UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matters of:	)	
PHILADELPHIA ELECTRIC COMPANY et al.	)	Docket Nos. 50-277 50-278
(Peach Bottom Atomic Power Station, Units 2 and 3)	)	
METROPOLITAN EDISON COMPANY et al.	)	Docket No. 50-320
(Three Mile Island Nuclear Station, Unit No. 2)	)	
PUBLIC SERVICE ELECTRIC AND GAS CO.	)	Docket Nos. 50-354 50-355
(Hope Creek Generating Station, Units 1 and 2)	)	
ROCHESTER GAS AND ELECTRIC CORPORATION et al.	)	Docket No. STN 50-485
(Sterling Power Project, Nuclear Unit 1	)	

NRC STAFF TESTIMONY
OF HOMER LOWENBERG

I am Assistant Director for Operations and Technology, Division of Fuel Cycle and Material Safety, Nuclear Regulatory Commission. A Statement of My Professional Qualifications appears in the Perkins* record (Fg. Tr. 2369).

* Duke Power Co. (Perkins Nuclear Station, Units 1, 2 and 3), Docket Nos. STN 50-488, 50-489, and 50-490. All transcript references in this testimony are from the Perkins record.

Introduction

In ALAB-562, at page 13, the Appeal Boards observed at Consolidated Item 5 - Phosphate Residues, that:

> "The production of phosphate fertilizer leaves a residue which conceivably could be reworked to recover the uranium it contains. Such operations could result in radon releases beyond those attendant upon the phosphate production itself. The amount of such releases has not been sufficiently quantified to allow comparison with the amount of radon released from the direct mining and milling of an equivalent amount of uranium." [Footnote omitted].

This observation was based on Intervenor's alleged deficiency No. 26 which asserted that:

> "Morton Goldman, at page 2342 of the tra. cript, indicates some uranium is being recovered commercially from the slag which is a byproduct of the production of phosphate fertilizer. Information should be obtained whether radon is released from the recovery of uranium by this process. If this process results in radon emissions, such emissions should be quantified."

Discussion

For the Perkins proceeding, the staff's estimates of radon emissions were based upon the effluents that may be projected from the mining and milling of uranium ores (Wilde and Magno affidavits, Fg. Tr. 2369). This was believed by the staff to be a conservatively high side method of estimating radon emissions attributable to uranium required for nuclear power for several reasons as follows:

1. The production of uranium from conventional mining and milling amounts to about 90% of the total uranium operations in the U.S. 1/

2. Conventional mining, either open-pit or underground, and associated milling are generally utilized to process the most concentrated deposits of uranium and thus should be associated with the potentially largest emissions of radon.

3. The extraction of uranium as a byproduct from some other mineral processing operation such as copper or phosphate production does not essentially change the radon emission rate from such activities.

4. Solution mining for recovery of uranium has little or no radon emissions associated with its operations.

The above quoted alleged deficiency, however, raises the question of the need for data concerning radon emissions associated with the byproduct recovery of uranium from phosphate fertilizers. Current practice concerning the byproduct production of uranium during fertilizer manufacture is to extract the uranium from the intermediate phosphoric acid liquor and not from slags or residues as stated in alleged deficiency #26. Further, it should be noted that this process is clearly a byproduct operation and that the mining and processing of phosphates was started long before there was a market for uranium in the commercial nuclear fuel cycle. Such mining and processing would continue whether or not uranium is recovered as a byproduct from such operations. Further, it should also be noted that radon is evolved from the radioactive decay of radium (half-life of about 1600 years). Many soils and rocks contain radium and uranium, but the evolution of radon is related to the radium content, not the uranium content.

Since uranium and radium are found in many natural deposits in approximate secular equilibrium (about equal activity quantities), one would expect to encounter uranium in radium bearing rocks and vice versa.

With regard to phosphate ores, both uranium and radium are present. In the processing of such ores to produce fertilizer, where the byproduct uranium may be extracted from the intermediate phosphoric acid liquor, the bulk of the radium in the marketable rock remains with the gypsum waste materials; however, about 1/10 of the total radium content may end up in the mix of fertilizer materials and become a potential source of radon in the fertilizer usage.[2/] Thus, radon may be evolved in the mining, processing, storage or use of gypsum wastes or in the actual fertilizer use. This situation is completely independent of whether uranium is recovered or not. Therefore, any radon evolved in this process is only chargeable to the production of fertilizer and not to the uranium fuel cycle.

When uranium is recovered for use from phosphate ore processing, it is extracted from the phosphoric acid mix by an extraction process. Thus, the separation of the uranium as a byproduct from phosphate fertilizer production does not either increase or decrease the evolution of radon from the operations.

Summary

It is not possible to ascribe any of the radon emissions from phosphate ore mining and processing to the byproduct uranium produced. On this basis any amount of the uranium produced from such sources would have no related radon emissions and thus would result in a decrease of the potential radon effluents attributable to the uranium fuel cycle.

Since the staff has conservatively (high side) assumed all nuclear fuel cycle uranium comes from uranium ores which have higher concentrations of uranium and radium than phosphate ores, we have, thus, estimated the maximum sources of radon that may be considered as effluents from the nuclear fuel cycle, and the radon emissions from phosphate fertilizer operations are not properly ascribable to the nuclear fuel cycle. Further, if all uranium sources from such unconventional operations were to be included, then the radon emissions attributable to the fuel cycle would be decreased.

References

1. U.S. Department of Energy, Statistical Data of the Uranium Industry, GJO-100(79), January 1, 1979, p. 85.

2. U.S. Nuclear Regulatory Commission, A Radiological Assessment of Radon-222 Released from Uranium Mills and Other Natural and Technologically Enhanced Sources, NUREG/CR-0573, February 1979, pp. 169-184.