



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

EPA-SAB-RAC-LTR-92-004

January 21, 1991/2

Honorable William K. Reilly
Administrator
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

OFFICE OF
THE ADMINISTRATOR

Subject: Idaho Radionuclide Study

Dear Mr. Reilly,

The Science Advisory Board's Radiation Advisory Committee has reviewed the Idaho Radionuclide Study in response to the Agency's request of January 4, 1991. The Committee heard briefings by Agency personnel and various public commenters on October 25, 1990, on February 5-6, 1991 and on May 21-22, 1991.

The Idaho Radionuclide Study was originally designed to support the rulemaking on the radionuclide National Emission Standard-Hazardous Air Pollutant (NESHAP), not for an explicit evaluation or remediation of individual radiation exposures. However, the study did provide radiation exposure data that has prompted the Agency's consideration of current and past uses of phosphorus slag. This item brought the matter back to the Science Advisory Board for a timely review to resolve the issues involved. The Agency's actions in this case could well set important precedents for sites with residual radioactivity and/or elevated exposure rates due to past technological activities.

Gamma-radiation exposure levels from elemental phosphorus slag can reach 60-65 $\mu\text{R/hr}$ in some areas, which is 4-5 times the background level prevalent in Southeastern Idaho. This level is within the range of background radiation worldwide; however, the radiation exposure levels in this case are increased due to technological activities. Members of the general public can come into contact with the gamma radiation fields associated with past uses of phosphorus slag, and exposure patterns can be highly variable.

At the meetings and in written comment the public raised many technical and policy issues for the Committee to consider. The discussion below addresses first the four questions asked by the Agency and then the broader technical and policy concerns.

Question 1: Was the Idaho Radionuclide Study implemented consistent with the SAB's review of the study design?

Most of the components specified in the study design were implemented in the Idaho Radionuclide Study, with three notable exceptions. First, measurements

were made in homes which homeowners volunteered for participation in the study, which did not conform with the study design to use a representative random sample of homes in each sector and potentially introduced a selection bias. Second, an actual ratio of indoor to outdoor concentrations of Po-210 could not be established as planned, which may result in overestimation of lung dose. However, this lack of a measured ration is not viewed as significant because the primary radiation doses are principally from direct gamma exposure. Third, indoor radon measurement data were not presented in the report as planned, but because the radon emanation rate from glassy phosphate slag materials has been found to be small, the absence of these data is also not viewed as significant.

Question 2: Were the study's exposure scenarios for "average" and "maximally exposed" individuals reasonable?

The gamma radiation exposure scenario for the "maximally exposed individual" is for a hypothetical person. It is highly unlikely that a single individual would be exposed to the maximum exposure rate in the home, workplace, and public sectors. The average exposure scenario incorporates a number of reasonable assumptions but due to the limited number of indoor measurements (particularly in Soda Springs), the nonrandom nature of home selection, and uncertainties in exposure conditions based on aerial surveys, the calculated population dose is unreliable. An estimated population dose is also of little value in this case because decisions on specific actions would require data on individual exposure.

Question 3: Are results of the study sufficient to make reasonable estimates of the population's radiation exposure due to slag?

No. The study cannot identify those members or segments of the population receiving the highest exposures or quantify those exposures that may occur at various exposure ranges above background. The study does demonstrate (based on actual exposure rates measured in homes and on the ground) that elevated gamma radiation levels occur in Pocatello and Soda Springs such that some persons could receive doses above the widely accepted population exposure guide of 100 millirems per year in excess of natural background. The present study does not provide the necessary data on which to base potential regulatory initiatives or remedial actions for individuals exposed to elevated radiation levels. The Agency should base any such actions on measured doses that are as accurate as possible for individuals who may have to make decisions about modifying their exposure situations.

The Committee recommends that the Agency prepare a plan for obtaining reliable exposure determinations and provide it for technical review. The Agency should work with local and state officials, the public, and industry to make measurements for individuals based on their particular exposure conditions. The study plan should contain, at a minimum, means for determining reference background for each area, the types of instruments to be used and their

deployment, and means to determine dose rate and accumulated doses from various areas, especially residences.

Question 4: Were the cancer risk factors used in estimating potential health effects appropriate?

The Office of Radiation Programs used the linear, nonthreshold relative risk model of BEIR III as approved by the Science Advisory Board and its Radiation Advisory Committee on September 9, 1988 (SAB-RAC-88-041). This model, based largely on the Hiroshima-Nagasaki acute exposure data, yields a lifetime risk estimate of 400 fatal cancers per million people exposed to one rem, with a confidence interval of 120-1200. Public comments presented to the Radiation Advisory Committee at its meetings February 4-6 and May 20-22, 1991 have raised the issue of the choice of models for estimating risks from low-dose, low-dose-rate radiation and the resulting radiation-induced cancer risk coefficients. Whereas the Committee is aware of these viewpoints, including the BEIR V report acknowledgment that the lower bound of risk may be zero, the Agency has used cancer risk factors in the Idaho Radionuclide Study in accordance with earlier SAB recommendations.

In its letter of September 9, 1988, the SAB also recommended that the Agency continue to keep abreast of ongoing studies and analyses of radiobiological data and make appropriate adjustments to its radiation risk assessment models and methodologies. The Office of Radiation Programs has underway several activities to accomplish this goal, which should be complete for SAB review in early 1992. The Committee estimates that incorporation of the recommendations of the BEIR V report is not likely to raise the central estimate risk coefficient by more than 25-30%.

Although the study design did not suggest that risk determinations would be made with the exposure data, such estimates were in fact made. Because the population dose estimate is flawed, the calculated risk estimates are not meaningful and of little value as a basis for future actions.

Technical/Policy Considerations


Written, oral and videotaped public comments submitted to the Committee made the Radiation Advisory Committee very much aware of the considerable interest by Idaho citizens, the elemental phosphorus industry, and other members of the public in the Agency's deliberations on this issue. These concerns are mainly about potential disruption in people's lives, costs, and risks involved in potential actions for phosphorus slag. The Idaho Radionuclide Study was not designed to and does not provide a sufficient basis for removal or remediation actions. A much more detailed study would be required before such actions can be considered.

The Committee suggests that the Agency establish a set of graded decision guidelines based upon technical and economic factors for both short-term and long-term exposure of the public due to past uses of slag, and make them available for public and SAB review. The Agency should make risk assessments for those persons exposed within the decision guidelines and should provide them with information for making informed decisions. Such information should include: (a) the risks that are estimated for various exposures; (b) the associated uncertainties of estimating risks for individuals (not populations); (c) the options available to them under various Agency programs for mitigation; and (d) the costs of potential remediation options and who will pay for them.

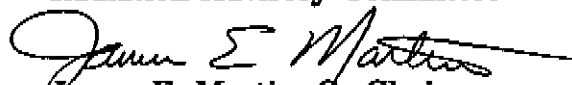
The Committee suggests that past and current phosphorus slag uses be considered separately, because the cost/risk considerations involved make them distinctly different technical issues for assessment and control, including selection of any action levels. The Agency's consideration of controls for future uses of phosphorus slag materials may be appropriate, but ought not automatically be a de facto basis for dealing with past uses of slag, since in the latter case the costs might be high compared to the benefits. However, the locations of fixed materials should be recorded and actions initiated to assure that the radioactivity due to slag content is considered in disposing of the materials when these areas are eventually replaced due to normal wear and tear.

These findings and comments represent the Radiation Advisory Committee's best scientific judgments drawn from a complex mix of technical and semi-technical issues brought before it. Numerous other situations exist where actual and potential exposure to residual radioactive substances may occur at similar levels and risks; therefore, the Committee urges the Agency to take the necessary steps to develop an overall policy for addressing situations of this type. The Committee looks forward to a written response from the Agency on the steps it plans to take.

Sincerely,


Raymond C. Loehr, Chair
Executive Committee
Science Advisory Board


Oddvar F. Nygaard, Chair
Radiation Advisory Committee


James E. Martin, Co-Chair
For the Idaho Radionuclide Study Review
Radiation Advisory Committee

Enclosure: Committee Roster