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WM Record File 109 WM Project 1  
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 Distribution: - 1 - **MAR 14 1985**

DEFENSE WASTE STUDY

MEMORANDUM FOR: Robert E. Browning, Director  
 Division of Waste Management

THRU: Joseph O. Bunting, Chief  
 Policy and Program Control Branch

FROM: Neil J. Numark  
 Policy and Program Control Branch

SUBJECT: CLARIFICATION OF DOE-RICHLAND COMMENTS  
 ON DEFENSE WASTE COMMINGLING STUDY

When I briefed you in December on the comments DOE received from other parties on their draft defense waste commingling study, you had some questions regarding the comments from Mike Lawrence at DOE-Hanford (enclosed). I recently spoke with Mel Shupe of his staff (FTS 444-6314) and obtained clarification in the following areas:

QUESTION 1: Why would Hanford wastes "likely have the same or more heat output as commercial waste," as stated in the Hanford comments?

ANSWER: The heat output will be high on a per unit volume basis, not on a per metric ton throughput basis. Although the burnup of fuels at the new N-reactor is only 5,000 MW-days/MTU (vs. 30,000-35,000 for commercial fuel, generally), the processing is fast and the large waste volumes undergo many stages of concentration, leading to high heat output per unit volume. Older Hanford wastes in the 149 single-shell tanks are cool because they have been decaying, are also derived from low burnup fuel, and are not highly concentrated like the fresh Purex wastes from the N-reactor, which are being stored in the 20 new double-shell tanks.

QUESTION 2: Why does the commingling study give smaller values for the volume of waste to be shipped from Hanford to a repository than the total volume of high-level waste at Hanford? (This concern was raised in comments by Washington, NRDC, and the Yakimas.) What does DOE now plan for wastes that are not "readily retrievable?"

ANSWER: The commingling study is based on in-situ disposal of older wastes which are not readily retrievable from the 149 single-shell tanks. The Defense Waste Management Plan (DOE/DP-0015, June 1983) states that "new and readily retrievable high-level waste will be immobilized for disposal in a geologic repository. Other high-level waste will be

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stabilized in place if, after the requisite environmental documentation, it is determined that the short-term risks and costs of retrieval and transportation outweigh the environmental benefits of disposal in a geologic mined repository." The Plan also states that all liquids (about 25,000m<sup>3</sup>) will be recovered from the single-shell tanks, concentrated, and transferred to double-shell tanks. This liquid waste is what the commingling report refers to as "readily retrievable."

QUESTION 3: What is planned for the cesium and strontium inventories?

ANSWER: About half of the old waste in the single-shell tanks has been processed to remove cesium and strontium, which have been converted to salts, sealed in metal capsules, and stored in water basins pending use. The other half still contains the cesium and strontium, and would be disposed in situ. The double-shell tank waste (new Purex waste and liquids from the old tanks) is not scheduled for removal of cesium and strontium for encapsulation. This waste is scheduled for immobilization beginning in 1990 and subsequent repository disposal.

QUESTION 4: How does one equate curies or cubic meters of defense high-level waste with metric tons heavy metal of commercial spent fuel to determine quantities going to a repository?

ANSWER: Shupe stated that the conversion depends on fuel burnup. EPRI stated in comments on the commingling study that they reserve judgment on whether 300,000 Ci of defense HLW is equivalent to 1 MTHM of commercial HLW, as suggested by EPA. The commingling study used this value to determine that the 20,000 defense HLW packages will be approximately equivalent to 10,000 MTHM of commercial HLW. Regardless of the metric ton equivalent of defense HLW, however, the number of defense waste packages is comparable to the number of commercial packages which one repository could accommodate (approx. 21,000 according to the commingling report).

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Neil J. Numark  
Policy and Program Control Branch

Enclosure:  
As Stated

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

MAR 14 1985

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THRU: Joseph O. Bunting, Chief  
Policy and Program Control Branch

FROM: Neil J. Numark  
Policy and Program Control Branch

SUBJECT: CLARIFICATION OF DOE-RICHLAND COMMENTS  
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*JOB*

*Trickett  
for Miller*

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*Comparison  
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in tanks?*

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Neil J. Numark  
Policy and Program Control Branch

Enclosure:  
As Stated

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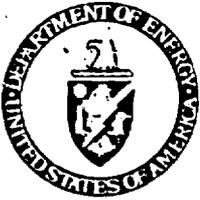
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ENCLOSURES

*R. Boyle*

*Note not given  
to oca - no  
copy available  
for RP*

*Classed notes to  
R E Browning & R Boyle*



## Department of Energy

Richland Operations Office  
P.O. Box 550  
Richland, Washington 99352  
SEP 24 1984

Secret

David B. Leclaire, Director  
Office of Defense Waste and Byproducts  
Management, DP-12/HQ

### HANFORD COMMENTS ON DRAFT REPORT: "AN EVALUATION OF COMMERCIAL REPOSITORY CAPACITY FOR THE DISPOSAL OF DEFENSE HIGH-LEVEL WASTE"

RL and contractors have reviewed the draft report, entitled, "An Evaluation of Commercial Repository Capacity for the Disposal of Defense High-Level Waste," and our comments are enclosed. In general, we find the document to be well organized and clearly written. It provides a discussion of most issues related to the location of a repository for defense waste. The recommendation that defense waste should be commingled in a commercial repository is reasonable based on the data presented. However, the following points should be considered prior to finalization.

- ● The data presented for defense high-level waste package characteristics are largely based on the Defense Waste Processing Facility at Savannah River. Hanford waste will be of higher heat content which would affect space requirements in the repository. Details of Hanford specifics are included in the enclosed comments. It is not expected that the conclusions would change upon incorporation of Hanford wastes in the analysis. See p. 4
- The recommendation is based in part on an expected cost advantage of placing defense waste in a commercial repository, rather than developing a separate facility. However, no consideration is given in the economic analysis to the fact that the Department of Energy (DOE) will be required to pay a share of the development costs. If DOE is required to pay such costs beginning immediately, a budgetary impact would occur that should be taken into account in the final decision.
- Some caveat should be given that the envelope of defense waste considered for the repository originate under the reference case identified in the Defense Waste Management Plan. For Hanford (and Idaho), selection of the reference case is subject to completion of the NEPA process. Should the reference case not be selected, it is conceivable but not likely that the decision to commingle wastes could merit reexamination.

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- There is a substantial amount of technical data in the report, some of which is not germane to the decision, i.e., once the decision has been made that the defense repository must meet all the licensing requirements of a civilian repository, the decision is independent of specific site analyses of radionuclide travel time, or other disposal option specifics. Much of the site-specific data is in a state of flux and can only be controversial, without adding to the decision → credibility. It is recommended that information not germane to the decision be removed from the report.

If you have any questions, contact Mel Shupe of my staff (FTS 444-6314).

*Michael J. Lawrence*

Michael J. Lawrence  
Manager

WMD:MWS

cc w/encl:  
B. Rusche, RW-1/HQ

**HANFORD COMMENTS ON DRAFT REPORT: "AN EVALUATION OF COMMERCIAL REPOSITORY CAPACITY FOR THE DISPOSAL OF DEFENSE HIGH-LEVEL WASTE"**General Comments

It is clearly stated in the Executive Summary that the bases and assumptions used in developing this report are those that existed at the time that the report was prepared. However, it would probably be prudent to update the report before it is released for general use. For example, on Page 1-11, the third baseline assumption is that the inventory in the commercial repository would be a 50:50 mix of spent fuel and commercial high-level waste. It is our understanding that this baseline mix has been revised, and the assumption now is that the first commercial repository will contain very little, if any, commercial high-level waste, because spent fuel will be the predominant waste form for some time to come. The baseline assumption used in this report should be checked carefully against those stated in the DOE Mission Plan to assure consistency.

In general, the document would benefit from more extensive use of references which would permit an informed member of the public to determine the bases for specific conclusions. An example would be the cost estimates presented in Tables 2-1 through 2-3 and Tables 3-1 and 3-2. They are unsupported by any details, either in the report or by reference to other sources. Since cost appears to be the major factor in deciding where to dispose of defense wastes ("the only factor that results in a significant advantage for either option is cost efficiency." - Page E-10), further details would appear to be necessary to support the conclusions reached in the report, if the report is to be perceived as credible. It should be noted that we agree with this report's finding that disposal of defense wastes in a civilian repository should be considerably less expensive than providing the disposal capacity in a defense-only repository.

As with most drafts, the report needs some editing and rewriting for clarification to make it more easily understood by the reader. An example of needed clarification is found on Page E-8, the first paragraph in the Transportation Section. The conclusion stated in the third sentence would seem incorrect knowing the major risk is associated with transportation accidents, i.e., injury or death resulting from collisions. This risk should be the same whether or not the vehicle is carrying radioactive materials. This reasoning would not lead to the conclusion that risks are "significantly smaller than predicted for the U.S. from other transportation activities." More likely, the authors intended the conclusion to be based upon the fact that the risk associated with the small number of shipments required to transport the radioactive waste is insignificant when compared to the risk based on the total U.S. transportation activities. Revising the sentence for clarification would assist the reader.

Based on the recent escalation in public interest in transportation issues, more discussion of transportation may be appropriate. The addition of 620-1000 canisters per year of defense waste (based on Table 1-1 of the report) to the flow into the repository will result in 2-3 more truck shipments per day (or, equivalently, 3-4 rail shipments per week) into the shared repository. Although this does not represent a vast increase over the planned shipments for the commercial wastes, it is likely to stir up proportionately more interest because (1) it will be different material, and (2) the public may link the "defense" wastes with nuclear arms issues, which are currently quite controversial.

Specific Comments

- ● Review by the Basalt Waste Isolation Project (BWIP) staff has identified no issues of concern relative to finalizing the Project's environmental assessment (EA), since the subject draft document would require approval of the President of the United States prior to implementation, and therefore has no impact on the present Civilian Radioactive Waste Management Program EAs. If future EA changes are requested to reflect a decision to include defense high-level waste in the first commercial repository, these changes could be kept sufficiently general to be narrative in nature. This is possible since the Repository Project EAs apparently have not specifically addressed defense wastes but the evaluation based on civilian wastes are expected to be bounding (conservative).
  - Page E-3, second paragraph, last sentence - Change sentence to, "By the year 2000, it is expected that the radioactivity in defense high-level waste will be three percent of the total of the high-level radioactive waste in this country."
  - Page E-4, second paragraph, first sentence - Change sentence to, "... are shown in Table E-1."
  - Page E-4, third paragraph - The estimate of \$435M for development and evaluation (D&E) costs for a defense-only repository assumes a site can be chosen from between the two sites selected by the commercial program for detailed characterization but not selected for the first commercial repository. This assumption should be reexamined for two reasons: (1) The two remaining qualified sites are candidates for the second commercial repository, and (2) NRC (10 CFR 60) requires that three sites be characterized; thus, even if DOE could circumvent (1), it would still have to screen, select, and characterize an additional third site.
- One could question the D&E costs provided, \$4.5 billion for the commercial repository and \$435 million for the defense-only repository. The cost for the commercial repository seems too high as well as the \$4.065 billion differential between the commercial and defense-only repository.
- Page E-4, third paragraph, third sentence - Some acknowledgement should be made that including defense waste will likely increase the D&E costs for a repository. The increase will likely be small but there will be a change.
  - Page E-8, first paragraph - It is likely the phrase "... that process is not applicable to a defense-only repository" is not correct (see comment above on Page E-4, third paragraph).
  - Page 1-7, first paragraph, fourth sentence - Change to read: "In the current Department of Energy (DOE) reference plan, the PUREX waste and readily retrievable older high-level stored waste will be processed in a vitrification facility [the Hanford Waste Vitrification Plant (HWVP)] beginning in the early 1990s".

- Page 1-7, first paragraph, sixth sentence - Change "120 canisters" to "75 canisters". Change "10-yr period" to "20 year period".
- Page 1-9, Table 1-1 - Revise the shipping schedule and quantities of defense waste packages for Hanford to reflect a production of 75 canisters per year for 20 years beginning in 1992.
- Page 1-10 - This table (and similar tables) should either include characteristics for both Hanford and Idaho high-level waste packages or present a single column that represents the "maximums" for Savannah River, Hanford, and Idaho combined. The following comments are applicable with respect to HWVP requirements.

Characteristic	HWVP
Total Weight of Waste Form (kg)	2,150
Total Weight of Canister (kg)	<u>2,600</u>
Heat Output (kW)	<u>6.5kW (design base)</u> (Actual production rates based on the presently designed feeds are expected to be in the 1.5 - 2.4 kW range)
Total Radioactivity of Waste (curies)	<u>2.5 x 10<sup>6</sup></u> ? (See "3 percent," p 2)

[The assumption of six pressurized water reactor (PWR) or 18 boiling water reactor (BWR) assemblies per waste package is not consistent with BWIP conceptual designs. BWIP presently assumes four PWR or nine BWR spent fuel assemblies per waste package. A change in heat output per waste package may significantly affect the cost comparisons since the number, size, and heat output of the waste packages form the basis for defining the underground layout, hence repository costs. The effect of the packing densities identified above will probably be to enlarge the area required for commercial high-level waste (CHLW) and further favor collocation of defense high-level waste (DHLW).

- Pages 1-11 and 1-12, Assumptions 6 and 7 - The assumption which provides a TiCode-12 overpack for CHLW is not consistent with current Civilian Radioactive Waste Management Program (CRWMP) planning. There does not appear to be any need [relative to meeting Nuclear Regulatory Commission (NRC) containment requirements] to use TiCode-12 for DHLW. If equivalent cost assumptions were made relative to waste package costs, the use of TiCode-12 should have no impact on the cost comparisons between defense waste repository options. In addition, there is the possibility that an outside reviewer of this document might incorrectly assume that the commercial program by omitting TiCode-12 overpacks, may be cutting corners. The BWIP plan is to use a carbon steel overpack for DHLW shipped in stainless steel canisters. It would be useful to indicate that TiCode-12 is not a waste acceptance requirement but is used to bound the cost analysis.

- Pages 2-4 and 2-5, Section 2.2 - Not all current repository conceptual designs for the CRWMP use the same emplacement concept (e.g., vertical versus horizontal) for waste packages. Since the emplacement configuration does not make a difference relative to a choice between collocation and separate location of a defense waste repository, consistency with present repository designs should be considered to avoid confusing the public.
- Page 2-12 - Data in several rows of Table 2-1 appear to be somewhat scrambled. Under the subheading Repository Systems, the Offsite Improvements under Site and the Shafts appear to have traded cost figures when going from the Reference Repository to the Augmented Repository.

→ Also, it is not apparent why a difference of \$600M exists between the cost of a surface facility at a hard-rock site and a salt site. Why would they not be nearly identical? 2283 vs. 2882

- Pages 2-12, 2-13, 2-28, 2-29, et. al. - Evaluation in terms of separate versus combined commercial/defense repositories should be made independently of geologic media. By presenting data in terms of salt and hard-rock repositories, the reader's attention is diverted from the purpose of the evaluation and focused on issues of site selection. Site recommendations have not been made and data used in the subject report may be questioned.
- ● Page 2-17, Table 2-4 - Programmatic documents issued by the CRWMP utilize Draft 4 (May 21, 1984) of 40 CFR 19] which is currently in interagency review. There are sufficient differences in Environmental Protection Agency (EPA) Draft 4 compared to that reference (December 29, 1982) on Page 2-2 that a reassessment of EPA considerations (e.g., use of Table 2-4 on Page 2-17) needs to be made by the authors prior to release of this document.
- Page 2-19, second paragraph - The assumption that all wastes are 10 years old may be incorrect. It should be explained how spent fuel age affects the results.
- ● Pages 2-20 and 2-21, Table 2-5 - The initial inventories of long-lived radionuclides for DHLW are for Savannah River waste only. Table 2-5 should also include inventories for Hanford and Idaho wastes.
- Page 2-22, first paragraph - Since Carbon-14 is the principal source of release at the accessible environment, it should be pointed out that the candidate repository sites all expect travel times much in excess of 1,000 years, with corresponding low Carbon-14 releases compared to the values reported in Table 2-8.
- Page 2-24, first paragraph - Congruent leaching and 1,000 year groundwater travel time is an overly simplistic assumption. As long as this approach is used, it is pointless to attempt to distinguish between hard-rock and salt on a waste isolation performance basis.
- ● Page 2-25, first paragraph, fourth sentence - States that heat output of the reference commercial waste package assumed in this study is greater than defense waste. However, as shown above, the waste from Hanford will likely have the same or more heat output as commercial waste.

- Page 2-26, first paragraph - Change "Table 2-9" to "Table 2-7".
- Page 2-28, Table 2-7 - The fractional release rate for defense waste appears to be inconsistent with other data on borosilicate glass leach rates.

The introduction of a 300 year containment time for "non-overpacked" canisters and a 1,000 year containment time for "overpacked" canisters is inaccurate and could lead to misconceptions about the existing repository environments. Actual container life may be well beyond the 300-1,000 year range, and will depend heavily upon factors other than the presence or absence of an overpack.

- Pages 2-33 and 2-35, Tables 2-9 and 2-10, and Pages 3-11 and 3-13, Tables 3-4 and 3-5 - The numbers presented in these tables are different from the calculations of health effects (during repository construction and operation) found in the various site-specific repository environmental assessments (to be issued on same time frame), which could lead to controversy. It is suggested that more emphasis should be made that the numbers in this report are ASSUMPTIONS for the purposes of comparison. It is also suggested that more complete references for the numbers used would improve credibility and traceability.
- Page 2-35, Table 2-10 - The basis for the assumption that non-radiological pollutants are 40 percent less for a repository in hard-rock (Footnote b) is not given.
- Page 2-42, next to last bullet - Not all affected Indian tribes can disapprove the site. It is only in the case where a site is proposed on the affected Indian tribe reservation.
- Page 2-53, fourth paragraph - The Transportation cost ratio for rail versus truck of 1.6 to 2.0 needs more discussion. The reader's ordinary perception is that rail is cheaper than truck. In this case:
  - Rail casks travel one-fifth of the vehicle miles that the truck casks do.
  - Overhead cost for security and permits is a function of number of trips and route control which is significantly less for rail than for truck.Whatever bases might exist for the judgment that rail is significantly more costly than truck are questionable at best.
- Page 2-57, Public Acceptability - This section is based primarily on supposition and it is difficult to foretell how various interest groups may feel. But if the report is going to make the attempt to forecast such matters it should at least recognize in the last paragraph of page 2-60 that local officials may perceive the addition as favorable if it provides increased employment opportunities especially if the area is already involved in nuclear defense program activities.

[ In general, this whole section is rather weak and almost each supposition made could be argued one way or the other.

- Page 3-3, Section 3.2 - Section 1.2 defines high-level waste as "... that (which) contains a combination of transuranic waste and fission products in concentrations as to require permanent isolation." Section 3.2 states that in a defense waste repository there would be no "transuranic waste." This is apparent but not actual contradiction, and should be clarified.
- Page 3-4, third paragraph - See comment above on Page E-4, third paragraph.
- Page 3-9, first paragraph - See comment above on Page 2-28, Table 2-7.
- Page 3-16 - In the cases of a defense-only repository, Section 101(a) of the NWPA limits the involved Indian tribe to that tribe on whose reservation a repository is proposed to be located. Thus, for purposes of Table 3-6 it may be prudent to use a term different from "affected Indian tribe" since under the NWPA the definition of affected Indian tribe is broader than the tribes covered by Section 101(a).

There may also be a question as to Section 101(b) as to whether the right of "participation and consultation" includes the right to disapprove (last bullet on page 3-16) of a site. HQ should be sure the position taken in this document is the interpretation HQ-OGC would give to the section. *Does include*