



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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DEC 15 1980

MEMORANDUM FOR: Guy A. Arlotto, Director
 Division of Engineering Standards
 Office of Standards Development

FROM: Thomas E. Murley, Director
 Division of Safety Technology
 Office of Nuclear Reactor Regulation

SUBJECT: FINAL OFFICE REVIEW OF WORKING PAPER 4 ON DRAFT GENERIC
 ENVIRONMENTAL IMPACT STATEMENT ON DECOMMISSIONING NUCLEAR
 FACILITIES, NUREG-0586, OCTOBER 1980

In response to a memorandum from R. Jones to H. Denton, dated October 17, 1980, we have reviewed the subject document.

The subject draft represents a substantial improvement over Working Paper 3, particularly in its discussions of the financial assurance aspects of decommissioning. However, certain financial assurance policies implied in this area are, as indicated in the enclosed comments, unacceptable and therefore we cannot concur in the draft GEIS. Also, many comments on Working Paper 3 of the GEIS given in August remain valid. Rather than repeat them here, we are enclosing our August comments; items 2, 3, 9, 10 and 13 of those comments are still of concern to us.

We do not concur with the document's treatment of residual radioactivity limit requirements. Our concerns have been voiced in conversations between our reviewers and C. Feldman, the SD task leader. I suggest a meeting between your people and our reviewers to resolve our differences prior to publication of this document.

Our detailed comments are enclosed. We have not made any editorial comments, although the services of a technical editor would be beneficial.

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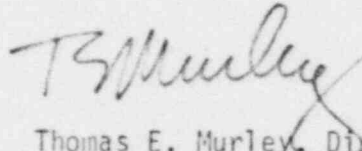
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Guy A. Arlotto

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This review was performed by R. Wood, P. Cota, P. Erickson, P. Matthews, F. Witt, F. Congel and R. Bangart.



Thomas E. Murley, Director
Division of Safety Technology
Office of Nuclear Reactor Regulation

Enclosure:

Comments on Working Paper 4 on
Draft Generic Environmental
Impact Statement on Decommission-
ing Nuclear Facilities, NUREG-
0586, October 1980

COMMENTS ON WORKING PAPER 4 ON DRAFT
GENERIC ENVIRONMENTAL IMPACT STATEMENT
ON DECOMMISSIONING NUCLEAR FACILITIES,
NUREG-0586, OCTOBER 1980

1. Overview. In the section on financial assurance, the draft correctly indicates that negative salvage value depreciation "does not offer the high degree of assurance" that other options do. However, the draft excludes, in this section at least, the possibility of coupling negative salvage value depreciation with insurance or some other surety arrangement. Such a combination at least theoretically provides adequate assurance of the availability of decommissioning funds and should not be summarily dismissed.
2. Section 0.2.6.2, p. 0-7. Continuing the above comment, the last part of the first paragraph should be revised, as follows: "While it is generally considered that the mechanism is less costly than the others, it has deficiencies because of the lack of assurance it, by itself, provides that funds will be available for decommissioning."

Also edit the last sentence of this paragraph.
3. Table 0.4-1, p. 0-11. The tables should be renumbered in sequence (e.g., Table 0.0-2 is on p. 0-45)
4. Section 2.6.2, p. 2-14. In the fourth line of the section, "facilities" should be changed to "licensees'."
5. P. 2-14, last paragraph. Sinking funds should be subject to periodic revision. It is too early to specify annual revision as opposed to some other interval.
6. P. 2-15, first paragraph, last sentence. Add parenthetical statement, as follows: "... the internal reserve is insufficient for decommissioning unless substantial additional financing mechanisms (such as insurance) are found to overcome the assurance deficiencies."
7. P. 2-15, fourth paragraph, last sentence. This sentence is wrong. The TBS study estimated that the cost of any of the decommissioning funding options would be less than 1% of a representative utility customer's total bill. The difference in cost among options is still generally 3-2-1.
8. The plural of surety is "sureties."
9. P. 15-7, first sentence. See comment 5.

10. P. 15-7, second paragraph, second sentence. "This mechanism usually uses negative net salvage value depreciation..."
11. The statement still disposes of the LWR ENTOMB option in a cavalier manner. It is stated without demonstration (pp. 4-6 and 4-7) that "the integrity of the entombing structure must be assured in some cases for hundreds of thousands of years," that "surveillance in perpetuity" would be required, and that this option is estimated to involve "an annual maintenance cost of \$40,000," presumably in perpetuity. Also, the brief description of ENTOMB on p. 0-5 of the Summary makes the virtually unsupported statement that ENTOMB is not a viable alternative. This option deserves a more thorough and unbiased treatment.
12. The recommended residual radioactivity limit requirements of between 1 and 10 mrem/yr in section 2.5.2 are unreasonably low, are not cost-effective (as discussed in comment #14), and are probably not verifiable by direct survey radiation measurements.
13. We recommend the following residual radiation limits for release of decommissioned reactor sites to unrestricted access:

- a. Surface Contamination

Surfaces must be decontaminated to levels consistent with Table 1 of Reg. Guide 1.86.

- b. Radioactive Material Other than Surface Contamination

Radioactivity in soil, concrete, and all structures must be removed such that the average radiation level from this radioactivity is less than 5uR/hr or alternatively less than 50%¹ above natural background² as measured at one meter from surface. The maximum radiation level at one meter from any "hot spot" must be less than two times natural background, total. The reactor licensee may confirm that the decommissioned reactor site is within these radiation limits through direct radiation measurements, calculations based on measured isotopic concentrations as described in NUREG-0707,³ or a combination of these two methods.

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1. Where radioactivity is measurable using NaI scintillation instrument or other equally sensitive instrument.
 2. Radiation from naturally occurring radioisotopes. As measured in a comparable uncontaminated structure or exterior soil surface.
 3. NUREG-0707, "Methodology for Calculating Residual Radioactive Levels Following Decommissioning."

The recommended radiation level of 5uR/hr above natural background for radioactive material other than surface contamination is justified on the basis that it is consistent with the acceptable surface contamination levels presented in Table 1 of Regulatory Guide 1.86. The Table 1 acceptable surface contamination levels given in dpm/100 cm². Converting these surface contamination levels to a whole-body dose rate at one meter from the surface yields approximately the recommended 5uR/hr level for radioactive material other than surface contamination. Based on an occupancy of 2000 hr/yr, which appears reasonable for a decommissioned reactor site, this would result in an actual dose to an individual of approximately 10 mrem/yr whole body dose, which is the upper limit of the draft GEIS recommended residual radioactivity level.

14. The document discusses only the technical capability and costs of making the radiation surveys for the release of a decommissioned reactor site for unrestricted use. The cost-benefit analysis is incomplete; it should include decontamination, radwaste handling, waste disposal, and all other costs associated with the complete decommissioning process over a range of residual activity limits. This is particularly of importance for handling activated metals, concrete, and soil.

The decommissioning residual radioactivity limits should be based on an equivalent or smaller dose commitment to the general public from decommissioned reactors compared to operating reactors. It is safe to conclude that there will be significantly fewer people exposed to the decommissioned reactor site than the population exposed to an operating reactor. The potential dose commitment for decommissioned nuclear reactor sites is much lower than for operating reactors because there will be no effluents: the population at risk is only that which occupies the approximately five-acre site of the former nuclear plant, exposed to residual activity, compared to 1,000 or more acres exposed to effluents from an operating reactor. In addition, the risk that the population is exposed to is probably less because, unlike the source of contamination for an operating reactor, the source of contamination at a decommissioned site will decrease, through radioactive decay, decreasing bio-availability, and reduced suspension of radionuclides, consequently reducing the dose and associated risk over time, and because the dose level in most areas of the site is probably below the detection capability of the radiation survey meters. It follows that the man-rem collective dose from a decommissioned site should be significantly less than that of an operating reactor. Therefore, the radiological risk to the general public should be considerably less for a decommissioned site.

15. The draft GEIS alludes to the recommended radiation levels for release of a decommissioned reactor site to unrestricted release as being consistent with EPA's current preliminary guidance and recommended policy. There is no specific reference to EPA's position in the draft GEIS. We are not aware of NRR attendance at meetings with SD and EPA on these matters. We request that NRR be invited to participate in future NRC/EPA meetings.

16. In addition to our suggested criteria in comment #13, the NRC should develop criteria, for low energy (less than or equal to 100 Kev) gamma and beta emitters with long half lives (at least six months), that are based on concentrations of pc/gm rather than mr/yr. NRR will assist standards in establishing these concentration limits. Therefore, the GEIS should be revised to state that "the NRC is also developing criteria for low-energy gamma and beta emitters that will be specified in concentration limits (pc/gm). The concentration limit for Sr-90 in soil, for instance, would be on the order of 5 pc/gm."

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COMMENTS ON DRAFT GENERIC ENVIRONMENTAL IMPACT
STATEMENT ON DECOMMISSIONING NUCLEAR FACILITIES,
NUREG-0585, JULY 1980

Although the subject draft represents a credible analysis of NRC's evolving decommissioning policies, many ambiguities should be eliminated in the revised draft. We have not made any editorial comments, although the draft is clearly in need of a strong editing hand

Our comments are as follows:

1. **General.** One consideration that this draft has not addressed is what is the environmental impact of extending the operating term of the license? In all the analyses presented, the assumption has been made that the plant will end operation according to the term of its license, or perhaps before if an accident occurs at the facility. The fact that a facility may operate considerably longer than the original term of the license should be acknowledged and its effects analyzed.
2. **General.** Throughout the draft, insufficient emphasis has been placed on other factors that affect the delayed decommissioning options. Choice of decommissioning mode is presented as a trade-off only between cost and residual radioactivity. Yet, another important factor to be considered is the added uncertainty caused by delaying decommissioning 50, 100, or more years. Such uncertainty results from the feeling that unforeseen technical or financial problems have a greater probability of occurring over long periods. Although some of this uncertainty may be reflected as a risk component of present-value cost, in general uncertainty is a subjective, unquantifiable "cost" that nevertheless should be considered.
3. **Abstract.** The second paragraph states, "Planned decommissioning has many positive environmental impacts such as the return of possibly valuable land to the public..." It is rather misleading to talk of returning land to the public as a positive environmental impact when the primary socioeconomic value of a site will probably be its potential as an electricity generating site.

Also, the phrase, "elimination of radioactively contaminated facility proliferation," should be reworded; "proliferation" is a misleading, loaded word in this context. Why not say, "... reducing the number of radioactively contaminated facilities..."?

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4. p. 0-2, Sec. 0.2.1. The term "deferred decontamination" in this context is misleading.
5. p. 0-6, Sec. 0.2.5.2. This section should be redone to reflect comment 11 below.
6. Table 0.0-1. For the sake of consistency and completeness, BWR's should be listed in the table with the other facilities.
7. Table 0.0-2 and general. The summary of estimated costs for decommissioning nuclear facilities should indicate what is actually included in such costs. For example, is the removal of non-radioactive facilities and structures included in these figures? (Particularly with the DECOR mode, are non-radioactive items encouraged to be removed even if not required (compare with page 0-9.)) Is the 25% contingency figure included? In general, this report has been somewhat difficult to follow in terms of what exactly is included in the cost estimates.
8. p. 0-15., Sec. 0.51.5. This section implies that the owner of a facility could convert it to other use only after residual radioactivity was reduced to unrestricted release limits. Does this mean that a nuclear facility could not under any circumstances be recommissioned unless unrestricted release limits were met? In other words, would it be acceptable for a plant being recommissioned as a nuclear facility to have somewhat higher levels of residual radioactivity if such levels could be justified? This point should be clarified, if true.
9. p. 0-21 ff. Specific conclusions are stated for some facilities but, although applicable, not others. For example, aesthetic effects for decommissioning MOX facilities are discussed but such effects for other facilities are not discussed elsewhere in the report. Similarly, sensitivity analyses and discussions of socio-economic impacts are provided for some facilities but not others. In general, a more consistent format should be established.
10. p. 2-5. The last half of the last paragraph is vague.
11. p. 2-12 ff. The section on financial assurance needs to be reworked.
 - a. In the last sentence of the second paragraph of Section 2.5, change "must" to "should."

- b. The definition of "prepayment" (2.5.2(1)) should be rewritten, as follows: "This involves providing up-front cash or liquid assets that will retain their value..."
 - c. "Sinking funds" (2.5.2(3)) is a separate category and should not be lumped with insurance. The last sentence under the definition should be deleted.
 - d. Sureties (2.5.2(2)) and insurance should be lumped together. Any discussion of premature closure should be made in the context of both sureties and insurance being applicable.
 - e. Whatever the merits are ultimately determined to be, at this point the list of financial assurance mechanisms should include discussion of the unfunded reserve (also called, negative salvage value depreciation accounting). Although this mechanism has weaknesses by itself, it could be coupled with other mechanisms such as premature closure insurance to increase its effectiveness. Furthermore, it is the method favored by most utilities and accepted by many PUC's. It cannot be ignored. (2.5.2.)
 - f. p. 2-13, third-to-last paragraph. Because interest rates add to the uncertainty of decommissioning, such should be indicated.
12. p. 5-9, second line. The draft states, "SAFSTOR of 30 years offers an optimum trade-off between cost and radiation dose." This same conclusion could have also been made for PWR's but was not. Since the trade-offs between cost and dose are similar for PWR's and BWR's, why weren't similar conclusions drawn?
13. p. 10-8. As indicated in earlier comments, the considerations used in analyzing one type of facility aren't always used for other type. In Section 10-5, "Comparison of Decommissioning Alternatives," socioeconomic effects, for example, are not considered for UF6 plants but were for other facilities.
14. p. 12-12, third line of Sec. 12-5. The section states, "ENTOMB appears to be the least viable option." However, this conclusion is not borne out at face value by Table 12.5-1 which indicates ENTOMB has both the lowest cost and lowest exposure rates. If \$3.25 million is not the total cost (i.e., if the cost is \$3.25 million plus the annual surveillance cost of \$46,000 per year for 200-300 years), such cost should be clarified.

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15. p. 13-8. When comparing decommissioning alternatives for nuclear energy centers, a combination of approaches could be used. Thus, facilities ending operation early in the center's life could be placed in safe storage while those closing later could be immediately dismantled or otherwise scheduled for optimal effect.
16. p. 15-5. The same comments as given in comment 11 pertain to Section 15.1.3.