

March 1979

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
PORTLAND GENERAL ELECTRIC	)	Docket Nos. 50-514
COMPANY, ET AL.	)	50-515
(Pebble Springs Nuclear Plant,	)	
Unit Nos. 1 and 2)	)	

NRC STAFF RESPONSE TO "MEMORANDUM CONCERNING BOARD  
QUESTIONS" DATED DECEMBER 15, 1978 PREPARED BY  
DR REGINALD L. GOTCHY AND DR. RICHARD WELLER

Introduction

In a "Memorandum Concerning Board Questions" dated December 15, 1978, the Board stated that it has received the "Revisions to NRC Staff Evaluation of Liquid Radwaste System" dated November 3, 1978. The Board noted that "the Staff assumed that 50% of the regenerant solutions will be discharged to the coolant reservoir without treatment." Under that assumption the Staff has estimated a release of 3.8 Ci/yr, over 100 times greater than estimated by the Applicant. However, the Staff's estimate of whole-body dose to a nearby resident is only 0.033 mrem/yr, much less than estimated by the Applicant. Accordingly, the Board asked for further information from the Staff concerning the basis for the estimated release rates and the calculation of dose.

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Response by Dr. Richard Weller

The purpose of this response is to provide the Board with further information concerning the basis for the estimated release rates of secondary system liquid effluents to the Pebble Springs reservoir. In addition, this response also includes and is attached as a corrected dose table, Table 2, of supplemental testimony, "Revisions to NRC Staff Evaluation of Liquid Radwaste Systems with Respect to Appendix I of 10 CFR Part 50 and Effect on Overall Cost-Benefit Balance," dated November 3, 1978, to account for input errors in the previous code calculation of the doses. As shown in revised Table 2, the estimated doses associated with the normal operation of the Pebble Springs Nuclear Plant, Unit Nos. 1 and 2, meet the requirements of Sections II.A and II.D of Appendix I to 10 CFR Part 50. The discussion of the dose calculations is addressed below in a separate response by Dr. R.L. Gotchy.

The Staff's re-evaluation (November 3, 1978 testimony) of the discharges of radioactive material in liquid effluents is based on the Applicant's submittal of Amendment 12 (June 1978) to the PSAR. In Amendment 12, the applicant modified the manner in which the processing of wastes in the Dirty Radwaste System (DRS) is controlled. The modification consists of deleting the commitment to fix the setpoint of the DRS process radiation monitor at  $10^{-6}$  uCi/cc to allow greater flexibility in the operation of the plant. This monitor determines whether the regenerant

solutions will be directed to the DRS for processing or to the supplemental waste holdup tank for ultimate discharge to the reservoir. In view of the deletion of the commitment to the radiation monitor fixed setpoint and the planned greater flexibility in plant operation, the staff assumed that 50% of the regenerant solutions would be discharged to the coolant reservoir without treatment. The previous staff Appendix I testimony (July 29, 1976) assumed that all of the regenerant solutions would be processed in the Dirty Radwaste System. It should be noted that the Applicant's model assumes that all secondary system wastes are discharged to the reservoir without processing.

The staff assumption of 50% discharge of regenerant solutions is based on several considerations. Firstly, the applicant has committed to satisfy the design objectives of Appendix I to 10 CFR Part 50, but has not committed to recycle wastes to the maximum extent practicable. Thus, the staff has assumed a higher discharge fraction for the Pebble Springs liquid effluents than would be assumed for a plant with a maximum recycle commitment. Secondly, the staff assumption of 50% discharge of regenerant solutions permits the applicant to satisfy the design objectives of Appendix I while operating the plant with the desired flexibility. Since it is less costly to discharge regenerant solutions than to process them through the DRS, there is an economic incentive to discharge wastes to the maximum extent consistent with the objectives of Appendix I. The assumed discharge of 50% of the regenerant solutions

results in a calculated liquid source term of 3.8 Ci/yr/reactor (the design objective in the Annex to Appendix I is 5 Ci/yr/reactor). It should be noted that this source term is based on "expected" values, over the assumed 30 year life of the plant, of 1.12% failed fuel and primary to secondary system leakage of 100 lb/day. It should also be recognized that during the actual operation of the plant, the parameters for fraction of regenerant waste discharged, failed fuel, and primary to secondary leakage may vary significantly from the values cited above. For example, for those periods of operation when there is no primary to secondary leakage, all (100%) of the regenerant solutions could be discharged to the coolant reservoir with no resultant environmental impact. However, when the "expected" values for the above parameters prevail, the staff's evaluation indicates that total discharge of 100% of regenerant solutions without treatment would not be within the design objectives of Appendix I.

#### Conclusion

For these reasons, the staff believes that its revised effluent release model is a realistic representation of the planned operation of the Pebble Springs nuclear plant.

Response by Dr. Reginald L. Gotchy

The Staff has reexamined its liquid pathway dose commitment estimates for Pebble Springs 1 and 2 as a result of releases through the "dirty radwaste system" (DRS) into the cooling reservoir. We have also examined the applicant's dose commitment estimates presented in their Amendment 12 (July 1978), Table II.2-12.

As a result of this review, the staff found the following:

(1) The tritium source term used by the Staff in its November 3, 1978 dose commitment estimates was a factor of 10 low due to a card punch error. This was a significant error, since tritium accounts for most of the total body dose commitment. This error has been corrected.

(2) The turnover rate for the reservoir which the staff had used was high by a factor of about 70. As a result, the reconcentration factor previously used was too low, and thus the corresponding dose commitments were too low. We have not been able to determine the source of this error, since the hydrologist who made the estimate is no longer with the NRC. Nevertheless, it has also been corrected, and the revised Table 2 of the November 3, 1978 staff testimony (as noted in Dr. Weller's response above) is attached.



(3) The major dose contributor to total body dose is tritium (about 80%) with the balance due almost entirely to cesium nuclides. Even though the applicant's source term for cesium is much larger than the staff's, there is less than a factor of 2 difference in the tritium source terms. Therefore, in terms of contributors to the total body dose commitment, there is not a large difference between the applicant and the staff's source terms.

(4) In reexamining the Pebble Springs ER and PSAR, the staff concluded that its previous interpretation of potential exposure pathways is correct, but that the applicant has generally been overly conservative in their July 1978 Amendment 12. For example, unless PGE has modified their position, there will be no recreational activities permitted within the exclusion area, and land use (e.g., by Krebs Brothers, Inc.) will be limited to agricultural purposes (ER, p. 2.1-3, 2.1-9; PSAR, p. 2.1-3). Further, under terms of their agreement with PGE, Krebs is prohibited from grazing dairy animals on irrigated crops (ER, p.2.2-7; PSAR, p. 2.1-3). However, Krebs is permitted to water livestock at the southerly edge of the reservoir (ER, p.2.5-4; PSAR, p.2.1-3), and the staff was unable to find an exclusion for watering dairy cattle or using irrigation water from the reservoir for growing food crops for human consumption.

As a result, the staff has calculated total body doses (as well as thyroid doses) for the following potential pathways:

- (a) Reservoir water—beef and milk cows (watering)— man
- (b) Reservoir water— food crops — man
- (c) Reservoir water—grazing crops — beef — man

The following pathways assumed by the applicant in Amendment 12 are in the staff's view overly conservative:

- (a) Reservoir water — man (drinking water)
- (b) Waterfowl consumption
- (c) Sunbathing
- (d) Swimming and boating
- (e) Ground contamination (requires living on irrigated grazing land).

When these pathways are removed, the applicant's estimated total body dose would be 0.066 mrem/yr which compares very well to the staff's revised estimate of 0.10 mrem/yr without the milk pathway or 0.21 mrem/yr with the milk pathway for an infant. Thus, the corrected staff estimate would be in reasonable agreement with the applicant for those pathways which could potentially exist.

Conclusion

In conclusion, the staff found and corrected some modeling errors and a punch card error in the tritium source term. The staff finds many of the applicant's assumed pathways are overly conservative and are excluded by written agreements with the land owner (Krebs Boos, Inc.) as stated in their ER. When the staff corrected previous errors and excluded those pathways assumed by the applicant in their July 1978 Amendment 12 (Table II.2-12), the dose commitment estimates of the staff and applicant are in reasonable agreement. Finally, it is concluded that the previous conclusions regarding the Appendix I analysis for liquid pathways at the Pebble Springs site remain the same, i.e., the liquid pathways for the proposed two unit station would not result in dose commitments in excess of Appendix I design objectives.



TABLE (Revised January, 1979)

COMPARISON OF PEBBLE SPRINGS NUCLEAR PLANT, UNIT NOS. 1 AND 2 WITH  
 APPENDIX I TO 10 CFR 50, SECTION 11.A, (MAY 5, 1975)<sup>a</sup> AND  
 SECTION 11.D, ANNEX (SEPTEMBER 4, 1975)<sup>b</sup>

<u>Criterion</u>	<u>Appendix I<sup>a</sup> Design Objectives</u>	<u>Annex<sup>b</sup> Design Objectives<sup>c</sup></u>	<u>Calculated Doses</u>
Liquid Effluents			
Dose to total body from all pathways (Adult)	3 mrem/yr/unit	5 mrem/yr/site	0.21 mrem/yr/unit
Dose to any organ from all pathways (infant thyroid)	10 mrem/yr/unit	5 mrem/yr/site	1.1 mrem/yr/unit
Doses to Population within 50 mile radius			
Liquid Effluents			
Dose to total body from all pathways, Units 1 and 2			1.4 man-rem/yr

<sup>a</sup>Federal Register, V. 40, p. 19442, May 5, 1975.

<sup>b</sup>Federal Register, V. 40, p. 40816, September 4, 1975.

<sup>c</sup>Design Objectives given on a site basis. Therefore, these design objectives apply to 2 units at the site.