

October 19, 1998

Dr. Carl J. Papperiello, Director
Office of Nuclear Material Safety and Safeguards
United States Nuclear Regulatory Commission
11545 Rockville Pike
Rockville, MD 20852-2738

Subject: Management of High-Level Waste Tanks at Department of Energy Sites

References:

- (1) Petition To Exercise Licensing Authority, Petition to the United States Nuclear Regulatory Commission filed by the Natural Resources Defense Council, July 28, 1998.
- (2) Letter from N. King Stablein, USNRC, to Roy J. Schepens, USDOE, dated June 30, 1998, Request For Additional Information Regarding Savannah River Site High-Level Waste Tank Closure: Classification of Residual Waste as Incidental.

I have a strong interest in this subject since I was substantially involved in it while serving at the Nuclear Regulatory Commission (NRC) until 1995. The two references cited above recently came to my attention and I wish to offer my personal comments as a member of the public on both Reference 1 (the NRDC Petition) and on Reference 2 (the NRC RAI) in this letter.

REFERENCE 1

The NRDC Petition requests that NRC assume and exercise immediate licensing authority over all high-level radioactive waste (HLW) that is stored in the 51 underground tanks located on the Savannah River Site. The NRDC Petition argues that nothing in the Energy Reorganization Act of 1974 (ERA), or any other potentially applicable law, defines or recognizes the term "incidental waste". The NRDC asserts that DOE has invented the term as a means of circumventing NRC licensing authority and safety oversight. The NRDC Petition further asserts that the licensing provisions of the ERA require that the hazardous waste [residue] remaining in the decommissioned tanks retains its classification as HLW. Therefore, the NRDC Petition argues, the tanks [containing the HLW residue] are subject to NRC licensing because they are being used "for the express purpose of subsequent long-term storage of high-level radioactive waste generated by the [AEC, ERDA, or DOE]".

Please note that I have added the bracketed words on residues to the NRDC arguments in the paragraph above. I did this to illustrate their essential line of argument, which is based on an incorrect premise. Their premise is that there is no distinction in HLW classification between the bulk of the radioisotopes initially placed in HLW tanks, and any residual isotopes that might be left in the tanks or elsewhere when the HLW is extracted and subjected to physical and chemical processing for disposal. The NRDC Petition's standard would have it that all waste residues, which are left or created in a

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manner incidental to careful extraction and processing HLW, are also HLW. That is not a reasonable standard considering the long-recognized behavior of liquid and solid forms of radioactive wastes generated in nuclear fuel reprocessing. That behavior was evidently understood and reflected in the promulgation of 10 CFR Part 50, App. F, the initial formal definition of high-level waste.

Appendix F to Part 50 was initially promulgated at the beginning of the 1970s to set key standards for commercial fuel reprocessing plants which were expected to be built. The first commercial fuel reprocessing plant, a small one at West Valley NY, had already run for four years after its startup in 1966. The Government fuel reprocessing plants began during World War II at Hanford, WA. Different chemical processes were tried to achieve the most effective extraction of plutonium from production reactor fuel. After much experiment the PUREX process emerged as the standard for fuel reprocessing. The PUREX process was adopted at Savannah River and elsewhere. The key part of the PUREX process for this discussion is solvent extraction. After the irradiated fuel is dissolved in concentrated nitric acid, the acid stream is passed through one or more cycles of solvent extraction. Each cycle mingles the acid stream with a stream of organic solvent. The plutonium and uranium move into the organic stream, while the acid stream carries the wastes away. Thus, Appendix F defines high-level liquid radioactive wastes as "those aqueous wastes from the operation of the first cycle solvent extraction, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent...". These aqueous waste streams contain the most concentrated waste and, by far, most of the waste generated in nuclear fuel reprocessing. Appendix F defines high-level waste but does not define incidental waste. However, when the Appendix F definition was promulgated, the Atomic Energy Commission specifically noted that the term HLW did not include "incidental" waste resulting from reprocessing plant operations, such as ion exchange beds, sludges, and contaminated laboratory items, such as clothing, tools and equipment. Neither were radioactive hulls and other irradiated and contaminated fuel structural hardware encompassed by the Appendix F definition. It is my recollection that ever since Appendix F was promulgated, common usage was to speak of high-level liquid waste as it is defined there, and of other wastes generated incidental to reprocessing as "incidental wastes" although they may be in several different categories.

Regulatory practice at DOE sites and at the three NRC-licensed sites (West Valley NY, Morris IL and Barnwell SC; only the first ever operated beyond cold testing) has followed the distinction of high-level waste and incidental waste in waste management design and practice. As a result the piping and components used to generate and transfer HLW to storage tanks can be decontaminated and treated as incidental waste. There has been continued identification of both the solid and liquid phase of the aqueous waste as HLW when it is neutralized for storage in carbon steel tanks. It has long been recognized that there will certainly be some significant residues in the carbon steel tanks after decades of HLW storage, both as fission products in the corroded walls and as sludge in the edges of the many ribs and stiffeners in the bottom of the tanks. It is not reasonable to say that even the slightest residue in a tank or a handling component requires classifying that tank or component as HLW. But it is reasonable to raise the question

about the effectiveness of HLW extraction from a tank or component, so that one may reasonably argue that the bulk or the large majority of the HLW has been removed. The NRC has already addressed the issue of total decontamination versus a high degree of decontamination in their Denial of Petition for Rulemaking (filed by the States of Washington and Oregon), Docket No. PRM-60-4, February 26, 1993. That denial of petition led to the adoption of three criteria for removal of HLW to a degree permitting regard of the residual fraction as incidental waste. The Denial of Petition and the three criteria were transmitted to DOE by my letter of March 2, 1993 to Ms. Jill Lytle. The NRC is now in active oversight of the DOE tank closure process as is evident from Reference 2. This manner of oversight is an adjudication of the type specifically expected by the Commission in the denial of petition in 1993.

At page 3, the NRDC Petition asserts that the absence of any oversight by NRC will represent a serious threat to public safety and the environment. I believe that the NRC oversight underway now, on the terms and bases described above, and with the rigor evident in Reference 2, is appropriate for the DOE tank closure process. I believe the administrative licensing action called for by the NRDC Petition would serve no useful purpose and would likely hinder oversight of the process. I recommend that the NRDC Petition be denied.

REFERENCE 2

When I read Reference 2 for the first time, it was apparent how the content and emphasis of the Denial of Petition and the presentation of the three criteria were so strongly influenced by the more complicated waste situation at Hanford. At Hanford there was, and is, much concern about both the waste residue left in the tanks after extraction and the residues left elsewhere after treatment of the extracted and concentrated HLW. The waste situation at Savannah River is much more definable, and it is useful to restate and discuss the three criteria with direct application to the Savannah River tanks.

Criterion 1: "...the waste has been processed (or will be processed) to remove key radionuclides to the maximum extent that is technically and economically practical..." The reasoning of the Commission on this criterion is presented clearly in the Denial of Petition at page 10 and following. The Savannah River closure process is facilitated by the greater predictability of tank contents and accuracy of records so that work on the first few tanks is a useful precedent for subsequent tanks. However, I believe it is important to note that the Commission left open situations where waste extraction might be much more difficult, for example, with the single shell tanks at Hanford. There it may be found that after "the waste has been processed to remove key radionuclides to the maximum extent that is technically and economically practical", the remaining residue is still a substantial fraction of the HLW. If that happens, I believe the Commission clearly wanted to deal with that as still another adjudication of this current type.

Criterion 2: "...the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C LLW, as established in 10 CFR 61.55..." The focus of attention for this criterion at Hanford was as much on the residues of the waste extract as it was for the residues in the tanks. Here, for

Savannah River the line of questioning on page 2 of the NRC RAI indicates that the NRC is focussed on the tank residue, and the determination of whether this classification can be met with reasonable application of the Branch Technical Position on Concentration Averaging. My only comment is that the Branch Technical Position is intended to provide generic guidance for materials to be sent to licensed disposal sites. A greater degree of flexibility is warranted for these centralized disposals in deeply buried and grouted tanks at a major DOE site. Consequently, the strict use of the intruder dose limit at 500 years may not be necessary.

Criterion 3: "...the wastes are to be managed, pursuant to the Atomic Energy Act, so that safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C are satisfied." Here too the line of questioning in the NRC RAI indicates vigorous pursuit of all issues related to performance assessment out to many years, including even the presence or lack of institutional controls for 10,000 years. I believe that NRC should pause at this point for some consideration of policies and requirements for surveillance, monitoring, and institutional controls across the board in our society. At the present time the statutes, regulations and licensing practices for uranium mill tailings impoundments provide designs for passive stability to 1,000 years, with greater assurance of stability for at least 200 years, and operation by DOE, under State or NRC oversight with no limit of time—indeinitely! Disposal sites for LLW and HLW may rely on active institutional controls for only 100 years but no one suggests that controls be abandoned after that time, indefinite custody is apparently assumed. The situation is even more strange for hazardous and toxic waste site disposals where active waste emplacement systems (dual liner with leachate collection systems, etc.) are installed with a commitment to monitor them indefinitely every 30 years, or in some cases every 5 years. The DOE sites have examples of all these disposal situations, some under NRC jurisdiction and some not. I recommend that vigorous pursuit of post closure controls for the tanks be held in abeyance until a more rational general approach to institutional controls is established. At a minimum this would involve consultation with NRC, DOE and the Environmental Protection Agency.

I hope these comments are useful to you, I will continue to follow the matter with interest. If you have any questions, please call me at (301) 926-3844.

Sincerely,



Robert M. Bernero
201 Summit Hall Rd.
Gaithersburg, MD 20877-1825

Copy: Dr. Thomas P. Cochran, NRDC