Enclosure 3 to DPG-19-042

RAIs and Responses
(non-proprietary version)

Chapter 2 - Scoping Evaluation

RAI 2-1

Provide information on sources of the safety classification for the Fuel Only (FO), Fuel with Control Components (FC), and Failed Fuel (FF) dry shielded canister (DSC) subcomponents in Table 2-6 and for the transfer cask subcomponents in Table 2-8 of the LRA, and revise Table 2-6 and Table 2-8 and modify the LRA as described below, as appropriate. If the resolution of this RAI causes a subcomponent to be added to the scope of renewal, an aging management review and aging management activities for this subcomponent should be provided. This information is needed to determine compliance with 10CFR 72.24(c) and 72.42(a).

Table 2-6 and Table 2-8 of the LRA provide the scoping evaluation results for the DSCs and transfer cask, in which the safety classification of each of subcomponents and the source drawings are identified; however, the staff is unable to identify documentation that shows safety classification of the subcomponents.

If the resolution of this RAI causes a subcomponent to be added to the scope of renewal, an aging management review and aging management activities for this subcomponent should be provided.

This information is needed to determine compliance with 10 CFR 72.24(c) and 72.42(a).

Response to RAI 2-1:

The safety classifications for the DSCs and transfer cask were obtained from the drawings listed in the notes at the end of LRA Table 2-6 and Table 2-8, which are provided in Enclosure 4 of this response submittal. These drawings are for the fabrication of the SMUD-specific components.

To aid the staff's review of the information, SMUD has generated two cross-matrix tables (Tables RAI 2-1-1 and RAI 2-1-2) that correlate each subcomponent listed in the LRA tables to the drawing and item number containing the safety classification. As a result of the review, SMUD identified items where additional clarification is warranted or where the safety classification for storage under 10 CFR Part 72 was changed. These items and clarifications are presented in Table RAI 2-1-3. Note that while the drawings listed in the notes at the end of LRA Table 2-6 indicate they are for a particular DSC, SMUD has reviewed the drawings for all the DSCs of that type and has ensured that the safety classification on the drawings listed in the notes are applicable to all the DSCs of that type.

The review also identified an incomplete listing of drawings in Note 1 of LRA Table 2-6 and a typographical error in the DSC serial number for the Failed Fuel DSC in LRA Table 2-11. These items have been corrected.

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4004	16	NUHOMS®-FO DSC	1	Cylindrical Shell	NUH-05-1021-FO1	0	1
NUH-05-4004	16	NUHOMS®-FO DSC	2	Outer Bottom Cover	NUH-05-1021-FO1	0	2
NUH-05-4004	16	NUHOMS®-FO DSC	3	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	4	Grapple Ring	NUH-05-1021-FO1	0	4
NUH-05-4004	16	NUHOMS®-FO DSC	5	Grapple Ring Support	NUH-05-1021-FO1	0	5
NUH-05-4004	16	NUHOMS®-FO DSC	6	Inner Bottom Cover	NUH-05-1021-FO1	0	6
NUH-05-4004	16	NUHOMS®-FO DSC	7	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	8	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	9	Spacer Disc Type “C”	NUH-05-1020-FO1	0	3
NUH-05-4004	16	NUHOMS®-FO DSC	10	Spacer Disc Type “A”	NUH-05-1020-FO1	0	1
NUH-05-4004	16	NUHOMS®-FO DSC	11	Guide Sleeve	NUH-05-1024-FO1 NUH-05-1025-FO1	0	1
NUH-05-4004	16	NUHOMS®-FO DSC	12	Oversleeve	NUH-05-1024-FO1 NUH-05-1025-FO1	0	3
NUH-05-4004	16	NUHOMS®-FO DSC	13	Spacer Disc Type “B”	NUH-05-1020-FO1	0	2
NUH-05-4004	16	NUHOMS®-FO DSC	14	Neutron Absorber Sheet	NUH-05-103-01	2	N/A
NUH-05-4004	16	NUHOMS®-FO DSC	15	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	16	Support Rod	NUH-05-1020-FO1	0	15
NUH-05-4004	16	NUHOMS®-FO DSC	17	Shear Key	NUH-05-1021-FO1	0	7
NUH-05-4004	16	NUHOMS®-FO DSC	18	Extension Plate	NUH-05-1024-FO1 NUH-05-1025-FO1	0	5
NUH-05-4004	16	NUHOMS®-FO DSC	19	Key	NUH-05-1022-FO1	0	3
NUH-05-4004	16	NUHOMS®-FO DSC	20	Siphon & Vent Block	NUH-05-1022-FO1	0	4

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4004	16	NUHOMS®-FO DSC	21	Siphon Tubing	NUH-05-1022-FO1	0	5
NUH-05-4004	16	NUHOMS®-FO DSC	22	Male Connector	NUH-05-1022-FO1	0	6
NUH-05-4004	16	NUHOMS®-FO DSC	23	Quick Connect, 1/2" Male	NUH-05-1022-FO1	0	7
NUH-05-4004	16	NUHOMS®-FO DSC	24	Lifting Lug	NUH-05-1022-FO1	0	8
NUH-05-4004	16	NUHOMS®-FO DSC	25	Support Ring	NUH-05-1022-FO1	0	9
NUH-05-4004	16	NUHOMS®-FO DSC	26	Top Shield Plug	NUH-05-1023-FO1	0	2
NUH-05-4004	16	NUHOMS®-FO DSC	27	Bottom Shield Plug	NUH-05-1021-FO1	0	3
NUH-05-4004	16	NUHOMS®-FO DSC	28	Inner Top Cover Plate	NUH-05-1023-FO1	0	5
NUH-05-4004	16	NUHOMS®-FO DSC	29	Outer Top Cover Plate	NUH-05-1023-FO1	0	3
NUH-05-4004	16	NUHOMS®-FO DSC	30	Siphon & Vent Port Cover Plate	NUH-05-1023-FO1	0	4
NUH-05-4004	16	NUHOMS®-FO DSC	31	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	32	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	33	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	34	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	35	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	36	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	37	Top End Spacer Sleeve	NUH-05-1020-FO1	0	7
NUH-05-4004	16	NUHOMS®-FO DSC	38	Bottom End Spacer Sleeve	NUH-05-1020-FO1	0	14
NUH-05-4004	16	NUHOMS®-FO DSC	39	Spacer Sleeve Type 1	NUH-05-1020-FO1	0	8
NUH-05-4004	16	NUHOMS®-FO DSC	40	Spacer Sleeve Type 2	NUH-05-1020-FO1	0	9

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4004	16	NUHOMS®-FO DSC	41	Spacer Sleeve Type 3	NUH-05-1020-FO1	0	10
NUH-05-4004	16	NUHOMS®-FO DSC	42	Spacer Sleeve Type 4	NUH-05-1020-FO1	0	11
NUH-05-4004	16	NUHOMS®-FO DSC	43	Spacer Sleeve Type 5	NUH-05-1020-FO1	0	12
NUH-05-4004	16	NUHOMS®-FO DSC	44	Spacer Sleeve Type 6	NUH-05-1020-FO1	0	13
NUH-05-4004	16	NUHOMS®-FO DSC	45	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	46	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	47	Stop Plate	NUH-05-1020-FO1	0	6
NUH-05-4004	16	NUHOMS®-FO DSC	48	Plate, 0.085 Thk	NUH-05-1024-FO1 NUH-05-1025-FO1	0	4
NUH-05-4004	16	NUHOMS®-FO DSC	49	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	50	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	51	{Not Used}			
NUH-05-4004	16	NUHOMS®-FO DSC	52	{Not Used}			
NUH-05-4004	16	NUHOMS®-FC DSC	1	Cylindrical Shell	NUH-05-1051-FC1	0	1
NUH-05-4004	16	NUHOMS®-FC DSC	2	Outer Bottom Cover	NUH-05-1051-FC1	0	2
NUH-05-4004	16	NUHOMS®-FC DSC	3	Lead Shielding	NUH-05-1051-FC1	0	3
NUH-05-4004	16	NUHOMS®-FC DSC	4	Grapple Ring	NUH-05-1051-FC1	0	4
NUH-05-4004	16	NUHOMS®-FC DSC	5	Grapple Ring Support	NUH-05-1051-FC1	0	5
NUH-05-4004	16	NUHOMS®-FC DSC	6	Inner Bottom Cover	NUH-05-1051-FC1	0	6
NUH-05-4004	16	NUHOMS®-FC DSC	7	Bottom Plug Post	NUH-05-1051-FC1	0	7
NUH-05-4004	16	NUHOMS®-FC DSC	8	{Not Used}			

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4004	16	NUHOMS®-FC DSC	9	Spacer Disc Type "C"	NUH-05-1050-FC1	0	3
NUH-05-4004	16	NUHOMS®-FC DSC	10	Spacer Disc Type "A"	NUH-05-1050-FC1	0	1
NUH-05-4004	16	NUHOMS®-FC DSC	11	Guide Sleeve	NUH-05-1054-FC1 NUH-05-1055-FC1	0	1
NUH-05-4004	16	NUHOMS®-FC DSC	12	Oversleeve	NUH-05-1054-FC1 NUH-05-1055-FC1	0	3
NUH-05-4004	16	NUHOMS®-FC DSC	13	Spacer Disc Type "B"	NUH-05-1050-FC1	0	2
NUH-05-4004	16	NUHOMS®-FC DSC	14	Neutron Absorber Sheet	NUH-05-103-01	2	N/A
NUH-05-4004	16	NUHOMS®-FC DSC	15	{Not Used}			
NUH-05-4004	16	NUHOMS®-FC DSC	16	Support Rod	NUH-05-1050-FC1	0	15
NUH-05-4004	16	NUHOMS®-FC DSC	17	Shear Key	NUH-05-1051-FC1	0	13
NUH-05-4004	16	NUHOMS®-FC DSC	18	Extension Plate	NUH-05-1054-FC1 NUH-05-1055-FC1	0	7
NUH-05-4004	16	NUHOMS®-FC DSC	19	Key	NUH-05-1052-FC1	0	3
NUH-05-4004	16	NUHOMS®-FC DSC	20	Siphon & Vent Block	NUH-05-1052-FC1	0	4
NUH-05-4004	16	NUHOMS®-FC DSC	21	Siphon Tubing	NUH-05-1052-FC1	0	5
NUH-05-4004	16	NUHOMS®-FC DSC	22	Male Connector	NUH-05-1052-FC1	0	6
NUH-05-4004	16	NUHOMS®-FC DSC	23	Quick Connect, 1/2" Male	NUH-05-1052-FC1	0	7
NUH-05-4004	16	NUHOMS®-FC DSC	24	Lifting Lug	NUH-05-1052-FC1	0	8
NUH-05-4004	16	NUHOMS®-FC DSC	25	Support Ring	NUH-05-1052-FC1	0	9
NUH-05-4004	16	NUHOMS®-FC DSC	26	{Not Used}			
NUH-05-4004	16	NUHOMS®-FC DSC	27	{Not Used}			
NUH-05-4004	16	NUHOMS®-FC DSC	28	Inner Top Cover Plate	NUH-05-1053-FC1	0	5

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4004	16	NUHOMS®-FC DSC	29	Outer Top Cover Plate	NUH-05-1053-FC1	0	3
NUH-05-4004	16	NUHOMS®-FC DSC	30	Siphon & Vent Port Cover Plate	NUH-05-1053-FC1	0	4
NUH-05-4004	16	NUHOMS®-FC DSC	31	Top Plug Bottom Casing	NUH-05-1053-FC1	0	6
NUH-05-4004	16	NUHOMS®-FC DSC	32	Top Plug Side Casing	NUH-05-1053-FC1	0	7
NUH-05-4004	16	NUHOMS®-FC DSC	33	Top Plug Top Casing	NUH-05-1053-FC1	0	8
NUH-05-4004	16	NUHOMS®-FC DSC	34	Top Plug Lifting Post	NUH-05-1053-FC1	0	9
NUH-05-4004	16	NUHOMS®-FC DSC	35	{Not Used}			
NUH-05-4004	16	NUHOMS®-FC DSC	36	Plate, Stiffening	NUH-05-1053-FC1	0	10,11
NUH-05-4004	16	NUHOMS®-FC DSC	37	Top End Spacer Sleeve	NUH-05-1050-FC1	0	7
NUH-05-4004	16	NUHOMS®-FC DSC	38	Bottom End Spacer Sleeve	NUH-05-1050-FC1	0	14
NUH-05-4004	16	NUHOMS®-FC DSC	39	Spacer Sleeve Type 1	NUH-05-1050-FC1	0	8
NUH-05-4004	16	NUHOMS®-FC DSC	40	Spacer Sleeve Type 2	NUH-05-1050-FC1	0	9
NUH-05-4004	16	NUHOMS®-FC DSC	41	Spacer Sleeve Type 3	NUH-05-1050-FC1	0	10
NUH-05-4004	16	NUHOMS®-FC DSC	42	Spacer Sleeve Type 4	NUH-05-1050-FC1	0	11
NUH-05-4004	16	NUHOMS®-FC DSC	43	Spacer Sleeve Type 5	NUH-05-1050-FC1	0	12
NUH-05-4004	16	NUHOMS®-FC DSC	44	Spacer Sleeve Type 6	NUH-05-1050-FC1	0	13
NUH-05-4004	16	NUHOMS®-FC DSC	45	Angle, 1-1/4 x 1-1/4 x 1/4	NUH-05-1054-FC1 NUH-05-1055-FC1	0	4
NUH-05-4004	16	NUHOMS®-FC DSC	46	Plate. 1.25 x	NUH-05-1054-FC1	0	5

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
				1.25 x 1/4	NUH-05-1055-FC1		
NUH-05-4004	16	NUHOMS®-FC DSC	47	Stop Plate	NUH-05-1050-FC1	0	6
NUH-05-4004	16	NUHOMS®-FC DSC	48	Plate, 0.085 Thk	NUH-05-1054-FC1 NUH-05-1055-FC1	0	6
NUH-05-4004	16	NUHOMS®-FC DSC	49	Bottom Plug Top Casing	NUH-05-1051-FC1	0	8
NUH-05-4004	16	NUHOMS®-FC DSC	50	Bottom Plug Side Casing	NUH-05-1051-FC1	0	11
NUH-05-4004	16	NUHOMS®-FC DSC	51	Plate, Stiffening	NUH-05-1051-FC1	0	9. 10
NUH-05-4004	16	NUHOMS®-FC DSC	52	Plate	NUH-05-1051-FC1	0	12
NUH-05-4005	14	NUHOMS®-FF DSC	1	Cylindrical Shell	NUH-05-1032-FF1	0	1
NUH-05-4005	14	NUHOMS®-FF DSC	2	Outer Bottom Cover	NUH-05-1032-FF1	0	2
NUH-05-4005	14	NUHOMS®-FF DSC	3	Key	NUH-05-1033-FF1	0	9
NUH-05-4005	14	NUHOMS®-FF DSC	4	Grapple Ring	NUH-05-1032-FF1	0	4
NUH-05-4005	14	NUHOMS®-FF DSC	5	Grapple Ring Support	NUH-05-1032-FF1	0	5
NUH-05-4005	14	NUHOMS®-FF DSC	6	Inner Bottom Cover	NUH-05-1032-FF1	0	6
NUH-05-4005	14	NUHOMS®-FF DSC	7	Spacer Disc	NUH-05-1031-FF1	0	1
NUH-05-4005	14	NUHOMS®-FF DSC	8	Top Spacer Disc	NUH-05-1031-FF1	0	2
NUH-05-4005	14	NUHOMS®-FF DSC	9	Inner Support Plate	NUH-05-1031-FF1	0	3
NUH-05-4005	14	NUHOMS®-FF DSC	10	Outer Support Plate	NUH-05-1031-FF1	0	4
NUH-05-4005	14	NUHOMS®-FF DSC	11	Lead Shielding	NUH-05-1032-FF1 NUH-05-1034-FF1	0	3
NUH-05-4005	14	NUHOMS®-FF DSC	12	Bottom Plug Post	NUH-05-1032-FF1	0	7
NUH-05-4005	14	NUHOMS®-FF DSC	13	{Not Used}			

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4005	14	NUHOMS®-FF DSC	14	{Not Used}			
NUH-05-4005	14	NUHOMS®-FF DSC	15	Siphon & Vent Block	NUH-05-1033-FF1	0	4
NUH-05-4005	14	NUHOMS®-FF DSC	16	Siphon Tubing	NUH-05-1033-FF1	0	5
NUH-05-4005	14	NUHOMS®-FF DSC	17	Male Connector	NUH-05-1033-FF1	0	6
NUH-05-4005	14	NUHOMS®-FF DSC	18	Quick Connect, 1/2" Male	NUH-05-1033-FF1	0	7
NUH-05-4005	14	NUHOMS®-FF DSC	19	Lifting Lug	NUH-05-1033-FF1	0	3
NUH-05-4005	14	NUHOMS®-FF DSC	20	Support Ring	NUH-05-1033-FF1	0	8
NUH-05-4005	14	NUHOMS®-FF DSC	21	Inner Top Cover Plate	NUH-05-1034-FF1	0	6
NUH-05-4005	14	NUHOMS®-FF DSC	22	Outer Top Cover Plate	NUH-05-1034-FF1	0	4
NUH-05-4005	14	NUHOMS®-FF DSC	23	Siphon & Vent Port Cover Plate	NUH-05-1034-FF1	0	5
NUH-05-4005	14	NUHOMS®-FF DSC	24	Top Plug Bottom Casing	NUH-05-1034-FF1	0	7
NUH-05-4005	14	NUHOMS®-FF DSC	25	Top Plug Top Casing	NUH-05-1034-FF1	0	9
NUH-05-4005	14	NUHOMS®-FF DSC	26	Top Plug Side Casing	NUH-05-1034-FF1	0	8
NUH-05-4005	14	NUHOMS®-FF DSC	27	Top Plug Post	NUH-05-1034-FF1	0	10
NUH-05-4005	14	NUHOMS®-FF DSC	28	{Not Used}			
NUH-05-4005	14	NUHOMS®-FF DSC	29	Liner, 1/4" Thk	NUH-05-1030-FF1	0	1
NUH-05-4005	14	NUHOMS®-FF DSC	30	Flange Plate	NUH-05-1030-FF1	0	15
NUH-05-4005	14	NUHOMS®-FF DSC	31	Shear Key	NUH-05-1032-FF1	0	13
NUH-05-4005	14	NUHOMS®-FF DSC	32	Top Lid Cover Plate	NUH-05-1030-FF1	0	15
NUH-05-4005	14	NUHOMS®-FF DSC	33	Bottom Lid Adapter Plate	NUH-05-1030-FF1	0	2

Table RAI 2-1-1 DSC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4005	14	NUHOMS®-FF DSC	34	Top Lid Lifting Pintle	NUH-05-1030-FF1	0	13
NUH-05-4005	14	NUHOMS®-FF DSC	35	Mesh, 6x6	NUH-05-1030-FF1	0	3
NUH-05-4005	14	NUHOMS®-FF DSC	36	Washer Plate	NUH-05-1030-FF1	0	4
NUH-05-4005	14	NUHOMS®-FF DSC	37	Spacer Bar	NUH-05-1030-FF1	0	5
NUH-05-4005	14	NUHOMS®-FF DSC	38	Cover Plate	NUH-05-1030-FF1	0	8
NUH-05-4005	14	NUHOMS®-FF DSC	39	Side Lid Plate	NUH-05-1030-FF1	0	15
NUH-05-4005	14	NUHOMS®-FF DSC	40	Bottom Plug Top Casing	NUH-05-1032-FF1	0	8
NUH-05-4005	14	NUHOMS®-FF DSC	41	Bottom Plug Side Casing	NUH-05-1032-FF1	0	11
NUH-05-4005	14	NUHOMS®-FF DSC	42	Plate, Stiffening	NUH-05-1032-FF1	0	9, 10
NUH-05-4005	14	NUHOMS®-FF DSC	43	Plate	NUH-05-1032-FF1	0	12
NUH-05-4005	14	NUHOMS®-FF DSC	44	Plate, Stiffening	NUH-05-1034-FF1	0	12

Table RAI 2-1-2 TC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-Component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4001	15	MP187	1	Inner Shell	2069-3000	2	1, 29
NUH-05-4001	15	MP187	2	Bottom End Closure, Machined Forge	2069-3000	2	2
NUH-05-4001	15	MP187	3	Bottom Structural Shell	2069-3000	2	3
NUH-05-4001	15	MP187	4	Top Structural Shell	2069-3000	2	4
NUH-05-4001	15	MP187	5	Top Flange, Machined Ring Forge	2069-3000	2	5
NUH-05-4001	15	MP187	6	Gamma Shield	2069-3000	2	6
.	15	MP187	7	Upper Trunnion Plug Cover Plate	2069-3002	1	10
NUH-05-4001	15	MP187	8	Upper Trunnion Plug Side Plate	2069-3002	1	11
NUH-05-4001	15	MP187	9	Upper Trunnion Sleeve	2069-3000	2	9
NUH-05-4001	15	MP187	10	Lower Trunnion Sleeve	2069-3000	2	10
NUH-05-4001	15	MP187	11	Pad Plate	2069-3000	2	11
NUH-05-4001	15	MP187	12	Bearing Block	2069-3000	2	12
NUH-05-4001	15	MP187	13	Tie Bar	2069-3000	2	13
NUH-05-4001	15	MP187	14	NSP Top Support Ring	2069-3000	2	14
NUH-05-4001	15	MP187	15	NSP Bottom Support Ring	2069-3000	2	15
NUH-05-4001	15	MP187	16	NSP Support Angle, Outer	2069-3000	2	16, 17, 18
NUH-05-4001	15	MP187	17	Rupture Plug	2069-3000	2	23
NUH-05-4001	15	MP187	18	Plugs	2069-3000	2	20
NUH-05-4001	15	MP187	19	Neutron Shield Shell	2069-3000	2	19
NUH-05-4001	15	MP187	20	Upper Trunnion Plug Bottom Plate	2069-3002	1	12
NUH-05-4001	15	MP187	21	Rails	2069-3000	2	21
NUH-05-4001	15	MP187	22	Castable Neutron Shield Material	2069-3000 / 2069-3001	2 / 1	22 / 11

Table RAI 2-1-2 TC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-Component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4001	15	MP187	23	Ram Closure Plate	2069-3001	1	2
NUH-05-4001	15	MP187	24	Top Closure Plate	2069-3001	1	3
NUH-05-4001	15	MP187	25	O-ring, Top Closure Plate (69.6 ID)	2069-3001	1	23
NUH-05-4001	15	MP187	26	O-ring, Top Closure Plate (71.4 ID)	2069-3001	1	24
NUH-05-4001	15	MP187	27	Screw, Cap Hd. Soc.	2069-3001	1	6
NUH-05-4001	15	MP187	28	O-ring, Ram Closure Plate (19.4 ID)	2069-3001	1	25
NUH-05-4001	15	MP187	29	O-ring, Ram Closure Plate (17.5 ID)	2069-3001	1	26
NUH-05-4001	15	MP187	30	Screw, Cap Hd. Soc.	2069-3001	1	9
NUH-05-4001	15	MP187	31	Filler Plate	2069-3000	2	8
NUH-05-4001	15	MP187	32	Hardened Washer (3" OD)	2069-3001	1	21
NUH-05-4001	15	MP187	33	Hardened Washer (1.5" OD)	2069-3001	1	22
NUH-05-4001	15	MP187	34	Screw, Cap Hd. Soc.	2069-3002	1	7
NUH-05-4001	15	MP187	35	Test Port Screw	2069-3001	1	15
NUH-05-4001	15	MP187	36	Vent/Drain Port Screw	2069-3001	1	15
NUH-05-4001	15	MP187	37	O-ring (2" ID)	2069-3001	1	16
NUH-05-4001	15	MP187	38	Impact Limiter Attch. Block	2069-3000	2	7
NUH-05-4001	15	MP187	39	Vent/Drain Port Seal	2069-3001	1	17
NUH-05-4001	15	MP187	40	Test Port Seal	2069-3001	1	17
NUH-05-4001	15	MP187	41	Test/Vent/Drain Threaded Insert	2069-3001	1	18
NUH-05-4001	15	MP187	42	Vent/Drain Port Plug	2069-3001	1	19
NUH-05-4001	15	MP187	43	Test Port Plug	2069-3001	1	19
NUH-05-4001	15	MP187	44	Tapered Pin	2069-3001	1	20

Table RAI 2-1-2 TC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-Component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4001	15	MP187	45	Lower Trunnion Plug Cover Plate	2069-3002	1	4
NUH-05-4001	15	MP187	46	Lower Trunnion Plug Shield Block	2069-3002	1	5
NUH-05-4001	15	MP187	47	Screw, Flat Hd. Cap	2069-3002	1	6
NUH-05-4001	15	MP187	48	Spacer Washer	Not Used MP187-1 built using Alternative 2 (2069-3001)	1	N/A
NUH-05-4001	15	MP187	49	NSP Support Angle, Inner	2069-3000	2	24, 25, 26
NUH-05-4001	15	MP187	50	Screw, Thread Insert (1"-8UNC)	2069-3000	2	27
NUH-05-4001	15	MP187	51	Screw, Thread Insert (2"-12UN)	2069-3000	2	28
NUH-05-4001	15	MP187	52	10 Gage Sheet	2069-3002	1	25
NUH-05-4001	15	MP187	53	Tube, 1-1/2" Sch. 40	2069-3002	1	24
NUH-05-4003	10	MP187	1	Castable Neutron Shield Material	2069-3001 / 2069-3002	1 / 1	11 / 1
NUH-05-4003	10	MP187	2	Outer Plug Cover Plate	2069-3002	1	13
NUH-05-4003	10	MP187	3	Outer Plug Sleeve	2069-3002	1	14
NUH-05-4003	10	MP187	4	Nut, 1/2-13UNC-2B	2069-3002	1	15
NUH-05-4003	10	MP187	5	Inner Plug Cover Plate	2069-3002	1	16
NUH-05-4003	10	MP187	6	Inner Plug Sleeve	2069-3002	1	17
NUH-05-4003	10	MP187	7	Inner Plug Inside Sleeve	2069-3002	1	18
NUH-05-4003	10	MP187	8	Pipe, 1" Sch. 40	2069-3002	1	19
NUH-05-4003	10	MP187	9	Lifting Eye, Drop Forged	2069-3002	1	20
NUH-05-4003	10	MP187	10	Bolt, 1-8UNC-2A	2069-3002	1	21
NUH-05-4003	10	MP187	11	Outer Plug Support Bracket	2069-3002	1	22

Table RAI 2-1-2 TC Safety Classification Cross-Matrix

Dwg #	Rev.	Component	Item No.	Sub-Component	Safety Classification Dwg No.	Rev.	Item No.
NUH-05-4003	10	MP187	12	Plate, 1/2" Thk	2069-3002	1	23
NUH-05-4003	10	MP187	13	Key Plug Cover Plate	2069-3002	1	2
NUH-05-4003	10	MP187	14	Flat Hd Socket Cap Screw	2069-3002	1	6
NUH-05-4003	10	MP187	15	Socket Hd Cap Screw	2069-3001	1	14
NUH-05-4003	10	MP187	16	Lower Trunnion	2069-3001	1	12
NUH-05-4003	10	MP187	17	Upper Trunnion	2069-3001	1	13
NUH-05-4003	10	MP187	18	Trunnion Back	2069-3001	1	10
NUH-05-4003	10	MP187	19	Key Plug Side Plate	2069-3002	1	8
NUH-05-4003	10	MP187	20	Key Plug Bottom Plate	2069-3002	1	9
NUH-05-4003	10	MP187	21	Hardened Washer	2069-3001	1	22

Proprietary Information on Pages 14 and 15
Withheld Pursuant to 10 CFR 2.390

[ ]

Impact:

LRA Tables 2-6, 2-8, 2-11, and 3-10 have been revised as described in the response.

Proprietary Information on Pages 17 through 26
Withheld Pursuant to 10 CFR 2.390

RAI 2-4

Provide additional information to address the potential for aging of the canister internals and the canister contents as a result of loss of the inert environment.

The canisters in service at Rancho Seco have a specified leak rate that is greater than the 'leak tight' criteria in ANSI N14.5. Over time, the loss of helium is expected to occur and the potential ingress of air may result in an internal environment that is not completely inert. Provide an analysis to show that the loss of helium and ingress of oxygen is not sufficient to significantly alter the inert environment inside the DSCs that is credited for preventing aging of the canister internals and contents. Alternatively, address the potential aging effects for the canister internals and contents and revise the LRA accordingly.

This information is needed to determine compliance with 10 CFR 72.24(c) and 72.42(a).

Response to RAI 2-4:

While not tested to the ANSI N14.5 leaktight acceptance criterion, the fully-welded Rancho Seco dry shielded canisters (DSCs) were designed, fabricated, inspected and tested to prohibit any release of the helium gas inside the fuel cavity, as stated in Rancho Seco FSAR Volume I, Sections 7.6.1 and 8.2.2. The licensing basis helium leak rate limit for the DSC described in Rancho Seco independent spent fuel storage installation (ISFSI) Technical Specification (TS) LCO 3.1.2 is 1×10^{-5} std cc/sec. This leak rate limit is an artifact of the Rancho Seco ISFSI initial license application review and approval occurring before the publication of NRC Interim Staff Guidance (ISG)-18 [1], which permitted licensing fully-welded spent fuel canisters as "leaktight" for the first time. The Rancho Seco DSC enclosure vessel design is the same as the NUHOMS® DSC designs that were licensed as "leaktight" after the publication of ISG-18.

SMUD recognizes that the Rancho Seco licensing basis includes a non-zero leak rate for the welded DSCs based on the licensing limitations existing prior to issuance of ISG-18. Therefore, an evaluation of the hypothetical impact of helium leaking from the DSC welded canister pressure boundary at the TS limit through the period of extended operation (PEO) has been performed. This evaluation conservatively determined that the helium loss would be less than 0.58% of the initial helium inventory and potential ingress of air into the canister would be less than 0.25% initial helium inventory. These small changes will have a negligible impact on the inert environment in the DSC during the PEO.

A summary of the evaluation has been added to Appendix A of the LRA.

Reference

1. Division of Spent Fuel Storage and Transportation, Interim Staff Guidance – 18, Revision 1, "The Design and Testing of Lid Welds on Austenitic Stainless Steel Canisters as the Confinement Boundary for Spent Fuel Storage," October 2008.

Impact:

LRA Section A.2.5 has been added as described in the response.

RAI 2-5

Justify how fuel transfer equipment originally used for retrievability is no longer classified as ITS and thus outside the scope of the renewal.

Section 2.3.2.1 of the renewal application states in part:

"The fuel transfer and auxiliary equipment are NITS items and their failure would not prevent fulfilment of any intended function supporting storage operations. The auxiliary equipment used to retrieve the DSCs from the HSMs is subject to standard maintenance and repair prior to use. Hence, the fuel transfer and auxiliary equipment does not meet scoping Criterion 2 and, therefore, are not in the scope of renewal."

However, Table 3-11 of the original licensing basis (i.e., Final Safety Analysis Report) states that transfer related equipment such as the cask, cask lifting yoke, and lifting yoke extensions are ITS. Justify how these ITS components are no longer ITS, and why they are not within the scope of the renewal when they are needed to satisfy retrievability. Provide any TLAA calculations for these components and update the FSAR as necessary.

This information is necessary to determine compliance with 10 CFR 72.122(h)(5) and 10 CFR 72.122(l).

Response to RAI 2-5:

The MP187 transfer cask is an important-to-safety (ITS) component under 10 CFR 72 and is in-scope for renewal as shown in LRA Table 2-1 because the MP187 transfer cask is used to retrieve the dry shielded canister (DSC) from the horizontal storage module (HSM). Other equipment included in the term "fuel transfer and auxiliary equipment" is defined in the first paragraph of LRA Subsection 2.3.2.1. All fuel transfer and auxiliary equipment except the MP187 transfer cask, cask lifting yoke and lifting yoke extensions is classified not important to safety (NITS) in Rancho Seco ISFSI FSAR, Volume I, Table 3-11. This NITS equipment was evaluated against scoping Criterion 2 of NUREG-1927 as described in LRA Subsection 2.3.2.1 and determined to be out of scope for renewal.

Rancho Seco ISFSI FSAR, Volume I, Table 3-11 lists the cask lifting yoke and lifting yoke extensions as ITS and QA Class 1 under the "Rancho Seco QA Classification" heading. Those designations are modified by a note beneath Table 3-11 that states "Graded Quality (per Standardized NUHOMS® SAR) [3.3.2]." Standardized NUHOMS® FSAR, Revision 4A, Section 3.4.4.1 states the following (reference citations omitted):

> The lifting yoke used for handling of the transfer cask within the fuel/reactor building is designed and procured as a "safety related" component as it is used by the licensee (utility) under the 10 CFR 50 program. The lifting yoke is controlled by NUREG-0612 and is designed to ANSI N14.6-1986 criteria for non-redundant yokes. Therefore, the lifting yoke is designed, constructed, and tested in accordance with "safety related" requirements as defined by 10CFR50, Appendix B and described in Chapter 11.

The “Class 1” designation under the Rancho Seco QA program as depicted in FSAR Table 3-11 is reflective of the use of the 10 CFR 50, Appendix B QA program under both the 10 CFR 50 and 10 CFR 72 licenses at the site. Table 3-11 of the Rancho Seco FSAR makes no distinction as to how this designation applies to the design functions of the cask lifting yoke and lifting yoke extensions under the respective licenses.

Additional citations from the Rancho Seco ISFSI FSAR pertaining to the safety classification of the cask lifting yoke and lifting yoke extensions are as follows:

- Volume I Section 3.2 states: “Since the cask will not be lifted over 80 inches once placed on the transfer trailer, the lifting yoke is not important to safety for storage purposes; however, it is given this classification to satisfy the evaluation of lifting the cask onto the transfer trailer under the Rancho Seco 10 CFR 50 license.”
- Volume I, Section 3.3.3.1 states: “…the cask lifting yoke and extensions are designated important to safety. Other important to safety equipment is required for handling operations within the RSNGS fuel building. These operations are performed under the RSNGS 10 CFR 50 operating license.”
- Volume I, Section 4.2.1 states: “In accordance with 10 CFR 72.3, the only components at the Rancho Seco ISFSI important to safety are the DSCs, HSMs, cask, and cask lifting yoke and extensions.”

SMUD has performed a review of the above FSAR statements in the context of the timeframe in which the FSAR was developed, which needed to reflect the use of the cask lifting yoke and lifting yoke extensions during fuel loading and cask handling in the Rancho Seco Fuel Building and DSC movements to the ISFSI. SMUD has determined that the intent of the QA Class 1 designation in Rancho Seco FSAR Table 3-11 is reflective only of these components’ functions under the (recently terminated) 10 CFR 50 license to prevent a cask drop inside the Rancho Seco Fuel Building. (These statements have not yet been formally revised to reflect the termination of the Part 50 license, which is an ongoing effort.)

The Rancho Seco Fuel Handling Building is decommissioned and no longer available for use. Further, there is no design basis activity under the Rancho Seco 10 CFR 72 ISFSI license requiring use of the cask lifting yoke or lifting yoke extensions. Thus, any reference to the cask lifting yoke and lifting yoke extensions being classified as ITS is historical information and solely in the context of their use under the now-terminated Rancho Seco 10 CFR 50 operating license. The cask lifting yoke and lifting yoke extensions are not required to retrieve the DSC from the HSM (as described further below) nor are they required for any other normal, off-normal, or accident storage activity or event through the period of extended operation (PEO). Therefore, they are out of scope for ISFSI license renewal. This is consistent with LRA Sections 1.3.1 and 2.3.2.1 and Note 4 beneath LRA Table 2-1.

The Rancho Seco licensing basis for retrieval is on a canister basis as described in LRA Section 2.2.1. No cask lifting yoke or lifting yoke extension is required to retrieve the DSC from the HSM because the MP187 transfer cask is not lifted by its trunnions or handled in the vertical orientation during retrieval of a DSC from an HSM. The DSC is retrieved using the hydraulic ram system to pull the DSC from the HSM directly into the MP187 transfer cask in the horizontal orientation. Please see the response to RAI B-5 for additional discussion of DSC retrieval operations and the transition of activities governed by 10 CFR 72 to those governed by 10 CFR 71. LRA Section 2.3.2.1 and Table 2-1 have been revised to clarify the scoping evaluation of the lifting yoke and extensions.

In preparing this RAI response, SMUD has determined that the current Rancho Seco FSAR information could lead to confusion with respect to the safety classification and the function of the cask lifting yoke and lifting yoke extensions during the ISFSI period of extended operation (PEO). Therefore, the Rancho Seco ISFSI FSAR is proposed to be clarified with regard to the cask lifting yoke and lifting yoke extensions as shown in revised LRA Appendix C.1 and C.3. These changes will be included in the Rancho Seco ISFSI FSAR revision submitted to the NRC after the license is renewed.

Impact:

LRA Section 2.3.2.1, Table 2-1, and Sections C.1 and C.3, C.3.5, C.3.6. C.3.7, and C.8 have been revised as described in the response.

RAI 2-6

Clarify the difference between all three canisters designs deployed at Rancho Seco as it relates to fatigue analyses.

Section 2.4.1 of the FSAR indicates that there are 3 versions of the NUHOMS-24P DCS design: (1) Fuel Only (FO), (2) Fuel with Control Components (FC), and (3) Failed Fuel (FF); however, the fatigue analysis in TN Calculation 502917-0201 Revision 1 of Enclosure 7 to DPG-18-114 does not distinguish between the 3 designs and is only referred to generically as the NUHOMS-24P. Clarify if the three versions of the canister affect the fatigue results and update the FSAR as appropriate.

This information is necessary to determine compliance with 10 CFR 72.122(l).

Response to RAI 2-6:

LRA Section A.2.1 has been revised to clarify that the DSC fatigue analysis applies to all three DSC models used for spent fuel storage at the Rancho Seco ISFSI. The structures of the FO, FC, and FF DSC models that are subject to fatigue are common in design, material, and operating conditions. The DSC fatigue evaluation is documented in AREVA TN Calculation 502917-0201, “Rancho Seco License Renewal Dry Storage Canister (DSC) Thermal Fatigue Analysis,” Revision 1 (LRA Reference A-7). The applicability of this fatigue evaluation across DSC designs was confirmed by reviewing each of the evaluations in the calculation for each of the six criteria contained in NB-3222.4(d).

DSC pressure boundary material

LRA Table 3-3, Table 3-4 and Table 3-5 show that the material for all pressure boundary components for all DSCs is [ ] stainless steel (note that the siphon & vent block for the FF DSC may also be made from [.] Therefore, the material properties of all pressure boundary components are the same except for [ ], which has a larger membrane stress (S_m) and therefore is bounded by the evaluation.

Criterion 1 – Atmospheric to Service Pressure Cycle

The evaluation in the calculation determined this criterion was satisfied because the pressure in the DSC is not cycled during its design life. The DSC is taken from atmospheric to service pressure just once after vacuum drying. There are no cycles back to atmospheric pressure thereafter. This is true for the FO, FC, and FF DSCs. Therefore, the evaluation is applicable to all three DSC types.

Criterion 2 – Normal Service Pressure Fluctuation

The evaluation was based on a DSC maximum normal operating pressure of 6.9 psig and S_m value of 18.7 ksi. The number of small pressure fluctuations due to seasonal ambient temperatures changes is independent of the DSC design.

The maximum normal operating pressure of 6.9 psig (21.6 psia) used in the evaluation is larger than the highest normal pressure for FO, FC, or FF DSC listed in FSAR Table 8-2a and Table 8-2b, i.e., 19.1 psia. Since the maximum normal pressure used in the evaluation bounds all three DSC types, and the pressure boundary material for all three DSC types have the same S_m value, the evaluation is applicable to all three DSC types.

Criterion 3 – Temperature Difference – Startup and Shutdown

The evaluation was based an instantaneous coefficient of thermal expansion of α=9.19x10^{-6} F^{-1} and a modulus of elasticity of E=26,500 ksi for the DSC and only one startup-shutdown cycle. Because the number of startup-shutdown cycles is independent of the DSC type, and all three DSC types have the same α and E values, the evaluation is applicable to all three DSC types.

Criterion 4 – Temperature Difference – Normal Service

The evaluation was based an instantaneous coefficient of thermal expansion of α=9.19x10^{-6} F^{-1} and a modulus of elasticity of E=26,500 ksi for the DSC and five significant seasonal ambient temperature changes per year. Because the number of significant seasonal ambient temperature changes per year is independent of the DSC type, and all three DSC types have the same α and E values, the evaluation is applicable to all three DSC types.

Criterion 5 – Temperature Difference – Dissimilar Materials

The evaluation concluded that because the structural material used to construct the DSC is homogeneous (all materials are stainless steel), this criterion is not applicable. This conclusion is applicable to all three DSC types, i.e., the material of construction for all three DSC types has the same modulus of elasticity and instantaneous coefficient of thermal expansion.

Criterion 6 – Mechanical Loads

The evaluation states that the only mechanical loads affecting the DSC are those associated with handling loads and a seismic event. It is also based on a 3.0S_m value of 56.1 ksi, (a S_m value of 18.7 ksi). Because the number of handling loading and seismic loads are independent of the DSC type, and all three DSC types have the same S_m value, the evaluation is applicable to all three DSC types.

Because the fatigue evaluations for of each of the six criteria are applicable to all three DSC designs, the differences among the three canister designs do not require a unique fatigue evaluation for each DSC design.

Impact:

LRA Section A.2.1 has been revised as described in the response.

RAI 2-7

Revise both the scoping evaluation and aging management sections of the LRA to include the greater than Class C (GTCC) DSC basket or provide justification for not including the GTCC DSC basket.

Appendix C, Section 4.2.4.2 of the Rancho Seco FSAR identifies that the GTCC DSC utilizes a basket, and Appendix C, Section 7.3.1.2 of the Rancho Seco FSAR states that the shielding analysis accurately modeled "…the GTCC waste within the container." From the description in Section 7.3.1.2, it appears that the GTCC basket is credited in the shielding analysis for the GTCC waste. If the GTCC basket is credited in the shielding analysis, the applicant should update both the scoping evaluation and aging management sections of the LRA. Otherwise, the applicant should justify not including the GTCC DSC basket.

This information is needed to determine compliance with 72.42(a).

Response to RAI 2-7:

[

] as shown in LRA Table 2-6. SMUD has reviewed the shielding analysis for the GTCC canister and confirmed that subcomponents of the GTCC basket, namely the cylindrical shell and bottom plate, are included in the shielding model. The GTCC basket cylindrical shell and bottom plate are identified as Items 1 and 9, respectively, on GTCC canister drawing 11221-1000. SMUD has determined that failure of either of these subcomponents could cause a reduction in shielding assumed in the shielding model. Thus, LRA Table 2-6 has been revised to classify these parts as in-scope for renewal consistent with scoping Criterion 2 of NUREG-1927 and to document the AMR performed on these parts. During the review, SMUD also identified that the GTCC basket subcomponents and associated materials in Table 3-2 required corrections. LRA Tables 3-2 and 3-6 have been revised to correct these items.

Impact:

LRA Tables 2-6, 3-2, and 3-6 have been revised as described in the response.

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Chapter 3 - Aging Management Review

RAI 3-1

Clarify how cracking due to thermal fatigue is managed in the aging management review results for the GTCC DSC and transfer cask subcomponents, and revise Table 3-6 and Table 3-10 of the LRA, as appropriate.

LRA Section 3.4.4.2 states that cracking of the DSC pressure boundary subcomponents due to thermal fatigue is an aging effect managed via a TLAA. However, TLAA is not identified for the outer top cover plate of the GTCC DSC, a pressure boundary subcomponent, in Table 3-6. LRA Section 3.7.4.2 states that cracking of the transfer cask subcomponents due to thermal fatigue is an aging effect managed via a TLAA. However, it does not appear that any TLAA aging management activities are identified in Table 3-10.

This information is needed to determine compliance with 10CFR 72.42(a).

Response to RAI 3-1:

SMUD's response to Observation 9 (OBS-9) in the NRC's Request for Supplemental Information (RSI) (ADAMS Accession No. ML18179A258) states that the potential cracking of dry shielded canister (DSC) pressure boundary subcomponents due to thermal fatigue could be addressed in a time-limited aging assessment (TLAA), and that the LRA had been revised accordingly. However, the revision to Table 3-6 in LRA Revision 1 as submitted with the RSI response failed to include TLAA as an aging management activity for the outer top cover plate. Note that the TN design treats both the inner and outer cover plates as redundant subcomponents, both classified as QA Category "A" confinement boundary parts. The greater than class C (GTCC) canister does not have redundant cover plates, but only uses a single QA Category "B" plate as the confinement boundary. Table 3-6 has been revised in response to this RAI to include the TLAA as an aging management activity for the outer top cover plate.

The response to observation OBS-9 also acknowledged that the fatigue evaluation of the transfer cask showed that cracking of the transfer cask subcomponents due to thermal fatigue could be managed via a TLAA. The LRA revision included in SMUD's response to the RSI identified the fatigue TLAA as an aging management activity on Table 3-10 by including note number four in the header of the aging management activity column. Note 4 of the table states "Cracking due to thermal fatigue of the transfer cask subcomponents has been addressed by performing a TLAA that bounds all subcomponents." Therefore, Table 3-10 in LRA Revision 1 already identifies that cracking due to thermal fatigue is managed via a TLAA and a revision to the table is not required.

Impact:

LRA Table 3-6 has been revised as described in the response.

RAI 3-2

(i) Provide additional description of factors that can cause stress corrosion cracking (SCC) other than atmospheric chloride deposition on the DSC shell, (ii) clarify why cracking from radiation induced SCC is determined to be an aging effect requiring management, (iii) demonstrate that the DSC external surface AMP is appropriate for managing this aging effect, and (iv) revise the LRA, as appropriate.

LRA Section 3.4.4.2 (Page 3-67) states that SCC is potentially operative on the external surface of the stainless steel DSC shell assembly and loss of material due to SCC in stainless steel is an aging effect requiring management. As a result, cracking due to SCC in stainless steel is included in the DSC external surface AMP. Based on Electric Power Research Institute (EPRI) Report 1015078 (EPRI, 2007), the same LRA section states that dissolved oxygen, sulfates, fluorides, and chlorides can provide the necessary environment for SCC to occur. However, LRA Section 3.4.4.2 (Pages 3-67 and 3-68) states that the potential for chloride induced SCC (CISCC) is minimal and cracking due to CISCC is not an aging effect requiring management. It is unclear what the SCC causing factors are other than atmospheric chloride deposition. Given this uncertainly in the basis for identifying SCC as an aging mechanism, it is also unclear if the DSC external surface AMP is appropriate for managing the potential aging effect of SCC (i.e., because the operating environment is an important factor for SCC, it is not clear if dust samples need to be collected and analyzed for species other than chloride. It is also unclear whether the detection methods are appropriate and if the frequency of inspection is sufficient.).

LRA Section 3.4.4.2 (Page 3-69) provided 3 references to indicate that gamma radiation dose rates in the order of 10^5 and 10^6 rad/h generated radiolytic oxidizing products to initiate localized corrosion (pitting corrosion and crevice corrosion) for unstressed specimens and initiate SCC for stressed specimens. However, this section did not state clearly what the expected dose rates on the DSC surface are and if they would be sufficiently high to produce these oxidizing products to initiate localized corrosion and SCC. This LRA section and LRA Section 3.4.4.6 conclude that cracking due to radiation-induced SCC is an aging effect requiring management. The radiation level and the radiolysis effects on corrosion that support the basis for this conclusion needs to be clarified. It is also unclear if the DSC external surface AMP is appropriate for managing the potential aging effect of radiation induced SCC. Specifically it is not clear if the radiolytic oxidizing products need to be monitored and the inspection frequency is appropriate to address the potential effect of gamma radiation on canister SCC.

This information is needed to determine compliance with 10CFR 72.42(a).

Reference:

EPRI. “Aging Effects for Structures and Structural Components (Structural Tools).” Report 1015078. Palo Alto, California: Electric Power Research Institute. 2007.

Response to RAI 3-2:

Part (i):

As stated in LRA Section 3.4.4.2, SMUD relied upon information in EPRI Report 1015078 [1] for performance of the aging management review of stainless steel for SCC. Section 2.3.2.2.2 of the EPRI report states that dissolved oxygen, sulfates, fluorides, or chlorides can provide the corrosive environment needed for SCC to occur. Of these, chlorides are the most likely chemicals to contribute to SCC in DSCs. Section 3.2.2.5 of the MAPS Report [2] discusses only chlorides as the chemical contributing to the corrosive environment needed for SCC, i.e., CISCC. SMUD has determined that the susceptibility of the Rancho Seco site to deposition of chlorides aerosols is low and has not identified any other specific factors (e.g., dissolved oxygen, sulfates, or fluorides) that would contribute to creating a corrosive environment conducive to SCC.

However, due to the sensitivity that the industry and NRC has placed on SCC of DSCs, SMUD does not wish to eliminate the possibility that SCC could occur due to some unknown factors. Therefore, SMUD has chosen to conservatively assume that SCC could potentially occur. Consequently, cracking due to SCC is an aging effect that must be managed. SMUD has revised the AMR in Section 3.4.4.2 to clarify that SCC is included as an applicable DSC aging mechanism for conservatism.

Part (ii):

Gamma radiation interaction with water has the potential to generate oxidizing products due to radiolysis (e.g., peroxides) that could cause localized corrosion, i.e., a corrosive environment. LRA Section 3.4.4.2 has been revised to clarify that a radiation-induced-environment may be a contributor to localized corrosion, but that it is not an aging mechanism/effect that requires management. The effects of the localized corrosion mechanisms are the aging effects that may require management and are discussed separately in LRA Section 3.4.4.2.

LRA Section 3.4.4.2 has also been revised to include an estimated gamma dose rate at the beginning of storage and at end of the PEO. To be consistent with the information already contained in the LRA, bounding dose rate for a 32-assembly DSC (the Rancho Seco DSCs each contain 24 fuel assemblies) are reported. From Table A-3, the gamma dose rates for 7 year cooled fuel, (i.e., the minimum cooling time allowed by the Technical Specifications) and at [ ] cooled were converted to Rad/hr. The conversion of 1 Rad = 1.44E+08 MEV/cm^3, as determined in Calculation 502917-0500 which was provided in the response to NRC's Request for Supplemental Information (ADAMS Accession No. ML18179A258), was used as follows:

At beginning of storage (i.e., 7 yr. cooled)

Gamma dose rate = [ ]

= [ ]

= [ ]

At the end of PEO (i.e., used [ ] cooled)

Gamma dose rate =[ ]

=[ ]

=[ ]

Due to the lack of data that these dose rates (10^3 Rad/hr to 10^4 Rad/hr) could have on localized corrosion, LRA Section 3.4.4.2 has been revised to assume that gamma radiolysis of water on the Rancho Seco DSC surfaces can occur. However, as stated above, while a radiation-induced environment may be a contributor to localized corrosion, it is not an aging mechanism/effect that requires management.

With regard to neutron assisted stress corrosion cracking, Section 3.2.2.9 of the MAPS report states that research indicates that neutron fluence levels of up to $2x10^{21}$ n/cm^2 were not found to enhance SCC susceptibility. Table A-2 of the LRA shows a maximum neutron fluence of [ ] for the Rancho Seco DSCs. Therefore, neutron assisted stress corrosion cracking is not a concern that needs to be addressed in the AMR or AMP.

Part (iii):

The DSC external surface aging management program in LRA Section B.3 was developed considering the guidance in EPRI Report 3002008193 [3] (e.g., the acceptance criteria comes from the ERPI report) for managing the effects of CISCC. The report identified CISCC as the most likely and limiting degradation mechanism that could lead to through-wall penetration of the DSCs. The EPRI report did not look into the factors that could contribute to the aqueous conditions causing corrosion, e.g., radiolysis, but rather simply assumed that the aqueous condition could lead to corrosion. Reliance on this guidance conservatively addresses other corrosion mechanisms such as pitting corrosion, crevice corrosion and SCC from other chemical species. The guidance does not call for the collection of deposits on the canister surface, but rather relies upon visual exams to identify precursors to SCC, i.e., corrosion, and manages the cracking effect due to those mechanisms. Therefore, the AMP is appropriate for managing the aging effects of SCC in a radiation-induced environment that contributes to SCC and SCC from other chemical species.

Part (iv):

The AMR (Section 3.4.4.2) and summary of AMR results (Section 3.4.4.6) have been revised to reflect the responses above. The revision to the AMR does not require a revision to the AMP.

References

1. EPRI Report 1015078, “Aging Effects for Structures and Structural Components (Structural Tools),” Electric Power Research Institute, December 2007.

2. NUREG-2214, “Managing Aging Processes in Storage (MAPS) Report,” U.S. Nuclear Regulatory Commission, draft report for comment, October 2017.

3. EPRI TR 3002008193, “Aging Management Guidance to Address Potential Chloride-Induced Stress Corrosion Cracking of Welded Stainless Steel Canisters,” March 2017.

Impact:

LRA Sections 3.4.4.2 and 3.4.4.6 have been revised as described in the responses.

RAI 3-3

Provide missing analysis to show that change in material properties due to thermal aging of carbon steel for the DSC basket assembly subcomponents is not an aging effect requiring management, and revise the LRA, as appropriate.

LRA Section 3.4.2 and Table 3-2 indicate that both carbon steel and stainless steel are used to construct the DSC basket assembly subcomponents. However, Section 3.4.4.2 only provided analysis and conclusion of change in material properties due to thermal aging of stainless steel for the DSC basket assembly subcomponents. The analysis and conclusion on carbon steel as the other material is missing.

This information is needed to determine compliance with 10CFR 72.42(a).

Response to RAI 3-3:

The DSC AMR in LRA Section 3.4.4.2 has been revised to address thermal aging of carbon steel. The AMR is based on the information contained in Section 3.2.1.8 of the Managing Aging Processes in Storage (MAPS) report [1]. There were no new aging management activities created as a result of this revised AMR.

References

1. NUREG-2214, "Managing Aging Processes in Storage (MAPS) Report," U.S. Nuclear Regulatory Commission, draft report for comment, October 2017

Impact:

LRA Section 3.4.4.2 has been revised as described in the response.

RAI 3-4

Justify why concrete degradation due to salt scaling is not included as an aging effect/mechanism for the HSM and basemat concrete, and modify the LRA as described below, as appropriate.

LRA Section 3.5.4 does not address aging effects due to salt scaling in the HSM concrete. The staff notes that salt scaling is defined as superficial damage caused by freezing a saline solution on the surface of a concrete body. The damage is progressive and consists of the removal of small chips or flakes of material. Similar to freeze and thaw damage, salt scaling takes place when concrete is exposed to freezing temperatures, moisture, and dissolved salts.

Justify that concrete degradation due to salt scaling is not credible. Alternatively, include this aging mechanism in the aging management review and revise the HSM AMP, Basemat AMP, and FSAR supplement in Appendix C, as appropriate, to address this aging mechanism.

This information is needed to determine compliance with 10CFR 72.42(a).

Response to RAI 3-4:

Salt scaling was not identified as a potential aging mechanism in the RAI because it was intended to be encompassed by the “freeze-thaw” aging mechanism. However, SMUD agrees that salt scaling should be addressed as a unique potential aging mechanism in the LRA. Salt scaling, if applicable, takes place when concrete is exposed to freezing temperatures, moisture, and dissolved salts. The degradation is maximized at a moderate concentration of salt (e.g., from deicing salts). While temperatures at the Rancho Seco independent spent fuel storage installation (ISFSI) site occasionally reach the freezing point, it is not a routine occurrence as discussed further below. Furthermore, any road deicing that does take place near the site is sufficiently far away from the ISFSI that there is essentially no salt from that process that reaches the horizontal storage modules (HSMs).

As currently discussed in LRA Section 3.5.4.2 for the freeze-thaw aging mechanism, the weathering index for Northern California is less than 50 day-in/yr. This is less than the 100 day-in/yr index below which freezing degradation is not considered significant. Based on this information, salt scaling of HSM concrete is not considered an applicable aging mechanism at the Rancho Seco ISFSI. LRA Sections 3.5.4.1 and 3.5.4.2 have been revised to address salt scaling as a result of this RAI response.

Impact:

LRA Sections 3.5.4.1 and 3.5.4.2 have been revised as described in the response.

RAI 3-5

Provide details on the aging management review of the below-grade concrete basemat that is exposed to an underground environment, and revise LRA Section 3.6, Basemat AMP, and FSAR supplement in Appendix C, as appropriate.

LRA Section 3.6.3 states that the below-grade portions of the basemat are in an underground environment and could be exposed to a groundwater/soil environment. However, the LRA does not specifically address aging mechanisms and effects for the concrete basemat exposed to an underground environment, nor does it provide aging management activities for managing aging mechanisms and effects for the below-grade concrete.

This information is needed to determine compliance with 10CFR 72.42(a).

Response to RAI 3-5:

SMUD has determined that the scoping evaluation, aging management review (AMR), and aging management program (AMP) in the LRA for the independent spent fuel storage installation (ISFSI) basemat would benefit from additional detail and clarification. In particular, there is no groundwater component to the underground environment at the Rancho Seco ISFSI site as described in further detail below. Also, changes to enhance consistency in the usage of the terms for the applicable environments with the terms defined in LRA Section 3.3.1.2 and in several other sections were necessary (e.g., “outdoors” versus “external” and “underground” versus “below-grade”). Lastly, the discussion of the potential and actual aging mechanisms applicable to the basemat reinforced concrete needed to be enhanced and better-aligned with those for the horizontal storage module (HSM) concrete.

The AMR for the portion of the basemat exposed to the underground environment has been added in new LRA Section 3.6.4, with other sections re-numbered as appropriate. This new section also clarifies the AMR for the basemat exposed to the sheltered, external, and embedded environments.

Consistent with the precedent in renewed CoC 1004 for the Standardized NUHOMS® System, aging effects of inaccessible areas of the basemat (i.e., beneath the HSM and underground) are managed by inspections of accessible areas of the basemat. It is also important to note that, as discussed in Rancho Seco ISFSI FSAR Section 2.4.6, groundwater at the Rancho Seco site is approximately 150 feet below grade. Therefore, the underground environment at the Rancho Seco ISFSI site does not have a “groundwater” component and there is no source of sustained soil moisture that would cause chemically-induced degradation of the basemat concrete. Thus, chemistry sampling is not warranted as part of the basemat AMP. The basemat AMR has been clarified in this regard.

While reviewing the AMR for the basemat in the LRA, some potentially confusing statements were also identified implying that only basemat settlement would be monitored and that no other credible aging-related degradation mechanisms for the basemat were relevant. Because there are other applicable aging mechanisms/effects that must be managed, these potentially confusing statements have been removed. The definition of the “underground environment” in LRA Section 3.3.1.2 has also been revised to remove the misplaced basemat scoping information and clarify the absence of a groundwater component in that environment.

Impact:

LRA Sections 2.3.1, 2.4.5, 3.3.1.2, 3.5.4.4, 3.6, 3.6.3, 3.6.5, B.4.2, B.4.5(4), B.6, B.6.2, B.6.3, B.6.5(1), B.6.5(3), B.6.5(4). B.6.5(6), C.2.3. C.2.4, and C.2.4.3 have been revised as described in the response.

LRA Section 3.6.4 has been added as described in the response.

LRA Tables B-2 and B-4 have been revised as described in the response.

RAI 3-6

Provide information on the service environment for the transfer cask plugs, and revise Table 3 10 of the LRA, as appropriate.

LRA Table 3-10 summarizes the AMR results for the in-scope subcomponents of the transfer cask; however, the service environment for the plugs (Drawing NUH-05-4001, Item 18) is missing from the table.

This information is needed to determine compliance with 10CFR 72.42(a).

Response to RAI 3-6:

LRA Table 3-10 has been revised to include the “encased/sheltered” service environment for the transfer cask plugs identified as Item 18 on Drawing NUH-05-4001.

Impact:

LRA Table 3-10 has been revised as described in the response.

Proprietary Information on This Page
Withheld Pursuant to 10 CFR 2.390

RAI 3-8

Resolve the discrepancy in various sections of the LRA regarding the assessment on cracking due to SCC for transfer cask subcomponents, and revise the LRA, as appropriate.

LRA Section 3.7.4.2 discussed SCC of transfer cask subcomponents as an aging mechanism. However, the discussion is not complete and no conclusion is given on the assessment. Cracking due to SCC is not included in Section 3.7.4.5 as an aging effect requiring management but is included in the Transfer Cask AMP in Appendix B.5.

This information is needed to determine compliance with 10CFR 72.42(a).

Response to RAI 3-8:

LRA Section 3.7.4.2 is intended to provide a discussion of the potential aging-related degradation mechanisms evaluated for the transfer cask (TC) and whether each is a credible aging mechanism. The discussion of stress corrosion cracking (SCC) of the TC subcomponents in LRA Section 3.7.4.2 has been expanded to include a justification for why SCC is not an aging effect that requires management and to include a conclusion statement. The explanation of SCC has also been revised to align better with the explanation of SCC in LRA Section 3.4.4.2. Table 3-10 and the TC AMP in Section B.5 have also been revised to remove any discussion related to cracking due to SCC

Impact:

LRA Sections 3.7.4.2, B.5.3, B.5.4, B.5.5(1), B.5.5(3), B.5.5(4), and Tables 3-10 and B-3 have been revised as described in the response.

Proprietary Information on Pages 47 and 48
Withheld Pursuant to 10 CFR 2.390

Appendix B – Aging Management Program

RAI B-1

Resolve the discrepancy in Section 3.5.4.2 and the HSM and Basemat AMPs of the LRA regarding whether loss of material and change in material properties due to microbiological degradation are aging effects requiring management for HSM concrete and basemat, and revise the LRA, as appropriate.

LRA Section 3.5.4.2 states that microbiological degradation is an applicable concrete aging mechanism. However, loss of material and change in material properties due to microbiological degradation are not included in the HSM AMP in Appendix B.4.3 and the Basemat AMP in Appendix B.6.3.

This information is needed to determine compliance with 10CFR 72.42(a).

Response to RAI B-1:

A review of the information in Section 3.5.1.12 of the Managing Aging Processes in Storage (MAPS) report indicates that while outdoor and sheltered environments may provide conditions favorable for microbiological degradation, these conditions would be intermittent at Rancho Seco. Therefore, the MAPS report [1] concludes that microbiological degradation is not considered credible during the period of extended operation in an outdoor or sheltered environment. LRA Section 3.5.4.2 has been revised to conclude that microbiological chemical attack of the HSM reinforced concrete is not an applicable aging mechanism in an external or sheltered environment. The HSM AMP has been revised to remove mention of microbiological degradation. LRA Sections 3.5.4.6, B.4.5 (Item 6), C.2.4.2, and Table B-2 have also been changed accordingly.

See the response to RAI 3-5 for changes to the basemat aging management review and aging management process related to microbiological degradation.

References

1. NUREG-2214, “Managing Aging Processes in Storage (MAPS) Report,” U.S. Nuclear Regulatory Commission, draft report for comment, October 2017.

Impact:

LRA Sections 3.5.4.2, 3.5.4.6, B.4.5(6), and C.2.4.2, and Table B-2 have been revised as described in the response.

RAI B-2

For the HSM Aging Management Program, provide additional information to address the following inconsistencies:

1. Justify that the proposed inspection frequency in the HSM AMP in Appendix B.4 and in the Basemat AMP in Appendix B.6 is adequate for ensuring that aging effects of the HSM and basemat concrete will be addressed before a loss of intended function or propose an alternate frequency, and revise the HSM AMP, Basemat AMP, and FSAR supplement in Appendix C, as appropriate.

   LRA Section B.4.5 of the HSM AMP and Section B.6.5 of the Basemat AMP, “Detection of Aging Effects,” state that performance of the baseline AMP visual inspection will be no later than two years after the period of extended operation commencement, with follow-on inspections at a frequency of 10 ± 2 years. If preceding inspection acceptance criteria have been exceeded or the trending from previous inspections is indeterminate, the interval between inspections is decreased to 5 ± 1 years. LRA Section B.4.5(4) also states that the 10 year inspection interval is consistent with the ASME B&PV code Section XI Subarticle IWA-2430 and justified based on the benign environmental conditions inside the HSM observed during the pre-application inspection.

   The NRC staff note that American Concrete Institute (ACI) ACI 349.3R and NUREG-1927, Revision 1 recommend a frequency of visual inspections of at least once every 5 years for above-grade (both readily accessible and normally inaccessible) areas and at least once every 10 years for below-grade (underground) areas. In addition, the staff note that the ASME B&PV code Section XI Subarticle IWA-2430 (2013 version) specifically refers to inservice examinations and system pressure tests required by Section XI Subsections IWB, IWC, IWD, IWE, and inservice examinations and tests of Section XI Subsection IWF. Inservice inspection requirements for concrete containment components are addressed in ASME B&PV code Section XI Subsection IWL. Article IWL-2000 references ACI 201.1R and ACI 349.3R, which are also referenced in the HSM Aging management Program. Subarticle IWL-2410 includes inservice inspection intervals that are consistent with ACI-349-3R. Finally, the staff note that while the pre-application inspection found that the exterior and interior of the HSM and the DSC support structure did not show significant indications of aging, the pre-application inspection was limited to the interior components in one HSM.

2. Provide additional information to explain why the HSM Aging Management Program does not include periodic radiation surveys to verify that there are no aging effects that affect the important to safety function of the HSM concrete structure.

   The HSM Aging Management Program relies on visual inspection of accessible and non-accessible areas and the acceptance criteria of ACI 349.3R. Inspection of non-accessible areas in periodic inspections is limited to a sampling of the HSM modules in service at the Rancho Seco ISFSI. Aging effects in non-accessible areas of HSM interiors that are not periodically inspected may result in reduced concrete shielding effectiveness and increases to worker dose. Periodic radiation surveys included as part of the HSM Aging Management Program would provide assurance that no aging effects that reduced shielding effectiveness has occurred in HSMs that were subjected to only an exterior inspection.

3. Resolve the discrepancy in Sections B.4.5(4) and B.4.5(7) of the HSM AMP and Table B-2 in Appendix B regarding the proposed inspection frequency, and revise the LRA, as appropriate.

   LRA Section B.4.5(4) of the HSM AMP, “Detection of Aging Effects,” states that performance of the baseline AMP visual inspection will be no later than two years after the period of extended operation commencement, with follow-on inspections at a frequency of 10 ± 2 years. If preceding inspection acceptance criteria have been exceeded or the trending from previous inspections is indeterminate, the interval between the sheltered environment HSM component inspections is decreased to 5 ± 1 year. LRA Section B.4.5(4) does not address decreased inspection intervals for external surfaces.

   LRA Section B.4.5(7) of the HSM AMP, “Corrective Actions,” also states that for sheltered environment SSCs, confirmed aging effects within accessible locations require expanded remote visual inspections within inaccessible locations. However, decreased inspection intervals of 5 ± 1 year are proposed for the HSM internal and external surfaces (including accessible, normally non-accessible, and inaccessible areas) in LRA Table B-2 in Appendix B.

This information is needed to determine compliance with 10CFR 72.24(e) and 10CFR 72.42(a).

Response to RAI B-2:

B-2(1):

While American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Section XI Subarticle IWA-2430 is not directly applicable to concrete structures, it does provide insight to inspection frequencies for components at nuclear power plants. Therefore, SMUD’s proposed Aging Management Program (AMP) frequency of 10 years for the horizontal storage module (HSM) and basemat was chosen to be consistent with that standard. However, because the ASME Code subarticle cited is not directly applicable to the concrete HSM or basemat, SMUD has deleted reference to IWA-2430 in the HSM and Basemat AMPs. The RAI states that a more appropriate Section XI subarticle for the inspection frequency may be IWL-2410. SMUD notes that Subsection IWL specifies requirements for Class CC (concrete containments) that are part of the pressure-retaining containment components of light-water-cooled plants. Since the HSM and basemat are not part of a containment system, the in-service inspection frequencies listed in Subarticle IWL-2410 are also not directly applicable.

Chapter 6 of ACI-349.3R states that the “evaluation frequency should be based on the aggressiveness of the environmental conditions and physical conditions of the plant structures.” It goes on to say that, in general, the structures should be monitored at a frequency of five years but inaccessible areas, or those in a controlled interior environment, may be monitored at a frequency of 10 years. When determining the inspection frequency, SMUD considered the interior of the HSM separately from the exterior of the HSM and basemat.

The exterior of the HSMs and basemat surface are accessible areas that are not protected from the direct exposure to sun, wind, or rain. However; the Rancho Seco site is located in an environment that is considered dry and away from sources of contaminants, i.e., a benign environment. The limited amount of moisture in the environment will reduce the rate of corrosion of embedded steel and leaching of the concrete. The lack of nearby industrial facilities limits the source for aggressive chemical attacks. As discussed in Section 3.5.1.3 of the MAPS report, alkali silica reaction requires the availability of moisture (e.g., relativity humidity greater than 80 percent) and is a slow degradation mechanism. Similarly, the lack of moisture will reduce the rate of the delayed ettringite formation (DEF) and settlement aging mechanisms. Therefore, the rate of degradation due to the aging effects/mechanisms listed in LRA Sections 3.5.4.6 and 3.6.5 (renumbered) is expected to be less than the rate of degradation used as the basis for the “in general” frequency listed in ACI-349.3R.

The interior of the HSM is a normally non-accessible area that is protected from direct exposure to sun, wind, or rain. While the concrete will see elevated temperatures and is exposed to radiation, these factors are not expected to contribute to the degradation rate of the credible concrete aging mechanisms/effects listed in LRA Section 3.5.4.6. While ambient air will flow through the HSM, the Rancho Seco site is located in an environment that is considered dry and away from sources of contaminants and thus not expected to accelerate the degradation rate of aging mechanism/effects. Therefore, the interior of the HSM is considered to be a benign environment for aging mechanism/effects. SMUD notes that performing an inspection of the interior of the HSM at a frequency greater than that of the DSC external surfaces (described in LRA Section B.3.5), will result in increased dose to workers/inspectors without a corresponding increase in safety.

The proposed frequencies are also supported by the results of the pre-application inspection performed in May 2017. As stated in LRA Section 3.2.4, direct visual inspections were performed on the HSM doors, roofs, and exterior concrete surfaces (i.e., exterior surfaces of all the HSMs) and the interior of one HSM (i.e., HSM-20). The inspection did not identify any age-related degradation effects after 17 years of service. Minor spalling was identified at an upper corner of one HSM (i.e., HSM-16) attributed to damage during transport and assembly of the HSM. In addition, the performance of a baseline inspection shortly into the period of extended operation will provide the opportunity to confirm the condition of the HSMs and basemat. As stated in LRA Sections B.4.5(4) and B.6.5(4), if any of the acceptance criteria are not met, the frequency of the inspections will be reduced to 5 ± 1 years.

Therefore, SMUD concludes that the 10-year inspection frequency referred to in American Concrete Institute (ACI) 349.3R for inaccessible areas and controlled interior environments is appropriate for the inspection frequency of the exterior of the HSM and basemat based on the lack of an aggressive environment and the physical conditions of the HSM and basemat structures.

SMUD has also revised the LRA to clarify that the pre-application exterior inspection was performed on all the HSMs, and the HSM AMP inspections are to be performed on the accessible surfaces of all the HSMs and the normally non-accessible surface of at least one HSM.

B-2(2):

When preparing the HSM AMP, SMUD considered information pertaining to previously-approved NUHOMS® HSM AMPs, namely the renewal of Calvert Cliffs ISFSI specific ISFSI license SNM-2505 [1]and Standardized NUHOMS® CoC 1004 [2].

The Calvert Cliffs HSM AMP includes annual gamma and neutron radiation surveys on each HSM door and semiannual readings of thermoluminescent dosimeters (TLDs) on the ISFSI perimeter fence. In order for these surveyed locations to detect a reduction in shielding effectiveness in non-accessible areas of an HSM, the degradation would have to be so severe that it is reasonable to expect that the aging mechanism causing the degradation would manifest itself in an external area that is periodically inspected. Therefore, SMUD determined that the radiation surveys outlined in the SNM-2505 HSM AMP, would not provide any more assurance that the HSM is able to perform its intended radiation shielding safety function than would be obtained from visual inspections.

The CoC 1004 HSM AMP does not include radiation surveys. Therefore, SMUD's proposed HSM AMP is consistent with the precedent in the renewed CoC for the Standardized NUHOMS® System. While Section 6.6 and Table 6-3 of the MAPS report do mention radiation surveys, it also allows for excluding such surveys from the AMP on a case-by-case basis.

In order to detect a reduction in radiation shielding effectiveness in non-accessible areas in HSMs that are not periodically inspected a detailed radiation survey of the entire surface of all HSMs would be necessary. As previously stated, in order for radiation surveys to detect a reduction in shielding effectiveness in non-accessible areas of an HSM, the degradation would have to be so severe that it is reasonable to expect that the aging mechanism causing the degradation would manifest itself in an external area that is periodically inspected. Therefore, the increase in worker dose to perform these surveys would not result in a corresponding increase in safety considering the degree of assurance that the visual inspections will provide in ensuring that the intended radiation shielding safety function will not be lost.

While not included in the proposed HSM AMP, SMUD performs quarterly radiation surveys of the Rancho Seco ISFSI in accordance with procedure SP.1112, "Quarterly Direct Radiation Monitoring of ISFSI." This procedure requires measuring the radiation dose rate inside the ISFSI perimeter fence as well as reading area monitoring badges every three months. Both of these surveys would detect any significant decrease in HSM shielding effectiveness or an increasing trend over time such that the cause could be determined and appropriate corrective actions could be implemented, if required.

Rancho Seco ISFSI Technical Specification (TS) 5.5.2 requires a radiological environmental monitoring program. Specifically, TS 5.5.2(a) requires a radiological environmental monitoring program to ensure the annual dose equivalent to any real individual located outside the ISFSI controlled area does not exceed the annual dose limits in 10 CFR 72.104(a). TS 5.5.2(c) requires dosimetry to monitor direct radiation around the ISFSI.

For the above reasons, SMUD has determined that additional periodic radiation surveys as part of the HSM AMP are not necessary to ensure an aging-related degradation of the intended radiation shielding safety function would be detected.

B-2(3):

The intent of the AMP is to reduce the HSM inspection frequency to 5 ± 1years if any of the acceptance criteria has been exceeded as shown in LRA Table B-2, regardless of the service environment. Therefore, Sections B.4.5(4) and B.4.5(7) have been revised to remove the discrepancy. In addition, Section B.4.5(5) has been revised to remove potential conflicts between the actions to be taken if there are confirmed aging effects for the sheltered environment SSCs and those that the SMUD corrective action program would call for per Section B.4.5(7).

References:

1. Letter from G H Gellrich (CCNP) to Document Control Desk (NRC), "Response to Fourth Request for Additional Information for Renewal Application to Special Nuclear Materials License No. 2505 for the Calvert Cliffs Site Specific Independent Spent Fuel Storage Installation (TAC No. L24475)," September 18, 2014, (ADAMS Accession No. ML14267A065).

2. Letter E-46190 from Jayant Bondre (AREVA Inc.) to Document Control Desk (NRC), "Response to Re-Issue of Second Request for Additional Information – AREVA Inc. Renewal application for Standardized NUHOMS® System – CoC 1004 (Docket No. 72-1004, CAC No. L24964)," September 29, 2016, (ADAMS Accession Number ML16279A367).

Impact:

LRA Sections 3.2.4.3, B.4.5(1), B.4.5(4), B.4.5(5), and B.4.5(7), B.6.5(4) and Tables B-2 and B-4 have been revised as described in the response.

RAI B-3

Resolve inconsistency regarding whether CISCC is an aging effect requiring management, and revise the LRA, as appropriate.

LRA Section 3.4.4.2 (Pages 3-67 and 3-68) states that the potential for CISCC is minimal and cracking due to CISCC is not an aging effect requiring management. LRA section B.3.3 states "the potential for chloride aerosols leading to chloride accumulation on ISFSI components at Rancho Seco is very low and that enhanced monitoring for CISCC is not warranted." However, LRA Section B3.5, Subsection 6.3 (Flaw Evaluation) refers to a review of industry operating experience (OE) on the consequences of through-wall CISCC.

This information is necessary to assure compliance with 10 CFR 72.42(a).

Response to RAI B-3:

LRA Section B.3.5(6) indicates that the acceptance criteria for the dry shielded canister (DSC) aging management program (AMP) follows the guidance in Electric Power Research Institute (EPRI) Report 3002008193, which focused on chloride-induced stress corrosion cracking (CISCC), but is being used to conservatively address other aging mechanisms. The discussion in LRA Section B.3.5, Subsection 6.3 (Flaw Evaluation) paraphrased the guidance in Section 5.3.3 of the EPRI Report. Because the EPRI guidance used the phrase "through-wall CISCC," that phrase was also used in LRA Section B.3.5, Subsection 6.3. However, because the DSC AMP is managing aging effects other than CISCC, LRA Section B.3.5, Subsection 6.3, has been revised to include a review of industry operating experience for any operating experience, repair experience, or generic industry analyses relating to the consequences of through-wall flaws.

Impact:

LRA Appendix B, Section B.3.5, Subsection 6.3 has been revised as described in the response.

RAI B-4

Resolve inconsistency regarding whether loss of material due to wear of transfer cask subcomponents is an aging effect requiring management, and revise the LRA, as appropriate.

LRA Section 3.7.4.2 states that loss of material due to wear of transfer cask subcomponents is not an aging effect requiring management. However, loss of material due to wear is in LRA Sections B.5.3 and B.5.5 of the Transfer Cask AMP. The inconsistency needs to be resolved.

This information is necessary to assure compliance with 10 CFR 72.42(a).

Response to RAI B-4:

As discussed in detail in the response to RAI B-5, Item 1, all of the Rancho Seco spent fuel has been transferred to the independent spent fuel storage installation (ISFSI), the plant has been decommissioned, and the 10 CFR Part 50 license terminated. Therefore, the transfer cask (TC) will not be used again until there is a need to retrieve the dry shielded canisters (DSCs) from the horizontal storage modules (HSMs) for inspection or offsite transportation. For offsite transportation, the DSCs will be extracted into the TC and the MP187 transportation requirements under its 10 CFR Part 71 certificate of compliance (CoC) will apply. The MP187 TC was used for dry run exercises and the transfer of 22 DSCs into the HSMs at the ISFSI in support of initial ISFSI operations and has been in onsite storage in a sheltered environment since that time. The MP187 will also be prohibited from being used as a transportation cask during the PEO by a new license condition proposed in the response to RAI B-5, Item 1.

The Nitronic® 60 stainless steel on the TC rails is designed to provide wear resistance for the dry run exercises and the initial DSC transfers. Furthermore, while the Rancho Seco ISFSI licensing basis includes no activity requiring picking up the TC by its trunnions, the trunnions are used to secure the TC to the HSM during DSC insertion and extraction. Based on these two TC functions, wear is a credible aging mechanism for the TC rails and trunnions only from their use during initial dry run exercises and DSC transfer operations. The TC rails and trunnions will see no wear during storage of the TC in a sheltered environment over the course of the PEO.

LRA Sections 3.7.4.2 and 3.7.4.5 have been revised to indicate that loss of material due to wear is an aging effect requiring management. The AMP consists of a pre-service inspection as clarified in the response to RAI B-5, Item 4. This is consistent with the information in the TC AMP in LRA Section B.5. Sections B.5.5(3) and B.5.5(4) have been revised to clarify that wear is not an aging mechanism for the fasteners.

LRA Sections 2.3.1, 2.4.3, 3.7.1, 3.7.3, 3.7.5.2, B.5.5(4), B.5.5(5), and C.2.4.4 have been revised to clarify that the TC may be used to retrieve a DSC for Inspections in addition to being used to ship a DSC offsite.

Impact:

LRA Sections 2.3.1, 2.4.3, 3.7.1, 3.7.3, 3.7.4.2, 3.7.4.5, 3.7.5.2, B.5.5(3), B.5.5(4), B.5.5(5), and C.2.4.4 have been revised as described in the response.

RAI B-5

Address the following for the transfer cask in the Transfer Cask AMP in Appendix B.5 and in other sections of the LRA, as appropriate:

1. Clarify if the Transfer Cask AMP in Appendix B.5 specifically addresses the aging management activities associated with the transfer cask serving as a pressure boundary for a leaking dry shield canister (including handling and storage) and accounts for the effects of the transfer cask's use as a transportation package. Revise the Transfer Cask AMP, and FSAR supplement in Appendix C, as appropriate.

   If the Transfer Cask will continue to be potentially used as a pressure boundary for a DSC and/or if the Transfer Cask will potentially be used as a transportation package in the period of extended operation covered by the LRA, provide the following information:

   a. identify where the Transfer Cask will be stored while serving as a pressure boundary for a leaking DSC

   b. revise both the Transfer Cask AMP in Appendix B.5 and the FSAR supplement in Appendix C, as appropriate; and

   c. update calculations provided in support of the LRA as necessary.

LRA Section B.5.2, Environment, identifies only a sheltered environment for the Transfer Cask AMP. LRA Section B.5.5.4 states the following:

The TC cask was used at SMUD during fuel loading and transfer operations that concluded in August 2002 for all DSCs except the GTCC canister, which concluded in 2006. All of the DSCs are in storage in the HSMs and the TC will only be used when the DSCs are to be retrieved from the HSMs for offsite shipment. Therefore, pre-service inspections are more appropriate for the TC at SMUD.

In addition, LRA Section A.2.2.1, Atmospheric to Service Pressure Cycle, states: *For on-site vertical storage conditions the cask is designed to serve as a pressure boundary during vertical storage of a leaking DSC.*

The staff notes that the Transfer Cask AMP does not describe how the range of past and possible future operational environments for the transfer cask are considered including the potential role of the transfer cask to store a leaking DSC (if such an event were to occur) or as a transportation package. Specifically, the staff notes that the aging management review does not appear to consider either (1) aging effects such as exposure to radiation, (2) combustible gas generation in the neutron shield material of the transfer cask due to radiolysis, or (3) boron depletion of the neutron shield for these potential operations

The applicant needs to provide, as necessary, both additional and clarifying information relative to the potential future uses of the Transfer Cask as well as updated calculations, AMPs, TLAAs and FSAR pages, which reflect the potential future uses of the Transfer Cask, as allowed by the licensee's design basis (the FSAR) and the cask's 10 CFR Part 71 certificate of compliance.

2. Justify the exclusion of the fill and drain ports' cover plates from the aging management review for the transfer cask. For any use of the transfer cask during the period of extended operations, it seems that these ports would be radiation streaming paths for exposing personnel and the cover plates would be important to mitigate radiation exposure from these ports.

3. Modify the transfer cask AMP's element 3 to address the interfacing surfaces of the trunnions and the transfer cask and the sealing surfaces of the transfer cask and the cask's lid.

   The trunnions are removable from the transfer cask and any operations that remove the trunnions or that reattach the trunnions to the transfer cask could be a source of wearing and degradation of these components at these surfaces. It is not clear that the AMP addresses these interfacing surfaces for the trunnions and transfer cask or for the cask and cask lid sealing surfaces.

4. Clarify the transfer casks AMP's element 4 to describe what constitutes 'prior to use' for inspections of the transfer cask.

   There should be an appropriate limit on how far in advance of a loading/unloading campaign the inspections may be done and still be considered to meet the 'prior to use' criterion. For example, this may be something like: "Inspections done within a year prior to the campaign are considered to meet 'prior to use' but inspections done more than a year in advance of the campaign are not."

This information is necessary to assure compliance with 10 CFR 72.42(a) and (b).

Response to RAI B-5:

Response to Item 1:

Rancho Seco ISFSI FSAR Volume I, Section 1.2 and Volume III, Section 8 both include a note stating that the MP187 transfer cask (TC) was initially intended to be licensed under 10 CFR Part 72 for vertical storage of a dry shielded canister (DSC) if required to recover from an off-normal event at the independent spent fuel storage installation (ISFSI). The MP187 TC was not ultimately licensed for this purpose under 10 CFR Part 72, either generically by TN or specifically for the Rancho Seco ISFSI. The note is solely intended to convey that some of the calculations performed in support of that intended licensing approach were still valid and relied upon as bounding conditions for licensing the MP187 as a transfer cask in the Rancho Seco ISFSI FSAR.

Use of the MP187 TC as a pressure boundary for a leaking DSC is not a licensed activity of the MP187 TC at the Rancho Seco ISFSI. The time-limited aging analysis (TLAA) described in LRA Appendix A, Section A.2.2 is for the fatigue evaluation performed for the MP187 TC, which used service conditions (e.g., internal pressure due to a leaking DSC) that bound those that would be seen at the Rancho Seco ISFSI. This TLAA was modeled off the original design fatigue analysis, which included vertical storage of a leaking DSC even though the Rancho Seco Part 72 license does not include that activity. The LRA has been revised to clarify that the MP187 TC is not licensed to store a leaking canister and the analysis in Appendix A Section A.2.2 is for a bounding condition.

Fuel loading operations at the Rancho Seco ISFSI are complete, the spent fuel pool has been decommissioned, and the 10 CFR Part 50 operating license has been terminated. The sole remaining purpose of the MP187 TC for the Rancho Seco ISFSI is to retrieve the DSCs from the HSMs for transportation offsite or inspection. Rancho Seco ISFSI FSAR Volume II, Figure 5-2 depicts the activities required to retrieve a DSC from a horizontal storage module (HSM). Retrieval is considered accomplished when the DSC is fully withdrawn from the HSM into the MP187 TC cavity and the top cover plate installed. Once this condition is achieved, the MP187 cask and DSC are no longer governed by 10 CFR Part 72. They are governed by the requirements of the MP187 transportation certificate of compliance (CoC) and safety analysis report (SAR), subject to the regulations of 10 CFR Part 71. This is consistent with the description of retrievability in Rancho Seco ISFSI FSAR Section 4.2.2.1 (12) and Figure 7.1-1 of the MP187 transportation SAR. Section 7.1.8 and Figure 7.1-4 of the MP187 transportation SAR also describe moving the loaded transportation cask to a rail car in the horizontal orientation using slings.

The MP187 TC top cover plate installation for retrieval is the essentially the same as it was for moving the DSCs from the Fuel Building to the ISFSI during initial fuel loading, with two important differences: 1) Retrieval takes place completely in the horizontal orientation, and 2) There is no potential for residual water to exist in the MP187 TC annulus from loading operations in the spent fuel pool. For these reasons, the MP187 TC does not require installation of the top cover seals or torqueing of all top cover plate screws. This is discussed in Rancho Seco ISFSI FSAR Volume I, Section 4.2.5.3, where it states that “only 12 of the 36 screws are required for on-site transfer. O-ring seals need not be installed during on-site transfer, although either elastomeric or metallic seals may be used.”

Lastly, SMUD recognizes that Section 7.1.3 of the MP187 10 CFR Part 71 transportation SAR for the MP187 addresses the potential use of the MP187 cask as a storage cask under a 10 CFR Part 72 license. Section 7.1.6 of the transportation SAR provides further instructions for sealing, vacuum drying, backfilling, and testing an MP187 cask to be used under a 10 CFR Part 72 license to store an intact or failed DSC. This information pertaining to using the MP187 cask as a storage cask in the 10 CFR Part 71 SAR is generic information and would need to either be explicitly repeated in a 10 CFR Part 72 ISFSI or cask FSAR or specifically incorporated by reference into a 10 CFR Part 72 ISFSI or cask FSAR to be part of the licensing and design basis for an ISFSI. The Rancho Seco ISFSI FSAR does not incorporate the storage function of the MP187 cask into its licensing and design bases. Therefore, the cask preparation activities discussed in Section 7.1.6 of the MP187 transportation SAR are not applicable to the Rancho Seco ISFSI license renewal and need not be addressed in the LRA.

With respect to using the MP187 for transportation during the period of extended operation (PEO), SMUD does not currently anticipate this occurring in the near future because there is no spent fuel disposal or interim storage facility available. In addition, 10 CFR Part 71 CoC 9255 for the MP187 package requires an amendment revision to update the certification from an “F-85” package to an “F-96” package before the impact limiters can be fabricated and the package used for shipping. Thus, there is no need to evaluate the environments and aging-related degradation that may be associated with the MP187 cask’s use as a transportation package. To address this portion of the RAI, SMUD proposes the following license condition that prohibits the use of the SMUD-owned MP187 cask as a transportation package without prior NRC approval.

> *The SMUD MP187 cask is prohibited for use as a transportation package once the cask reaches 20 years of age. Prior to using the MP187 cask to transport spent fuel or GTCC canisters, SMUD will submit a license amendment to the NRC proposing a modification to the MP187 aging management program to address its use as a transportation package to ensure its intended storage functions as a transfer cask as described in the Rancho Seco ISFSI FSAR will be maintained though the period of extended operation.*

Based on the above discussion, the MP187 TC is not required to perform a pressure boundary function during the PEO at the Rancho Seco ISFSI, nor will it be used as a transportation package without prior NRC approval. The MP187 TC will remain in a static condition at the Rancho Seco site in a sheltered environment as described in the LRA. It will remain in this condition until such time as it may be used to transport the Rancho Seco spent fuel or Greater than Class C (GTCC) DSCs off site or retrieve a DSC for inspection. Therefore, no other environments need to be considered in the aging management review (AMR) and no new aging management activities are required at this time. The LRA has been revised to clarify that the time spent in retrieval operations represents a negligible fraction of the MP187 TC total life span.

Response to Item 2:

A review of LRA Table 2-8 indicates that the MP187 transfer cask does not have subcomponent parts called “fill and drain ports’ cover plates.” However, the table does list Test/Vent/Drain Port, Threaded Insert (Drawing NUH-05-4001, Item #41), Vent/Drain Port, Plug (Drawing NUH-05-4001, Item #42), and Test Port, Plug (Drawing NUH-05-4001, Item #43). SMUD has confirmed with the NRC that these are the subcomponents that the NRC is referring to in RAI B-5, Item 2. These subcomponents were previously determined to not have a 10 CFR Part 72 safety function and were out of scope for renewal.

These three subcomponents were reviewed again and a new determination was made that they are implicitly included in the design basis shielding model. Therefore, SMUD has revised Table 2-8 to indicate that the three subcomponents are in-scope for renewal. Table 3-10 has also been revised to reflect the results of the AMR performed on these three subcomponents.

Response to Item 3:

Wear requires relative motion between two surfaces and some interfacing force applied to the surfaces, e.g., a heavy object being pushed across a surface. While the removal and reattachment of the trunnions to the transfer cask involve relative motion of the trunnions’ surfaces to the trunnion sleeves’ surfaces, there is minimal force applied to the surfaces. Therefore, wear of the interfacing surfaces of the trunnions and trunnion sleeves, is not a credible aging mechanism for these surfaces.

Installation and removal of the lid involves motion that is perpendicular to the mating surfaces, i.e., no relative motion. Therefore, wear of the interfacing surfaces of the lid and TC is not a credible aging mechanism for these surfaces.

SMUD has reviewed the information in Chapter 4 of the MAPS Report [1] and observed that none of the systems where the trunnions or a lid are bolted to a cask included wear of the interfacing surfaces.

Therefore, wear is not an applicable aging mechanism for these surfaces and no changes to element 3 of the transfer cask AMP are necessary.

Response to Item 4:

SMUD concurs that an appropriate time limit should be established on how far in advance of a loading/unloading campaign the aging management inspections may be performed and still be considered to meet the “prior to use” criterion. Considering that age related degradation is a slow process, SMUD has determined that an inspection within one year prior to the campaign is an appropriate limit. This limit provides flexibility in scheduling the inspection while still providing assurance that aging of the sub-components will not prevent fulfillment of an intended safety function.

Changes are made to LRA Section B.5.5(4) and Table B-3 regarding this limit.

References:

1. NUREG-2214, “Managing Aging Processes in Storage (MAPS) Report,” U.S. Nuclear Regulatory Commission, draft report for comment, October 2017.

Impact:

LRA Sections Section 3.7.3, A.2.2, A.2.2.1, A.2.2.2, A.2.2.3, A.2.2.4, A.2.2.5, A.2.2.6, B.5.5(4), C.2.3, C.2.4.4, D.2.2, and Tables 2-8, 3-10, and B-3 have been revised as described in the response.