MAR 24 1997 Sta. 37 (20)

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 617649

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	R. D. Claghorn, Numatec Hanford Corporation	NA
5. Proj./Prog./Dept./Div.:	**6. Design Authority/ Design Agent/Cog. Engr.:**	**7. Purchase Order No.:**
TWRS	R. D. Claghorn	NA
8. Originator Remarks:		**9. Equip./Component No.:** NA
Approval/Release		**10. System/Bldg./Facility:** NA
11. Receiver Remarks: **11A. Design Baseline Document?** [ ] Yes [X] No		**12. Major Assm. Dwg. No.:** NA
		13. Permit/Permit Application No.: NA
		14. Required Response Date:

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev. No.	(E) Title or Description of Data Transmitted	(F) Approval Designator	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	HNF-SD-WM-RPT-294	-	0	Decision Document for the Final Disposition of Cesium and Strontium Capsules	NA	1,2	1	

16. KEY

Approval Designator (F)	Reason for Transmittal (G)	Disposition (H) & (I)
E, S, Q, D or N/A (see WHC-CM-3-5, Sec.12.7)	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist. (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION
(See Approval Designator for required signatures)

(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN	(G) Reason	(H) Disp.	(J) Name (K) Signature (L) Date (M) MSIN
		Design Authority			
		Design Agent			
1	1	Cog.Eng. R. D. Claghorn Ronald D. Claghorn 3/19/97			
1	1	Cog. Mgr. P. S. Schaus P. S. Schaus 3/21/97			
		QA			
		Safety			
		Env.			

18.	19.	20.	21. DOE APPROVAL (if required) Ctrl. No.
R. D. Claghorn Ronald D. Claghorn 3/21/97	R. J. Murkowski 3/24/97	P. S. Schaus P. S. Schaus 3/21/97	[ ] Approved [ ] Approved w/comments [ ] Disapproved w/comments
Signature of EDT Originator Date	Authorized Representative for Receiving Organization Date	Design Authority/ Cognizant Manager Date	

BD-7400-172-2 (05/96) GEF097

Decision Document for the Final Disposition of Cesium and Strontium Capsules

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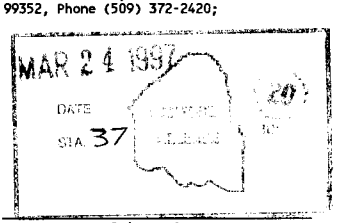
U.S. Department of Energy Contract DE-AC06-96RL13200

EDT/ECN: 617649 UC: 721
Org Code: 8C451 Charge Code: D4CG2
B&R Code: EW3130010 Total Pages: 42

Key Words: cesium, strontium, decision document

Abstract: This report was prepared to document decisions regarding the disposition of cesium and strontium capsules. A Decision Support Board was established to consider the multiple drivers for decisions regarding disposition of cesium and strontium capsules and make decisions that form the near-term guidance for the project. The decision process included several Decision Board meetings, documented in this report, in which technical and programmatic information was presented by Tank Waste Remediation System (TWRS) technical staff and considered by the Decision Board. The process also included preparation of the decision documentation, which is presented in this report.



Release Approval Date

Release Stamp

Approved for Public Release

HNF-SD-WM-RPT-294
Revision 0

DECISION DOCUMENT FOR THE FINAL DISPOSITION OF CESIUM AND STRONTIUM CAPSULES

March 1997

R. D. Claghorn
Numatec Hanford Corporation
Richland, Washington

Prepared for
U.S. Department of Energy
Richland, Washington

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CONTENTS

FIGURE

TABLE

LIST OF TERMS

CSB	Canister Storage Building
DOE	U.S. Department of Energy
EIS	Environmental Impact Statement
FY	Fiscal year
HLW	High-level waste
LMHC	Lockheed Martin Hanford Corporation
MYPP	Multi-Year Program Plan
NHC	Numatec Hanford Corporation
PHMC	Project Hanford Management Contractor
RL	U.S. Department of Energy-Richland Field Office
SNF	Spent Nuclear Fuel
SST	Single-shell tank
TWRS	Tank Waste Remediation System
WESF	Waste Encapsulation and Storage Facility

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Tank Waste Remediation System Disposal Program
Project Hanford Management Contractor,
Numatec Hanford Corporation

3/21/97
Date

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DECISION DOCUMENT FOR THE FINAL DISPOSITION OF CESIUM AND STRONTIUM CAPSULES

1.0 INTRODUCTION

This report was prepared to document decisions regarding the disposition of cesium and strontium capsules. This process described in WHC-IP-1231, *TWRS Systems Engineering Manual*, Section 7.0, "Decision Management" (WHC 1996), was followed to make the decisions. A Decision Support Board was established to consider the multiple drivers for decisions regarding disposition of cesium and strontium capsules and make decisions that form the near-term guidance for the project. The decision process included several Decision Board meetings, documented in this report, in which technical and programmatic information was presented by Tank Waste Remediation System (TWRS) technical staff and considered by the Decision Board. The process also included preparation of the decision documentation described in WHC (1996) which is presented in this report.

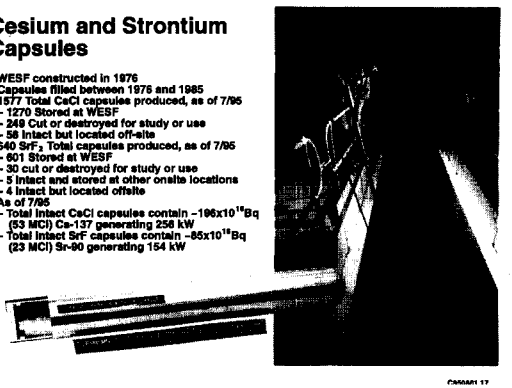
The following section provides background information and the framework for a decision related to the disposition of the capsules. The three decision elements--the decision plan, the decision summary, and the record of decision--are presented following the decision framework discussion. Finally, an appendix containing the Decision Board meeting minutes is presented.

1.1 DECISION FRAMEWORK

Most of the cesium and strontium capsules are currently stored onsite in pool cells at the Waste Encapsulation and Storage Facility (WESF). The continued storage at WESF would be unacceptable for the long term (hundreds of years) because the lifetime integrity of the capsules is uncertain and the cost of this type of storage is high. Figure 1 provides a summary of the capsule data as of July 1995.

Currently there are 1,295 cesium capsules stored at WESF, including two inner capsules and one capsule with a damaged outer weld currently stored in WESF's F Cell. An additional 33 capsules, which are stored at the 327 building, will be returned through fiscal year (FY) 1998. Three to four capsules will be generated when residual salt from the cesium legacy program (ADS-8400) is re-encapsulated (four is assumed for planning purposes). This totals to a cesium capsule count of 1,332.

Figure 1. Cesium and Strontium Capsules.



There were 640 strontium capsules produced at WESF; 601 of these are presently stored in the WESF pool cell. Of the 39 strontium capsules remaining, only four capsules that are stored at the Nevada Test Site have been committed to be disposed of by other U.S. Department of Energy (DOE) programs. Though there are no formal plans, the remaining capsules have the potential to be returned to WESF and, therefore, are included in the potential inventory to be dispositioned by the TWRS. The total number of strontium capsules then is 636.

These capsules were designed to last 50 to 100 years. The integrity of these capsules, however, has now been deemed uncertain due to the unexpected failure of a capsule that was used for commercial purposes. An investigation of the failure could not verify a specific failure mechanism (DOE 1990). The investigation, however, noted important differences in the operating environment at the commercial facility versus the environment provided by the pool storage at WESF. For example, the WESF thermal cycles are more controlled and less severe. The favorable conditions at WESF reduce the concern for failure of the capsules stored in the WESF pools.

The current baseline is that the Transition Projects will maintain the capsules in safe, clean, and stable interim storage at WESF or other temporary storage outside of the TWRS scope until the TWRS Program can prepare them for final disposal.

Once the capsules have been declared a HLW, the end product, i.e., the waste form and the packaging, must comply with the requirements of the federal HLW repository. The halide waste form has not yet been approved for disposal at the repository. Therefore,

requirements for an overpacked capsule configuration would have to be defined through a special waste acceptance process written specifically for cesium and strontium capsules.

1.2 STATEMENT OF THE DECISION

Based on the preceding discussion, the decisions to be made regarding the disposition of cesium and strontium capsules are: how and where will Hanford prepare the cesium and strontium capsules for disposal, i.e., will the capsules be overpacked or will the contents be vitrified?; when will Hanford prepare the capsules for disposal?

A Decision Support Board was established to address relevant issues and recommend to TWRS management the path forward to resolve these issues and provide guidance to the cesium/strontium capsule project. The board consisted of Luc de Lamartinie, Ken A. Gasper, Langdon K. Holton, P. S. (Steve) Schaus, and Dwayne R. Speer. The following decision plan is from the "Revision of the Decision Plan for Preparation of the Cesium/Strontium Capsules for Disposal" (Boston 1996), modified by comments from DOE-RL (Taylor 1997) and revised to present the decision in the past tense.

Decision Plan

Statement of the Decision

How and when will Hanford prepare the cesium and strontium capsules for disposal?

Decision Class	Class III
Responsible Decision Maker	L. de Lamartinie, Technical Baseline Manager, Tank Waste Remediation System Disposal Program Project Hanford Management Contractor, Numatec Hanford Corporation
DOE Concurrence	W. J. Taylor, DOE/Director Waste Disposal Division
Project Manager	P. S. (Steve) Schaus, Project Manager, Cesium/Strontium Capsules, Tank Waste Remediation System Disposal Program Project Hanford Management Contractor, Lockheed Martin Hanford Corporation

Decision Strategy

The decision board was used to evaluate the technical and programmatic issues associated with this decision. An Alternative Generation Analysis data package was prepared to assist the board with the evaluation (Slaathaug and Claghorn 1997). The significance of the assumptions and other parameters was quantified in charts and/or tables. Decision criteria that can not be easily quantified by a single parameter were presented to the board as figures, lists of issues, narrative text, etc.

The decision criteria for each option were presented in the form of an alternatives analysis. For this decision, the options considered were:

- Overpack
  - At the HLW Vitrification Facility
  - At a Canister Storage Building (CSB)
  - At a Standalone Facility
- Open the capsules and vitrify their contents
  - Process During Phase I
  - Process During Phase II

All overpack options were assumed to have interim storage at a CSB. In addition to the options above, continued storage in the WESF or in a CSB was evaluated as a basis for the timing of the disposal activity. The timing for the implementation of the decision depends on the feasibility of modifying existing contracts and program baselines.

The decision primarily focuses on the economics of each option, the acceptability of halide salts as a waste form, and the safety impacts.

Decision Criteria

Life-Cycle Cost (capital)	Total Dollars
Life-Cycle Cost (operating)	Total Dollars
Development Status	Available, Field Testing, Prototype, Under Development, Unavailable
Maintainability	Low, Medium, High
Operability	Low, Medium, High
Schedule	Meets Tri-Party Agreement milestone or not

Long Term Radiological and Toxicological Risk	Considers impact to air, groundwater, long term, recreational land use
Near Term Industrial Risk	Considers both construction and operations risks
Environmental Acceptability	Includes consideration of regulatory compliance, permitting, complexities, and land use issues
Public Acceptance	Considers the acceptability of an alternative relative to expressed stakeholder values and concerns

Information Required

Acceptability of the capsule disposal at the HLW repository.

Action Time Frame

Decision Strategy Identified August 13, 1996.
Decision Completed (recommendation to RL) by March 31, 1997

Interactions with Other Decisions

Processing scope for Phase I - the current scope does not provide for the processing of capsules (DOE-RL, 1996a and 1996b)
Decision 4.2.4, *Dispose Waste*, determines that any Hanford material that is designated as High-Level Waste will be disposed of at a federal repository (McConville et al. 1996)
Decision 4.2.4.1.1, *Interim Storage of Dispositioned Cesium/Strontium Capsules*, is a proposed decision that would determine where overpacked capsules would be stored prior to their shipment to the federal repository

Constraints/Influences

A decision to place capsules in dry storage (as opposed to water storage) could impact the viability of the overpack option.
Acceptability of halide waste form at the repository (overpack options only)
TWRS EIS - the EIS addresses both vitrification and overpack
Vendor Proposals for Privatization
Decision 4.2.4.1.1 *Interim Storage of Dispositioned Cesium/Strontium Capsules*
Record of Decision for TWRS-EIS: no final recommendation on disposal of capsules.

Critical Events

Issue the final version of the Alternative Generation Analysis Report by March 31, 1997 (*Trade Study for the Disposition of Cesium and Strontium Capsules*, WHC-SD-WM-ES-382, Rev 1 [Slaathaug and Claghorn 1997])
TWRS EIS June 1996
TWRS ROD, March 1997.

Current Planning Basis

The basis for the FY 1996 multi-year program plan (MYPP) was that the capsules will be overpacked at a standalone facility and disposed of within an offsite geologic repository. However, the basis for the FY 1997 MYPP assumed the capsule contents would be vitrified during Phase II. The TWRS EIS addresses both vitrification and overpack, but the ROD defers the decision as to which to select. It recommends storing the capsules at WESF for 10 years and then readdressing the situation at that time.

2.0 DECISION SUMMARY ELEMENT

This section documents the technical and programmatic performance information that was used in deriving conclusions and making the decisions.

2.1 PRIMARY ASSUMPTIONS

The assumptions used in this document are that the capsules have been designated as a HLW and will need to be disposed of offsite in a federal repository. Also, all capsules are assumed to be clean, intact, and structurally sound. The system concepts presented here and in the *Trade Study for the Disposition of Cesium and Strontium Capsules* (Slaathaug and Claghorn 1997) do not provide mechanisms for receiving anything other than clean, intact, and structurally sound capsules.

It is assumed that Phase I and Phase II will proceed as presently scheduled. Also it is assumed that the Phase I HLW contractor(s) will partake in the proposed extension. This will allow enough time to complete the capsule options that require the Phase I HLW vitrification facility.

2.2 DEFINITION OF ALTERNATIVES CONSIDERED

This analysis considered numerous alternatives for final disposal of the capsules and selected the following cases for a detailed evaluation as shown in Table 1:

2B. Overpack and Storage at a HLW CSB

2C. Overpack for Interim Storage at a HLW CSB Followed by Overpacking for Repository Disposal at the HLW CSB Before Final Disposal

3A. Overpack at a HLW Vitrification Facility Followed by Storage at a HLW CSB

3B. Blend Capsule Contents with Phase II HLW Feed Streams and Vitrify at the Phase II HLW Vitrification Facility.

3C. Blend Capsule Contents with Phase I HLW Feed Streams and Vitrify at the Phase I HLW Vitrification Facility.

4. Blend Cesium Capsule Contents with Phase I HLW Feed Streams and Vitrify at the Phase I HLW Vitrification Facility. Overpack the Strontium Capsules at Either the Phase I or II HLW Vitrification Facility.

Table 1. Alternatives by Performance Measure Matrix. (Sheet 1 of 2)

Performance Measure	Alternatives		
	2B Overpack and Store at a HLW CSB	2C Interim Overpack at the CSB, Store, and Reoverpack at the CSB	3A Overpack at the HLW Vitrification Facility and Store at a CSB
Life-Cycle Capital	31 - 48	43 - 70	29 - 46
Life-Cycle Expense	193 - 247	223 - 280	218 - 272
Life-Cycle Total (in 1995 $ millions)	224 - 295	266 - 350	247 - 318
Schedule	Meets all applicable Tri-Party Agreement milestones depending on acceptability of halide waste form.	Meets all applicable Tri-Party Agreement milestones depending on acceptability of halide waste form.	Meets all applicable Tri-Party Agreement milestones depending on acceptability of halide waste form.
Operability	Simple processes.	Simple processes. Process for retrieving capsules from interim overpacks needs to be developed.	Simple processes.
Maintainability	Easy to maintain.	Easy to maintain. Second overpack may be more difficult due to possible loss of capsule integrity.	Easy to maintain.
Onsite Safety Risk	Low.	More interaction with capsules leads to higher operational risk.	More onsite transportation than 2B.
Offsite Safety Risk	Waste form is soluble.	Waste form is soluble.	Waste form is soluble.
Environmental Acceptability	Fewer effluents than vitrification. Final form is soluble.	Fewer effluents than vitrification. Final form is soluble. Interim overpacks will need to be D&D and disposed of.	Fewer effluents than vitrification. Final form is soluble.
Technical Maturity	Process - high. Waste form - low. Capsule integrity an unknown.	Process - medium. Waste form - low. Capsule integrity an unknown.	Process - high. Waste form - low. Capsule integrity an unknown.
Public Acceptance	Soluble waste form will be a concern to the public.	Soluble waste form will be a concern to the public.	Soluble waste form will be a concern to the public.
Complexity of Interfaces	Requires complicated interface with the repository to determine if halides will be acceptable and to determine if an overpack is required.	Requires complicated interface with the repository to determine if halides will be acceptable and to determine if an overpack is required.	Requires complicated interface with the repository to determine if halides will be acceptable and to determine if an overpack is required.

Table 1. Alternatives by Performance Measure Matrix. (Sheet 2 of 2)

Performance Measure	Alternatives		
	3B Vitrify Capsule Contents at the Phase II HLW Vitrification Facility	3C Vitrify Capsule Contents at the Phase I HLW Vitrification Facility	4 Overpack Strontium Capsules and Vitrify Cesium Contents at the HLW Vitrification Facility and Store at a CSB
Life-Cycle Capital	39	22	35 - 52
Life-Cycle Expense	196	110	175 - 229
Life-Cycle Total (in 1995 $ millions)	235	132	210 - 281
Schedule	Meets all applicable Tri-Party Agreement milestones.	Meets all applicable Tri-Party Agreement milestones. Tight schedule due to negotiations with private companies already initiated.	Meets all applicable Tri-Party Agreement milestones depending on acceptability of halide waste form. Tight schedule due to negotiations already initiated with Privatization companies.
Operability	More complex than overpacking but does not require complicated machinery.	More complex than overpacking but does not require complicated machinery.	More complex than straight overpacking but removal of strontium processing increases operability.
Maintainability	Harder to maintain because higher degree of contamination makes it more difficult to repair equipment.	Harder to maintain because higher degree of contamination makes it more difficult to repair equipment.	Harder to maintain because higher degree of contamination makes it more difficult to repair equipment.
Onsite Safety Risk	Processing capsule contents invariably means higher risk.	Processing capsule contents invariably means higher risk. No more than 3B.	More onsite transportation than 2B. Open capsules invariably means higher risk.
Offsite Safety Risk	Much lower release from glass.	Much lower release from glass.	Strontium salt waste form will be more soluble than glass form. Much lower release rates for cesium.
Environmental Acceptability	Glass waste form is more acceptable.	Glass waste form is more acceptable.	Fewer effluents than complete vitrification of all capsules. Final strontium waste form will be more soluble than glass. Much lower release rates for cesium.
Technical Maturity	Uses proven technology.	Uses proven technology.	Overpacking: Process - high. Waste form - low. Capsule integrity an unknown. Vitrification: Uses proven technology. Removal of strontium processing decreases complexity.
Public Acceptance	Glass waste form will be more acceptable to the public. Increased releases from processing may be of concern.	Glass waste form will be more acceptable. Increased processing releases will not. Earlier end date is better.	Soluble waste form will be a concern to the public. Glass waste form for cesium will be more acceptable. Increase releases may be of concern.
Complexity of Interfaces	Produces a standard high-level waste form; no additional Hanford-repository interface required	Produces a standard high-level waste form; no additional Hanford-repository interface required	Requires complicated interface with the repository to determine if halides will be acceptable and to determine if an overpack is required.

Two "no-action" scenarios--continued wet storage at the WESF or interim dry storage at a HLW CSB--were used to provide a basis for the timing and duration of the capsule disposition alternatives. Interim storage scenarios are considered "no-action" because these scenarios do not provide for the final disposal of the capsules.

2.3 EVALUATION OF ALTERNATIVES

Table 1 presents a summary of the findings of this analysis as a function of the performance measures chosen to evaluate each alternative. Additional detail is provided below.

2.3.1 Cost

The study first shows that the costs for interim storage and disposal of the equivalent of about 250 canisters of HLW dominates over the cost of incorporating the cesium and strontium in the HLW glass. Even in Case 4 where only the strontium capsules are overpacked, the disposal cost is still a significant portion of the total.

The cost of storage in WESF prior to disposal actions is also high - $8 million per year plus $17 million in capital upgrades. So, it is desireable to decrease this cost by doing one of the following:

- Remove the capsules from WESF for processing as soon as possilble
- Remove the capsules from WESF and put them into dry storage
- Decrease the operational cost of WESF.

The study shows that the capital cost for the vitrification of capsules is the same order of magnitude as the capital cost for the overpack option. The *Trade Study* also shows that capital cost of incorporating the capsule disposition process (overpacking or vitrification) as an addition to either a CSB or as an addition to the HLW vitrification facility is much less than building a standalone facility. Additionally, assuming that future onsite transportation costs are similar to the current cost of transporting capsules, an overpack operation at a CSB would provide a significant amount of savings in transportation versus overpack at the vitrification facility.

2.3.2 Schedule

All options are expected to meet all applicable Tri-Party Agreement milestones. However, in doing this, the overpacking operations must assume that the repository will accept the halide waste form. Also the vitrification during Phase I options (Case 3C and Case 4) may impact the Phase I privatization schedule if implemented.

2.3.3 Safety and Environmental Acceptability

With regard to onsite worker safety and secondary waste generation, the vitrification of capsule contents is an inherently messy, albeit a short-term, operation. The vitrification alternative will create both solid and liquid secondary wastes. The metallic capsule containers will be separated from their contents and shredded for size reduction, thereby creating about 120 drums of remote-handled waste for burial. Removing chloride from the cesium salt will create an additional 115 drums of chloride-loaded ion-exchange resin that will require disposal as mixed waste. Decontamination of the capsule disassembly equipment and cell will create liquid wastes. In contrast, an overpacking operation is expected to create very little secondary wastes.

With regard to offsite safety, the glass made with the vitrification alternative is much more stable than the current halide (salt) form of the cesium and strontium. The cesium chloride is very soluble in water and the strontium fluoride, although not nearly as soluble as the cesium chloride, is more soluble than glass. Corrosion of the capsules due to their contact with the halide contents is highly dependent on temperature and on the types and quantities of impurities that reside within the capsules. However, there is insufficient knowledge about these impurities to obtain a definitive determination of how long the capsules will remain intact in an interim storage environment and after disposal in the geologic repository. Preliminary informal communications with the repository project indicate that halide salts would be an unacceptable waste form.

Environmental acceptability and public acceptance will be lower in the short term for the vitrification options due to the higher amount of secondary waste and effluents produced as well as the higher risk of contamination and radionuclide release during processing. However, in the long term, vitrification will rank much higher due to the stability of the final waste form.

2.3.4 Maturity and Operability of the Process

Technical maturity of the overpacking process is high, but the long-term integrity of the capsules will be of a concern. The vitrification process uses proven technology, but processing data and knowledge based on blending the halide salts with other tank wastes are lacking. The impact of the cesium and strontium capsule salts on melter performance is unknown at this time. However, melter performance data collected during Phase I operations will increase the technical maturity of Phase II operations. This will be beneficial to Case 3B.

Operability and maintainability levels will be higher in the overpacking operations than in the vitrification options. This is due to both the contamination of equipment that will occur when the capsules are opened and the higher degree of complexity of the operation. While capsule processing is not assumed to be overly complex, it will certainly be more complex than overpacking.

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3.0 RECORD OF DECISION

The conclusions reached by the Decision Board are as follows.

3.1 ALTERNATIVE SELECTED

The Project Hanford Management Contractors (PHMC) have completed their decision analysis for the preparation of the cesium/strontium capsules for disposal using accepted systems engineering practices and tools. Based on the results of the decision analysis and its supporting trade study (Slaathaug and Claghorn 1997), the PHMC recommends the following technical and programmatic approaches to DOE-RL:

Technical Recommendation: The PHMC recommends that the contents of the cesium/strontium capsules be processed to meet HLW feed requirements, blended with other tank wastes, vitrified into a canistered borosilicate glass waste form, and stored for eventual disposal at the geologic repository.

Programmatic Recommendation: For purposes of planning the TWRS program baseline, the PHMC recommends that processing of the cesium/strontium capsules be included as part of TWRS Privatization Phase II contract scope.

3.2 DATE OF SELECTION

The decisions were made at a series of Decision Board meetings documented in Appendix A.

3.3 DECISION CRITERIA

Refer to the "Decision Plan" and the "Decision Summary" for the criteria used in making these decisions.

3.4 RATIONALE FOR THE SELECTION

The rationale for these decisions are both technical and programmatic.

Technical Rationale:

- The recommended approach eliminates technical and regulatory issues potentially associated with the acceptability of halide salts for direct disposal that would be present in the overpacking alternative.

- Cost estimates comparing vitrification with overpacking options showed that there was no significant cost differences between the two.

- If the cesium and strontium salts are blended with other high-level tank wastes, no additional canisters of glass are produced; all overpacking options generate an additional number of canisters that must be stored, shipped and disposed.

Programmatic Rationale:

- The Transition Projects' current baseline shows continued operation of the WESF through 2016; this is consistent with the estimated four (4) years needed by TWRS to blend the cesium/strontium salts with other high-level tank wastes in TWRS Privatization Phase II scheduled to begin in FY 2012.

- A Phase II deployment will allow sufficient time to complete engineering studies and technology demonstrations in support of the Phase II RFP and to prolong the availability of capsules for possible beneficial uses.

3.5 EXTERNAL ASSUMPTIONS

A number of enabling assumptions were made that give rise to programmatic and technical risks from the decisions to dispose of cesium and strontium capsules. These are summarized below:

- It is assumed that the cesium and strontium capsules have no future beneficial uses.

- It is assumed that a vitrification facility will be prepared to vitrify capsule contents by the year 2012.

3.6 ALTERNATIVES CONSIDERED

Refer to the Decision Summary for a description of the alternatives considered. Refer to the *Trade Study for Disposition of Cesium and Strontium Capsules* (Slaathaug and Claghorn (1997) for a more detailed description of these same alternatives.

3.7 FUTURE ACTIONS

Future actions to implement this decision are:

- Update the TWRS functional requirements baseline to incorporate vitrification of capsules.

- Revise the multi-year program plan for 1998 to incorporate the programmatic recommendations.

- Define and execute necessary research, development and engineering studies to support the vitrification option and Phase II privatization request for proposals.

- Perform additional engineering studies to lower the cost of the present storage in WESF by either decreasing the operating cost of WESF or by implementing new technology to interim store the capsules.

- Prepare the necessary *National Environmental Policy Act* documentation to arrive at a record of decision for capsule disposition.

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APPENDIX A

DECISION BOARD MEETING MINUTES

MEETING MINUTES

SUBJECT: **DECISION BOARD - CAPSULE DISPOSAL**

TO: Distribution			BUILDING	
FROM:			CHAIRMAN J. O. Honeyman	
DEPARTMENT-OPERATION-COMPONENT	AREA	SHIFT	DATE OF MEETING September 23, 1996	NUMBER ATTENDING 13

All of the board members were in attendance:
Ken Gasper, Langdon Holton, Jim Honeyman, Steve Schaus, Dwayne Speer

Others in attendance:
D. D. Button, R. D. Claghorn, J. S. Garfield, G. E. Kulynych, P. E. LaMont, R. J. Murkowski, G. W. Reddick, E. J. Slaathaug

QUESTIONS, IDEAS, ISSUES, CONCERNS, OTHER POSSIBLE ALTERNATIVES:

1. Has interim storage using surface casks been considered? Lease dry casks to save money?

2. Does Case 2B (overpack in CSB) requires a new storage vault?

3. Has the overpack concept been fully analyzed for heat removal? Is dry storage even acceptable? What are the potential additional requirements on a CSB facility? Use forced air? Additional structural or heat transfer needs?

4. Have the effects of chloride and fluoride during vitrification been analyzed for Phase II? Phase I? What is the impact on glass volume (the number of glass canisters) of vitrifying capsule material? Shouldn't the glass volume increase? What are the implications on melter operation, corrosion, the offgas system?

5. Can other interim storage options (besides WESF) be used before disposal occurs? What happens if beneficial uses materialize?

6. What is the baseline plan for capsule disposal? What is the cost for a standalone facility for overpacking?

7. What are bases for costs, are they on the same basis to permit legitimate comparison of alternatives?

MEETING MINUTES (Continued)

8. In case 2B, why wait until 2010 to overpack capsules? Must the Phase II storage be available or can a new vault be added sooner?

9. Can capsule handling and overpacking be accomplished in the Spent Nuclear Fuel (SNF) facilities at the CSB after SNF project has stored all of its canisters?

10. What is the purpose of WESF and how much life extension work will be accomplished before 2010? Will all life extension projects initiate in 2004? Does WESF have any other uses other than capsule storage? Other uses would reduce the costs assigned to capsules for storage?

11. Does the repository care about waste form? What are the official and unofficial positions of RW? Are mobility, corrosivity, and chemical reactivity important?

12. Are the capsules classified as HLW and how does this decision relate to other Hanford waste designations? When will capsules be declared HLW and who makes the decision? Was vitrified cesium from B Plant determined to be RH-TRU and will this decision affect the capsules' classification?

13. Has the solid waste generated from opening, emptying, and processing the capsule contents been estimated? What is the cost for disposal?

14. If the capsule material as chlorides and fluorides is unacceptable can the material be converted to another form or repackaged to be acceptable? Can cesium be loaded into glass? Up to 20% loading?

15. What are the prospects for beneficial use of strontium? Cesium? How large is the market? Would capsules be returned for disposal? Will beneficial use be resolved in FY 1997?

16. What is the risk of overpacking versus vitrification? What is the risk of the overpacked canisters compared to the vitrified material? Onsite? Offsite?

17. What are the risks of opening capsules? Is strontium fluoride removal and handling more difficult than cesium chloride? Should different approaches be used for the strontium capsules versus the cesium?

18. Do costs include R&D for proving processes and equipment?

MEETING MINUTES (Continued)

19. How should cost and other uncertainties be addressed? Provide a range?

20. How are capsule management and capsule integrated? Will capsule management plan be completed before disposal decision is made?

22. Are processing costs for disposal of the capsules large enough?

The second board meeting is scheduled for Thursday, September 26 (2:00 p.m.).

Items suggested for the second board meeting:

a. Establish costs for splitting cesium and strontium disposal approaches.

b. Accelerate the schedules for getting out of WESF as much as feasible to get the alternatives on equal footing for comparison.

c. Examine a suboption which uses some other facility than WESF for interim storage.

d. Provide the baseline cost estimate which uses a standalone facility for overpacking the capsules.

e. Provide background for the cost details. Provide a range for costs.

f. Examine an alternative with dry cask storage.

g. Examine an alternative for pack and store (long term) onsite (similar to an EIS alternative).

Other items, issues:

MEETING MINUTES

SUBJECT: **CAPSULE DISPOSAL DECISION BOARD**

TO:	BUILDING
Distribution	
FROM:	CHAIRMAN
	J. O. Honeyman

DEPARTMENT-OPERATION-COMPONENT	AREA	SHIFT	DATE OF MEETING	NUMBER ATTENDING
			September 26, 1996	12

Board members in attendance - Ken Gasper, Langdon Holton, Dwayne Speer

Others - Ron Claghorn, Dave Evans, Bob Filbert, John Garfield, George Kulynych, Phil LaMont, Ed Randklev, George Reddick, Eric Slaathaug

1. The purpose of the decision board was discussed - capsule disposal is a TWRS function.

2. Capsule management and the draft management plan were discussed. Transition projects maintains possession of the capsules until disposal starts. Decisions on capsule storage are currently made at DOE-HQ.

3. The disposal alternatives were reviewed, including two new alternatives requested by the board. A split approach for strontium and cesium was analyzed. A dry cask storage approach was analyzed.

4. The cost for the baseline plan was presented. The baseline is a standalone facility for overpacking and dry storage.

B. Topics suggested for the next meeting

1. Review the revised alternatives with the full board.

2. Review the risks of each alternative.

3. Discuss criteria to be used to evaluate the alternatives.

4. Review the information available about strontium fluoride processing.

5. Review the information available about cesium chloride processing.

MEETING MINUTES

SUBJECT: **CESIUM/STRONTIUM CAPSULE DISPOSITION DECISION BOARD MEETING #3 MINUTES**

TO: Distribution		BUILDING		
FROM:		CHAIRMAN Luc de Lamartinie		
DEPARTMENT-OPERATION-COMPONENT	AREA	SHIFT	DATE OF MEETING December 6, 1996	NUMBER ATTENDING 14

Attendees: George Reddick, Phil LaMont, Steve Schaus,* Eric Slaathaug, Dwayne Speer,* Ed Randklev, Thierry Flament, Luc de Lamartinie,** Ron Claghorn, Langdon Holton,* Rod Powell, Dan Button, Ken Gasper,* Bob Filbert

*Decision Board Member
**Decision Maker

Statement of Decision — Should the cesium and strontium capsules be overpacked or their contents vitrified for purposes of final disposal at the geologic repository assuming both waste forms are acceptable?

Introductions

Introduction of Luc de Lamartinie as the Decision Maker to the rest of the Board and others in attendance. Luc introduced Thierry Flament who is a fellow Numatec employee and is examining the capsule document to see if there are possible French technologies that may be employed to dispose of the capsules.

Minutes

George Reddick began by mentioning that a primary assumption in the document/decision path is that the capsules have been classified as waste and will need to be disposed of. Dwayne Speer stated that by September '97 the Capsule Management Plan being prepared by Bob Filbert for RL is scheduled to be completed. Also a Part A permit application must be filed by December '97 for any capsules which a beneficial use (BU) contract had not been executed. Both of these are Tri-Party Agreement milestones. At that time the capsules not selected for BU will be declared as waste. Dwayne went on to state that the declaration of the capsules as waste is reversible. Therefore if additional BUs are defined after the December '97 date, capsules that had previously been declared as waste can be re-declared by-product material and used for BUs.

MEETING MINUTES (Continued)

The newest version of the executive summary was handed out to the meeting attendees.

Steve Schaus explained that the document was currently undergoing another revision based upon the comments received from an independent review team. The executive summary handed out in this meeting has been revised based upon comments received from the independent reviewers, but the body of the document has not.

Langdon Holton requested and received a copy of the document that was being reviewed by the independent review team and suggested that each Decision Board member also should get a copy. Eric Slaathaug and/or Ed Randklev will distribute copies of the document to the other Decision Board members following the meeting.

George Reddick and Steve Schaus went on to explain that the revised version of the document will not address onsite storage or disposal options. These options are considered to be the responsibility of Transition Projects and will be included in the Capsule Management Plan.

Steve went on to explain the alternative generation and screening for the new version of the document. A simplified block diagram for the options was then shown and discussed. Dan Button requested that the meeting attendees receive copies of the overheads. These overheads are attached to these meeting minutes.

Steve then explained why options were screened out or left in. The explanations for the rejected items are summarized below:

Option 1b -	Continued storage, but dry and at an enclosed facility. Outside TWRS scope.
Option 1c -	Continued storage, but dry and in wells. Outside TWRS scope.
Option 2a -	Transport of the capsule to the repository where they are overpacked for disposal. Rejected informally by RW.
Option 2b -	Overpacking of the capsules at a standalone facility. Cost restrictive based upon estimates from previous studies.
Option 2c -	Overpacking the capsules at WESF. Size restrictive.
Option 3a -	Processing and vitrifying the capsule contents at a standalone facility. Cost restrictive based upon estimates from previous studies.
Option 5 -	Overpacking the capsules then storing and ultimately disposing of them onsite. Outside of TWRS scope.

MEETING MINUTES (Continued)

Descriptions of the options carried forward:

Option 1a -	Continued storage at WESF. This is considered to be outside of TWRS scope, but it is kept for it will serve as a basis for timing/costs for the other options.
Option 2d -	Overpacking of the capsules at the Phase II HLW vitrification facility. Interim storage will be at a CSB.
Option 2e -	Overpacking and interim storing the capsules at a CSB.
Option 3b -	Processing and vitrifying the capsule contents at the Phase I HLW vitrification facility.
Option 3c -	Processing and vitrifying the capsule contents early (2013-2016 time frame) at the Phase II HLW vitrification facility.
Option 3d -	Processing and vitrifying the capsule contents late (2025-2028 time frame) at the Phase II HLW vitrification facility.
Option 4 -	Overpacking the strontium capsules at the Phase II HLW vitrification facility with interim storage at a CSB coupled with processing and vitrifying the cesium capsule contents at the Phase II HLW vitrification facility.

A simplified block diagram for each option is given as page 1 of the attachment.

Langdon Holton questioned if altering the scope of Phase I processing is possible at this late date because the Phase IB contract will be awarded in 1998. Dan Button expanded this to question if it was legal to alter the contract. Steve Schaus stated that these are unknowns at this time.

Langdon asked how the HLW unit price will be affected. Steve stated that he was unsure, but that the cost for the accelerated option (Option 3b) included the additional cost for capsule processing in Phase I based on earlier estimates by Fluor (for the M&O) and NUS (for privatization).

Dan then stated that the CSB is designed for Envelope D heat loads and asked how the addition of the capsules would affect the CSB. The document examines this and concludes that the capsule contents can be added to the Phase I HLW feed without exceeding the Envelope D limits. However if the canister count does not increase, the heat load obviously will. Also stated during this conversation is the possibility that the non-HLW Phase I vendor may send its removed Cs, Sr, Tc, etc., to the HLW Phase I vendor. This was not considered in the document, but may need to be addressed. This was left an open item.

MEETING MINUTES (Continued)

Langdon then asked if the costs for 3b include the additional costs for processing. Steve reiterated that they did and went on to say that they are based upon the NUS and Fluor estimates.

Phil LaMont then asked if an option for processing the capsules at an offsite location (DWPF or West Valley) was considered. Steve stated that the document did not, but that an EM HLW meeting was scheduled for next week that will examine mix-matching of HLW from other locations. Ed Randklev added that the DWPF canisters will have a low heat load and that the WV operations are expecting a low can count. This will probably eliminate WV from consideration. Phil then went on to point out that since DWPF has a low heat load, the DWPF CSB and the facility shielding may not support the increased radionuclide levels. Ron Claghorn added that adding the capsule processing operations to an existing facility will be much more difficult than including it during initial design. Tentatively (depending on the outcome of Steve's EM meeting) the DWPF option will be included. Dwayne stated that the option will end up being included, but then immediately rejected. The shipping of the capsules will probably be a high expense and high risk item. Even if the transport costs are not restrictive, he postulated that the states through which the capsules will need to be transported may protest.

Rod Powell then asked where the document got its performance measures. Ron stated that the performance measures used in the document are standard. The performance measures incorporate the 23 stakeholder values (Table 3-1 of the document) which, in turn, incorporate the 99 comprehensive stakeholder values (*Public Values Related to Decisions in the TWRS Program* [PNL-10107 UC-630]). These performance measures have been used in previous decision analyses. The list of stakeholder values (and the performance measure(s) that corresponds to it) may need to be revisited in order to insure that the are still current with the options under consideration.

Luc de Lamartinie then asked where the WESF cost came from and if they were reasonable. Dwayne Speer explained that the cost used in the document were taken from the '96 ADS. Current cost projections assume $12 million per year. These costs are based on WESF being currently run as if it was still encapsulating material (includes maintaining hot cells, manipulator inspection/repair, 4-shift schedule, etc.). As some of these operations are removed/eliminated, the yearly cost should drop. Dwayne concluded by stating that the $8 million per year assumed in the document is reasonable.

MEETING MINUTES (Continued)

Dwayne later stated that the upgrades to WESF will be initiated in 2009 if it is projected that the capsules will remain after 2011. This may impact the cost estimates and timing for some of the options. The upgrades will extend the life of WESF by 20 years.

Facility decontamination and decommissioning (D&D) cost allowances for the options were brought into question. The consensus of the attendees was that the D&D cost for the capsule processing options would be much higher than the overpacking options. Ron Claghorn stated that the document assumes a percentage (30%) of the total capital cost (minus WESF upgrades) for the total D&D costs. Since the processing options have higher capital costs for the processing facilities, the D&D will be higher. However the total D&D costs for the overpacking options may be higher because they include the cost for D&Ding the CSB. Ron continued by saying that the D&D operations for the capsule processing is a small part of a very large plant, so the incremental D&D cost should be minor.

Luc de Lamartinie then asked if there is a cheaper, smaller disposal container that can be used in the overpacking operations. This may decrease the repository fee costs, because the overall volume will be reduced and the smaller overpacks could then be inserted between the larger ones. Steve Schaus stated that we have no basis for disposal fee estimates for other containers. We would have to go back to RW to get an estimate and, at this time, they do not have the staff to support us. For the overpacking case, we decided to piggy-back upon the canister design already accepted for SNF at the repository. Also, by using the same

design, canister handling operations at the repository and CSB will not be impacted. Ed Randklev then added that increasing the radionuclide density at the repository or CSB will increase the capsules internal temperatures and will increase corrosion and capsule failure. Langdon Holton stated that this may need further examination due to the repository fee being such a large cost item for the overpacking cases.

Langdon asked why the repository has not made a decision regarding the acceptability of overpacked capsules. Steve explained that the repository had a large cutback in funding and personnel. Because of this they have not been able to address the question. Ed went on to add that the word from RW is that it will more likely accept the overpacked Sr capsules than the Cs capsules, but most likely will not accept either. Currently the repository is not planning to seek a RCRA permit for disposal of hazardous wastes which would include SrF_2 and CsCl. When asked why then are the overpacking options still carried, Steve stated that they could not be eliminated because the repository has not stated definitively that it will not accept the overpacked capsules.

MEETING MINUTES (Continued)

Ken Gasper then asked if the capsules are processed during the HLW extension period (2007-2011), will the contractual problems mentioned by Dan be avoided. This was left open due to Dan leaving for another meeting.

Langdon then asked if the capsules could be processed at WESF and then pumped to the HLW private contractor. George addressed this by stating that doing this would increase the volume processed, the exposure risk at WESF, and the cost (due to WESF upgrades and transfer system upgrades).

Ken stated that the risk for 3b would be lower if WESF operations were extended. The present schedule has the capsules transported to the Phase I HLW facility and prepared for vitrification from 2002-2005. The contents are then vitrified during 2002-2007 time frame. This results in the slurried contents being stored at the facility for 2-5 years. Extending the transport and processing schedule from 2002-2005 to 2002-2007 will increase the safety of the operation. This will be included in the future revision of the document.

The question of how hard it will be to process the capsule contents was brought up. Ed stated that processing the cesium capsules will not be a problem. There is plenty of information regarding the dissolution of the CsCl here and at other sites. Oak Ridge developed a process for removing the SrF_2 from the capsules. This process utilized a milling cutter machine that was manufactured at Oak Ridge. This device reduced the amount of material lost during capsule retrieval operations. This device is presently here at Hanford, but the exact location and state of it is unknown. Langdon stated that Eric Straalsund designed the Hanford cutting tool.

Ken asked that we obtain good documentation for the inclusion/exclusion of capsule processing during Phase I. This will greatly benefit the decision board while making their decision.

Tasks and Status

1. Distribute copies of the revised document to all board members (Slaathaug/Randklev).
   Complete.

2. Tentatively include processing the capsules at DWPF as an option. Final acceptance will be based on outcome of EM HLW meeting (Schaus/Claghorn).
   In progress. Savannah River has been requested to support a cost estimate for this option. It will be included in the document as an option.

MEETING MINUTES (Continued)

3. Distribute copies of presentation slides to all audience members (Slaathaug).
   These will be mailed out separately.

4. The board members should review the revised document and submit their comments to Eric Slaathaug (de Lamartinie, Holton, Gasper, Schaus, Speer).
   In progress.

5. Type up and distribute meeting minutes (Slaathaug).
   Complete.

MEETING MINUTES

SUBJECT: **CESIUM/STRONTIUM CAPSULE DISPOSITION DECISION BOARD MEETING #4 MINUTES**

TO: Distribution	BUILDING			
FROM:	CHAIRMAN Luc de Lamartinie			
DEPARTMENT-OPERATION-COMPONENT	AREA	SHIFT	DATE OF MEETING January 29, 1997	NUMBER ATTENDING 8

Attendees: George Reddick, Steve Schaus,* Eric Slaathaug, Dwayne Speer,* Luc de Lamartinie,** Ron Claghorn, Langdon Holton,* Ken Gasper*

*Decision Board Member
**Decision Maker

Statement of Decision — Should the cesium and strontium capsules be overpacked or their contents vitrified for purposes of final disposal at the geologic repository assuming both waste forms are acceptable?

Objective

Steve Schaus stated that the main objective of this meeting was for the decision board members to reach a consensus as to their recommendation to DOE for the disposition of the cesium and strontium capsules.

Minutes

Steve Schaus began by updating the attendees as to the status of the DWPF option that was proposed by Phil LaMont in meeting #3. He stated that we have contracted Savannah River (Joe Gentilucci) to perform a study as to the feasibility and costs associated with the vitrification of the capsule contents at the DWPF. He gave a "heads up" to Dwayne Speer that they should be contacting him shortly regarding the costs for transporting the capsules to the DWPF. Steve went on to state that the decision could still be made before the study is completed, but the results of the DWPF option would be included in the board's recommendation. The trade study would be completed as part of the 3/31 deliverable to RL.

Langdon Holton then stated that when a decision is made, it could possibly contain a several caveats. After some debate, Luc de Lamartinie settled the point by stating that the board should recommend a solution, but caveat it as needed. The decision will have uncertainties (impact of Phase I, acceptance of salt at repository, etc.) and therefore should state so.

MEETING MINUTES (Continued)

Langdon then stated that the board must be careful to not detrimentally impact long term planning with its decision.

Langdon Holton then brought up the point that the Capsule Management Plan (authored by Bob Filbert) may be an outlier (not consistent with the TWRS's recommendation for disposition of the capsules). Dwayne Speer stated that the beneficial use contracts would need to be in place by the end of this fiscal year - which he believes to be unlikely. George Reddick then commented that even if the capsules are declared waste - which they would have to be to be disposed of - this does not preclude their use at a later date. The declaration of the capsule as waste is not irreversible. Steve Schaus then concluded the discussion by stating that even if some capsules are earmarked for beneficial uses, it is highly unlikely that all would be. Also the capsules that would be used would be returned to DOE eventually for disposal. Therefore the decision made by the board would still be valid, just the timing would be different.

Langdon Holton then brought up some questions/comments he had about the trade study. The first was that when some cesium/strontium solutions were vitrified onsite, they were declared as remote handled transuranic. However TWRS has always held the position that they will be declared as HLW. This is an inconsistency in designation. George Reddick then asked how the RH-TRU designation originated. Langdon explained that the glass was made out of cesium and strontium solutions before the solutions were made into salt. Possibly the solutions were contaminated in B-Plant with transuranics (even though - as Langdon and George Reddick pointed out - B-Plant did not contain any TRU). Isotopics of the glass showed that it was contaminated with defense material and not private industry TRU. It was then asked why this is a problem. Steve Schaus stated that if the capsules are RH-TRU the geologic repository could not accept them. Luc de Lamartinie then asked Ron Claghorn to obtain a good definition of the terms and to review and propose a solution.

Langdon's second comment dealt with the treatment of the non-standard capsules. George Reddick stated that the material in 327 will be re-encapsulated and transported to WESF. Dwayne Speer added that the new capsules will look different, but they will have the same integrity. Also the capsule material will be out of the 300 area this fiscal year. Luc de Lamartinie concluded the discussion by stating that the document will address the treatment of the non-standard capsules.

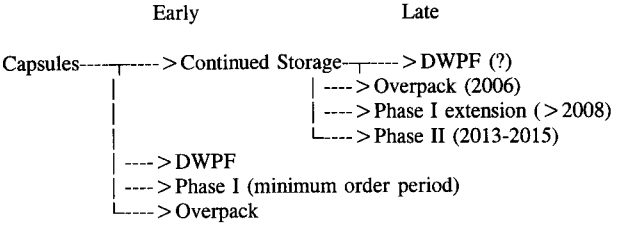
Langdon's third comment was that he liked the addition of the correspondence between RW and RL. In this correspondence, he noted that RW was to look at disposing the capsule salt in the repository in FY '97. Steve Schaus then stated that this was cut from their budget and is not scheduled to be completed anytime in the immediate future.

MEETING MINUTES (Continued)

Ken Gasper then noted that Steve Schaus' diagram on the white board (see below) had the DWPF option in Phase I only. He questioned this because he did not believe it proper that DWPF be ruled out even if it was concluded that earlier processing of the capsules was not better because of impacts on Phase I.

	Vitrification	Overpacking
Later	Phase II HLW Vitrification Facility*	Phase II HLW Vitrification Facility
Earlier	Phase I HLW Vitrification Facility or DWPF	CSB or Phase I HLW Vitrification Facility

Steve stated that he did this because the DWPF option was to be considered only as an early out option. Also since DWPF operations are scheduled to be completed by 2016, waiting will leave less material to blend the capsule contents with. Ken countered by stating that if Phase II fails or no HLW contract is granted in Phase I, DWPF may be THE option. Luc de Lamartinie then stated that the document should address the impacts schedule changes will have on the recommendation. Langdon Holton then drew the following figure on the white board. He stated that this logic would preclude the use of Phase I processing during the minimum order quantity period.



MEETING MINUTES (Continued)

Steve Schaus suggested that the board's recommendation could be simply laid out to vitrify the capsule contents in Phase II. Luc de Lamartinie then pointed out that Phase I processing and the DWPF options are outside of the PHMC's responsibility and therefore would be difficult for us to make recommendations about. Steve then stated that this supports the Phase II processing option as the recommended decision because it is the one that we have the most influence on.

Ken Gasper then proposed eliminating the overpacking options and thereby reduce the complexity of the decision. Langdon Holton then asked if there is anyone who would challenge the decision to eliminate the overpacking options. No one could come up with anyone, but Steve Schaus did state that the EIS recommended continued storage for 10 years and then reevaluating the decision at that time.

Luc de Lamartinie then stated that he is not presently happy with the overpacking costs. Why are there only 8 capsules per overpack? Why are we using the canister size we are? Is the cost for the repository on a per cubic meter basis? Steve Schaus then stated that the cost is on a per canister basis, not a cubic meter basis. He went on to state that the canister size was chosen for commonality and that more capsules may cause heat transfer problems. Langdon Holton then added that changing the internal canister design or using He instead of air as the heat transfer medium may eliminate the heat transfer problems. Steve countered by stating that any incremental canisters will increase the cost for the option. George Reddick then stated that there may be wattage limits imposed on the CSB, transport casks, or at the repository that may limit the amount of capsules that can be put into a canister. Eric Slaathaug then added that adding suboptions to an option that may be impossible to implement (due to the repository probably not accepting the capsules in salt form) may be a waste of manpower, time, and money. Luc de Lamartinie then stated that he would prefer that the document cover all arguments for overpacking. Therefore he would like to meet with Steve Schaus, Eric Slaathaug, and Ron Claghorn to discuss what impacts incorporating changes to the overpacking options would have on the projects overall cost and schedule.

Luc de Lamartinie then stated that he is not secure with the WESF costs used in the document. He asked Dwayne Speer if the costs are for the storage of the capsules only or if other costs are included. Dwayne stated that the current cost for WESF is $12-$13 million/year which includes the costs for upgrading WESF for continued operations. He went on to state that the $8 million/year used in the document was a number that he felt comfortable with using, but it may not be fully optimized. Luc de Lamartinie then asked if the costs for capsules can be separated out of the total. Not entirely, Dwayne stated. Some things may be able to be discounted, but others are coupled. Luc stated that he would feel

MEETING MINUTES (Continued)

more comfortable recommending the late option (Phase II) if the dollar difference between the early and late options were less. Steve Schaus then pointed out that the decision to vitrify may not be monetarily driven, but politically driven. Langdon Holton then stated that the decision and the document should place less emphasis on cost.

Tasks and Status

1. Address misdesignation of vitrified capsule contents. (Claghorn/Holton).
   Langdon Holton sent a note to Patrick Weaver dated 1/30/97 (see attached)

2. Discuss alternative overpacking options. (Claghorn, de Lamartinie, Schaus, Slaathaug).
   Discussions ongoing

3. Determine if WESF costs for capsule storage can be separated from overall WESF costs (Speer).
   In progress

4. Type up and distribute meeting minutes (Slaathaug).
   Complete.

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DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	R. D. Claghorn, Numatec Hanford Corporation	Date 3/20/97
Project Title/Work Order		EDT No. 617649
Decision Document for the Final Disposition of Cesium and Strontium Capsules, HNF-SD-WM-RPT-294, Revision 0		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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G. E. Kulynych	H5-31	X			
L. de Lamartinie	H5-61	X			
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R. J. Murkowski	H5-03	X			
R. W. Powell	H5-03	X			
E. H. Randklev	H5-27	X			
G. W. Reddick	N1-26	X			
P. S. Schaus	G3-21	X			
E. J. Slaathaug	H5-49	X			
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D. J. Washenfelder	H5-27	X			