CNWRA *A center of excellence in earth sciences and engineering*

A Division of Southwest Research Institute
6220 Culebra Road • San Antonio, Texas, U.S.A. 78228-5166
(210) 522-5160 • Fax (210) 522-5155

September 8, 1999
Contract No. NRC-02-97-009
Account No. 20-1407-001

U.S. Nuclear Regulatory Commission
Attn: Dr. C.A. Greene
Office of Nuclear Material Safety and Safeguards
TWFN Mail Stop 7C-24
11545 Rockville Pike
Washington, DC 20555

Subject: Transmittal of Report "Review of the U.S. Department of Energy Evaluation of the Disposability of Aluminum-Based Spent Nuclear Fuel—Final Report" (IM 20-1407-001-930)

Reference: NRC comments letter dated August 17, 1999 to N. Sridhar from C. Greene, Savannah River Site Aluminum-Based Spent Fuel (SRSASF) Intermediate Milestone 20-1407-001-930: Review of the U.S. Department of Energy Evaluation of the Disposability of Aluminum-Based Spent Nuclear Fuel—Final Report

Dear Dr. Greene:

Enclosed please find the subject report, which incorporates changes to address NRC comments in the referenced letter. Please discard the report sent on September 7, 1999. If you need further clarification, please do not hesitate to call me at (210) 522-5538 or Sean Brossia at (210) 522-5797.

Sincerely yours,

N. Sridhar

Narasi Sridhar
Element Manager
Corrosion Science & Process Engineering

NH15

NS:SB:jg
Enclosures

cc:

J. Linehan	W. Reamer	K. Chang	CNWRA EMs
D. DeMarco	S. Wastler	J. Holonich	J. Weldy
B. Stiltenpole	B.J. Davis	J. Greeves	S. Brossia
B. Meehan	C. Green (3)	D. Dancer	A. Chowdhury
T. Ahn	D. Brooks	W. Patrick	T. Nagy (SwRI Contracts)
J. Contardi	K. Stablein	CNWRA Dir.	

Washington Office • Twinbrook Metro Plaza #210
12300 Twinbrook Parkway • Rockville, Maryland 20852-1606

delete all distribution except: File Center + NRC PDR

Responses to comments and suggestions by NRC on 20-1407-001-930 SRSASF Final Report

1. **Concern about placing report in PDR:**

   There is language in several sections of the deliverable (2.3, 3, 3.1, and 3.2) that refers to Part 63 and requirements therein. The way the author phrases certain points could be misconstrued. For instance, in Section 3.1.1, the "postclosure requirements in the proposed NRC regulation in 10 CFR 63.113 do not specifically require criticality control. However, to meet the system performance requirements stated in Part 63.113 and to demonstrate the efficacy of multiple barriers, DOE should evaluate the adverse consequences due to criticality events." The second sentence in this quote seems to require that DOE has to do more than what is actually required in proposed Part 63. According to 63.114 (e) and (f) Features, Events, and Processes (FEPs; such as criticality) "must be evaluated in detail if the magnitude and time of the resulting expected annual dose would be significantly changed by their omission." Also FEPs can be excluded from the performance assessment based on probability arguments (63.114 (d)).

   The NRC staff does agree with the CNWRA's conclusion that "DOE should evaluate the adverse consequences due to criticality." However, the reasons are not Part 63.113 and to demonstrate the efficacy of multiple barriers. In reality, the reasons are to determine whether criticality would cause " the magnitude and time of the resulting expected annual dose would [to] be significantly changed by their omission."

   Accept. We have changed the text in these locations to more accurately reflect what is required in 10 CFR Part 63.

2. **Provide a reference (Federal Register) for the proposed Part 63 rule.**

   Accept. Citation to the Federal Register has been added.

3. **There is a question in regard to the basis for the DOE criterion of 350 °C canister temperature limit.**

   The DOE's temperature limit of 350 °C originated in the MGDS-DIS document in which the DOE examined the requirements for public heath and environmental safety set forth by the EPA and NRC. This has been clarified in the text, as well as clarification that the technical basis for this temperature limit was based on cladding creep.

4. **Tae has done some work on the thermal stability of canister construction materials and has pointed out that nitrides may form (Section 2.1.3, second paragraph of Center report).**

   Thermal embrittlement of the canister materials is certainly possible. In light of the temperatures involved during interim storage (200 °C) it doesn't seem likely that thermal embrittlement of 316L will occur. For example, the time-temperature-transformation curves for carbide formation in 316 indicate that carbide formation is unlikely at temperatures below about 400 °C (Weiss and

Stickler, 1972; Hall and Briant, 1984). Given that other phases, such as nitrides, σ, and χ form at even higher temperatures than carbides, it doesn't seem that thermal embrittlement of 316L at these temperatures will be a significant issue. Furthermore, nitrides do not typically occur in austenitic alloys containing low nitrogen, such as 316 L SS. They can form in the ferritic phase in welds if nitrogen is high (above 0.1%). That being said, however, it is still recommended that the DOE examine this in further detail.

5. **For the acceptance criteria for interim dry storage (2.4/2.4.1 Statement of issue) the governing rule should be referenced, i.e., part 72.**

This citation has been added to this section. The focus of the section, though, was not to examine the acceptance criteria for the fuel in light of 10 CFR Part 72, but rather to examine what impact the acceptance criteria may have on disposability. This has been clarified in the text.

6. **Section 2.4.3, what is the strategy for acceptance if the integrity of the canister is not maintained throughout the interim storage period?**

This section only deals with acceptance of the fuel, not the canister and does not discuss the canister at all. The issues with regard to canister integrity are addressed in section 2.1. In general, though, the DOE has not fully examined what they would do if canister integrity is not maintained throughout the interim storage period.

7. **Draft ASTM standard should be included in the list of references.**

The draft ASTM has been added to the reference section.

EDITORIAL COMMENTS

1. 3.1.1: first paragraph: 10CFR6/3/.113

Accept.

2. 3.3.2.2: first paragraph: foreign /research/ reactors

Accept.

3. 4.1: missing word - canister /and/ waste form.

Accept.

4. 4.2: first bullet, second sentence: sentence ends peculiarly - DOE should describe techniques /required/to ensure...

Accept.

5a. Exec Summary, first paragraph, last sentence: take out word /and/.

Accept.

5b. Exec Summary, second paragraph: preclosure operations --> ISA

Accept.

6. 2.1.3: first paragraph: missing /s/ - possibility for localized corrosion of canister exist/s/

Accept.

7. 2.2.2: first paragraph: specify type of fuel assemblies - /Material Test Reactor (MTR)/ fuel assemblies) was used...

Accept.

8. 2.2.3: second paragraph: Al-base/d/ SNF....

Accept.

9. 2.3.2: second paragraph: take away parentheses from UxAlySiz

Accept.

10. 2.3.3: extra word /are/

Accept.

REFERENCES

Hall, E.L. and C.L. Bryant. 1984. Chromium depletion in the vicinity of carbides in sensitized austenitic stainless steels. *Metallurgical Transactions A* 15A, 793-811.

Weiss, B. and R. Stickler. 1972. Phase instabilities during high temperature exposure of 316 austenitic stainless steel. *Metallurgical Transactions* 3, 851-866.