

From: "Paul M. Blanch" <pdblanch@home.com> *Public*
To: NRC Concerns <nrc_concerns@onelist.com>
Date: Thu, May 20, 1999 6:36 PM
Subject: NRC letter on maximum exposure criteria for decommissioned sites

Attached is a letter from the NRC explaining that there is no maximum limit to public radiation exposure at decommissioned sites released for unrestricted access. Also note that the NRC will allow a site to store high level waste at these sites under a Part 50 license for a power reactor, even though the site may not even have a reactor or containment within 100 miles.

Sounds good to me!

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May 19, 1999

Mr. Paul M. Blanch
Energy Consultant
135 Hyde Road
West Hartford, CT 06117

Dear Mr. Blanch:

I am responding to the e-mail message you sent me on February 10, 1999, in connection with the Millstone Unit 1 decommissioning public meeting held in Waterford, Connecticut, on February 9, 1999. I am replying to you on the basis of the questions and concerns you expressed at that meeting and at the public meeting (Yankee Rowe Nuclear Power Station License Termination Plan) held in Shelbourne, Massachusetts, on January 13, 1998.

The purpose of this letter is to address the questions you have raised in your e-mail and at the two public meetings regarding certain regulations for which the NRC has in place, and to discuss matters associated with how the staff assesses annual dose rate. The discussion below reflects the staff's positions. In developing this response, the staff has ensured that the key points can be linked directly to referenced material. I trust you will find this information responsive and helpful in better understanding NRC's oversight role in addressing plants undergoing decommissioning.

The list of references in the responses can be found in the enclosure to this letter (Enclosure 1). Your questions and concerns are answered, to the extent possible, in the same order as you presented them in your February 10, 1999, e-mail and at the two public meetings.

The first issue raised in your e-mail message states "NRC can more than triple its allowable exposure with a simple redefinition of unrestricted access." You raised this same issue at the Millstone meeting on February 9, 1999, and at the Yankee Rowe meeting on January 13, 1998. The apparent inconsistency you raise is between a permissible exposure rate of 10 microrad per hour ($\mu\text{R/hr}$), and EPA's annual dose rate of 15 mrem/yr, or NRC's annual dose rate of 25 mrem/yr. The use of any of these dose rates without an understanding of the assumptions made in deriving the dose rate results in an over-simplification of what each dose rate means. According to the cleanup criteria of the NRC Site Decommissioning Management Plan's (SDMP's) (reference 1) Appendix C Action Plan (reference 2), the maximum indoor exposure rate should be less than 5 $\mu\text{R/hr}$ above natural background radiation at 1 meter, with an overall dose objective of 10 mrem/yr. The maximum exposure rate criterion for outdoor radiation is 10 $\mu\text{R/hr}$ above natural background radiation measured at 1 meter from the ground surface, as provided in Option 1 of the Branch Technical Position (reference 3), Appendix C of NUREG/BR-0241 (reference 4), and Enclosure 3 of Policy and Guidance Directive FC 83-23 (reference 5). According to Table 1 in Appendix C to NUREG/BR-0241 (reference 4), the dose basis (effective dose equivalent—EDE) corresponding to 10 $\mu\text{R/hr}$ at 1 meter above natural background radiation is approximately 24 mrem/yr, which is generally expressed in terms of potential dose to the reasonably maximally exposed individual (estimate based on effective,

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unshielded occupancy of about 2360 hours for outside exposure). Therefore, relating 10 μ R/hr to a dose rate of 87 mrem/yr, which is more than three times the limit, is not appropriate because of the occupancy assumption made in deriving the dose rate. Section 20.1402 of NRC's final rule for radiological criteria for license termination (10 CFR Part 20, Subpart E) (62 FR 39058, July 21, 1997), states that a site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from natural background radiation results in a TEDE (total effective dose equivalent) to an average member of the critical group that does not exceed 25 mrem/yr, including the dose from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as is reasonably achievable (ALARA). This means that the radiation dose from contamination remaining on the property will be as far below 25 mrem/yr as is reasonably achievable (e.g., 25 mrem/yr may be compared to a dose of about 5 millirem of natural background radiation from one round-trip cross-country airline flight; 50 mrem/yr average from medical examinations; and 300 mrem/yr average in the U.S. from natural background radiation). The staff believes that the NRC site release criterion is sufficiently protective of public health and safety, and the environment.

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You have asked how EPA calculates its limit of 15 mrem/yr for unrestricted access and have noted the inconsistency between the EPA and the NRC criteria. You raised the same issue at the Millstone public meeting on February 9, 1999. We understand that the EPA begins with the dose limit of 15 mrem/yr and then uses multimedia pathway models, such as DOE's "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD Computer Code" (reference 6), to determine soil concentration values for a variety of isotopes. As long as the licensee determines that the soil concentrations are below these values, the assumption is made that the TEDE would be less than 15 mrem/yr. The pathway models used by the EPA also assume a variety of scenarios, including the rural residential scenario. For additional information on this topic, you can contact EPA at:

U.S. Environmental Protection Agency
Office of Radiation and Indoor Air (ORIA) (6601J)
401 M Street, SW
Washington, DC 20460
Phone: (202)564-9320

The NRC recognizes the inconsistency between the EPA and NRC criteria. NRC has concluded that the NRC criteria are soundly based on considerations of risk, radiation protection principles, national and international standards, and the costs compared to associated benefits of cleanup. Additionally, the NRC criteria resulted from informed and open discussions as part of the rulemaking process. The NRC has discussed the inconsistency with EPA and is attempting to address the issue. The NRC's position on this issue is given in the enclosed letter to EPA dated December 12, 1997 (Enclosure 2).

The next issue raised in your e-mail message relates to "no one spending more than 8 hours per day on the site" and "access restricted to 8 hours per day." You raised the issue of living

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there at the site 365 days a year in a tent or "whatever" at the Yankee Rowe public meeting

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(January 13, 1998). You also raised a similar issue at the Millstone public meeting (February 9, 1999). The assumption was made at the meetings that unrestricted release may result in an individual living there 24 hours per day for 365 days per year, and potentially camping out and sleeping on the ground. NRC's Policy and Guidance Directive PG-8-08, "Scenarios for Assessing Potential Doses Associated With Residual Radioactivity," examines three scenarios (A, B, and C) (reference 7). Scenario C (resident farmer) is intended to represent the reasonably maximally exposed individual. Because scenario C is based on "prudently conservative" assumptions that tend to overestimate potential doses, use of this scenario should result in estimated doses that will be greater than the exposure to future residents most of the time. Under the resident-farmer scenario (scenario C), an individual would reside on the site, and ingest a larger percentage of vegetables grown in the onsite garden, consume meat and milk produced on site, and consume aquatic food from a pond near the site. The assumption is that the person is not only exposed to the external radiation, but also inhales the contaminated air and dust, and ingests water and food produced on the contaminated site. PG-8-08 (reference 7), DOE's RESRAD (reference 6) and DandD code as identified in reference 8 provide default parameters as percentages or fractions of time spent on site by individuals. In general, for example, references 6, 7, and 8 assume spending approximately 50 percent of time indoors on site, approximately 25 percent of time outdoors on site, and approximately 25 percent of time away from the site. The gardening is assumed to occur in the contaminated area. All of the resident's drinking water comes from the onsite well.

The dose estimate is based on average dose to a member of the critical group. According to 10 CFR 20.1003, "Critical Group means the group of individuals reasonably expected to receive the greatest exposure to residual radioactivity for any applicable set of circumstances"; and "Individual means any human being."

ICRP (International Committee on Radiation Protection) 46 "Radiation Protection Principles for the Disposal of Solid Radioactive Waste" (reference 9) states the following:

The critical group should be representative of those individuals in the population expected to receive the highest dose equivalent, and should be relatively homogeneous with respect to the location, habits and metabolic characteristics that affect the doses received. It may comprise existing persons, or a future group of persons who will be exposed at a higher level than the general population. When an actual group cannot be defined, a hypothetical group or representative individual should be considered who, due to location and time, would receive the greatest dose. The habits and characteristics of the group should be based on present knowledge using cautious, but reasonable, assumptions. {Paragraph 46}

Therefore, in establishing the criteria for release of the site, the Commission made reasonable assumptions about the amount of time an individual would spend on the site. The use of 25 mrem/yr, which is one-quarter of the annual permissible dose rate to a member of the public from licensed operation, provides sufficient conservatism to adequately protect those individuals that do not fit the standard scenarios.

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At the Millstone public meeting (February 9, 1999), you raised the issue about the differences in the applicable decommissioning regulations used by Connecticut Yankee Atomic Power Company (CYAPCo) for Haddam Neck Plant and by Maine Yankee Atomic Power Company (MYAPCo) for Maine Yankee Atomic Power Station. Simply stated, there are no differences. Each of these facilities must meet the requirements of the Commission's regulations. You stated that Maine Yankee essentially is decommissioning without an Appendix B (quality assurance) program. Appendix B applies to all Part 50 licensees, including MYAPCo. With respect to quality assurance, both CYAPCo and MYAPCo meet the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Connecticut Yankee's "Quality Assurance Program," Revision 1 (reference 10), meets the requirements of Appendix B to 10 CFR Part 50 and additional regulatory requirements. The NRC staff accepted CYAPCo's "Quality Assurance Program" in a letter dated October 14, 1997. Revision 14 to MYAPCo's (operational) quality assurance program (OQAP) (reference 11) and additional information submitted by MYAPCo comply with the requirements of Appendix B to 10 CFR Part 50. The commitments made by MYAPCo in Revision 14 to the OQAP are consistent with the requirements of Appendix B to 10 CFR Part 50 for decommissioning Maine Yankee Atomic Power Station. The NRC staff accepted MYAPCo's commitments in a letter dated July 24, 1998.

At the Yankee Rowe public meeting in Shelbourne, Massachusetts (January 13, 1998), you raised a concern regarding the adequacy of a 10 CFR Part 50 license in ensuring the safe storage of spent fuel during decommissioning. A license issued under the provisions of 10 CFR Part 50 provides acceptable protection for the health and safety of the public and the plant staff with regard to the storage of spent reactor fuel. The 10 CFR Part 50 regulations protect health and safety, not only at operating plants but also at permanently shutdown facilities. The Commission has made a generic determination [10 CFR 51.23(a)] that, if necessary, spent fuel generated in any reactor can be stored safely in the spent fuel pool and without significant environmental impacts for at least 30 years beyond the licensed operational life of the facility.

Finally, you were also concerned at the Shelbourne public meeting that according to the License Termination Plan, Part 50 (rather than Part 72) is going to remain in effect through the entire decommissioning process, including the long-term storage of spent fuel. NRC regulations in 10 CFR Part 72, Subpart K, states the following: "A general license is hereby issued for the storage of spent fuel in an independent spent fuel storage installation at power reactor sites to persons authorized to possess or operate nuclear power reactors under 10 CFR Part 50 of this chapter." If Yankee Rowe elects to build an onsite dry storage facility, the regulations allow for construction and operation of an independent spent fuel storage installation without additional licensing requirements. The dry casks for use at such a facility must be certified under the appropriate regulations in 10 CFR Parts 20 and 72. The licensee must comply with all of the conditions of the certificate of compliance to use Part 72. Again, as stated in the previous paragraph, the Commission found the degree of safety required by 10 CFR Part 50 to be acceptable, as discussed in the letter that NRC sent to you on August 6, 1997.

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We appreciate your sharing of concerns and questions, and your participation in the decommissioning process. If you have any further questions, please do not hesitate to contact me.

Sincerely,

ORIGINAL SIGNED BY:

John A. Zwolinski, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

- Enclosures: 1. List of References
2. Letter to EPA dated December 12, 1997

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REFERENCES

1. U.S. Nuclear Regulatory Commission, Site Decommissioning Management Plan, NUREG-1444, October 1993.
2. U.S. Nuclear Regulatory Commission, "Action Plan To Ensure Timely Cleanup of SDMP Sites" (57 FR 13389), April 16, 1992.
3. U.S. Nuclear Regulatory Commission, Branch Technical Position, "Disposal or Onsite Storage of Thorium or Uranium Wastes From Past Operations," SECY 81-576 (46 FR 52061), October 23, 1981.
4. U.S. Nuclear Regulatory Commission, NMSS Handbook for Decommissioning Fuel Cycle and Materials Licensees, NUREG/BR-0241, March 1997.
5. U.S. Nuclear Regulatory Commission, Policy and Guidance Directive FC 83-23: Termination of Byproduct, Source and Special Nuclear Material Licenses, November 4, 1983, NUDOCS Accession Number 9303080065.
6. U.S. Department of Energy, Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD, Data Collection Handbook, ANL/EAIS-8, Argonne National Laboratory, April 1993.
7. U.S. Nuclear Regulatory Commission, Policy and Guidance Directive PG-8-08: Scenarios for Assessing Potential Doses Associated with Residual Radioactivity, Division of Waste Management/NMSS, May 1994, NUDOCS Accession Number 9406150116.
8. Sandia National Laboratories, Review of Parameter Data for the NUREG/CR-5512, Residential Farmer Scenario and Probability Distributions for the DandD Parameter Analysis, W. E. Beyeler, T. J. Brown, W. A. Hareland, S. Conrad, N. Olague, D. Brosseau, E. Kalinina, D. P. Gallegos, and P. A. Davis, Letter Report for NRC Project JCN W6227, January 30, 1998.
9. ICRP 1985, "Radiation Protection Principles for the Disposal of Solid Radioactive Waste," ICRP-46, July 1985.
10. Connecticut Yankee Atomic Power Company, Connecticut Yankee Quality Assurance Program for the Haddam Neck Plant, CYQAP Manual, Rev. 01, April 25, 1997.
11. Maine Yankee Atomic Power Company, Revision 14 to the Maine Yankee Atomic Power Station's (Operational) Quality Assurance Program, July 24, 1998.

Enclosure 1

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