash are limited to a small number of laboratory leaching studies, including some by USGS researchers, and sparse data for natural water near some ash disposal sites. These preliminary results indicate that concentrations are typically below the current drinking water standard for radium (5 picocuries per liter) or the initially proposed drinking water standard for uranium of 20 parts per billion (ppb).

Summary

Radioactive elements in coal and fly ash should not be sources of alarm. The vast majority of coal and the majority of fly ash are not significantly enriched in radioactive elements, or in associated radioactivity, compared to common soils or rocks. This observation provides a useful geologic perspective for addressing societal concerns regarding possible radiation and radon hazard.

The location and form of radioactive elements in fly ash determine the availability of elements for leaching during ash utilization or disposal. Existing measurements of uranium distribution in fly ash particles indicate a uniform distribution of uranium throughout the glassy particles. The apparent absence of abundant, surface-bound, relatively available uranium suggests that the rate of release of uranium is dominantly controlled by the relatively slow dissolution of host ash particles.

Previous studies of dissolved radioelements in the environment, and existing knowledge of the chemical properties of uranium and radium can be used to predict the most important

chemical controls, such as pH, on solubility of uranium and radium when fly ash interacts with water. Limited measurements of dissolved uranium and radium in water leachates of fly ash and in natural water from some ash disposal sites indicate that dissolved concentrations of these radioactive elements are below levels of human health concern.

Suggested Reading:

Tadmore, J., 1986, Radioactivity from coal-fired power plants: A review: Journal of Environmental Radioactivity, v. 4, p. 177–204.
Cothern, C.R., and Smith, J.E., Jr., 1987, Environmental Radon: New York, Plenum Press, 363 p.

Ionizing radiation exposure of the population of the United States, 1987: Bethesda, Md., National Council on Radiation Protection and Measurements, Report 93, 87 p.

Swaine, D.J., 1990, Trace Elements in Coal: London, Butterworths, 278 p.

Swaine, D.J., and Goodarzi, F., 1997, Environmental Aspects of Trace Elements in Coal: Dordrecht, Kluwer Academic Publishers, 312 p.

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STATE OF ILLINOIS)
)
COUNTY OF SANGAMON)

PROOF OF SERVICE

I, the undersigned, on oath state that I have served the attached Illinois Environmental Protection Agency's Pre-Filed Answers to Pre-Filed Questions of Prairie Rivers Network, upon the persons to whom they are directed, by procedures specified by the Illinois Pollution Control Board or by placing a copy of each in an envelope addressed to:

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General Counsel
Illinois Dept. of Natural Resources
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Matthew J. Dunn, Chief
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(Electronic filing)

(Attached Service List – **First Class Mail**)

and sending or mailing them, as applicable, from Springfield, Illinois on September 22, 2009, and with sufficient postage affixed as indicated above.

Mark Wight

Brenda Boehnke

SUBSCRIBED AND SWORN TO BEFORE ME

This 22 day of September, 2009.

Cynthia L. Wolfe
Notary Public

OFFICIAL SEAL
CYNTHIA L. WOLFE
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 10-2-2011

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