

June 20, 2003

Ms. Robin M. Nazarro
Director, Science Issues
Natural Resources and Environment
United States General Accounting Office
441 G Street, NW
Washington, DC 20548

Dear Ms. Nazarro:

I would like to thank you for the opportunity to review and submit comments on the draft report, "SPENT NUCLEAR FUEL: Low Risk of Harm from Terrorist Attacks and Severe Accidents, but Potential Options Exist to Further Enhance Security" (GAO-03-426). The U.S. Nuclear Regulatory Commission (NRC) appreciates the time and effort that you and your staff have taken to review this important topic. Overall, the report provides a reasonable characterization of the current understanding of risks associated with spent fuel storage.

The NRC does not consider the results of NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants," to be appropriate for characterizing the consequences of terrorist attacks at spent fuel pools as it was prepared for a very different purpose. The results of this study, which was not endorsed by the Commission and which several commenters asked be peer-reviewed in light of its obvious over-conservatism, are considered to be unrealistically conservative. That is one of the reasons why we are reevaluating the predicted results of such events. It is very important when discussing the results of these analyses that the report clearly state that these analyses were overly conservative. The report also references the results of NUREG/CR-6672, "Reexamination of Spent Fuel Shipment Risk Estimates." The analyses in this document are similarly overly conservative. We have enclosed a recent letter the Commission received from the Chairman of the Advisory Committee on Nuclear Waste (ACNW). The ACNW's review stated that NUREG-6672 overestimates the radiological releases by several orders of magnitude. The Committee also states that it "believes that it is unfortunate that such overestimates of consequences are published by NRC in NUREG reports, because they get separated from the caveats and are used as though they were valid best estimates." The Commission agrees with the ACNW. The enclosure provides some specific comments on the draft report which we hope help to clarify these points.

Specific comments relative to factual accuracy, clarity, and completeness of the report are provided in Enclosure 2. In addition, we have communicated separately with the GAO review team relative to minor editorial comments.

Ms. Robin M. Nazzaro

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Should you have any questions about these comments, please contact either Mr. William Dean at (301) 415-1703, or Ms. Melinda Malloy, at (301) 415-1785, of my staff.

Sincerely,

/RA by William F. Kane Acting For/

William D. Travers
Executive Director
for Operations

Enclosures:

1. ACNW Letter dated 6/4/03
2. Specific Comments on Draft Report GAO-03-426

cc: Daniel Feehan, GAO (Denver)
Robert Sanchez, GAO (Denver)

SPECIFIC COMMENTS ON DRAFT REPORT GAO-03-426

The NRC staff suggests that the following changes be included into the report for factual accuracy, clarification, and/or completeness:

1. Page 6, Background section

- The 1st complete sentence should be revised to clearly indicate the normal practice of burning assemblies through multiple cycles as follows:

~~“Nuclear power plants must replace~~ A portion of the assemblies in nuclear power plants must be replaced every 1 to 2 years as the fuel in the reactor expends energy,...

- The last sentence before the 1st full paragraph should be revised as follows to reflect the fact that water is used for shielding:

“Barriers such as thick walls, and sealed containers, and water are used to shield individuals from exposure to this radiation.”

- The 1st sentence in the 1st full paragraph should indicate that the NRC, together with the Department of Transportation, regulates the transportation of commercially owned spent fuel, and should clarify that the entire statement pertains to commercial nuclear power plants. We suggest the following changes:

“NRC regulates not only the construction and operation of commercial nuclear power plants but also the storage, transportation (together with the Department of Transportation), and disposal of their commercially owned spent fuel.”

- The 2nd sentence in the 1st full paragraph states that the NRC requires each operating nuclear power plant to have a safety and security plan. We recommend changing “plan” to “programs,” which we believe is a more comprehensive description of the NRC’s requirements.

2. Page 8, Background section

- Line 5 states that some portion of the spent fuel would have to burn in a sustained high temperature fire to achieve a wide dispersal. This statement would be more accurate by changing “spent fuel” to “spent fuel assemblies.”
- Footnote 5 is misleading as written. If the gases have short half lives, then they would probably have already decayed and not be present in the spent fuel.

3. Page 9, Background section

- In the 2nd full paragraph on page 9, the 3rd sentence (“Also, NRC requires measures to address theft or sabotage”) should be deleted because these measures do not apply while Department of Energy (DOE)-titled fuel is in transit. The report should cite any DOE requirements regarding security of fuel in transit.

4. On page 11, under the section “Shipping Containers Protect against Widespread Release of Fuel in Transit”
 - The last sentence of the 1st paragraph is slightly misleading. We recommend modifying it to read:

“Although NRC is confident in these results, it is sponsoring further assessments to further validate computer models and address technical uncertainties heightened security concerns.”
 - Footnote 9 is also misleading. Although it is technically true that some fraction of particles released could become airborne and travel, the footnote does not give any indication of the actual probability of particles being inhaled or the actual risk to the public in this situation. We recommend that the footnote be deleted.

5. Pages 11-12, under the section “Sabotage Studies,” discuss a DOE-sponsored study to estimate the human health impact of the most severe radioactive release from a truck container containing spent fuel. Although the discussion indicates that the computer model used to predict the release used conservative assumptions, it does not provide sufficient context that alerts the reader to how excessively conservative the assumptions were. Quoting results from a study that uses assumptions in this way without providing appropriate context can provoke misunderstanding.

6. Page 15, under the section “Widespread Release from Wet Storage Theoretically Possible but Unlikely”
 - In the two paragraphs on this page, the term “fire” is used to pertain to two different types of fire which may be confusing to the reader. In the 1st paragraph, the discussion relates primarily to a “zirc” fire, which is severe fuel overheating and damage. The 2nd paragraph includes “fires” (non-zirc) as events that could cause drainage of the spent fuel pool and a zirc fire. To avoid the potential for reader confusion, the report should be clear as to when it is discussing zirc fires in spent fuel and other kinds of fires.
 - We recommend adding a clarification that NUREG-1738 was a deliberately conservative assessment of risk because the NRC was examining whether a reduction in requirements would be justified by the results. This could be achieved by adding the following sentence to the end of the 1st paragraph:

“The NRC concluded that this study, while adequate for its purpose of establishing a risk-informed basis to evaluate exemptions from regulations or reductions in regulatory requirements for decommissioning facilities, is an unrealistically conservative portrayal of the threat from terrorist attacks on spent fuel pools.”
 - To reflect that further assessments have been performed but have not yet been published, we recommend modifying the 3rd sentence in the 1st paragraph to read:

“NRC’s most recent published assessment of this risk (2001) , published in 2001, found...”

- The 1st sentence of the 2nd paragraph states that the NRC study was conducted to assess the risks associated with the safety and security at nuclear reactors that have been permanently shut down. The study was conducted to assess the risks of accidents. Therefore, the phrase “safety and security” in line 1 should be replaced with “accidents.”

7. Page 16, under the section “Widespread Release from Wet Storage Theoretically Possible but Unlikely”

- In the paragraph preceding Table 1, the 2nd, 3rd, and 4th sentences should be revised to ensure consistent use of the terms “radioactive material” and “spent fuel,” and a new sentence added between the 3rd and 4th to clarify the reasons for the uncertainty in amount of radioactive material released during a spent fuel pool fire:

“For example, for some cases, the study assumed that a spent fuel pool fire would involve 100 percent of the spent fuel assemblies radioactive material in the pool...Two of the authors of the study noted that it was not certain how many much spent fuel assemblies would actually burn in a fire...The uncertainty in the amount of radioactive material released depends on the fuel age and distribution and the characteristics of the accident scenario. The authors noted that some fuel assemblies material might not reach the high temperatures burn and that much of the radioactive some material might remain trapped in the pool or building.”

- In the 2nd to last sentence before Table 1, “the data” should be changed to “two levels of radioactivity.”
- Table 1 reports the number of latent cancer fatalities. The text preceding the table implies that the information in the table comes out of the NRC study (NUREG-1738). NUREG-1738 did not report latent cancer fatalities for the cases shown in Table 1. The GAO may have derived these values using the person-rem doses reported in NUREG-1738, but these latent cancer fatality values are only approximate. In addition, the latent cancer fatality values reported in the table for the lower level of radioactivity (3500) suggest no sensitivity to decay time. The results reported in NUREG-1738 (e.g., Table 3.7-2 for early evacuation) indicate at least some reduction in person-rem dose and, therefore, latent cancer fatalities over time. We recommend deleting this table from the report to avoid confusion and possible misinterpretation.
- In lines 1 and 2 of the paragraph following Table 1, “risk” should be changed to “probability,” which is more correct.

8. Page 17, under the section “Widespread Release from Wet Storage Theoretically Possible but Unlikely”

- The 2nd full sentence should be revised as follows to accurately reflect the staff’s study:

“For example, according to the 2001 report, heating the least-decayed spent fuel to the ignition point—were it to occur at all—would take hours, perhaps even days.”

- In the 1st full paragraph, the sentence following the reference to footnote 19 indicates that air ventilation of spent fuel becomes less effective “under the increasingly dense storage conditions that have resulted in [spent fuel pools] over the past few years.” This statement is misleading in the sense that high-density racking has been done for many years and the report should be revised to reflect this. We suggest the following:

“Under the ~~increasingly~~ dense storage conditions that ~~have resulted over the past few years~~ exist, however, air ventilation ~~becomes~~ is less effective.”

- The last two sentences of the 1st paragraph provide two highly speculative examples of possible effects from a terrorist attack, and no explanation is provided as to why the effects are significant. In NRC’s view, more analysis and discussion is needed. The examples should be omitted.
9. Page 18, under the section “NRC Continues to Study the Risks of Storing Spent Fuel in Pools,” in the 1st full paragraph, 2nd sentence, it should be noted that regulatory improvements or legislative initiatives to improve security and safety and better protect public health would be made if warranted, and that the studies also include an evaluation of mitigation strategies. In addition, this sentence could be misunderstood by a reader that the NRC’s contractor, Sandia, would make the regulatory improvements. To address these comments, we suggest revising the sentence as follows:

“NRC has also contracted with Sandia National Laboratory for a series of studies to define potential threats, identify potential vulnerabilities, evaluate potential mitigation strategies and, if warranted, suggest then make regulatory improvements or suggest legislative initiatives to improve security...”

10. On page 23, under the section “Shipping Oldest Fuel First,” footnote 26 uses Uranium-234 and its half life (245,000 years) as an example of how long some components of spent fuel remain deadly. Using the half lives of Uranium-235 and Uranium-238 would be more illustrative.
11. On page 24, the section “Shipping Fuel from Densely Packed Pools First” indicates that shipping spent fuel from densely packed spent fuel pools first could have security benefits. Although a few spent fuel pools have low density racking in at least part of the pool, it should be noted that nearly all spent fuel pools are densely packed.
12. Page 33, Appendix I, under the section “Requirements for Preventing Release of Spent Fuel in Transit”
- The 1st sentence of the 1st paragraph states that NRC requires transporters of spent fuel to implement measures to protect shipments from sabotage. These measures would not be applicable to shipments of DOE-titled spent fuel. See also Comment 3.
 - The last sentence indicates that the NRC requires armed escorts be either aboard the shipping vehicle or in a following vehicle in areas of high population. This was true prior to September 11, 2001. We recommend that the report note that the NRC has since strengthened its requirements in this area. We suggest the following addition:

“...in areas of high population. After the events of September 11, 2002,
however, NRC strengthened its requirements in this area.”

13. On page 39, under the section “Requirements for Preventing Release of Spent Fuel in Dry Storage,” the language in the 2nd full sentence reflects the current requirements for guards in 10 CFR 73.51 for an away-from-reactor independent spent fuel storage installation (ISFSI), but does not reflect the current NRC regulatory requirements embodied in the Orders and interim compensatory measures that were imposed on ISFSIs last fall. We suggest changing the text to read as follows:

“NRC requires...detection systems, and guards, ~~but the guards need not be armed.~~ Rather, The guards are also need to be able to contact local law enforcement agencies for assistance, if required...”