

July 18, 1980

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARDS

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

LICENSEES' REPLY TO THE PROPOSED FINDINGS  
OF FACT OF THE OTHER PARTIES

Pursuant to 10 C.F.R. §2.754(b)(3) and the Appeal Boards' Orders in this proceeding, Philadelphia Electric Company et al., Metropolitan Edison Company et al., and Public Service Electric and Gas Co. ("Licensees")<sup>1</sup> submit their reply to the proposed findings of fact filed by intervenors Ecology Action of Oswego ("EAO") and Environmental Coalition on Nuclear

1 Rochester Gas and Electric Corporation has been dropped as a party to this proceeding because the Sterling project was cancelled. See, Appeal Boards' Memorandum and Order dated June 23, 1980 at p. 2.

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Power ("ECNP").<sup>2</sup> To the extent that the proposed findings of fact by EAO and ECNP and not addressed specifically herein, Licensees' response to those findings is contained in "Proposed Findings of Fact Submitted on Behalf of Philadelphia Electric Company et al., Metropolitan Edison Company et al., and Public Service Electric and Gas Co.", dated April 28, 1980.<sup>3</sup>

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2 The proposed findings of fact filed by the Commission Staff ("Staff") on the radon source term issues are generally consistent with Licensees' proposed findings and will therefore not be addressed in this Reply. The Staff also included a series of proposed findings on the health effects resulting from radon emissions. Those findings are addressed separately in Licensees' response to "NRC Staff Motion for Leave to Include Health Effects Findings."

3 ECNP Proposed Findings 27 and 28 accuse Licensees and Staff of "fraudulent concealment" of the dangers of radon releases, and charge the Appeal Boards with "illegal conduct" and with committing an "arbitrary and illegal denial of due process" against ECNP. These and other charges of the same nature throughout ECNP's proposed findings are baseless and should be rejected. Moreover, ECNP's findings are generally couched in abusive and inflammatory language; this intervenor has been cautioned in the past against making grossly inaccurate statements and using language which is insulting and disrespectful in tone. See, Metropolitan Edison Co. (Three Mile Island Nuclear Station, Unit 2), ALAB-474, 7 NRC 746, 748-749 (1978); Pennsylvania Power & Light Co. (Susquehanna Steam Electric Station, Units 1 and 2), Docket Nos. 50-387 and 50-388, Order Denying Requests of ECNP (December 6, 1979), at p. 8. Under similar circumstances, the Appeal Board has stricken filings and suggested that even more severe sanctions might be appropriate. Louisiana Power & Light Co., (Waterford Steam Electric Station, Unit 3), ALAB-121, 6 AEC 319 (1973).

## I. EMISSIONS FROM MILL TAILINGS PILES

### A. Implementation, Verification and Effectiveness of Mill Tailings Stabilization Guidelines.

I-37.<sup>4</sup> Intervenors<sup>5</sup> allege a number of shortcomings in the proposed Staff criteria and regulations ("Regulations") for the management and disposal of mill tailings. They find the Regulations "vague and rather general." ECNP Proposed Finding ("PF") 2. They claim that there is no requirement that radon emissions from stabilized mill tailings be measured to assure compliance with the 2 pCi/m<sup>2</sup>-sec limit (ECNP PF 3, EAO PF 6); that even if measurements are taken, it will be difficult to show that actual releases exceed the limit (EAO PF 6); that the Regulations do not require remedial work until the measured radon releases after stabilization actually exceed the limit (ECNP PF 6);<sup>6</sup> that the Regulations do not require that

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4 Proposed Findings I-1 through I-36 are included in the Licensees' Proposed Findings filed on April 28, 1980.

5 ECNP and EAO have endorsed and adopted each other's findings. Therefore, their position will be referred to herein as that of "Intervenors" without regard to which organization proposed a given finding.

6 ECNP PF 3 states that the Regulations do not require remedial work "when the calculated rate of radon releases exceeds two pico-curies per square meter per second." This proposed finding misinterprets the process envisioned by the Regulations. Prior to licensing of a mill, projected radon releases from its mill tailings piles are calculated to determine whether they will comply (after stabilization) with the 2 pCi/m<sup>2</sup>-sec limit. Staff witness Miller testified that a mill will not be licensed unless the radon emissions from the tailings after stabilization are calculated not to exceed the 2 pCi/m<sup>2</sup>-sec (continued next page)

the mill tailings sites be identified with signs indicating the toxic nature of the piles (id.); and that the Regulations do not require placement of mill tailings in "permanent, secure repositories" (id.). These criticisms of the Regulations are without merit.

I-38. With respect to the "vagueness" charge, Staff witness Miller testified that the Regulations provide general standards for the disposition of mill tailings to assure their long-term stability. Tr. 184 (Miller). The tailings disposal requirements are expressed in terms of performance objectives; because of the highly site-specific nature of the tailings disposal problem, the details of the program must be developed in light of site-specific conditions. Miller at p. 9. Thus, in accordance with § 203 of the Uranium Mill Tailings Radiation Control Act of 1978 (the "Act"), the Commission (through its Staff) has the ultimate responsibility for fleshing out the details of the tailings disposal program and ensuring that it is carried out appropriately at each site. Tr. 180-181, 186-187 (Miller). To carry out this responsibility, the Staff

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limit. Tr. 169-170 (Miller). After the mill is licensed and tailings piles are generated, confirmatory measurements will be taken and, if actual radon releases exceed the limit, remedial work will be ordered. Tr. 188 (Miller). No testimony was offered by any party suggesting that remedial work should be undertaken before measured releases from stabilized tailings piles exceed the limit; therefore, ECNP PF 6 has no basis on the record and must be rejected.



will supplement the Regulations with regulatory guides or similar documents establishing the details of the tailings disposal and management program. Id.

I-39. With respect to the claim that the Regulations do not require that measurements be taken, Mr. Miller stated that the Staff intends to take periodic radon emission measurements at the stabilized piles even if such measurements are not explicitly mandated by the Regulations. Tr. 186-187 (Miller); see also, Tr. 171, 178-179, 188 (Miller).

I-40. Regarding the alleged difficulty in ensuring that the emissions limit is being met, Mr. Miller stated that it may be difficult by taking radon flux measurements "to precisely determine that [the mill operator] is meeting the [limit]", but only because natural background "can vary from 1 to 3 [pCi/m<sup>2</sup>-sec] or even higher"; the Staff nevertheless "will be confirming... that [the operator] is about [the 2 pCi/m<sup>2</sup>-sec] level." Tr. 171 (Miller).

I-41. On the matter of deep repository disposal, Mr. Miller testified that it would be possible to dispose of the mill tailings by placing them in a "massive deep geologic repository", but that it was unnecessary to go to such great lengths to isolate the tailings because, "the mode of disposal [selected in each case] is adequate to protect public health, safety and the environment." Tr. 287-288 (Miller).

I-42. Finally, the claim that the tailing sites will not have signs identifying the nature of the materials buried there is erroneous, for proposed Environmental Protection Agency criteria on radioactive waste storage and disposal require emplacement of "passive methods of communicating to future people the potential hazards which could result from an accidental or intentional disturbance of disposed radioactive wastes." 43 Fed. Reg. 53262, 53264 (November 15, 1978); Tr. 467-468 (Goldman). Thus, the alleged shortcomings do not exist and the Regulations, as interpreted and applied by the Staff, will ensure proper isolation of the mill tailings.

B. Regulatory Control of Mill Tailings Isolation.

I-43. Intervenors allege that there is "no basis" in the record for assuming that mill tailings piles will be stabilized, monitored and maintained, or for expecting that radon releases can be kept below the 2 pCi/m<sup>2</sup>-sec limit for thousands of years.<sup>7</sup> ECNP PF 12. These allegations are at odds with the record, which contains ample evidence that mill tailings piles will be stabilized and will remain in that condition for many thousands of years.<sup>8</sup> Miller at pp. 11-17, 32; Tr. 205 to 216-a, 276-277 (Miller); Tr. 468-469 (Goldman).

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7 Intervenors predict that the 2 pCi/m<sup>2</sup>-sec limit "can and will be violated with absolute impunity" and that "the record does nowhere demonstrate that the existing allowable release rate for radon will not be formally relaxed, if not abolished entirely, as soon as it becomes politically expedient to do so." ECNP PF 11. Such speculations find absolutely no support in the record.

8 Intervenors would have the Appeal Boards disregard the (continued next page)

32; Tr. 205 to 216-a, 276-277 (Miller); Tr. 468-469 (Goldman).

I-44. Intervenors also insist that long-term stability of mill tailings will require continuous institutional controls and remedial work which can not be assumed to persist for the period of toxicity of the tailings. ECNP PF 4, 12, 16. However, the uncontroverted testimony at the hearing shows that isolation of tailings will be accomplished by means of physical barriers which do not require ongoing active maintenance and institutional controls to preserve isolation. Miller at pp. 11-16, 33-34; Tr. 195-196 (Miller). Indeed, maintenance-free disposal, to the maximum extent practicable, is required by the Act, the Regulations and Staff practice; Staff "would not license a mill where [it] knew that active maintenance would be required." Section 203 of the Act, 92 Stat. 3036; Tr. 195-196, 204-205 (Miller). Nonetheless, institutional controls

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testimony of Staff witness Miller and Licensees' witness Goldman on the basis that neither is "qualified to testify about the rates and direction of future geologic and climatological trends and their effects on the integrity of [stabilized mill tailings.]" ECNP PF 8, 20. These witnesses declined to offer any predictions as to what the climate will be in the future in the areas where the tailings will be located. Moreover, their testimony does not hinge on any set of assumed climatic conditions; therefore, Intervenors' criticism is not valid. Also, the qualifications of these witnesses, as shown in the record, are more than adequate to support their status as expert witnesses in the various areas in which they offered testimony in this proceeding; these qualifications were in no way challenged at the hearing. Nor did Intervenors introduce any evidence to contradict the testimony of Messrs. Miller and Goldman.

I-45. With respect to the quality control and monitoring program, Intervenors allege that the Staff does not itself inspect tailings reclamation projects, and "25, 50 or 100 years from now the mill tailings might not be inspected very carefully." ECNP PP 7. Intervenors misconstrue the testimony which they allege supports this proposed finding. Compare, Tr. 176-177 (Miller). A fair reading of Mr. Miller's testimony actually indicates that the methods of inspecting the condition of stabilized mill tailings will vary from site to site; for instance, where the stabilized pile is observed to have 40 or 50 feet of cover on it, no detailed inspection is necessary to verify compliance with the Regulations.<sup>9</sup> A detailed inspection is, of course, not required where the pile is obviously in a stabilized condition. And, contrary to Intervenors' proposed findings, the Staff proposes to implement a thorough inspection program featuring a combination of visual inspection, ground or aerial photography, water sampling, and other surveillance measures intended to verify that the tailings remain in stabilized condition. Miller at pp. 16-17; Tr. 178-179, 199-200 (Miller).

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<sup>9</sup> Licensees' witness Goldman testified that erosion of stabilized tailings is easy to detect, for loss of cover material or gulleying of tailings piles can be determined visually without need to resort to radiation measuring instrumentation. Tr. 461 (Goldman).



C. De-Stabilizing Effects of Erosion, Tails Migration and Other Factors on Stabilized Piles.

I-46. Intervenors assert that, because of possible climatic and geologic changes and other factors, the integrity of stabilized piles can not be guaranteed over the full period of pile toxicity of 80,000 years, the half-life of thorium-230.<sup>10</sup> EAO PF 1; ECNP PF 1,5,6,9,10,12,14,15. Such guarantee is not legally required under the Act, the Atomic Energy Act, or NEPA; indeed, it is impossible to give complete assurances that, if institutional controls disappear, every tailings pile will remain stabilized for such a long period of time. Miller at pp. 15-16; Tr. 213, 216-a (Miller); Tr. 498 (Goldman). However, the disposal methods that the Staff is requiring mill licensees to implement in accordance with the Regulations will eliminate or minimize erosion of the stabilizing cover for thousands of years at most sites, and are in fact likely to lead to additional cover being deposited over time at the sites. Miller at pp. 12-16; Tr. 210 (Miller).

I-47. Staff witness Miller enumerated the site selection criteria and disposal methods required by the Regulations that will assure long-range tailings stability.<sup>11</sup>

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<sup>10</sup> This proposed finding assumes that remedial action will not be available to maintain the tailings in a stabilized condition. As noted, however, any stabilization failures will be remedied in a timely manner. Miller at pp. 15-17.

<sup>11</sup> The preferred tailings disposal alternative is below grade (continued next page).

These criteria and methods were developed in part on the basis of a study conducted by consultants to the Staff, J.D. Nelson and T.A. Shepherd, "Evaluation of Long Term Stability of Uranium Tailings Disposal Alternatives", Colorado State University, April 1978 ("the Colorado State study"). Miller at p. 13; Tr. 237-238 (Miller). The Colorado State study identified the potentially most serious stabilization failure mechanisms and suggested siting and design features that could be employed to minimize or reduce them. Miller at p. 13. Thus, the siting criteria and disposal methods maximize protection against floods and earthquakes by placing the tailings away from upstream rainfall catchment areas, and away from potentially active faults; utilize sites where good wind protection exists; provide for relatively flat embankment slopes to minimize erosion; establish a vegetative or rip-rap cover to retard wind and water erosion; and provide for an impoundment design that incorporates features to promote deposition of sediments to enhance the thickness of the cover over time. Criterion 4; Miller at p. 12; Tr. 201, 205-207, 234, 239-241, 251-252, 276, 295-296 (Miller). These measures make it reasonably probable that, except for isolated,

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burial in specially excavated pits or in mines. Criterion 3; Miller at p. 12. Where below grade disposal is not possible or desirable, the tailings are to be disposed of above grade utilizing methods that minimize erosion potential. Criterion 4; Miller at p. 12.

site-specific failures, the tailings will be protected for very long periods of time against the de-stabilizing effects of erosion<sup>12</sup> and other natural forces.<sup>13</sup> Miller at pp. 13-14, 32.

D. Radon Emission Rates From Uncovered Piles.

I-48. Intervenors have questioned the appropriateness, for low ore grades, of the linear relationship between ore grade and mill recovery fraction utilized in Dr. Goldman's analysis. ECNP PF 18.<sup>14</sup> Dr. Goldman's uncontradicted

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12 It is also worth noting that the average denudation rate in the arid regions in which the tailings will be located is quite slow, on the order of a foot every four thousand years. Tr. 209-210 (Miller). Thus, barring drastic changes in climate or improbable, extraordinary events (such as major floods or earthquakes) the stabilized tailings should remain in that condition for many thousands of years. Id. And, as stated above, it is equally likely that the stabilizing cover will actually increase over time. Tr. 210 (Miller).

13 ECNP PF 10 states that the reclamation techniques claimed by the Staff to reduce radon emissions from mill tailings for thousands of years are essentially the same techniques which, at the Perkins hearing, were said by Staff witness Gotchy to be effective for only 500 years. The Boards need not examine the accuracy of ECNP's characterization, nor that of the estimates made by Mr. Gotchy (which were made at Perkins just for the purpose of computing health effects and which have been described herein by Staff witness Miller as "extremely conservative", Tr. 218 (Miller); Miller at p. 16) because the testimony offered at the Perkins hearing preceded the enactment of the Act, the issuance of the draft Generic Environmental Impact Statement on Uranium Milling (NUREG-0511), and the publication of the proposed Regulations; the disposal methods and criteria described by Staff witness Miller at the hearing are based on the new regulatory requirements and the additional knowledge gained since the Perkins hearing. Miller at pp. 3-4; Tr. 208-210, 215 (Miller). Therefore, the Perkins testimony noted by ECNP is of no consequence because Mr. Miller's testimony supersedes the evidence offered in Perkins.

14 ECNP PF 18 seriously misconstrues Dr. Goldman's testimony. (continued next page)

testimony, however, was that the relationship he utilized gave the best linear fit to the existing data points (which go down to the current ore grade of .1%) and was expected to be a reasonable approximation of the recovery fraction for ore grades down to .07%. Tr. 442, 475-479 (Goldman). In any event, Dr. Goldman testified that radon emissions are far more strongly dependent on the bulk diffusion coefficient and tailings depth than they are on the recovery fraction. Goldman at pp. 5-7, 12-13. Therefore, any inaccuracies that might exist in the recovery fraction projections for very low ore grades will be inconsequential compared to the more determinative factors in the radon release computation.

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Dr. Goldman did not, as the finding claims, "agree that other curves, representing a much larger increase of tailings volume with decreasing ore grades can be drawn through the existing data, and may in fact more accurately reflect the underlying function which determines the data (Tr. 486-490)." On the contrary, Dr. Goldman stated: "I have no basis whatsoever for accepting that that [nonlinear] form of a curve might be a more accurate representation [than his straight line approximation]." Tr. 489. He went on to say that the data points to which his straight line was fitted represent a variety of mills and processes acting on a variety of ores (Tr. 490) and that there is no analytical function that would describe the industrywide averages represented by those points (Tr. 493). Dr. Goldman was, moreover, quite emphatic in rejecting the curvilinear relationship presented to him on cross-examination as not representative of actual recovery experience at operating mills: "Accepting the curvilinear relationship prepared by Dr. Kepford does not comport with my own knowledge of the performance of certain mills... I find it very difficult to accept the kind of relationship projected by the curvilinear relationship he has made... I have enough knowledge of individual mill performance to suspect that that curvilinear relationship provides a projection that is too low for what I know the experience of selected mills to be operating on ore grades which are in the range of a 10th of a percent". Tr. 491-492.



I-49. Another proposed finding (ECNP PF 21) is that "[n]o evidence was introduced concerning the actual depths of the mill tailings piles which are being produced to fuel the reactors which are subject to this proceeding." This is the same type of objection raised by Intervenors in alleged deficiency No. 1 with respect to the mines from which uranium ore would come, and rejected by the Appeal Boards in ALAB-562 as unworkable. See, ALAB-562, 10 NRC 437, 447 (1979). There is, of course, no way of knowing the depth of the mill tailings piles that will result from producing fuel over the next several decades for the reactors in the instant proceeding. Moreover, such information is unnecessary, for the record shows without dispute that the average depth of tailing piles at active sites is between 12 and 13 m, as determined independently by the Staff and by Licensees' witness Goldman. Miller at p. 29; Goldman at pp. 11-12. In the absence of any indication to the contrary, it is proper to assume that the average depth of tailing piles at active sites is a reasonable approximation of the depth of tailings piles in future.<sup>15</sup>

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<sup>15</sup> ECNP PF 21 also alleges that utilizing average pile depths "results in a substantial underestimation of short term radon releases, due to the shielding effect of piles which exceed certain depths." To the extent, however, that this allegation (wholly unsupported by the record) attempts to question the estimates of the short term radon releases from uranium mills during the active milling period (which is the period during which the tailings piles have not yet achieved their ultimate depth), it constitutes an impermissible attempt to interject a new alleged "deficiency" of the Perkins record into this proceeding. The Perkins record contains an estimate of 1,130 (continued next page)

E. Survivability of Uncovered Tailings Piles.

I-50. Intervenors have proposed a finding that 1000 Ci/year per AFR could potentially be released from an uncovered mill tailings pile. EAO PF 3; ECNP PF 23. This value, however, constitutes an upper limit that would be reached only if the tailings pile were dispersed completely into a uniform, thin layer over a wide area of the ground and remained so dispersed through the tailings toxicity period of 80,000 years. Tr. 57 (Pohl); Tr. 497 (Goldman). There is no basis on the record for assuming that this improbable, "worst case" scenario will take place; its sole expositor, Intervenors' witness Pohl, declared himself unable to testify as to the reasonableness of assuming such a complete dispersal of the tailings piles. Tr. 36-37 (Pohl). On the other hand, both Staff witness Miller and Licensees' witness Goldman rejected complete dispersal of the piles as an unreasonable and unrealistic postulation. Tr. 293-294 (Miller); Tr. 502-503 (Goldman). Dr. Goldman also testified that, in the unlikely event of complete tailings dispersion, the tailings would not remain dispersed in a thin layer over the surface of the ground and exposed for a long period of time, but instead would either be carried by surface

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Ci/yr per AFR of Rn-222 emitted by the tailings piles prior to stabilization, which includes 750 Ci/yr per AFR associated with emissions from tailings during the active milling period. See Affidavit of Paul J. Magno, foll. Perkins Tr. 2369, at p. 2. This estimate has never been challenged by any party.

waters to the ocean or would be covered or deposited upon by other soil materials. Tr. 502-503 (Goldman).

I-51. Intervenors also disagree with the testimony that mill tailings piles will remain in place without substantial erosion for long periods of time even after loss of the stabilizing cover. EAO PF 1; ECNP PF 19. They object mainly to the relevancy of Dr. Goldman's testimony on the long-term survival of Indian mounds in the eastern and central part of the United States. Dr. Goldman stated that there are differences between the Indian mounds and mill tailings piles in terms of location, climatic conditions,<sup>16</sup> and existence of vegetative cover. Tr. 445-446 (Goldman); Goldman at p. 16. Nonetheless, the existence of the Indian mounds demonstrates that even primitive earthen structures can survive, relatively undisturbed, the natural forces of erosion for long periods of time without the benefit of modern engineering construction techniques. Tr. 482-483 (Goldman). The Indian mound experience also suggests that any dispersion of mill tailings piles,

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16 The areas in which the Indian mounds are located are generally more subject to rainfall erosion and flooding, but less subject to wind erosion, than the arid regions in which the mill tailings are located. Goldman at p. 16. On the other hand, in order for the stabilizing cover protecting the tailings to have disappeared, one would have to assume that climatic changes had taken place, perhaps resulting in more precipitation in the now arid regions in which the tailings will be disposed. See, Tr. 209-210 (Miller). Thus, the climatic conditions at the Indian mound sites may well anticipate those at the mill tailing sites at the time the stabilizing cover is lost.

time without the benefit of modern engineering construction techniques. Tr. 482-483 (Goldman). The Indian mound experience also suggests that any dispersion of mill tailings piles, after loss of stabilizing cover, will be a slow process that allows ample time for remedial action to restore the piles to a stabilized condition. Goldman at p. 20. The slow dispersion of unstabilized mill tailings is also demonstrated by the actual dispersion rates experienced at inactive mill sites, for which Dr. Goldman calculated a mean dispersion rate of the order of .036% per year. At this rate, complete dispersal of a pile would occur in about 2700 years. Id.

I-52. Finally, Intervenor's raise the possibility of human intrusion -- accidental or deliberate -- into an inactive tailings pile. EAO PF 4, 5, 7.<sup>17</sup> However, the tailings will be disposed of in remote areas and, under the Act, ownership and control of the sites where the tailings are to be disposed will be lodged with the Federal or State government, so that intrusion into the tailings piles is highly unlikely in view of their remote location and the monitoring and remedial care to be provided by the government. Section 202 of the Act, 92 Stat. 3033-3036; Criterion 1; Miller at pp. 5, 6, 17; Tr.

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17 There is no support on the record for the fanciful speculation of ECNP in its PF 12 that the mill tailings may be viewed by future people as "relics of a past civilization and become tourist attractions for young families with small children" or that future people may remove the rip-rap cover "to construct stone dwelling huts on the mill tailings piles."



resulting releases to the intruder will only be an isolated incident that will not alter the industry-wide radon release estimates provided by the witnesses in this proceeding.

## II. ABANDONED UNDERGROUND MINES

No reply findings.<sup>19</sup>

## III. OPEN PIT MINES

No reply findings. See n. 19, supra.

## IV. WATER PATHWAYS

IV-12. Intervenors find fault with the preferred method of mill tailings' disposal specified by the Regulations, i.e. below grade burial. EAO PF 8. In their view, below grade burial "will bring tailings into closer proximity to the groundwater." What matters, of course, is not whether buried tailings are in "closer proximity" to the groundwater but whether in fact they come in contact with it. Staff witness Miller testified that, in licensing a mill for which the tailings will be placed below grade, a careful review will be

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19 No proposed findings of fact were filed by ECNP or EAO with respect to radon emissions from abandoned underground mines, open-pit mines, and those emissions associated with the recovery of uranium as a by-product of phosphate fertilizer production. Therefore, Licensees' proposed findings of fact in these areas remain uncontested and should be adopted.

made of the hydrology of the disposal area to ensure that the groundwater table does not rise to the level of the tailings. Tr. 325-327 (Miller).

IV-13. With respect to seepage from the buried tailings into the groundwater (another contamination mechanism postulated by Intervenors) there was undisputed testimony that radionuclides do not dissolve readily in groundwater, move very slowly in it, and tend to react chemically with the soil and become fixed to it. Tr. 513-517 (Goldman). Thus, any effect from groundwater contamination by tailings would be confined to the immediate vicinity of the tailings and would not result in any significant radon releases to the environment. Id.

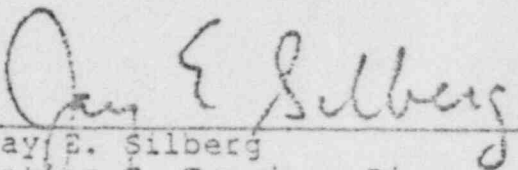
Furthermore, the migration of dissolved radionuclides from mill tailings is no different than the natural migration of these substances in the groundwater, for the ores from which mill tailings result are normally found below the groundwater table. Tr. 358 (Wilde); Tr. 505-507 (Goldman); Miller at p. 41. Thus, any radionuclides from mill tailings that may find their way into the groundwater will at most only increase slightly the concentration that would have occurred had the ores not been mined and milled, and may actually result in less transport of radionuclides by the groundwater than if the ore had not been mined. Miller at p. 41.

V. EMISSIONS ASSOCIATED WITH THE RECOVERY OF URANIUM AS A  
BY-PRODUCT OF PHOSPHATE FERTILIZER PRODUCTION

No reply findings. See n. 19, supra.

Respectfully submitted,

SHAW, PITTMAN, POTTS & TROWBRIDGE

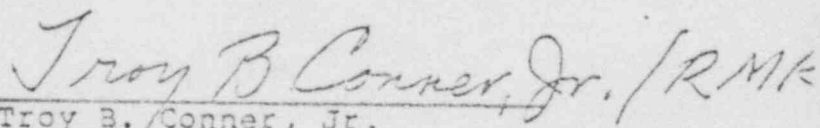
  
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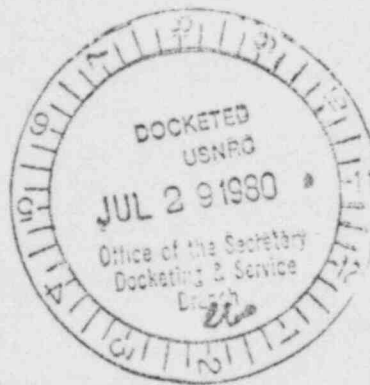
Dated: July 13, 1980.

CERTIFICATE OF SERVICE

I hereby certify that copies of "Licensees' Reply to the Proposed Findings of Fact of the Other Parties," "Licensees' Reply to Filings by Other Parties on Disposition of Alleged Deficiency No. 1," and "Licensees' Response to NRC Staff Motion for Leave to Include Health Effects Findings," dated July 18, 1980, in the captioned matter, have been served by deposit in the United States mail this 18th day of July, 1980, in accordance with the attached service list.

*Robert M. Rader*

Robert M. Rader





BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of )

PHILADELPHIA ELECTRIC )  
COMPANY, ET AL )

Docket Nos. 50-277  
50-278

(Nuclear Station Atomic Power )  
Station, Units 2 and 3) )

SERVICE LIST

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UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING APPEAL BOARD

In the Matter of )

ATOMIC SERVICE ELECTRIC )  
& GAS COMPANY, ET AL )

Docket Nos. 50-354  
50-486

(Hope Creek Generating Station, )  
Units 1 and 2) )

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