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Monticello Nuclear Generating Plant
Operated by Nuclear Management Company, LLC

June 15, 2006

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Monticello Nuclear Generating Plant
Docket 50-263
License No. DPR-22

Comments Regarding the Safety Evaluation Report for the Monticello Nuclear Generating Plant License Renewal Application (TAC No. MC6440)

The Nuclear Management Company, LLC (NMC) has reviewed the Safety Evaluation Report (SER) issued by the NRC on April 26, 2006, (ADAMS Accession No. ML061160476). This SER was issued for the Monticello Nuclear Generating Plant License Renewal Application. Enclosure 1 provides NMC's comments regarding the SER. Our review focused on technical content, and the majority of our comments identify proposed corrections. Enclosure 2 provides marked-up SER pages showing the location of the NMC comments.

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Enclosures (2)

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ENCLOSURE 1

Nuclear Management Company, LLC, Comments on the NRC Draft License Renewal Safety Evaluation Report for the MNGP

Comment Number	Page Number	Section/ Line Number	Proposed Change
1	v	5	Abbreviations start on page "xiv".
2	xiv	6	ADAMS is the abbreviation for "Agencywide Documents Access and Management System".
3	xiv	13	AMG - "guideline" is misspelled.
4	xiv	41	CASS - "austenitic" is misspelled, also insert "stainless" in front of "steel".
5	xvi	--	"HPC" is High Pressure Coolant Injection per MNGP LRA.
6	xviii	46	PM – "maintenance" is misspelled.
7	xix	--	"RCI" is Reactor Core Isolation Cooling per MNGP LRA.
8	2-2	2.1.2.1.1	Add a period to the sentence.
9	2-4	2.1.2.1.1	Under the "Fire Protection" heading, add "10 CFR 50, Appendix R, and commitments made to NRC Branch Technical Position APCSB 9.5-1, Appendix A" in addition to 10 CFR 50.48.
10	2-6	2.1.2.1.2	Make "Maintenance Rule Document" plural by adding an "s." This occurs in various other places also.
11	2-14	12	"...plant control drawings..." should be "...plant controlled documents..."
12	2-14	18	"...drywell suppression chamber..." should be "...drywell/suppression chamber..."
13	2-17	2.1.3.1.3	The following sentence should be modified as follows: "Color-coded boundary P&IDs were established for each mechanical system within the scope of license renewal. ~~that was determined to be a pressure boundary by mapping system-level license renewal intended function pressure boundaries onto P&IDs."~~ While most system components were in scope for pressure boundary, some were in scope for other reasons such as flow restriction.
14	2-22	--	Under the "Insulation" section, "...high pressure coolant room..." should be "...high pressure coolant injection (HPC or HPCI) room..."
15	2-24	2.1.3.3	"..Plant Operations Committee..." should be "...Plant Operations Review Committee..."
16	2-30	2.3.1.2.1	Under intended functions, "provides structural support to SR components (vessel and internals), change to "(vessel internals).
17	2-32	2.3.1.3.1	Under intended functions, "provides structural support to SR components (vessel and internals), change to "(vessel internals).
18	2-44	2.3.2.5.1	Under intended functions, change "essentially leak-tight barrier (mechanical) to "fission product retention".

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19	2-51	11	Delete 4th bullet "tanks". The nitrogen bottles (tanks) were deleted IAW the MNGP LRA Annual Update (see page 12 of 149 of the Annual Update). Add "The nitrogen supply bottles connected to the distribution rack are not long-lived components and not subject to an AMR." to page 2-50, Section 2.3.3.1.1, as a closing sentence, if deemed applicable.
20	2-52	30	Generic comment throughout the document. "...of an SR function..." should be "...of a SR function..."
21	2-59	19	Change "...tank (T-83) system..." to "...tank (T-83) subsystem..."
22	2-60	02	Change "...DGN air starting system..." to "...DGN air starting subsystem..."
23	2-89	16	Change "...grid location C6..." to "...grid location C-6..."
24	2-95	12	Change "...condensate storage system..." to "...condensate storage (CST) system..." This same omission was made in the MNGP LRA in Section 2.3.4.1.
25	2-101	38	Change "provides removal and holdup for fission products" to "provides plateout and holdup for fission products" or, as stated in the MNGP LRA, "plateout and holdup of radioactive material". The CDR system intended functions do not provide for removal.
26	2-103	36	See comment number 2. "...piping is an HELB line..." should be "...piping is a HELB line ..."
27	2-166	10	Section 2.4.13 is in the LRA not in the SER. Add "of the LRA." After Section 2.4.13 or delete sentence.
28	3-7	B2.1.4	Row 2 / Column 4 – add "containments, structures, and component supports".
29	3-7	B.2.1.10	Row 7 / Column 2 – Change "exception" to "exceptions".
30	3-7	B.2.1.11	Row 8 / Column 2 – Change "exception" to "exceptions".
31	3-7	B2.1.13	Row 10 / Column 4 – add "reactor coolant system".
32	3-8	B.2.1.32	Row 11 / Column 3 – Add NA.
33	3-9	B2.1.6	Row 4 / Column 3 – Add NA.
34	3-15	3	Change "directly buried" to "direct buried". See LRA page B-155, Line 8.
35	3-15	15	Change "induce this effect" to "induce this aging effect". See LRA page B-155, Line 5.
36	3-18	24 & 27	Change "NUREG-1 801" to "NUREG-1801". Remove space between 1 and 801. Delete ' after absence.

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37	3-36	37	"Inservice" should be "inservice".
38	3-41	2nd para.	Change verb tenses "is" to "was" and "are" to "were".
39	3-45	42	Change "Torus header columns" to "Vent system supports" per LRA Table 2.4.6-1, Row 2, Col 1 and Table 3.5.2-6.
40	3-49	3	Change "Program Parameters Monitored or Inspected" to "Parameters Monitored or Inspected".
41	3-51	9 & 10	Should read "MNGP does not use a zinc primer, instead, a modified phenolic-based primer is used in the torus."
42	3-58	6 - 8	8.2(3c) is incorrect. Should be revised to read: "Since carbon steel piping was retained in the exhaust header, procedures were developed for (1) periodically performing a random sampling of HCU filters to determine if cleaning and flushing is required and (2) periodically performing a flush of the CRD exhaust header." The original commitments (MNGP# M83166A and M83167A) do not require a task frequency of "every refueling outage". The original commitments also do not imply that ALL HCU filters will be inspected and replaced, but only a random sample.
43	3-61	5	Change "GE NE-523-A71-0594" to "GE NE -523-A71-0594-A".
44	3-63	45	Change "standby liquid control system" to "Standby Liquid Control System".
45	3-83	10	"Tolytriazole" is misspelled.
46	3-87	6	After "Report of the Instrument Air Working Group" remove: "GL 88-14, ANSI/ISA S7.3, ANSI/ISA Z86.1-1973, EPRI TR 103595, and". These appear to be repetitious and redundant.
47	3-87	36	Add a space between "the" and "Scope of Program".
48	3-96	38	The statement that "The GALL Report recommends for "Detection of Aging Effects" program element..." is incorrect. The following paragraph quoted from the GALL Report is found in the Program Description and not in the Detection of Aging Effects section. Should read: "Enhancement: The Program Description in the GALL Report recommends the following: In addition, a sample of sprinkler heads...".
49	3-98	2	There are three commitment numbers associated with the Fire Water System Program. Change "commitment numbers 30 and 31 in Table A.5" to "commitment numbers 30, 31 and 32 in Table A.5".
50	3-98	12	Need to break paragraph (2) into two paragraphs. Related to Comment #49 above. New paragraph starts with "(3) Procedures to be used for aging management activities of the Fire Water System Program...".

Nuclear Management Company, LLC, Comments on the NRC Draft License Renewal Safety Evaluation Report for the MNGP

51	3-109	40	Add a space between "the" and "Scope of Program".
52	3-127	26	Change "EPRI 10213" to "EPRI 104213".
53	3-135	38	Change "These inspections and walkdowns timely (i.e., prior to the loss of intended function) detect aging effects" to "These inspections and walkdowns provide timely detection of aging effects (i.e., prior to the loss of intended function)."
54	3-136	1	Split long, first sentence into two as used in LRA. Should read: "The applicant stated that normal design standards, procedural requirements, CLB information, and industry codes or standards (e.g., EPRI, INPO, etc.), will be used to determine acceptance criteria. Acceptance criteria will be included in implementing instructions and procedures for age-related degradation such as corrosion, leakage, deformation, cracking and other adverse conditions that negatively impact the ability to perform a license renewal intended function."
55	3-137	40	Last sentence in paragraph is a duplicate of previous sentence. Combine to read: "In LRA Section B1.3, "Quality Assurance Program and Administrative Controls," the applicant described the quality attributes of the plant-specific AMPs and summarized them as follows:"
56	3-141	3.1.1-08	The jet pump sensing lines are not in the scope of license renewal inside the vessel and the flange leak detection line is covered in line 3.1.1-07. This is not discussed in the staff evaluation. Similar situations are discussed in staff evaluations such as in line item 3.1.1-25.
57	3-143	3.1.1-23	There are no cast austenitic stainless steel (CASS) pump casings at MNGP. This is not discussed in the staff evaluation.
58	3-150	3.1.2.2	The first paragraph of the section states that the applicant provides information on how it will manage the following aging effects; however, four of the aging effects listed are not managed by MNGP, since they are relevant just to PWRs. This is discussed later in the report; however the opening paragraph is misleading.
59	3-153	14	Insert "Section" between "ASME" and "XI".
60	3-154	3.1.2.2.4	The eighth paragraph of the section states: "Because the applicant will perform a one-time inspection for cracking of stainless steel small-bore piping and use and an appropriate methodology to exclude the aging effect...". The applicant has already performed an analytical evaluation to exclude the aging effect, as discussed in the preceding paragraph. Therefore, only the one-time inspection is needed for aging management.
61	3-155	3.1.2.2.4	The third paragraph from the end of the section states: "As the reactor flange leak detection line has the same material, and environment and consequently the same aging effects as other Class 1 small-bore piping...". The reactor flange leak detection line is not a Class 1 pipe, but does have the same material, environment and the same aging effects as Class 1

			small-bore piping.
62	3-156	14	Add a space between "Table 3.1-1" and "states".
63	3-160	33 & 34	Reword as "ASME Section XI, In-Service Inspection, Subsections IWB, IWC, and IWD Program".
64	3-162	3.1.2.3.3	The fourth paragraph of the section states: "...the staff found that the applicant's proposed AMP acceptable to manage the aging effect of crack initiation and growth due to cyclic loading of stainless steel material in the steam dryer exposed to reactor coolant water or steam environment at uprated power conditions." Although the cracking in the steam dryer was discovered in the industry after power uprate was accomplished, the cracking is assumed to occur even if power uprate is not carried out.
65	3-172	4 & 5	Delete "high-pressure core spray".
66	3-174	27	Delete "high-pressure core spray".
67	3-174	3.2.2.2.3	The fifth paragraph of the section states: "The staff determined that the use of the One-Time Inspection Program alone in certain cases, such as no flow conditions, where the use of the Plant Chemistry Program was not a viable option, was acceptable." The continual reference to "such as no flow conditions" in the section is incorrect. The Plant Chemistry Program is credited for aging management in no flow conditions. The One-Time Inspection Program is used to verify the effectiveness of the Plant Chemistry Program in stagnant flow areas per NUREG 1801, XI.M2 Water Chemistry. The One-Time Inspection Program is used alone when Plant Chemistry cannot be credited such as in an air/gas environment with the potential for moisture.
68	3-175	3.2.2.2.4	The fourth paragraph of the section begins with a discussion of the loss of material due to MIC; however, the end of the paragraph discusses loss of material due to pitting and crevice corrosion. The topic should be the loss of material due to MIC.
69	3-176	3.2.2.2.5	"The environments applicable to this item are characteristic of long incubation periods (air/gas environments with the potential for moisture)." This section discusses elastomer degradation. The environment which causes degradation in elastomers is high temperature air or ozone.
70	3-181	3.2.2.3.2	The Combustible Gas Control System was deleted from the scope of License Renewal. This section could be removed or a note added about the deletion.
71	3-181	3.2.2.3.3	Last sentence of this section; add the word "respectively" at the end of the last sentence to match the aging mechanisms with the appropriate AMPs.
72	3-182	3.2.2.3.4	The third paragraph of the section states: "...water chemistry for impurities (e.g., chloride and sulfate) that accelerate corrosion or crack initiation and growth and that cause heat transfer degradation due to fouling...". Should state "... that accelerate corrosion or crack initiation and growth or that

			cause heat transfer degradation due to fouling..."..
73	3-182	3.2.2.3.4	The last part of the third paragraph discusses system corrosion inhibitors concentrations. This discussion is irrelevant here since the section discusses the Plant Chemistry Program which does not use corrosion inhibitors but rather controls detrimental contaminants. Corrosion inhibitors are used in the Closed Cycle Cooling Water Program.
74	3-185	3.2.2.3.6	The third paragraph of the section. Same comment as numbers 72 and 73.
75	3-186	3.2.2.3.7	The last part of the third paragraph discusses system corrosion inhibitors concentrations. This discussion is irrelevant here since the section discusses the One Time Inspection and the Open Cycle Cooling Water Programs which do not use corrosion inhibitors. Corrosion inhibitors are used in the Closed Cycle Cooling Water Program. The Plant Chemistry Program controls detrimental contaminants.
76	3-187	3.2.2.3.7	In the sixth paragraph of the section. Same comment as number 72.
77	3-187	3.2.2.3.7	The seventh paragraph of the section. Same comment as number 75.
78	3-190	5	Table 3.3-1 first row, fourth column under "AMP in LRA" states the Compressed Air Monitoring Program (B2.1.14)". Delete this verbiage. This AMP is not addressed in the LRA for this line item nor is it relevant to the spent fuel pool cooling and cleanup system for line item 3.3.1-01.
79	3-193	3.3.1-22	This line item was not used at MNGP. Add line item 3.3.1-22 of the MNGP LRA which states: "This line item was not used at MNGP. The Fire Protection Program is applied to those components in the fire system associated with the diesel fire pump with the exception of the diesel fire pump diesel engine fuel oil supply. See item 3.3.1-21 for further discussion. The Fire Protection Program includes performance and condition monitoring of the diesel fire pump. Components in the diesel fire pump diesel engine fuel oil supply are included in the Emergency Diesel Generators System. See item 3.3.1-07 for further discussion. For these components, the aging effect is managed by the combination of the Fuel Oil Chemistry and One-Time Inspection Programs."
80	3-198	22	Delete the repeated statement "with the CLB".
81	3-199	22	Add a colon ":" at the end of the sentence.
82	3-205	13 & 16	Correct "3.2.2.2.7" to read "3.3.2.2.7".
83	3-207	3.3.2.2.10	Add verbiage that: "NMC will visually examine the unclad boral coupon sample prior to extended operation. The coupon will be removed from the spent fuel pool for a brief period of time, visually examined, and then immediately returned to the spent fuel pool." This is stated in the LRA Annual Update (see page 49 of 149 of Annual

			Update).
84	3-209	20	The beginning of the third paragraph states "The staff review of LRA Section 3.3.2.3..." Section 3.3.2.3 of the LRA is Time-Limited Aging Analysis. Change Section 3.3.2.3 to "Tables 3.3.2-1 through 3.3.2-18".
85	3-211	33	Add a single quotation mark after "Tools".
86	3-211	37	"superseded" is misspelled.
87	3-211	38	Move quotation mark from after "Revision 1" to after "(Structural Tools)".
88	3-217	16	Change "The applicant stated that material science..." to "The applicant stated that materials science..."
89	3-222	23 & 24	Change "...and loss of copper alloy material for..." to "...and loss of material for copper alloy for..."
90	3-223	15	Change "...and loss of copper alloy material for..." to "...and loss of material for copper alloy for..."
91	3-223	19	Change "...appropriate AMP for..." to "...appropriate AMPs for ..."
92	3-223	22	Add "heaters/coolers" to this sentence.
93	3-223	26	Delete "manifolds" and "piping and fittings" from this paragraph. There are no copper alloy manifolds or piping and fittings component types exhibiting these aging effects/mechanisms that are managed by the CCCW AMP in Table 3.3.2-6.
94	3-225	13	Change "...appropriate AMP for..." to "...appropriate AMPs for ..."
95	3-231	5	Change "...pitting corrosion and MIC in LRA..." to "...pitting corrosion, MIC and loss of material due to selective leaching in LRA..."
96	3-233	5	"B2.30" should be "B2.1.30".
97	3-233	29	"B2.13" should be "B2.1.13".
98	3-233	48	"B2.14" should be "B2.1.14".
99	3-240	3.4.1.-07	This line item was not used at MNGP. Add line item 3.3.1-07 of the MNGP LRA states: "This line item was not used at MNGP. See item 3.4.1-02." MNGP used both the Plant Chemistry Program and One-Time Inspection Program vice just the Plant Chemistry Program.

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100	3-241	3.4.1-12	Delete the statement under the "Staff Evaluation" column ("Not applicable. MNGP has no buried condensate storage tanks or AFW piping.") This was deleted in the LRA Annual Update (see page 66 of 149 of the Annual Update) and replaced with: "Emergency Diesel Generators System Oil Storage Tank external surface is managed by the Buried Piping & Tanks Inspection Program."
101	3-247	20	Change "...System Conditioning Monitoring Program is a new..." to "...System Conditioning Monitoring Program is an existing..."
102	3-256	Section 3.5, bullet # 7	For clarification may want to change, HPC building to, HPCI building
103	3-260	Second row	Under the heading, "AMP in LRA," may want to add, Protective Coating Monitoring & Maintenance (B2.1.27)
104	3-260	Second row	Under the heading, "Staff Evaluation," may want to add, but is credited for preventing degradation of coatings that could lead to the clogging of ECCS suppression pool suction strainers.
105	3-261	Fourth row	Under the heading, "Staff Evaluation," may want to replace with a statement similar to that provided in the sixth row of this page, Consistent with GALL Report with enhancements in the Structures Monitoring Program to include RG1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.
106	3-261	Sixth row	Under the heading, "AMP in LRA," may want to add: Fire Protection (B2.1.17)
107	3-262	Sixth row	Under the heading, "AMP in LRA," may want to add: None Members subjected to fatigue are accounted for by Code in their design.
108	3-262	Sixth row	Under the heading, "Staff Evaluation," may want to replace with, Consistent with GALL Report which recommends further evaluation (See 3.5.2.2.3).
109	3-272	41	"cycling" should be "cyclic".
110	3-291	Fifth para.	For the sentence, However, the applicant stated that supports in LRA Table 3.5.2-6 incorporating the use of lubrite or similar materials are inspected by the ASME Section XI, Subsection IWF Program. May want to add the following between the word that and supports. aging effects for lubrite or similar materials are not significant and although

			no aging management is required, the
111	3-291	37	Add the word "experience" after the word "operating".
112	3-297	Third para.	The sentence, Table 3.5.2-13 includes a number of submerged items (items 7, 9, 12, and 15) where the PCP has been identified as the only AMP. This statement is not accurate for Monticello LRA, Table 3.5.2-13. All submerged (treated water) components include at least two (2) AMPs. Should consider removing this sentence.
113	3-299	Fourth para.	The entire paragraph starting with the sentence, The staff's review of the applicant's programs, the aging effects, and plant-specific and industry operating experience determined that the aging effect of loss of material due to MIC, pitting, and crevice corrosion of stainless steel material exposed to a treated water environment is managed effectively by the Plant Chemistry Program,... appears to be out-of-place. May want to consider moving this paragraph to page 3-293, at the bottom, following the sentence, The 10 CFR 50, Appendix J Program specifies pneumatic pressure tests and visual examinations to verify the structural and leak integrity of the primary containment.
114	3-300	14	The reference to LRA Section "3.5.2.3.15" should be "3.5.2.1.15".
115	3-303	14	Delete "and component groups".
116	3-303	15	Delete "systems".
117	3-303	22	Delete "and component groups".
118	3-303	25	Delete "and component groups".
119	4-11	4.2.3.2	2nd para. – add "that is" prior to "applicable".
120	4-11	4.2.3.2	3rd para, 1st sentence - add "MNGP" before last "RPV".
121	4-12	4.2.4.2	2nd para. 1st sentence - start with "Prior to License Renewal the RPV core .."
122	4-13	4.2.4.2	2nd para. – reference to SER Section 4.2.2 should be 4.2.1.2.
123	4-16	4.2.6.2	Table 4.2.6-1 – after "Ni(%)" row add "CF", "134.9" and "138.5 in columns labeled "Value", "CB&I EFPY" and "MNGP 54 EFPY" respectively.
124	4-18	4.2.7.2	Table 4.2.7-1 – same as previous comment except "CF" and "138.5" only in "Value" and "MNGP 54 EFPY" columns only.
125	4-26	9	Delete the word "Code".
126	4-27	6	Delete the word "Code".
127	4-28	4.5.2	Last para. (beginning with "the staff compared") 2nd sentence – suggest changing to include identification of all applicable locations as follows:

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			NUREG/CR-6260 identified several locations for consideration: the reactor vessel shell, the recirculation system RPV nozzles, the core spray.....
128	4-29	4.5.2	1st para. – redundant, recommend deletion. See following comment.
129	4-29	4.5.2	3rd para. (ending with "....NUREG/Cr-6260 locations.") – add the previously deleted para. as follows: The staff also noted that the environmental fatigue .....Table 4.3.1-1. Also change reference to "Table 4.5.1" to "LRA Section 4.5".
130	4-29	4.5.2	4th para. – same as previous comment for reference to "Table 4.5.1".
131	4-29	4.5.2	6th para. 2nd sentence – core spray safe ends were replaced in 1986 not 1980.
132	4-29	4.5.2	6th para. last sentence – suggest the following "Because the applicant has implemented an effective HWC program, the environmental impact on the fatigue usage of carbon steel safe-ends is not significant."
133	4-29	4.5.2	7th para. – suggest deleting 1st two sentences and changing the 3rd to "The applicant stated that the environmental factors for the feedwater nozzle and the feedwater line RCIC tee connection evaluations considered....."
134	4-29	4.5.2	7th para. – change "replacement" to "cladding removal" (2 places) and "1980" to "1977" (2 places)
135	4-30	4.5.2	Add summary statements for RPV shell and recirc. nozzles.
136	4-41	4.8.2	Last para. 2nd sentence – delete "the postulation of a high" and add "test data" after "static friction".
137	4-42	4.8.2	2nd para. –may want to change the following "The staff evaluated.....operating environment, due to other coefficient of friction data indicating that a lower value may be appropriate."
138	4-43	4.8.2	1st para. – insert "could" before "exceed".
139	4-44	4.9.2	2nd para. –change "contended" to "identified".
140	B-1	6	Date of Palmisano Letter to NRC was "March 16, 2005".

ENCLOSURE 2

MARKED-UP DRAFT SER PAGES

Safety Evaluation Report

Related to the License Renewal of the Monticello Nuclear Generating Plant

Docket No. 50-263

Nuclear Management Company, LLC

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

April 2006

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Should be "xiv"

Abstract iii

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ABBREVIATIONS

AC	alternating current
ACBs	air circuit breakers
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACSR	aluminum conductor steel reinforced
ADAMS	Agency Document Access Management System
ADS	automatic depressurization system
AERM	aging effects requiring management
AFW	Auxiliary Feedwater
AIR	instrument and service air
AISC	American Institute of Steel Construction
AMAs	aging management activities
AMG	aging management guidline
AMP	aging management program
AMR	aging management review
AMSAC	ATWS mitigating system actuation circuitry
AN2	alternate nitrogen system
ANSI	American National Standards Institute
AOV	air operated valve
APR	automatic pressure relief
APRM	average power range monitor
AR	action request
ARI	alternate rod injection
ARM	area radiation monitor
ART	adjusted reference temperature
AS&CR	auxiliary steam and condensate recovery
ASD	alternate shutdown
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
AWI	administrative work instruction
BAW	Babcock and Wilcox
BTRS	boron thermal regeneration system
BWR	boiling water reactor
BWROG	Boiling Water Reactor Owners Group
BWRVIP	boiling water reactor vessel and internals project
CA	calculation
CAP	corrective action program
CASS	cast austentitic steel
CCCW	closed-cycle cooling water
CCW	closed cooling water or component cooling water
CDR	main condenser
CD-ROM	compact disk-read only memory

Should be "Agencywide Documents Access and Management System"

Correct spelling should be "guideline"

1. Correct spelling is "austenitic"
2. Insert "stainless" in front of "steel"

ESF	engineered safety feature
ESW	emergency service water
EXT	external
FAC	flow-accelerated corrosion
F_{en}	environmental fatigue factor
FHA	fire hazards analysis
FIR	fire system
FOH	diesel fuel oil transfer house
FP	fire protection
FPP	fire protection plan
FSAR	final safety analysis report
FSD	functional system description
FW	feedwater
GALL	generic aging lessons learned
GDC	general design criteria or general design criterion
GE	General Electric
GEIS	Generic Environmental Impact Statement
GL	generic letter
GSI	generic safety issue
HAZ	heat-affected zone
HELB	high-energy line break
HE/ME	high energy/moderate energy
HEPA	high efficiency particulate filter
HGR	hangers and supports
HJTC	heated junction thermocouple
HPB	HPCI building
HPC	high pressure coolant
HPCI	high pressure coolant injection
HTV	heating and ventilation
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
HX	heat exchanger
I&C	instrumentation and controls
IASCC	irradiation assisted stress corrosion cracking
ID	inside diameter
IEB	Inspection and Enforcement Bulletin
IEEE	Institute of Electrical and Electronics Engineers
IF	intended function
IGA	intergranular attack
IGSCC	intergranular stress corrosion cracking
IN	information notice
INPO	Institute of Nuclear Power Operations
INS	intake structure
IPA	integrated plant assessment
IR	insulation resistance

High Pressure Coolant Injection

MWh	Megawatt hour
MWt	Megawatt thermal
NDE	non-destructive examination
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969
NFPA	National Fire Protection Association
Ni	nickel
NMC	Nuclear Management Company, LLC
NMS	neutron monitoring system
NP	nuclear procedure
NPAR	nuclear plant aging research
NPS	nominal pipe size
NPSH	net positive suction head
NRC	U.S. Nuclear Regulatory Commission
NSAC	nuclear safety analysis center
NSAS	nonsafety affecting safety
NSP	Northern States Power Company
NSR	nonsafety-related
NSSS	nuclear steam supply system
NUMARC	Nuclear Utility Management and Resource Council
NUREG	designation of publication prepared by NRC staff
OBE	operating-basis earthquake
OCA	owner control area
OCCW	open-cycle cooling water program
ODSCC	outside-diameter stress-corrosion cracking
OE	operating experience
OGB	off gas storage and compressor building
OGS	off gas stack
OI	open item
OQAP	operational quality assurance plan
OSP	off site power
P&ID	piping and instrumentation diagram
PA	public address system
PAB	plant administration building
PASS	post accident sampling system
PBDs	program basis documents
PBX	private branch exchange
PCIS	primary containment isolation system
PCM	primary containment mechanical
PCT	primary containment
PFM	probabilistic fracture mechanics
pH	concentration of hydrogen ions
PM	preventative maintenanance
PPM	parts per million
PPS	plant protection system
PRF	penetration room filtration

Correct spelling is "maintenance".

PRM	process radiation monitor
PSI	pounds per square inch
P-T	pressure temperature
PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PUAAG	Plant Unique Analysis Application Guide
PUAR	Plant Unique Analysis Report
PULD	Plant Unique Load Definition
PVC	polyvinyl chloride (plastic)
PW	pipe whip
PWR	pressurized water reactor
PWSCC	primary water stress-corrosion cracking
QA	quality assurance
QC	quality control
Q-List	quality list
RAD	radwaste solid & liquid
RAI	request for additional information
RBC	reactor building closed cooling water
RBM	rod block monitor
RCI	reactor core isolation
RCIC	reactor core isolation cooling
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
REC	reactor recirculation
RG	Regulatory Guide (NRC)
RHR	residual heat removal
RHV	reactor head vent
RI-ISI	risk-informed inservice inspection
RIT	reactor internals
RLC	reactor level control
RMC	reactor manual control
RMS	radiation monitoring system
RMWST	reactor makeup water storage tank
RPS	reactor protection system
RPT	recirculation pump trip
RPV	reactor pressure vessel
RSW	residual heat removal service water
RT_{NDT}	reference temperature nil ductility transition
RT_{PTS}	reference temperature pressurized thermal shock
RTS	reactor trip system
RV	relief valve
RVI	reactor vessel instrumentation
RWB	radioactive waste building
RWC	reactor water cleanup
RWST	refueling water storage tank
RX	reactor

reactor core isolation cooling

applicant uses to identify SCs subject to an AMR. LRA Section 3, "Aging Management Review Results," contains the following information:

- Section 3.1, "Aging Management of Reactor Coolant System"
- Section 3.2, "Aging Management of Engineered Safety Features"
- Section 3.3, "Aging Management of Auxiliary Systems"
- Section 3.4, "Aging Management of Steam and Power Conversion System"
- Section 3.5, "Aging Management of Containments, Structures, and Component Supports"
- Section 3.6, "Aging Management of Electrical and Instrumentation and Controls"

LRA Section 4, "Time-Limited Aging Analyses," contains the applicant's identification and evaluation of time-limited aging analyses.

2.1.2.1 Scoping Methodology

In LRA Section 2.1, the applicant described the methodology used to scope SSCs pursuant to 10 CFR 54.4(a) scoping criteria. The following sections present the applicant's scoping methodology, as described in the LRA.

2.1.2.1.1 Application of the Scoping Criteria in 10 CFR 54.4(a)

The applicant described the general approach to scoping safety-related (SR) and nonsafety-related (NSR) SSCs and SSCs credited with demonstrating compliance with certain regulated events in LRA Section 2.1.2, "Application of Scoping Criteria in 10 CFR 54.4(a)." The following sections describe the scoping approaches specific to each of the three 10 CFR 54.4(a) scoping criteria.

Application of the Scoping Criteria in 10 CFR 54.4(a)(1).

In LRA Section 2.1.4.2.1, "Scoping Criterion 1 - Safety Related SSCs," the applicant presented its scoping methodology as it pertains to SR criteria pursuant to 10 CFR 54.4(a)(1). The applicant used MNGP Q-List and Q-List Extension color-coded drawings to code items as SR in the MNGP plant equipment electronic database (CHAMPS), which also served as one of a number of information sources in the current licensing basis (CLB) used to identify SSCs meeting Scoping Criterion 1. For example, information from the Updated Safety Analysis Report (USAR), technical specifications (TSs), and design documents was reviewed to ensure all major system and structure functions had been identified properly. These functions were compared to Scoping Criterion 1 to identify SSCs within the scope of license renewal which are relied upon to remain functional during and following design basis events (DBEs).

CHAMPS and controlled drawings were used to identify components required to support system-level and structure-level functions within the scope of license renewal. These components included within the scope of license renewal generally matched information in CHAMPS. Differences noted were documented and resolved.

the general area of Scoping Criterion 1 components are within the scope of license renewal and assumed to leak anywhere around the circumference or along the length of the pipe. All non-pressurized liquid systems directly above Scoping Criterion 1 components are also within the scope of license renewal. Leaks were assumed to occur anywhere along the length of the piping system.

Air and gas systems are not included within the scope of license renewal because they do not contain NSR components whose failure could prevent satisfactory accomplishment of Scoping Criteria 1 functions. Site-specific operating experience was reviewed to verify that Monticello air/gas systems have not affected other plant equipment negatively. The applicant's review of industry operating experience also revealed no events of this nature. Because none of the air/gas lines are high-energy lines and all supports in buildings with Scoping Criterion 1 components are within the scope of license renewal, air/gas systems are not Scoping Criterion 2 items.

NSR conduits, cable trays, junction boxes, or lighting fixtures may contain or be routed near Scoping Criterion 1 cables or other components; therefore, all NSR conduits, trays, junction boxes, and lighting fixtures and their supports located within structures housing SR equipment are within the scope of license renewal. Additionally, conduits, trays, junction boxes, and lighting fixtures and their supports required for regulated events located in structures not housing Scoping Criterion 1 equipment are within the scope of license renewal.

Though most heating, ventilation, and air conditioning (HVAC) ducts and their supports are NSR, they are located throughout the plant, typically along ceilings and thus, above many Scoping Criterion 1 SSCs. Like air/gas pipe systems, HVAC ducts are not hazards to other plant equipment. Falling is a concern; therefore, all HVAC duct supports located within structures housing Scoping Criterion 1 components are within the scope of license renewal.

Application of the Scoping Criteria in 10 CFR 54.4(a)(3).

In LRA Section 2.1.4.2.3, "Scoping Criterion 3 - Other Regulations Identified in 10 CFR Part 54," the applicant discussed the methodology used to identify SSCs credited with functions that demonstrate compliance with regulations for fire protection, environmental qualification (EQ), anticipated transients without scram (ATWS), and station blackout (SBO) pursuant to the 10 CFR 54.4(a)(3) license renewal scoping criteria. The applicant did not evaluate pressurized thermal shock because it is not applicable to boiling water reactors (BWRs).

Fire Protection

10 CFR 50, Appendix R, with commitments made to NRC Branch Technical Position APCSB 9.5-1, Appendix A and

In LRA Section 2.1.4.2.4, "Fire Protection," the applicant described the scoping of SSCs relied on to perform functions that demonstrate compliance with 10 CFR 50.48 fire protection requirements. The applicant stated that a detailed evaluation of the CLB including CHAMPS, the Safe Shutdown Analysis, the Fire Hazards Analysis, plant drawings, the USAR, and the Operations Manual was performed for fire protection, and SSCs supporting either fire protection design features or safe shutdown following postulated fires are within the scope of license renewal.

- Calculations
- Plant Modifications and Alterations
- Nuclear Steam Supply System Supplier, Architect-Engineer, and Vendor Reports, Specifications, and Drawings
- Maintenance Rule Document ← s
- CHAMPS

The applicant stated the review of these documents was performed to identify the major SSCs and their respective functions. Functions of SSCs that were determined to be within the scope of license renewal were identified as intended functions pursuant to 10 CFR 54.4(b). CHAMPS and controlled drawings were used to identify components required to support system-level and structure-level functions within the scope of license renewal. These sources also were used to develop the list of SCs subject to an AMR.

2.1.2.1.3 Plant and System-Level Scoping

LRA Section 2.1.4 states that the scoping process categorizes the entire plant according to major SSCs and commodity groups. SSC and commodity group functions were identified and evaluated against criteria in 10 CFR 54.4(a) to determine whether the function was an intended function. The SSC or commodity was deemed within the scope of license renewal and received further screening if a portion of the SSC or commodity fulfilled a scoping criterion.

2.1.2.1.4 Component-Level Scoping

After identifying the intended functions of systems and structures, the applicant identified components that support intended functions. The applicant considered components supporting intended functions as within the scope of license renewal and screened them to determine whether an AMR was required.

Commodity groups were used when component evaluations were by component type rather than by system or structure. Components constructed from similar materials, exposed to similar environments, and performing similar intended functions form the commodity groups. Commodity group components were not associated with specific systems or structures during the evaluation, but with their assigned commodity groups. AMR of each commodity group took place as if it were a separate, individual system. Electrical components, component supports, and fire stops and seals were placed in separate commodity groups.

CHAMPS does not uniquely identify all components installed in the plant. For example, CHAMPS does not typically include such items as cables, raceways, piping, conduits, fireproofing, general construction items (e.g., nuts, bolts), or consumable materials (e.g., diesel fuel, resins, etc.). Components not uniquely identified in CHAMPS that are within the scope of license renewal are identified as commodities or generic assets (e.g., pipe, structural steel) in their respective system or structure in the license renewal database to ensure proper coverage and evaluation.

drywell/suppression

plant controlled documents

The applicant's evaluation of NSR SSCs attached directly and those within close spatial proximity to SR SSCs considered recent industry guidance on the subject as a result of recent staff license renewal evaluations, taking into account that all active as well as passive SR SSCs could be affected adversely by spray or wetting from an NSR pressurized system in the same general location of the plant, regardless of the duration of that exposure. Specifically, the applicant used a "spaces" approach to identify SR SSCs and NSR SSCs in the same "general area" defined as a location sharing a common floor and common walls. This definition was expanded during plant walkdowns in the 10 CFR 54.4(a)(2) evaluation to include adjacent areas (i.e., separated by a wall or barrier) if there could be communication between the two areas. In those instances, the adjacent area was considered part of the general area.

As part of this evaluation, the applicant first listed the SR components and their locations within the plant. Review of ~~plant control drawings~~ like P&IDs, DBDs, and CHAMPS identified plant areas where NSR and SR SSCs were located. The applicant performed walkdowns of all accessible locations to identify NSR SSCs within these areas and types of potential interactions that could occur (i.e., leaking, spraying, physical impact). For inaccessible areas, the applicant relied on controlled plant piping layout drawings and operator knowledge of the plant design and operation to identify potential component interactions. The inaccessible areas included the ~~drywell suppression~~ chamber, steam chase, reactor water cleanup and traversing incore probe rooms, condenser room, and steam jet air ejector room. Where the applicant identified potential interactions between the NSR SSCs and SR SSCs within a general area, it included those NSR SSCs within the scope of license renewal. The applicant further documented the results on marked up P&IDs, which highlighted the NSR SCs identified, and described the general area and SR SCs that could be affected by the NSR line failure. The staff reviewed a sample of the marked up P&IDs for the CRD system and reviewed the applicant's determination of areas of no potential interactions between NSR and SR SSCs. The staff determined that the applicant had evaluated the 10 CFR 54.4(a)(2) scoping criterion consistently with the applicant's written instructions for such an evaluation and that the results had been documented with technical supporting justifications. The staff did not identify any specific concerns regarding the implementation of the 10 CFR 54.4(a)(2) scoping methodology for the system sample reviewed.

The applicant also discussed its 10 CFR 54.4(a)(2) scoping evaluation process for NSR SSCs directly attached to SR SSCs to determine equivalent anchor locations required to establish system boundaries for the evaluation. With respect to the equivalent anchor criteria, the applicant identified locations in each relevant system where support and attachment are such that failure of the piping system beyond the boundary point would not adversely affect the SR functions of connected SR components. The applicant relied on its piping stress analysis of record to determine equivalent anchor locations. In most cases this boundary encompassed at least two levels of supports in each orthogonal direction and for those few cases where such support was not available, the applicant evaluated the piping stress analysis to determine alternate anchorage locations. The alternate anchorage locations included (1) selected wall penetrations, (2) large pieces of plant equipment, (3) transition points between the piping systems and flexible connections like tubing and ducting, and (4) locations where the piping system moment of inertia ratio exceeds 40:1 between the main and branch lines. In each case, the applicant provided a technical justification for the use of the equivalent anchorage location based on CLB information related to the piping stress analysis of record. The staff reviewed the methodology for a selected sample of mechanical systems and confirmed that the applicant's evaluation was consistent with the guidance and that results had been documented adequately and justified technically.

discussion of the methodology and results with the applicant's personnel responsible for these evaluations, and reviewed ALEX. The staff verified that the applicant had identified and used pertinent engineering and licensing information to determine the SSCs within the scope of license renewal in accordance with the 10 CFR 54.4(a)(3) criterion.

Conclusion

Based on this sampling review, discussions with the applicant, and review of the applicant's scoping process, the staff determined that the applicant's methodology for identifying systems and structures meeting the 10 CFR 54.4(a)(3) scoping criterion is adequate.

2.1.3.1.3 Plant-Level Scoping of Systems

The applicant documented its methodology for scoping systems in accordance with 10 CFR 54.4(a) in procedure LRPP 2-1. The applicant's approach to scoping systems was consistent with the methodology described in LRA Section 2.1.4. Specifically, LRPP 2-1 specified that personnel scoping for license renewal use CLB and DBE documents to describe systems, including lists of all functions that the system is required to accomplish. Sources of information included the USAR, DBDs, Q-List and Q-List Extension Drawings, CHAMPS, the Maintenance Rule document, P&IDs, and docketed correspondence. The applicant then compared system function lists to the scoping criteria to determine whether the system functions met the 10 CFR 54.4(a) scoping criteria. The applicant documented the scoping results in ALEX, which included a description of the system, a list of functions performed by the system, identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system, references, and a list of components performing intended functions. During the scoping methodology audit, the staff reviewed a sampling of ALEX scoping reports and concluded that they contain an appropriate level of detail to document the scoping process.

mechanical

Color-coded boundary P&IDs were established for each system within the scope of license renewal ~~that was determined to be a pressure boundary by mapping system-level license renewal intended function pressure boundaries onto P&IDs.~~ A preparer and an independent reviewer comprehensively evaluated the license renewal color-coded P&IDs for completeness and accuracy of the review results. The staff reviewed several license renewal color-coded boundary P&IDs and verified that systems within license renewal boundaries were identified in ALEX.

Delete

Conclusion

On the basis of a review of the LRA, ALEX, scoping and screening implementation procedures, license renewal color-coded P&IDs, and a sampling review of system scoping results, the staff concluded that the applicant's scoping methodology for systems is adequate. In particular, the staff determined that the applicant's methodology reasonably identified systems within the scope of license renewal and their associated intended functions.

2.1.3.1.4 Mechanical Component-Level Scoping

After the applicant had identified systems within the scope of license renewal and their associated intended functions, a review was performed to identify the components of each system within the scope of license renewal that supported an intended function. As described in

screening of SSCs within the scope of license renewal. Screening activities identified passive components, long-lived components, component intended functions, consumables, and component replacement based on performance or condition. The applicant relied on the guidance of NEI 95-10 to develop the plant-specific listing of passive components of interest during the review.

Conclusion

The staff reviewed the LRA, procedures, drawings, and the ALEX database. The staff also reviewed the results of the scoping and screening methodology for select structures including the diesel fuel oil transfer house, offgas stack, and intake structure (flood control). The staff found the applicant's methodology consistent with the description in LRA Sections 2.1.4 and 2.1.5 and the guidance of SRP-LR Section 2.1. Based on review of information contained in the LRA, the applicant's detailed scoping implementation procedures, and a sampling review of structural scoping and screening results, the staff concluded that the applicant's methodology for identification of structural SSCs subject to an AMR meets 10 CFR 54.21(a)(1) requirements.

Electrical and I&C Component Screening

The applicant described the electrical and I&C screening methodology in LRA Section 2.1.5.4, Procedure LRPP 2-1, and Technical Report TR-005. The applicant identified evaluation boundaries for the electrical and I&C systems previously determined to be within the scope of license renewal. Components within the evaluation boundary were reviewed to identify SCs performing intended functions, and such SCs were then compiled into ALEX. ALEX was reviewed to identify the passive and long-lived components subject to an AMR in accordance with 10 CFR 54.21. In addition, the applicant identified and reviewed fuse holders in accordance with the guidance contained in ISG-05, "Electrical Fuse Holders." The applicant documented the results of these activities in four technical reports, "Electrical Penetrations," "Non-EQ Cables and Connections," "Fuse Holders," and "Offsite Power/SBO Recovery Path."

Conclusion

The staff reviewed the LRA, procedures, drawings, ALEX, and a sample of the results of the screening methodology. The staff found the applicant's methodology consistent with the description in LRA Section 2.1.5.4 and the applicant's implementing procedures. Based on review of information in the LRA, the applicant's detailed screening implementation procedures, and a sampling review of electrical and I&C screening results, the staff concluded that the applicant's methodology for identification of electrical and I&C SCs subject to an AMR meets 10 CFR 54.21(a)(1) requirements.

Insulation

LRA Table 2.1-1 described the intended function of thermal insulation to "limit heat transfer to maintain temperature within design limits." During the audit, the staff reviewed Technical Report TR-010, "Scoping and Screening of Thermal Insulation," which described how thermal insulation was scoped and screened at MNGP. No insulation at MNGP is classified as SR, so insulation can be within the scope of license renewal only for environment control or seismic II/I intended functions. The applicant stated that thermal insulation to limit room heat-up was within the scope of license renewal in two areas: high pressure coolant room piping insulation and

injection

2.1.3.3 QA Controls Applied to LRA Development

The staff reviewed the QA controls used by the applicant for reasonable confidence that the LRA scoping and screening methodologies were adequately implemented. Although the applicant did not develop the LRA under a 10 CFR Part 50, Appendix B QA program, the staff determined that the applicant utilized the following QA processes during the LRA development:

- Implementation of the scoping and screening methodology was governed by written procedures and guidelines.
- The LRA was reviewed and approved by the Offsite Review Committee and the Plant Operations Committee prior to submittal to the staff.
- The applicant planned to retain certain license renewal documents as quality records or controlled documents.

Review

- The applicant performed an industry peer review of license renewal activities.
- The applicant's Nuclear Oversight Department performed a self-assessment in the area of implementation of license renewal procedures.

Conclusion

On the basis of review of pertinent LRA development guidance, discussion with the applicant's license renewal personnel, and review of the Nuclear Oversight quality audit report (Observation Report 2004-002-5-021), the staff concluded that such QA activities provided reasonable assurance that LRA development activities were consistent with LRA descriptions.

2.1.3.4 Training

The staff reviewed the applicant's training process to ensure that guidelines and methodology for scoping and screening activities were consistent and appropriate. The applicant had developed ten license renewal lesson plans to train all technical leads and site personnel in license renewal activities. The applicant developed and used Procedure LRPP 1-4 to train contract personnel supporting the license renewal effort. Contract personnel also were required to review the applicable regulations, NEI 95-10, the applicable administrative work instruction, and the License Renewal Project Plans. In addition, the applicant created "Documentation of Information Sharing" on specific license renewal topics as they were developed and also conducted periodic training sessions for all license renewal personnel.

Conclusion

On the basis of discussions with the applicant's license renewal project team responsible for the scoping and screening process and a review of selected documentation in support of the process, the staff concluded that the applicant's personnel understood the requirements and guidance and adequately implemented the scoping and screening methodology documented in the LRA. The staff concluded that license renewal personnel were adequately trained and qualified to perform the applicable license renewal activities.

by 10 CFR 54.4(a), and the reactor head vent system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.2 Reactor Pressure Vessel

2.3.1.2.1 Summary of Technical Information in the Application

In LRA Section 2.3.1.2, the applicant described the RPV system. The RPV system consists of the RPV top head enclosure, vessel shell, nozzles, nozzle safe ends, penetrations, bottom head, and support skirt and attachment welds. RPV internals are included in the reactor internals (RIT) system. The RPV serves as a high integrity barrier against leakage of radioactive materials to the drywell.

The RPV system contains SR components that are relied upon to remain functional during and following DBEs. In addition, the RPV system performs functions that support fire protection, ATWS, and SBO.

The intended functions within the scope of license renewal include the following:

- provides a pressure-retaining boundary
- provides structural support to SR components (vessel ~~and~~ internals)

DELETE "and".

In LRA Table 2.3.1-2, the applicant identified the following RPV system component types that are within the scope of license renewal and subject to an AMR:

- bottom head components - bottom head dollar plate, bottom head torus
- nozzle safe ends - control rod drive return line cap
- nozzle safe ends - core spray
- nozzle safe ends - feedwater (FW) nozzle
- nozzle safe ends - instrument & standby liquid control (SLC)
- nozzle safe ends - jet pump instrument
- nozzle safe ends - main steam
- nozzle safe ends - recirculating water
- nozzle safe ends and flanges - instrument
- nozzles - control rod drive return line
- nozzles - feedwater
- nozzles - main steam
- nozzles - recirculation outlet, recirculation inlet, core spray, jet pump instrument, instrument & SLC
- penetration - bottom head drain line
- penetration - control rod drive stub tubes

2.3.1.3 Reactor Pressure Vessel Internals

2.3.1.3.1 Summary of Technical Information in the Application

In LRA Section 2.3.1.3, the applicant described the RPV internals. The RPV internals consist of all the SCs within the reactor vessel that provide support for the core, control rod system support, instrumentation support, steam quality enhancement, and that direct coolant flow.

The RPV internals contain SR components that are relied upon to remain functional during and following DBEs. The failure of NSR SSCs in the RPV internals could potentially prevent the satisfactory accomplishment of an SR function of SSCs within the scope of license renewal. In addition, the RPV internals perform functions that support fire protection, ATWS, and SBO.

The intended functions within the scope of license renewal include the following:

DELETE "and"

- provides a pressure-retaining boundary
- provides structural support to SR components (vessel ~~and~~ internals)
- spray pattern - to provide adequate flow in a specified distribution spray pattern

In LRA Table 2.3.1-3, the applicant identified the following RPV internals component types that are within the scope of license renewal and subject to an AMR:

- access hole covers
- control rod drive housing
- control rod guide tube (CRGT)
- CRGT base
- core plate
- core plate bolts
- core shroud (upper, central, lower)
- core spray lines and spargers, piping supports, clamp modification, core spray lines (headers), spray rings, spray nozzles, thermal sleeves
- intermediate range monitor dry tubes, source range monitor dry tubes, incore flux monitor guide tubes, low power range monitor (LPRM) dry tubes
- jet pump assembly - riser pipe
- jet pump assemblies - castings: elbow, collar, flare, flange, transition piece
- jet pump assemblies - diffuser
- jet pump assemblies - holddown beams
- jet pump assemblies - inlet header
- jet pump assemblies - inlet elbow
- jet pump assemblies - mixing assembly

10 CFR 54.4(a), and the HPC system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.5 Primary Containment Mechanical System

2.3.2.5.1 Summary of Technical Information in the Application

In LRA Section 2.3.2.5, the applicant described the primary containment mechanical (PCM) system. The PCM system includes the containment atmosphere control and nitrogen control components, the hydrogen-oxygen analyzing (HOA), the post-accident sampling (PAS) and the hard pipe vent (HPV) subsystems. The PCM system was created to separate out the mechanical components of the primary containment (PCT) system for license renewal evaluation purposes. The mechanical components, and also the associated electrical and I&C components, were transferred from the PCT system to the PCM system. The resulting PCT system contains only the structural components of the primary containment system. For license renewal evaluations, the PCM system also includes the portions of the mechanical containment penetration assemblies that are extensions of the mechanical piping; these are the flued heads and guard pipes of the mechanical containment penetration assemblies. The other components of the containment penetration assemblies (e.g., the sleeves) are evaluated in the PCT system. The PAS subsystem consists of a liquid and gas sample station located outside the secondary containment in the turbine building near the control room access door. The system is designed to provide samples under all conditions ranging from normal shutdown and power operation to the design basis LOCA. The HPV subsystem provides a vent path from the pressure suppression chamber (wetwell) vapor space to a release point above the reactor building.

The PCM system contains SR components that are relied upon to remain functional during and following DBEs. The failure of NSR SSCs in the PCM system could potentially prevent the satisfactory accomplishment of an SR function of SSCs within the scope of license renewal. In addition, the PCM system performs functions that support fire protection, EQ, and SBO.

The intended functions within the scope of license renewal include the following:

- provides filtration
- provides a pressure-retaining boundary
- provides pressure boundary or ~~essentially leak-tight barrier (mechanical)~~ fission product retention

In LRA Table 2.3.2-5, the applicant identified the following PCM system component types that are within the scope of license renewal and subject to an AMR:

- accumulators
- fasteners/bolting
- filters/strainers
- flow element
- manifolds
- piping and fittings
- rupture disks
- thermowells
- valve bodies

system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and the SCT system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

In LRA Section 2.3.3, the applicant identified the SCs of the auxiliary systems that are subject to an AMR for license renewal.

The applicant described the supporting SCs of the auxiliary systems in the following sections of the LRA:

- 2.3.3.1 alternate nitrogen system
- 2.3.3.2 chemistry sampling system
- 2.3.3.3 circulating water system
- 2.3.3.4 control rod drive system
- 2.3.3.5 demineralized water system
- 2.3.3.6 emergency diesel generators system
- 2.3.3.7 emergency filtration train system
- 2.3.3.8 emergency service water system
- 2.3.3.9 fire system
- 2.3.3.10 fuel pool cooling and cleanup system
- 2.3.3.11 heating and ventilation system
- 2.3.3.12 instrument and service air system
- 2.3.3.13 radwaste solid and liquid system
- 2.3.3.14 reactor building closed cooling water system
- 2.3.3.15 reactor water cleanup system
- 2.3.3.16 service and seal water system
- 2.3.3.17 standby liquid control system
- 2.3.3.18 wells and domestic water system

The staff's review findings regarding LRA Sections 2.3.3.1 – 2.3.3.18 are presented in SER Sections 2.3.3.1 – 2.3.3.18, respectively.

2.3.3.1 Alternate Nitrogen System

2.3.3.1.1 Summary of Technical Information in the Application

In LRA Section 2.3.3.1, the applicant described the alternate nitrogen system (AN2). The AN2 system consists of two separate SR trains providing a SR back-up pneumatic source from nitrogen bottle racks located in the turbine building. The AN2 system interfaces with the instrument and service air (AIR) system through a check valve with the nitrogen side held at a slightly lower pressure to allow the AIR system to be used during normal operation. In the event of an accident, which also disables the AIR system, the AN2 system would automatically supply the required pneumatic loads. Manifold and system pressures of each train are monitored by pressure switches, which give control room annunciation on low pressure.

The nitrogen supply bottles connected to the distribution rack are not long-lived components and not subject to an AMR.

The AN2 system contains SR components that are relied upon to remain functional during and following DBEs. In addition, the AN2 system performs functions that support fire protection, EQ, and SBO.

The intended function, within the scope of license renewal, is to provide a pressure-retaining boundary.

In LRA Table 2.3.3-1, the applicant identified the following AN2 system component types that are within the scope of license renewal and subject to an AMR:

- fasteners/bolting
- flexible connections
- piping and fittings
- ~~tanks~~ Delete
- valve bodies

2.3.3.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.1 and the USAR using the evaluation methodology described in SER Section 2.3. The staff conducted its review in accordance with the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and USAR in accordance with the requirements of 10 CFR 54.4(a) to verify that the applicant had not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant had identified as being within the scope of license renewal to verify that the applicant had not omitted any passive and long-lived components that should be subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.1 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.3.1-1, dated September 16, 2005, the staff noted that the license renewal boundary drawing LR-36049-10 at location B-8 and C-8 shows the nitrogen supply bottles as within the scope of license renewal; however, these nitrogen supply bottles are not listed in LRA Table 2.3.3-1 as a component type subject to an AMR. These nitrogen supply bottles provide a pressure boundary intended function and are passive and long-lived; therefore, the staff requested that the applicant clarify whether these nitrogen supply bottles are included with another component type (i.e., tanks) and if not, to justify why they are not listed in Table 2.3.3-1 or update the table to include these components.

In its response, by letter dated October 14, 2005, the applicant stated that nitrogen supply bottles are periodically replaced and therefore are not long-lived and are not subject to AMR pursuant to the requirements of 10 CFR 54.21(a).

Based on its review, the staff found the applicant's response to RAI 2.3.3.1-1 acceptable, because the nitrogen supply bottles are periodically replaced and therefore are not subject to AMR; therefore, the staff's concern described in RAI 2.3.3.1-1 is resolved.

2.3.3.1.3 Conclusion

The staff reviewed the LRA to determine whether any SSCs that should be within the scope of license renewal had not been identified by the applicant. No omissions were identified. In addition, the staff performed a review to determine whether any components that should be subject to an AMR had not been identified by the applicant. No omissions were identified. On the basis of its review, the staff concluded that the applicant had adequately identified the AN2 system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and the AN2 system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.2 Chemistry Sampling System

2.3.3.2.1 Summary of Technical Information in the Application

In LRA Section 2.3.3.2, the applicant described the chemistry sampling (CHM) system. The CHM system provides for sampling the process fluid of various systems to obtain representative data from which the performance of the plant systems and equipment can be evaluated. The sampling locations are chosen to ensure that representative samples can be obtained. The sample streams are routed by the shortest route to a common sample collection area. There is a collective sample station for each building in the plant: radwaste building sample station, located in the radwaste building; reactor building sample station, located in the reactor building; and turbine building sample station, located in the turbine building. The stations are provided with closed loop process lines that discharge to the equipment drain tanks and then to the waste collector tank for reprocessing. Each sample station typically consists of a sample rack with sample shutoff valves; sample coolers; sample chillers; sample modules; instrumentation for conductivity, pH, dissolved oxygen, dissolved hydrogen, total organic carbon; and a local data acquisition system panel. There is a ventilated fume hood for collection of grab samples adjacent to the sample rack. a

The failure of NSR SSCs in the CHM system could potentially prevent the satisfactory accomplishment of ~~an~~ SR function of SSCs within the scope of license renewal.

The intended function, within the scope of license renewal, is to provide a pressure-retaining boundary.

In LRA Table 2.3.3-2, the applicant identified the following CHM system component types that are within the scope of license renewal and subject to an AMR:

- chillers
- fasteners/bolting
- filters/housings
- flow element
- heat exchangers

2.3.3.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.6 and the USAR using the evaluation methodology described in SER Section 2.3. The staff conducted its review in accordance with the guidance described in SRP-LR Section 2.3.

In conducting its review, the staff evaluated the system functions described in the LRA and USAR in accordance with the requirements of 10 CFR 54.4(a) to verify that the applicant had not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant had identified as being within the scope of license renewal to verify that the applicant had not omitted any passive and long-lived components that should be subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.6 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.3.6-1, dated September 16, 2005, the staff noted that the DGN system includes a DOL subsystem which stores and supplies diesel fuel oil for the operation of the plant diesel generators, diesel fire pump, and heating boiler. The DOL subsystem (except such portions as the heating boiler oil storage tank and its day tank) is SR and within the scope of license renewal; however, license renewal boundary drawing LR-36051 sheet 1 shows the truck fill connection at location B-5 and the diesel oil receiving tank (T-83) ~~system~~ subsystem (including pump, piping, etc.) at location A-7 as not within the scope of license renewal; therefore, the staff requested that the applicant clarify whether these components are within the scope of license renewal and subject to an AMR in accordance with the applicable requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a), respectively, or justify their exclusion.

In its response, by letter dated October 14, 2005, the applicant stated that the diesel oil receiving tank (T-83) and truck fill connection are utilized for receiving, storing, and sampling diesel fuel oil prior to transfer of the fuel oil to the diesel oil storage tank (T-44) and that these components are not SR. The applicant explained that failure of the truck fill connection and the diesel oil receiving tank (T-83) and connecting piping outside the diesel fuel oil transfer house (pump house) would not impact the intended function of any SR SCs. The applicant, therefore, concluded that the NSR fill connection, diesel oil receiving tank, and connecting piping outside the pump house performed no license renewal function as defined by 10 CFR 54.4(a) and, therefore, are not within the scope of license renewal.

Based on its review, the staff found the applicant's response to RAI 2.3.3.6-1 acceptable, because the applicant provided a satisfactory explanation as to why the components are outside the scope of license renewal; therefore, the staff's concern described in RAI 2.3.3.6-1 is resolved.

The staff's review of LRA Section 2.3.3.6 identified an area in which information provided in the LRA needed to be verified by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

subsystem

Inspection Item 2.3.3.6-1

LRA Section 2.3.3.6 states that DGN air starting ~~system~~ components within the scope of license renewal are located between the air compressor discharge check valves and the diesel engine air start motors; however, license renewal boundary drawing LR-36051 shows at locations A-3, B-3, C-3, and D-3 that the license renewal boundaries terminate in the middle of those pipes connected between the compressor air dryers and discharge check valves (GSA-32-2, GSA-32-1, GSA-32-4, and GSA-32-3). The actual locations of the license renewal scope boundaries for these components are not clear. The NRC Regional Inspection Team performed an inspection to ensure that the license renewal scope boundaries for these components satisfy the 10 CFR 54.4(a)(2) criteria.

The inspection team determined the scope boundaries are just upstream of the respective check valves as indicated. The actual boundaries are where the carbon steel pipe connects to the copper alloy tubing at the nipple to the air dryers. Due to the relative flexibility between the piping and tubing, the boundary is the tubing transition point. This transition point is depicted on the boundary drawing between the check valve and the air dryer. The inspectors determined that the license renewal boundaries satisfy the 10 CFR 54.4(a)(2) criteria. Therefore, the staff's concern described in Inspection Item 2.3.3.6-1 is resolved.

2.3.3.6.3 Conclusion

The staff reviewed the LRA to determine whether any SSCs that should be within the scope of license renewal had not been identified by the applicant. No omissions were identified. In addition, the staff performed a review to determine whether any components that should be subject to an AMR had not been identified by the applicant. No omissions were identified. On the basis of its review, the staff concluded that the applicant had adequately identified the DGN system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant had adequately identified the DGN system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.7 Emergency Filtration Train System

2.3.3.7.1 Summary of Technical Information in the Application

In LRA Section 2.3.3.7, the applicant described the emergency filtration train (EFT) system. The EFT system is an ESF system per the MNGP licensing basis. The EFT system has been included within this section, and the related aging management section, for consistency with the SRP-LR and GALL Report. The heating, ventilating and air conditioning system that serves the main control room (MCR) and the EFT building is designed to provide cool air in the summer and warm air for heating in the winter. Ductwork is used to distribute air. The air flow in the MCR and portions of the EFT building is normally recirculated with return air arranged to pass back to the air conditioning unit while supplemental outside air is drawn through filtration units. The EFT system will serve the MCR and EFT building during normal or emergency conditions. An emergency condition is defined as that due to a high radiation or detection of toxic chemical vapors in the outside air. The air handling units are self-contained package units complete with electric coils for heating and cooling coils for air conditioning. In the normal operating mode, the MCR and EFT building first and second floors, excluding the battery room, are served by one of

omitted any passive and long-lived components that should be subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.13 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.3.15-1, dated September 16, 2005, the staff noted that drawing LR-36254 at location C-8 contains two references (line REW3-4" EBD from reactor recirculation loop B and line REW31-2"-ED from reactor vessel drain) to drawing LR-36243 at location C-5; however, drawing LR-36243 only shows one reference (line REW31-2"-ED which is also capped) to drawing LR-36254; therefore, the staff requested that the applicant clarify this discrepancy and confirm which portions of the piping are within the scope of license renewal and subject to an AMR in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a), respectively, or justify their exclusion. C-6

In its response, by letter dated October 14, 2005, the applicant clarified the drawing annotations showing the convergence of the two lines REW3-4"-EBD and REW31-2"-ED is shown on LR-36243 grid location ~~C6~~. The extension of line REW3-4"-EBD is shown as a dashed line on LR drawing LR-36243 instructing the reviewer to look at LR drawing LR-36254 for the details on that pipe. The applicant confirmed the correctness of the drawings and that both lines are within the scope of license renewal and subject to an AMR in accordance with the requirements of 10 CFR 54.4(a) and 10 CFR 54.21(a).

Based on its review, the staff found the applicant's response to RAI 2.3.3.15-1 acceptable, because the applicant confirmed the lines are within the scope of license renewal; therefore, the staff's concern discussed in RAI 2.3.3.15-1 is resolved.

The staff's review of LRA Section 2.3.3.15 identified an area in which information in the LRA needed to be verified by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

Inspection Item 2.3.3.15-1

License renewal drawing LR-36254 at location B-8 shows two RWN36-3"-HC lines as within the scope of license renewal. One continues to waste collector tank T-24 shown in drawing LR-36045, and one continues to waste surge tank T-23, also shown in drawing LR-36045; however, the license renewal scope boundaries for these lines terminate in the middle of the pipe runs. The actual locations of the license renewal scope boundaries for these lines are not clear. The NRC Regional Inspection Team performed an inspection to ensure that the license renewal scope boundaries for these lines satisfy 10 CFR 54.4(a)(2) criteria.

The inspection team conducted walk downs, which confirmed that the two RWN36-3"- HC lines pass into the 985' pump room and the radwaste building. There are no safety-related components in the 985' pump room or the radwaste building. Drawing LR-36045 will be revised to change the two RWN36-3"- HC lines (at location D-8) to outside the scope of license renewal. The transition into the 985' pump room will be shown on the continuation drawing LR-36254. The inspectors determined that the license renewal boundaries satisfy the

The applicant described the supporting SCs of the steam and power conversion system in the following sections of the LRA:

- 2.3.4.1 condensate storage system
- 2.3.4.2 condensate and feedwater system
- 2.3.4.3 main condenser system
- 2.3.4.4 main steam system
- 2.3.4.5 turbine generator system

The staff's review findings regarding LRA Sections 2.3.4.1 – 2.3.4.5 are presented in SER Sections 2.3.4.1 – 2.3.4.5, respectively.

2.3.4.1 Condensate Storage System

2.3.4.1.1 Summary of Technical Information in the Application

(CST)

In LRA Section 2.3.4.1, the applicant described the condensate storage system. The condensate storage system provides a large storage capacity of reactor quality water. The normal plant uses for condensate storage water are as follows: (1) hotwell makeup and reject, (2) CRD supply, (3) fuel storage pool makeup, (4) demineralizer and radwaste processing, (5) filling the refueling wells, (6) miscellaneous plant flushing and decontamination services, (7) pressurizing RHR and CSP piping, and (8) normal suction supply for HPC and RCI systems. In addition to the above, the condensate storage system provides storage for reclaimed water from the radwaste system. The suppression pool is the SR source of water for HPCI.

The condensate storage system contains SR components that are relied upon to remain functional during and following DBEs. The failure of NSR SSCs in the condensate storage system could potentially prevent the satisfactory accomplishment of an SR function of SSCs within the scope of license renewal. In addition, the condensate storage system performs functions that support EQ and SBO.

The intended function, within the scope of license renewal, is to provide a pressure-retaining boundary.

In LRA Table 2.3.4-1, the applicant identified the following condensate storage system component types that are within the scope of license renewal and subject to an AMR:

- fasteners/bolting
- filters/housings
- flow element
- gauges (flow, level and sight)
- heat exchangers
- instrumentation
- manifolds
- piping and fittings
- pump casings
- restricting orifices

The NRC Regional Inspection Team performed an inspection to ensure that the license renewal scope boundary for this pipe satisfies 10 CFR 54.4(a)(2) criteria.

The inspection team conducted a walk down and confirmed that the license renewal boundary ends as line CH5-3"-HC enters the 985' pump room. There are no safety-related components in the 985' pump room. Walls and floors are not typically shown on all P&ID. The inspectors determined that the license renewal boundary satisfies the 10 CFR 54.4(a)(2) criteria. Therefore, the staff's concern described in Inspection Item 2.3.4.2-1 is resolved.

2.3.4.2.3 Conclusion

The staff reviewed the LRA to determine whether any SSCs that should be within the scope of license renewal had not been identified by the applicant. No omissions were identified. In addition, the staff performed a review to determine whether any components that should be subject to an AMR had not been identified by the applicant. No omissions were identified. On the basis of its review, the staff concluded that the applicant had adequately identified the CFW system components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant had adequately identified the CFW system components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.3 Main Condenser System

2.3.4.3.1 Summary of Technical Information in the Application

In LRA Section 2.3.4.3, the applicant described the main condenser (CDR) system. The CDR system provides a heat sink for the steam cycle, removes non-condensable gases, and serves as a central collection point for system drains. The system is NSR, but is credited for post-accident plate out and holdup of radioactive iodine in the LOCA and control rod drop accident (CRDA) analyses pursuant to USAR Sections 14.7.2.4.1 and 14.7.1.6, respectively. Also included in the NSAS function is the automatic closure of mechanical vacuum pump (MVP) suction valves that isolate the condenser lines to the MVP on primary containment isolation system (PCIS) Division 1 logic which includes detection of high activity in the main steam lines. The CDR system consists principally of the main condenser, which condenses steam exhausted from the turbine and turbine bypass system (TGS system). The main condenser is a twin shell, dual pressure surface condenser. Each of the two low-pressure turbines exhausts into a condenser shell. Condenser structural integrity is continuously demonstrated during normal operation when the condenser is required to maintain vacuum. Following a design basis accident, when the condenser is required to perform its intended function, the MSIVs will be closed and vacuum will be lost. The condenser will not be required to perform a pressure boundary function because atmospheric conditions will exist inside the condenser.

The failure of NSR SSCs in the CDR system could potentially prevent the satisfactory accomplishment of an SR function of SSCs within the scope of license renewal.

The intended functions within the scope of license renewal include the following:

- provides ~~removal~~ plateout and holdup for fission products
- provides a pressure-retaining boundary

Based on its review, the staff found the applicant's response to RAI 2.3.4.3-1 acceptable, because pipe line number OG6-8-HC and the downstream piping have an internal environment of air, which does not have the ability to impact the intended function of SR SSCs, and as such, are not within the scope of license renewal; therefore, the staff's concern described in RAI 2.3.4.3-1 is resolved.

In RAI 2.3.4.3-2, dated September 16, 2005, the staff noted that LR drawing LR-54817-4 at location A-7 is not listed in LRA Section 2.3.4.3 as a license renewal drawing for the CDR system; therefore, the staff requested that the applicant clarify why LR-54817-4 is not included in LRA Section 2.3.4.3 as a license renewal drawing for the CDR system.

In its response, by letter dated October 14, 2005, the applicant stated that drawing LR-54817-4 shows the flow diagram for the recombiner building. There are no CDR components within the scope of license renewal inside the recombiner building. Consequently, LR-54817-4 is not included in LRA Section 2.3.4.3 as a license renewal drawing for the CDR system.

Based on its review, the staff found the applicant's response to RAI 2.3.4.3-2 acceptable, because drawing LR-54817-4 shows no CDR components within the scope of license renewal; therefore, the staff's concern described in RAI 2.3.4.3-2 is resolved.

The staff's review of LRA Section 2.3.4.3 identified areas in which information in the LRA needed to be verified by the NRC Regional Inspection Team to complete the review of the applicant's scoping and screening results.

Inspection Item 2.3.4.3-1

The CDR system is NSR, but is credited for post-accident plate out and holdup of radioactive iodine in the LOCA and control rod drop accident (CRDA) analyses per USAR Sections 14.7.2.4.1 and 14.7.1.6, respectively. Drawing LR-36035-2 at locations C-6 and B-6 have piping outside the scope of license renewal with continuations to condenser E-1B connection 29 on drawing LR-36035 at location D-6. The portion of piping on LR-36035 is within the scope of license renewal. Consequently, the actual locations of the license renewal boundary for these pipes are not clear. The NRC Regional Inspection Team performed an inspection to ensure that the license renewal scope boundary for these pipes satisfies 10 CFR 54.4(a)(2) criteria.

Lines RV34-6"-HB and RV33-6"-HB connect to condenser E-1B at connection 29 on LR-36035. The intended function of the piping is not for post-accident plate out and holdup of radioactive iodine, but for pressure boundary for NSR affecting safety-related as shown on LRA Table 2.3.4-3, "Main Condenser System." Lines RV34-6"-HB and RV33-6"-HB shown on LR-36035-2 are in the Steam Jet Air Ejector (SJAE) room. There are no safety-related components in the SJAE room and, therefore, this piping is not required to be within the scope of license renewal.

Piping PS9-2"-ED, shown on LR-36035-2, is also in the SJAE Room; however, this piping is ~~an~~ a HELB line and therefore, is within the scope of license renewal. The boundary for the HELB line ends at the valves as stated in USAR Appendix I, Table I.2-1, Page 8.

Drawing LR-36035-2 will be revised to depict a wall that lines RV34-6"-HB and RV33-6"-HB pass through into the SJAE Room. The lines will be shown within scope of license renewal as

2.5.2.1 Electrical Penetrations

2.5.2.1.1 Summary of Technical Information in the Application

In LRA Section 2.5.2.1, the applicant described the electrical penetrations. The electrical penetrations assemblies consist of one or more electrical conductors and materials, which provide a pressure boundary between the inboard and outboard sides of the penetration. The penetration must be capable of maintaining the license renewal intended function of "electrical continuity" through the boundary. The cable and material associated with maintaining the license renewal intended function is the focus of this review. Portions and materials of the penetration assembly associated with the license renewal intended function "pressure boundary" (or essentially leak-tight containment barrier) are in Section 2.4.13. For an electrical penetration to be within the scope of license renewal, it must support an intended function of one of the systems or components identified as within the scope of license renewal. MNGP uses penetrations manufactured by GE and D.G. O'Brien. There are 24 electrical penetrations at the MNGP. Nineteen of these are in use and five are spares. There are six penetrations designated as requiring EQ and are addressed in SER Section 4.7. Of the remaining 13 penetrations, only four are within the scope of license renewal. The other nine penetrations do not contain cables which provide a license renewal SR intended function, or are credited for any of the regulated events.

of the LRA

The intended function of electrical penetrations is to provide electrical connections to specified sections of an electrical circuit

In LRA Table 2.5.2-1, the applicant identified the following commodity groups that are within the scope of license renewal and subject to an AMR:

- non-EQ insulated cables and connections
- non-EQ electrical and I&C penetration assemblies except cable and connections (electrical components only - potting compound, vapor barrier, and support)
- non-EQ electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance

2.5.2.1.2 Staff Evaluation

The staff reviewed LRA Section 2.5.2.1 and the USAR using the evaluation methodology described in SER Section 2.5. The staff conducted its review in accordance with the guidance described in SRP-LR Section 2.5.

2.5.2.1.3 Conclusion

On the basis of its review, the staff concluded that the applicant had adequately identified the electrical penetrations components that are within the scope of license renewal, as required by 10 CFR 54.4(a), and that the applicant had adequately identified the commodity groups for electrical penetrations components that are subject to an AMR, as required by 10 CFR 54.21(a)(1).

containments, structures, and component supports

MNGP's AMP (LRA Section)	GALL Comparison	GALL AMP(s)	LRA Systems or Structures That Credit the AMP	Staff's SER Section
ASME Section XI, Subsection IWF Program (B2.1.3)	Consistent with enhancement	XI.S3	containments, structures, and component supports	3.0.3.2.3
Bolting Integrity Program (B2.1.4)	Consistent with enhancements	XI.M18	reactor coolant system, engineered safety features, auxiliary systems, steam and power conversion system	3.0.3.2.4
Buried Piping & Tanks Inspection Program (B2.1.5)	Consistent with enhancements	XI.M34	engineered safety features; auxiliary systems; containments, structures, and component supports	3.0.3.2.5
BWR Control Rod Drive Return Line Nozzle Program (B2.1.7)	Consistent with exceptions	XI.M6	reactor coolant system	3.0.3.2.6
BWR Feedwater Nozzle Program (B2.1.8)	Consistent with enhancements	XI.M5	reactor coolant system	3.0.3.2.7
BWR Penetrations Program (B2.1.9)	Consistent with exceptions	XI.M8	reactor coolant system	3.0.3.2.8
BWR Stress Corrosion Cracking Program (B2.1.10)	Consistent with exception s	XI.M7	reactor coolant system, engineered safety features, auxiliary systems	3.0.3.2.9
BWR Vessel ID Attachment Welds Program (B2.1.11)	Consistent with exception s	XI.M4	reactor coolant system	3.0.3.2.10
BWR Vessel Internals Program (B2.1.12)	Consistent with exception and enhancement s	XI.M9	reactor coolant system	3.0.3.2.11
Closed-Cycle Cooling Water System Program (B2.1.13)	Consistent with exceptions and enhancement	XI.M21	engineered safety features, auxiliary systems	3.0.3.2.12
Compressed Air Monitoring Program (B2.1.14)	Consistent with exceptions and enhancements	XI.M24 Delete s	auxiliary systems	3.0.3.2.13
Fire Protection Program (B2.1.17)	Consistent with exception and enhancement s	XI.M26	auxiliary systems; containments, structures, and component supports	3.0.3.2.15
Fire Water System Program (B2.1.18)	Consistent with enhancement	XI.M27	auxiliary systems	3.0.3.2.16

Add "reactor coolant system"

MNGP's AMP (LRA Section)	GALL Comparison	GALL AMP(s)	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Flow-Accelerated Corrosion Program (B2.1.19)	Consistent	XI.M17	reactor coolant system, engineered safety features, auxiliary systems, steam and power conversion system	3.0.3.1.2
Fuel Oil Chemistry Program (B2.1.20)	Consistent with exceptions and enhancements	XI.M30	auxiliary systems	3.0.3.2.17
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program (B2.1.22)	Consistent with exception and enhancement s	XI.M23	containments, structures, and component supports	3.0.3.2.18
Open-Cycle Cooling Water System Program (B2.1.24)	Consistent	XI.M20	engineered safety features, auxiliary systems, steam and power conversion system	3.0.3.1.5
Plant Chemistry Program (B2.1.25)	Consistent with exceptions	XI.M2	reactor coolant system, engineered safety features, auxiliary systems, steam and power conversion system	3.0.3.2.19
Primary Containment In-Service Inspection Program (B2.1.26)	Consistent	XI.S1	containments, structures, and component supports	3.0.3.1.6
Protective Coating Monitoring & Maintenance Program (B2.1.27)	Consistent with enhancements	XI.S8 Delete s	containments, structures, and component supports	3.0.3.2.20
Reactor Head Closure Studs Program (B2.1.28)	Consistent	XI.M3	reactor coolant system	3.0.3.1.7
Reactor Vessel Surveillance Program (B2.1.29)	Consistent with enhancement	XI.M31	reactor coolant system	3.0.3.2.21
Structures Monitoring Program (B2.1.31)	Consistent with enhancements	XI.S6 Delete s	containments, structures, and component supports	3.0.3.2.23
System Condition Monitoring Program (B2.1.32)	Plant-specific	NA	reactor coolant system; engineered safety features; auxiliary systems; steam and power conversion system; containments, structures, and component supports	3.0.3.3.2

MNGP's AMP (LRA Section)	GALL Comparison	GALL AMP(s)	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Thermal Aging & Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program (B2.1.33)	Consistent	XI.M13	reactor coolant system	3.0.3.1.8
Electrical Equipment Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements Program (B3.1)	Consistent	X.E1	electrical and instrumentation and controls	3.0.3.1.9
Metal Fatigue of the Reactor Coolant Pressure Boundary Program (B3.2)	Consistent with enhancement	X.M1	reactor coolant system, engineered safety features	3.0.3.2.24
New AMPs				
Bus Duct Inspection Program (B2.1.6)	Plant-specific	NA	electrical and instrumentation and controls	3.0.3.3.1
Electrical Cables & Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (B2.1.15)	Consistent	XI.E1	electrical and instrumentation and controls	3.0.3.1.1
Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program (B2.1.16)	Consistent with exceptions	XI.E2	electrical and instrumentation and controls	3.0.3.2.14
Inaccessible Medium Voltage (2kV to 34.5kV) Cables Not Subject to 10 CFR 50.49 EQ Requirements Program (B2.1.21)	Consistent	XI.E3	electrical and instrumentation and controls	3.0.3.1.3
One-Time Inspection Program (B2.1.23)	Consistent	XI.M32	reactor coolant system, engineered safety features, auxiliary systems, steam and power conversion system	3.0.3.1.4

direct

program element, "Parameters Monitored or Inspected" included as part of MNGP AMP B2.1.21, the MNGP program will test medium-voltage cables (2kV to 34.5 kV) within the scope of license renewal exposed to moisture (~~directly~~ buried or in underground conduit) and energized more than 25 percent of the time. The staff reviewed this response and found it acceptable.

In the course of its review, the staff noted the applicant's statement that, in the "Preventive Actions" program element, periodic actions, like inspecting for water collection in cable manholes and conduit and draining water as needed, are taken to prevent prolonged exposure of medium-voltage cables to significant moisture. In the LRA, the applicant stated:

> Medium voltage cables, for which such actions are taken, are not required to be tested since operating experience indicates that prolonged exposure to significant moisture and being energized for significant periods of time are required to ~~induce this effect~~.

induce this aging effect

In RAI B2.1.21-1, dated November 7, 2005, the staff noted its position that inaccessible medium-voltage cables be tested and inspected. Therefore, the staff requested that the applicant remove the line from the LRA indicating that medium-voltage cables are not required to be tested. In addition, the staff requested that the applicant state the inspection frequency and its basis.

In its response, by letter, dated December 7, 2005, the applicant stated that it will revise the "Preventive Action" program element of LRA Section B2.1.21 to delete the following text:

> Medium-voltage cables, for which such actions are taken, are not required to be tested since operating experience indicates that prolonged exposure to significant moisture and being energized for significant periods of time are required to induce this effect.

In its letter, dated March 15, 2006, the applicant amended the "Detection of Aging Effects" program element by adding the following statement:

> In addition, the underground electrical vaults (manholes, handholes, etc) containing cable at MNGP are designed and installed without a concrete bottom. The electrical vaults are set on natural soil which is porous river sand. Historically, water accumulation in electrical vaults has not been an issue due to the natural draining of the porous soil. The inspection frequency for water collection will be based on actual plant experience. For those electrical vaults within the scope of license renewal, the initial inspection frequency for water accumulation will be at least once every two years. The first inspection for license renewal is to be completed before the period of extended operation.

Based on its review, the staff found the applicant's response to RAI B2.1.21-1 acceptable. The staff found that the applicant's response addresses the staff's concern regarding testing and inspection of water in manholes for inaccessible medium-voltage cables. Therefore, the staff's concern described in RAI B2.1.21-1 is resolved.

During the audit and review, the staff asked the applicant how operating experience is captured. The applicant indicated that the MNGP CAP program identifies, tracks, and trends site operating experience related to all site components. Any site component identified as degraded, as failed, or as potentially unable to fulfill its intended functions is documented in the site CAP database. These components are then evaluated by plant engineering for extent of condition and appropriate follow-up actions taken. Plant engineering also trends related CAPs to identify generic issues. Trended site issues are addressed in program health reports presented to site management on a scheduled basis. The CAP also addresses 10 CFR 54.21 issues and external operating events from the INPO, LIS, NMC Fleet, and NRC. The staff reviewed the applicant's response and found it acceptable.

The staff recognized that the CAP, which captures the internal and external operating experience issues, will ensure evaluation and incorporation of operating experience for objective evidence of adequate management of aging effects.

USAR Supplement. In LRA Section A2.1.23, the applicant provided the USAR supplement for the One-Time Inspection Program.

Subsequently, by letter, dated June 10, 2005, the applicant revised its USAR supplement to include the following commitment, documented as commitment number 38 in Table A.5:

Remove extra space

> Prior to the period of extended operation, the MNGP One-Time Inspection Program will be implemented as a new program consistent with the recommendations of NUREG-1 801 Chapter XI Program XL.M32, "One-Time Inspection." This program will include measures to verify the effectiveness of the following aging management programs: Plant Chemistry Program and Fuel Oil Chemistry Program. This program will also confirm the absence of age related degradation in selected components (e.g., flow restrictors, venturis) within License Renewal scope.

Delete

The staff reviewed this section and determined that the information in the USAR supplement as augmented by the commitment adequately describes the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review and audit of the applicant's One-Time Inspection Program, the staff determined that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report. The staff concluded that the applicant demonstrated that the effects of aging will be adequately managed so intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concluded that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 Open-Cycle Cooling Water System Program

Summary of Technical Information in the Application. In LRA Section B2.1.24, the applicant described the Open-Cycle Cooling Water (OCCW) System Program, stating that this is an existing program that is consistent with GALL AMP XI.M20, "Open-Cycle Cooling Water System." The MNGP OCCW System Program relies on the implementation of the

Examination Category B-D, for full penetration welds of nozzles in reactor vessels, pressurizers, steam generators (primary side), and heat exchangers (primary side): This category specifies volumetric examination of all nozzle-to-vessel welds and the nozzle inside radius.

In its letter, dated August 11, 2005, the applicant stated that its ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program will deviate from the requirements of ASME Section XI, Table IWB–2500-1 and Figure IWB-2500-7(b) with regard to the examination volume for Category B-D components.

The applicant identified that, based on its implementation of ASME Section XI Code Case N-613-1, examination of Category B-D components (full penetration welded nozzles in vessels) will deviate from the requirements of the 1995 Edition through 1996 Addenda of ASME Section XI, Table IWB-2500-1, Item No B3.90 and from the requirements of ASME Section XI, Figure IWB-2500-7(b). Specifically, Figure IWB-2500-7(b) requires that a minimum volume of material equal to a distance of one-half the reactor vessel shell thickness (i.e., a distance of approximately 2-1/2 inches for MNGP) be included in the examination volume on each side of the weld; however, the applicant's ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program at MNGP, instead, includes a reduced examination volume of one-half inch of base metal on each side of the widest portion of the weld. The applicant provided the following technical justification for the reduction in examination volume:

> The required examination volume for the reactor vessel pressure retaining nozzle-to-vessel welds extends far beyond the weld into the base metal, and is unnecessarily large. The proposed alternative re-defined the examination volume boundary to ½ inch of base metal on each side of the widest portion of the weld, removing from examination the base metal that was extensively examined during prior inspections, and that is not in the high residual stress region associated with the weld.
>
> The creation of flaws during plant service in the volume excluded from the proposed reduced examination is unlikely because of the low stress in the base metal away from the weld. The stresses caused by welding are concentrated at or near the weld. Cracks, should they initiate, occur in the high-stressed areas of the weld. These high-stress areas are contained in the volume that is defined by Code Case N-613-1 and are thus subject to examination. During previous examinations, no indications exceeding the allowable limits of the preservice or Inservice criteria were found in the reactor vessel nozzle to shell examination volumes including the base metal areas proposed for exclusion from examination in this request.

should be lower case i

The staff reviewed the applicant's description and technical justification for this exception summarized in the preceding paragraph. The staff also reviewed the applicant's request for relief, dated February 27, 2004, "Request for Authorization to Utilize Code Case N-613-1," which provides a similar technical justification and includes tables of previous examination results. Because the examination volume still will include the heat-affected regions of base metal around the welds where new cracks are most likely to occur and previous examinations of the base metal beyond the heat-affected regions have detected no unacceptable conditions, the staff concluded that this exception is acceptable.

bracket attachment, to describe applicable examination requirements and any available results from the time of vessel manufacture, to describe inspections since initial start-up of the plant, to identify and describe stressors that the welds experience during normal operation, to state whether the welds have experienced any stressors different from the normal operating stressors, and to summarize any related industry experience with similar welds known to the applicant.

In its response, dated September 16, 2005, the applicant provided additional information on weld type and examinations. The four 3-1/2-inch thick stabilizer brackets are welded to the outside of the RPV with a double-bevel groove weld (3/16-inch root opening, 1/8-inch root face, and 30-degree groove angle) and a concave reinforcing fillet. At the time of vessel manufacture an ultrasonic (UT) examination is conducted of the vessel shell surface before the stabilizer brackets are welded at the weld location to a depth at least equal to the thickness of the bracket and over the entire area of the subsequent connection, plus a band all around this area half as wide as the thickness of the bracket. After the stabilizer brackets are welded to the vessel, a magnetic particle examination is conducted of the welds. The only examination of the stabilizer bracket welds since manufacture was in March 2005. This was a VT-3 visual examination of the stabilizer brackets using a flashlight and mirror looking for cracks or linear indications, wear, corrosion, and contaminants. No reportable indications were found in this examination on any of the four stabilizer brackets.

The applicant's response also provided the following bases to conclude that degradation of the stabilizer bracket welds is unlikely:

- Degradation of the stabilizer bracket welds is unlikely because the cumulative fatigue usage factor for the stabilizer brackets is extremely low, so cracking due to fatigue is not expected to occur.
- The brackets and welds are made of carbon steel, and stress corrosion cracking is not applicable for this material; furthermore, during reactor operation, the drywell is maintained in an inert atmosphere with the reactor pressure vessel at high temperatures, so loss of material due to general corrosion is not expected to occur.
- MNGP does not use boric acid or a borated solution as a moderator in the reactor coolant system. Therefore, loss of material due to boric acid corrosion of external surfaces does not occur.
- The RPV stabilizers are connected with flexible couplings to the brackets on the RPV and to the biological shield wall. The RPV stabilizers, brackets, and their attachment welds are designed to withstand and resist local loads (jet reactor forces) and seismic loads while allowing axial and radial movement due to normal thermal growth. During normal operation there is no loading on the stabilizer brackets; and the stabilizers, brackets and attachment welds have never experienced the loads for which they were designed.
- Because of design differences, the Duane Arnold plant was able to conduct surface examinations on portions of their stabilizer bracket attachment welds in April 2005 and no reportable indications were found.

Enhancement: The GALL Report recommends for the"Scope of Program" program element associated with the enhancement:

> Starting with the 1990 Addenda to the 1989 Edition, the scope of Subsection IWF was revised. The required percentages of each type of nonexempt support subject to examination were incorporated into Table IWF-2500-1. The revised percentages are 25% of Class 1 nonexempt piping supports, 15% of Class 2 nonexempt piping supports, 10% of Class 3 nonexempt piping supports, and 100% of supports other than piping supports (Class 1, 2, 3, and MC). For pipe supports, the total sample consists of supports from each system (such as main steam, feedwater, residual heat removal), where the individual sample sizes are proportional to the total number of nonexempt supports of each type and function within each system. For multiple components other than piping within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined. To the extent practical, the same supports selected for examination during the first inspection interval are examined during each successive inspection interval.

In the LRA, the applicant stated that its ASME Section XI, Subsection IWF Program will be enhanced to inspect Class MC components supports consistent with the GALL Report, Chapter III, Section B1.3, "Supports for ASME Class MC Components."

During the audit and review, the staff asked the applicant for more details about its current IWF program and to identify the inspections that the enhancement will add. In response, the applicant provided the following information:

- The current MNGP IWF program does not include VT-3 examination of MC supports.
- The current MNGP IWE program includes general visual examinations of MC components and their supports in accordance with ASME Section XI, Table IWE-2500-1.

The applicant stated that the following MC supports are included in examinations conducted under the current IWE program:

- Torus/ring header seismic restraints
- Drywell male and female stabilizers
- Shield stabilizers
- Torus columns
- Torus saddles
- ~~Torus header columns~~ ← Vent system supports
- Downcomer bracing

The applicant further stated that for the period of extended operation, the ASME Section XI, Subsection IWF Program will perform VT-3 examinations of MC supports listed above in

inspections found in EPRI TR-104213, "Bolted Joint Maintenance & Application Guide," and EPRI NP- 5067, Volumes 1 and 2, "Good Bolting Practices Handbook." The staff reviewed the "~~Program~~ Parameters Monitored or Inspected" and "Acceptance Criteria" elements and concluded that the applicant has acceptable criteria for visual bolting inspections and acceptance criteria for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, Structures Monitoring Program and System Condition Monitoring Program. The staff has reviewed and approved similar enhancements to bolting programs based on EPRI NP-5067 and EPRI TR-104213 as documented in NUREG-1743, "Safety Evaluation Report Related to the License Renewal of Arkansas Nuclear One, Unit 1." Based on these reasons, the staff found that the guidelines for enhancements to the Bolting Integrity Program reflect industry practice and meet the recommendations of GALL AMP XI.M18, "Bolting Integrity."

The staff's review of LRA Section B2.1.4 identified an area in which additional information was necessary to complete the review of the applicant's program elements. The applicant responded to the staff's RAI as discussed below.

In RAI B2.1.4-1, dated July 20, 2005, the staff noted that Table Item Numbers 3.3.1-18, 3.3.1-24, and 3.4.1-08 in the LRA provide a general discussion of the Bolting Integrity Program as applied to the ESF, auxiliary, and steam and power conversion (SPC) systems. Therefore, the staff requested that the applicant state whether all closure bolting in the ESF, auxiliary, and SPC systems is managed for loss of preload by the Bolting Integrity Program though the AMR tables contain no specific line items for this aging effect.

In its response, by letter, dated August 16, 2005, the applicant stated:

> As discussed in Section B2.1.4 of the License Renewal Application, the Bolting Integrity Program manages aging effects for bolting within the scope of license renewal. This includes closure bolting that is required to support a pressure boundary intended function for components of the systems listed in Section B2.1.4, Scope of Program. Detection of aging effects includes visual inspection of pressure retaining joints for signs of leakage, which may be the result of loss of preload. With the exception of the Emergency Filtration (EFT) System, this includes all closure bolting of the Engineered Safety Features (ESF), Auxiliary, and Steam and Power Conversion (SPC) systems in the LRA. As noted in LRA Table 3.3.2-7, bolting of the EFT System is not susceptible to aging effects due to is location in a controlled environment and is, therefore, not included in the Bolting Integrity Program.

In a phone conversation on November 4, 2005, the staff requested that the applicant explain why closure bolting of the EFT system is not susceptible to aging effects and not included in the Bolting Integrity Program.

In its response, by letter, dated November 17, 2005, the applicant stated that bolting in the EFT system is not susceptible to aging effects (i.e., corrosion) due to its location in a controlled air environment; however, the Bolting Integrity Program is credited with managing the loss of preload aging effect for the EFT system. The applicant supplemented its response to RAI B2.1.4-1:

Should read "a modified phenolic-based primer is used in the MNGP torus"

In its response, by letter, dated August 16, 2005, the applicant stated that the tee-quencher support design at the MNGP is different from the design at Hatch 2. Also, all bolts are 1-inch diameter, 3.75-inch long, hex bolts procured to the requirements of American Society for Testing Materials (ASTM) A-325 Type 1 or A-193 Grade B7 material specification. These are not high strength bolts, having ultimate strength of approximately 125 ksi or less, and are well below the ultimate strength of SA540 Grade B21 Class 1 bolts at Hatch 2. Further, analysis of the Hatch 2 event determined that the most likely cause of SCC of the high-strength bolts was significant contribution of hydrogen embrittlement. One possible source of the hydrogen embrittlement was the use of a zinc primer inside the torus. MNGP does not use a zinc primer, instead, ~~using a modified phenolic-based primer~~. Finally, underwater inspections of these bolts are performed periodically and in May 1993 identified no problems or loose connections.

Based on its review, the staff found the applicant's response to RAI B2.1.4-2 acceptable. The staff concurred with the applicant's conclusions that the Hatch 2 event is not applicable to MNGP because the tee-quencher design is different from the design at Hatch 2. The bolts at MNGP are lower strength bolts not susceptible to SCC and any source of hydrogen has been minimized by application of phenolic-based instead of zinc-based primer inside the torus. In addition, the applicant performs periodic inspection of tee-quencher bolts in accordance with the requirements of its Primary Containment In-Service Inspection Program, providing added assurance that bolting materials inside the torus will be adequately managed during the period of extended operation. Therefore, the staff's concern described in RAI B2.1.4-2 is resolved.

On the basis of its review of the above industry and plant-specific operating experience, the staff concluded that the Bolting Integrity Program will adequately manage the aging effects identified in the LRA for which this AMP is credited. The staff concluded that this program attribute is acceptable.

USAR Supplement. In LRA Section A2.1.4, the applicant provided the USAR supplement for the Bolting Integrity Program.

Subsequently, by letter, dated June 10, 2005, the applicant revised its USAR supplement to include the following commitment, documented as commitment number 10 in Table A.5:

> Prior to the period of extended operation, the guidance for performing visual bolting inspections contained in EPRI TR-104213, Bolted Joint Maintenance & Application Guide, and the Good Bolting Practices Handbook (EPRI NP-5067 Volumes 1 and 2) will be included in the Bus Duct Inspection Program, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, Structures Monitoring Program and the System Condition Monitoring Program.

The staff reviewed this section and determined that the information in the USAR supplement as augmented by the commitment adequately describes the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review and audit of the applicant's Bolting Integrity Program, the staff determined that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report. Also, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period

Should be revised to: (1) periodically performing a random sampling of HCU filters to determine if cleaning and flushing is required and (2) periodically performing a flush of the CRD exhaust header.

- Section 8.2(3b) - The remainder of the CRDRL does not meet the definition of Class 1, 2, or 3 pipe and, therefore, NUREG-0313 does not require augmented inspections.
- Section 8.2(3c) - Since carbon steel piping was retained in the exhaust header, procedures were developed for ~~(1) inspection and replacement of the hydraulic control unit filters every refueling outage and (2) flushing the exhaust water header every refueling outage.~~

The applicant further stated that its commitment in response to GL 80-95 to implement the requirements for the CRDRL nozzle specified in NUREG-0619 Section 8 has been completed. The activities described above relating to NUREG-0619 Sections 8.2(3a) and 8.2(3c) are existing NRC commitments and will continue through the period of extended operation.

On the basis of its review of the completion of CRDRL nozzle related modifications, the completion of commitments in response to GL 80-95, and operating experience for the AMP B2.1.7 program, the staff found this exception acceptable.

During the audit and review, the staff asked the applicant whether its current approved ISI relief requests or Code Cases affect any of its AMP program elements. In its letter, dated August 31, 2005, the applicant identified the following additional exception to the GALL Report program element:

Exception 2: The GALL Report recommends for the "Corrective Actions" program element associated with the exception taken:

> Repair is in conformance with IWB-4000 and replacement in accordance with IWB-7000.

In its letter, dated August 11, 2005, the applicant stated an approved alternative allows the use of the ASME Section XI 2001 Edition in lieu of the 1995 Edition with the 1996 Addenda for repair/replacement activities.

The staff concluded that this item is not an exception and that with regard to this item, the affected program element is consistent with the GALL Report. The staff's evaluation is documented in SER Section 3.0.3.1.7.

The staff reviewed those portions of the AMP B2.1.7, "BWR Control Rod Drive Return Line Nozzle Program," which the applicant claimed were consistent with GALL AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle," and found them consistent. The staff found the applicant's LRA AMP acceptable because it conformed to the recommended GALL Report AMP with the exceptions as described above.

Operating Experience. In LRA Section B2.1.7, the applicant stated that the BWR CRDRL Nozzle Program inspections are implemented through the ISI Program, which incorporates applicable requirements of the ASME Code. The inspection and testing methodologies have been effective in detecting aging effects due to cracking. Engineering evaluations were performed based on plant and industry experience and component and programmatic corrective actions implemented as required. For example, In 1977 the CRDRL nozzle safe end

Inspections scheduled in accordance with GE NE-523-A71-0594 provide timely detection of cracks.

In the LRA, the applicant stated the BWR FW Nozzle Program will be enhanced by including the recommendations of GE NE-523-A71-0594, Revision 1, "Alternate BWR Feedwater Nozzle Inspection Requirements."

-A

By letter, dated September 24, 1999, the BWR Owners Group (BWROG) submitted for staff review Topical Report GE-NE-523-A71-0594, Revision 1, "Alternate BWR Feedwater Nozzle Inspection Requirements." This report proposed an alternative to the recommendations of NUREG-0619, "BWR Feedwater Nozzle and Control Rod Return Drain Line Nozzle Cracking." The topical report made the following proposals: (1) accept the UT as the basis to eliminate supplemental liquid penetrant testing of inside radii of the RPV nozzles, (2) lengthen the time interval between routine UT of inside radii of the RPV nozzles, and (3) reduce the inspection area of inside radii of the RPV nozzles. In its review of the topical report, the staff focused on the quality and reliability of the UT examinations. In its letter to BWROG, dated March 10, 2000, the staff approved the proposed inspection program and schedule as described in the BWROG topical report; therefore, GE NE-523-A71-0594, Revision 1, is an acceptable alternative to the NUREG-0619 inspection guidelines.

-A

The applicant stated that it had made four long-term inspection commitments based on NUREG-0619 in 1989, as follows:

(1) Review of on-line FW nozzle thermal sleeve leak detection system data monthly.

(2) Perform external UT examinations on two of the four FW nozzles each refueling outage.

(3) Perform visual inspections of the spargers and the nozzle blend radius areas of all four FW nozzles each refueling outage.

(4) Perform PT examinations of nozzles at the next appropriate opportunity in the event that: (a) UT examinations indicate a flaw or (b) Excessive leakage (greater than 0.3 gpm) is identified by on-line leakage monitoring systems.

In the corresponding SER the staff stated that MNGP will continue inspections for "9 inspection interval-refueling cycles or 135 startup/shutdown cycles" as stated in NUREG-0619. The inspection interval began with the installation of welded thermal sleeves during the 1981 refueling outage. With the completion of inspections during the 1998 refueling outage, the applicant had completed the required nine inspection interval-refueling cycles with no observed degradation of the FW nozzles. The most recent FW nozzle inspections during the third 10-year ASME Section XI In-Service Inspection Program (ending on May 1, 2003) also revealed no cracking on these nozzles.

-A

During the audit and review, the staff asked the applicant to clarify plans to update its current BWR FW Nozzle Program to meet the recommendations in GE NE-523-A71-0594, Revision 1. The applicant stated that (1) the requirement specified in ASME Section XI Table IWB-2500-1, Examination Category B-D, for full penetration welded nozzles has been incorporated into the BWR FW Nozzle Program; (2) the region inspected, examination techniques, and personnel qualifications will be consistent with the recommendations of GE NE-523-A71-0594, Revision 1, Section 4.0; and (3) the requirement of ASME Section XI Appendix VIII including IWB-2400

-A

In its letter, dated June 10, 2005, the applicant added the following commitments to USAR Section A2.1.8, documented as commitment numbers 18 - 20 in Table A.5, stating that prior to the period of extended operation:

(1) The parameters monitored and inspected are consistent with the recommendations of GE NE-523-A71-0594-A, Revision 1.

(2) The regions being inspected, examination techniques, personnel qualifications, and inspection schedule are consistent with the recommendations of GE NE-523-A71-0594-A, Revision 1.

(3) That inspections will be scheduled per recommendations of GE NE-523-A71-0594-A, Revision 1.

The BWR FW Nozzle Program is not currently augmented by the recommendations of GE NE-523-A71-0594, "Alternate BWR Feedwater Nozzle Inspection Requirement." The program will be enhanced by including the recommendations of the GE NE-523-A71-0594-A, Revision 1. The program is updated periodically as required by 10 CFR 50.55a.

Conclusion. On the basis of its review and audit of the applicant's BWR FW Nozzle Program, the staff determined that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report. Also, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period of extended operation will result in the existing AMP being consistent with the GALL Report AMP to which it was credited. The staff concluded that the applicant demonstrated that the effects of aging will be adequately managed so intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concluded that it adequately describes the program, as required by 10 CFR 54.21(d).

Standby Liquid Control System

3.0.3.2.8 BWR Penetrations Program

Summary of Technical Information in the Application. In LRA Section B2.1.9, the applicant described the BWR Penetrations Program, stating that this is an existing program that is consistent, with exceptions, with GALL AMP XI.M8, "BWR Penetrations." The MNGP BWR Penetrations Program is part of the MNGP ASME Section XI In-Service Inspection Program. The BWR Penetrations Program is in accordance with ASME Section XI 1995 Edition through the 1996 Addenda (with approved ISI relief requests) and provides for condition monitoring of the BWR penetrations. The BWR water chemistry is controlled per the EPRI guidelines of BWRVIP-130 (TR-1008192) BWR Water Chemistry Guidelines - 2004 Revision. BWRVIP-130 supersedes previous revisions of the guidelines, including BWRVIP-29 (TR-103515), BWR Water Chemistry Guidelines - 1993 Revision. Monticello's program activities incorporate the inspection and evaluation guidelines of BWRVIP-49, BWR Vessel and Internals Project, Instrument Penetration Inspection and Flaw Evaluation Guidelines, for instrument penetrations and BWRVIP-27, BWR Vessel and Internals Project, BWR Standby Liquid Control System/Core Plate DP Inspection and Flaw Evaluation Guidelines, for the ~~standby liquid control system~~. The program is updated periodically as required by 10 CFR 50.55a and the BWRVIP.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. Details of the staff's audit evaluation of this AMP are

Spelling should be "Tolytriazole"

2. For the cooling loops of the EDG system.

   a. Nitrite - The chemical range for nitrite is identical to EPRI TR-107396 (500 to 1,000 ppm) and more restrictive than EPRI TR-1007820 (50 to 1,500 ppm).

   b. pH - The range for pH is 9.0 to 10.7, which is more restrictive than the 8.5 to 11.0 range in EPRI TR-1007820 and close to the 8.5 to 10.5 range specified in EPRI TR-107396.

   c. Tolyltriazole - The specified range for tolytriazole is 10 to 40 ppm, as opposed to the 5 to 30 ppm range recommended in EPRI TR-107396, and more restrictive than the 5 to 100 ppm range recommended in EPRI TR-1007820. No adverse impacts for slightly higher tolytriazole ranges were identified in EPRI TR-107396.

   d. Chloride - Chloride is not monitored in the cooling loops of the EDG system. Chloride is monitored in the makeup demineralized water source, which provides makeup to the cooling loops. Chloride limits for demineralized water have a limit of 10 ppb, which is substantially lower than the limit of 10 ppm established by the EPRI reports.

3. For the piping and heating coils of the HTV system.

   a. For the piping and heating coils of the HTV system, chemical ranges are not specified by EPRI TR-107396 or by EPRI TR-1007820, so are monitored in accordance with vendor recommendations and plant experience. These include conductivity, pH, phosphate, sulfites, and total gamma activity and are specified by plant procedure.

4. For the closed cooling loop used on the #14 air compressor of the instrument and service air system.

   a. Glycol Percent Volume - Both EPRI TR-107396 and EPRI TR-1007820 recommend that glycol percent volume remain above 30 percent to avoid becoming a nutrient for microbiological growth. Further, EPRI TR-1007820 recommends the level remain below 60 percent. The applicant maintains a concentration of about 50 percent, which is within the range specified by the EPRI reports.

   b. pH - A specific range for pH is not specified by MNGP procedure; however, procedures require routine sampling and measurement of pH and pH is maintained within the range specified by EPRI TR-1007820 of 7.5 to 11.0.

The staff reviewed the operating ranges of each of the above ten chemical control parameters and noted that eight were either equivalent to or more conservative than the range recommended by the EPRI technical reports. One, the chromate, had a higher range, but the applicant took effective action to mitigate effects of that higher range. The last was in accordance with vendor recommendations and plant operating experience, as the GALL Report provided no recommendation.

On the basis of the above review and a review of MNGP operating experience for AMP B2.1.13, the staff found this exception acceptable.

Delete, they are redundant

The staff observed that, in lieu of the EPRI NP-7079 guidelines recommended by the GALL Report to detect degradation of compressed air system function, the applicant developed procedures and instructions based on GL 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment;" ANSI/ISA S7.3, "Quality Standard for Instrument Air;" ANSI/ISA Z86.1-1973, "Commodity Specification for Air and Drager Operating Instruction;" EPRI TR 103595, "Report of the Instrument Air Working Group;" ~~GL 88-14, ANSI/ISA S7.3, ANSI/ISA Z86.1-1973, EPRI TR 103595,~~ and INPO 88-01 augmented by IN 81-38, "Potentially Significant Equipment Failures resulting from Contamination of Air-Operated Systems;" and IN 87-28, "Air System Problems at U.S. Light Water Reactors," with Supplement 1. The staff reviewed and compared ANSI/ISA-S7.3-1975 with ANSI/ISAS7.0.01-1996 and found ANSI/ISA-S7.3-1975 acceptable for use as its criteria are more conservative than recommended by ANSI/ISA-S7.0.01-1996.

During the audit, the staff asked that the applicant clarify why it took exception to ASME OM-S/G-1998 Part 17, which provides guidance for performance testing of instrument air systems in light water reactor power plants. The applicant responded that the scope of components included in the compressed air monitoring activities includes distribution piping, valves, accumulators for air-operated safety-related valves, and the containment isolation valves of the instrument air system. The applicant stated that the instrument air system compressors, receivers, filters, and dryers are not within the scope of license renewal. The applicant also stated that its Compressed Air Monitoring Program will adequately manage aging for those instrument air system components within the scope of license renewal. The staff reviewed several procedures and instructions to determine their adequacy and completeness, their frequencies, and their results, including a sampling from the applicant's CAP, and concluded that the applicant was able to ensure timely detection of degradation of the compressed air system function shown by its ability to detect corrosion or high leak rates or the failure of any component to meet its performance limits. The staff found the applicant's response acceptable.

On the basis of a review of the above exception and of a review of operating experience for the AMP B2.1.14 program, the staff found this exception acceptable.

In the LRA, the applicant stated that the following enhancements will make this AMP consistent with the recommendation in the GALL Report.

Add a space between "the" and "Scope"

Enhancement 1: The GALL Report recommends for the"Scope of Program" program element associated with the enhancement:

> The program manages the effects of corrosion and the presence of unacceptable levels of contaminants on the intended function of the compressed air system. The AMP includes frequent leak testing of valves, piping, and other system components, especially those made of carbon steel, and a preventive maintenance program to check air quality at several locations in the system.

In the LRA, the applicant stated the Compressed Air Monitoring Program procedures will be revised to include corrective action requirements if water vapor, oil content, or particulate acceptance limits are not met. Also, acceptance criteria for oil content testing will be clarified and acceptance limit bases for water vapor, oil content, and particulate tests will be provided.

enhancement and confirmed that the implementation of the enhancement prior to the period of extended operation will result in the existing AMP being consistent with the GALL Report AMP to which it was credited. The staff concluded that the applicant demonstrated that the effects of aging will be adequately managed so intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concluded that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 Fire Water System Program

Summary of Technical Information in the Application. In LRA Section B2.1.18, the applicant described the Fire Water System Program, stating that this is an existing program that is consistent, with enhancement, with GALL AMP XI.M27, "Fire Water System." The Fire Water System Program relies on testing of water-based fire protection system piping and components in accordance with applicable National Fire Protection Association (NFPA) recommendations. In addition, this program will be modified to include (1) portions of the fire protection sprinkler system that are subjected to full flow tests prior to the period of extended operation and (2) portions of the fire protection system exposed to water that are internally visually inspected. To ensure that the aging mechanisms of corrosion and biofouling/fouling are properly being managed in the fire water system, periodic full flow flush tests and system performance tests are conducted. The system is also normally maintained at required operating pressure and is monitored such that loss of system pressure is immediately detected and corrective actions initiated.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. Details of the staff's audit evaluation of this AMP are documented in the MNGP audit and review report. The staff reviewed the enhancement and the associated justifications to determine whether the AMP, with the enhancement, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical personnel and reviewed, in whole or in part, the documents cited in the staff's audit and review report, which assesses the AMP elements' consistency with GALL AMP XI.M27.

The Program Description in the GALL Report recommends the following:

In the LRA, the applicant stated that the following enhancement will make this AMP consistent with the recommendation in the GALL Report.

Enhancement: ~~The GALL Report recommends for "Detection of Aging Effects" program element associated with the enhancement:~~

> ...In addition, a sample of sprinkler heads is to be inspected by using the guidance of NFPA 25, Section 2.3.3.1. This NFPA section states that "where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing." It also contains guidance to perform this sampling every 10 years after the initial field service testing...

In the LRA, the applicant stated the Fire Water System Program will be enhanced by implementing procedures that will be revised to include the extrapolation of inspection results to

30, 31 and 32

In its letter, dated June 10, 2005, the applicant included commitments to Section A2.1.18, documented as commitment numbers ~~30 and 31~~ in Table A.5, which state that, prior to the period of extended operation, the Fire Water System Program:

(1) Implementing procedures will be revised to include extrapolation of inspection results to below grade fire water piping with conditions similar to those within above grade fire water piping.

(3) "make this a new paragraph"

(2) Sprinkler heads will be inspected and tested per NFPA requirements or replaced before the end of their 50-year service life and at 10-year intervals thereafter during the extended period of operation to ensure that degradation, such as corrosion, is detected promptly. Procedures to be used for aging management activities of the Fire Water System Program will be verified and testing will be performed in accordance with applicable NFPA codes and standards. Relevant procedures will be revised as appropriate.

Conclusion. On the basis of its review and audit of the applicant's Fire Water System Program, the staff determined that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report. Also, the staff reviewed the enhancement and confirmed that the implementation of the enhancement prior to the period of extended operation will result in the existing AMP being consistent with the GALL Report AMP to which it was credited. The staff concluded that the applicant demonstrated that the effects of aging will be adequately managed so intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concluded that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 Fuel Oil Chemistry Program

Summary of Technical Information in the Application. In LRA Section B2.1.20, the applicant described the Fuel Oil Chemistry Program, stating that this is an existing program that is consistent, with exceptions and enhancements, with GALL AMP XI.M30, "Fuel Oil Chemistry." The Fuel Oil Chemistry Program mitigates and manages aging effects on the internal surfaces of diesel fuel oil storage tanks and associated components in systems that contain diesel fuel oil. The program includes: (a) surveillance and monitoring procedures for maintaining diesel fuel oil quality by controlling contaminants in accordance with applicable ASTM Standards; (b) periodic draining of water from diesel fuel oil tanks, if water is present; (c) periodic or conditional visual inspection of internal surfaces or wall thickness measurements (e.g., by UT) from external surfaces of diesel fuel oil tanks; and (d) one-time inspections of a representative sample of components in systems that contain diesel fuel oil.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. Details of the staff's audit evaluation of this AMP are documented in the MNGP audit and review report. The staff reviewed the exceptions and enhancements and the associated justifications to determine whether the AMP, with the exceptions and enhancements, remains adequate to manage the aging effects for which it is credited.

the GALL Report are consistent with the GALL Report. In addition, the staff reviewed the exceptions, and the associated justifications, and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. The staff concluded that the applicant demonstrated that the effects of aging will be adequately managed so intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concluded that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.3.2.20 Protective Coating Monitoring & Maintenance Program

Summary of Technical Information in the Application. In LRA Section B2.1.27, the applicant described the Protective Coating Monitoring & Maintenance Program, stating that this is an existing program that is consistent, with enhancements, with GALL AMP XI.S8, "Protective Coating Monitoring and Maintenance Program." The Protective Coating Monitoring and Maintenance Program applies to Service Level 1 protective coatings inside containment to address the concerns of NRC GL 98-04, "Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Cooling Accident because of Construction and Protective Coating Deficiencies and Foreign Material in Containment." The Protective Coating Monitoring and Maintenance Program prevents the degradation of coatings that could lead to the clogging of Emergency Core Cooling System (ECCS) suppression pool suction strainers. MNGP does not credit the Protective Coating Monitoring and Maintenance Program for the prevention of corrosion of carbon steel components. As outlined in MNGP's response to GL 98-04, the Protective Coating Monitoring and Maintenance Program is a comparable program for monitoring and maintaining protective coatings inside the primary containment and subject to the requirements of ANSI N101.4-1972, to the extent specified in ANSI N18.7-1976 and as modified by RG 1.54, June 1973.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. Details of the staff's audit evaluation of this AMP are documented in the MNGP audit and review report. The staff reviewed the enhancements and the associated justifications to determine whether the AMP, with the enhancements, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical personnel and reviewed, in whole or in part, documents cited in the staff's audit and review report, which assesses the AMP elements' consistency with GALL AMP XI.S8.

In the LRA, the applicant stated that the following enhancements will make this AMP consistent with the recommendation in the GALL Report.

Add a space between "the" and "Scope"

Enhancement 1: The GALL Report recommends for the"Scope of Program" program element associated with the enhancement:

> The minimum scope of the program is Service Level 1 coatings, defined in RG 1.54, Rev 1, as follows: "Service Level 1 coatings are used in areas inside the reactor containment where the coating failure could adversely affect the operation of post-accident fluid systems and thereby impair safe shutdown."

swelling, or discoloration that may indicate overheating or aging degradation. The bus supports will be inspected for structural integrity and cracking.

The staff confirmed that the "Parameters Monitored or Inspected" element satisfies the SRP-LR A.1.2.3 criterion and is capable of detecting the presence and extent of aging effects. On this basis, the staff found the applicant's parameters monitored or inspected program element acceptable.

(4) Detection of Aging Effects - The applicant stated that this program visually inspects internal portions of bus ducts, the bus insulating system, and the bus supports. In addition, a torque test or resistance test of a sample of accessible bolted connections will be performed. The program will be completed before the end of the initial 40-year license term and every 10 years thereafter, a period adequate for preventing failures of the bus ducts as experience shows that aging degradation is a slow process. A 10-year inspection frequency provides two data points during a 20-year period to characterize the degradation rate.

In RAI B2.1.6-1, dated November 7, 2005, the staff noted that vendors do not recommend the re-torque of bolted connections unless the joint requires service or the bolted connections are clearly loose. The torque required to turn the fastener in the tightening direction (restart torque) is not a good indication of the preload after the fastener is in service. Due to relaxation of parts of the joint, the final loads are likely to be lower than the installed loads; therefore, the staff requested that the applicant justify how re-torquing of bolted connections is a good indicator of the preload after the fastener is in service.

104213

In its response, dated December 7, 2005, the applicant stated that it will follow the guidance of EPRI ~~10213,~~ Section 8.2, "Inspection of Electrical Bolted Joints," which does not recommend re-torquing of bolted connections. A sample of accessible bolted connections will be checked for loose connection by thermography or by connection resistance measurement with a low range ohmmeter. Metal enclosed bus (MEB) internal surfaces will be visually inspected for aging degradation of insulating material and for foreign debris and excessive dust buildup, and evidence of moisture intrusion. Bus insulation will be visually inspected for signs of embrittlement, cracking, melting, swelling, or discoloration that may indicate overheating or aging degradation. Internal bus supports will be visually inspected for structural integrity and cracks. This program will be completed before the period of extended operation and every ten years thereafter if visual inspection is not used to check bolted connections. A 10-year inspection interval will provide two data points during a 20-year period to characterize the degradation rate. This inspection frequency is adequate to prevent failures of the MEBs, as experience shows that aging degradation is a slow process.

Visual inspection will be used as an alternative to thermography or connection resistance measurement for accessible bolted connections covered with heat shrink tape, sleeving, insulating boots, etc. Visual inspection of the insulation material will detect surface anomalies, such as discoloration, cracking, chipping, or surface contamination. When this alternative visual inspection is used to check bolted connections, the first inspection will be completed before the period of extended operation and every five years thereafter.

Based on its review, the staff found that the visual inspection of bus ducts and internal bus supports will indicate aging effects and that thermography or resistance checks of a sample of bolted joints will ensure that bolted connections do not loosen from ohmic heating. The staff

well as other types of corrosion as appropriate. Significant surface degradation will be evaluated via the corrective action process.

Item e

Cracking due to stress corrosion cracking and loss of material due to crevice corrosion for the stainless steel spent fuel pool liner in a treated water environment is managed by the Plant Chemistry Program as stated in LRA Table 3.5.2-15 (Page 3-748). This is consistent with GALL line item III.A5.2-b...

...Additionally, Note 539 states, "The System Condition Monitoring Program is credited for monitoring the spent fuel pool water level and spent fuel pool leakage". This note was specifically added to define the consistency with GALL and to differentiate between the two AMPs with regard to what aging effect/mechanism was managed by each.

Based on its review, the staff found the applicant's response to RAI B2.1.32-2 acceptable. The applicant addressed inspection methods and acceptance criteria for various aging effects: change in material properties for elastomers, SCC, pitting and crevice corrosion. The methods described by the applicant are acceptable detection techniques for the aging effects addressed; therefore, the staff's concern described in RAI B2.1.32-2 is resolved.

The staff confirmed that the "Detection of Aging Effects" element satisfies SRP-LR Section A.1.2.3 criteria. The detection of aging effects links the parameters monitored or inspected to the aging effects managed, the System Condition Monitoring Program adequately describes data collection, and examination methods and frequency are adequately linked to plant-specific and industry operating experience. On this basis, the staff found the applicant's proposed detection of aging effects program element acceptable.

(5) Monitoring and Trending - The applicant stated that the System Condition Monitoring Program is capable of detecting the effects of aging before a structure's (hangers and supports) or component's loss of function can occur. Visual inspections performed at least once per year for systems and components accessible during normal plant operation may increase in frequency based on the safety significance, production significance, or operating experience of each system. Systems and components accessible only during plant outages are inspected at least once per refueling interval. These inspections and walkdowns ~~timely~~ (i.e., prior to the loss of intended function) ~~detect aging effects~~. Inspection and walkdown results are documented for condition trending information.

The staff confirmed that the "Monitoring and Trending" element satisfies SRP-LR Section A.1.2.3 criteria. The System Condition Monitoring Program monitors and trends certain attributes like leakage and addresses the predictability of the extent of degradation, and thus, timely corrective action. On this basis, the staff found the applicant's proposed monitoring and trending program element acceptable.

provide timely detection of aging effects

Insert "."

Acceptance criteria will

(6) Acceptance Criteria - The applicant stated that normal design standards, procedural requirements, CLB information, and industry codes or standards (e.g., EPRI, INPO, etc.), will be used to determine acceptance criteria ~~to~~ be included in implementing instructions and procedures for age-related degradation such as corrosion, leakage, deformation, cracking, and other adverse conditions that negatively impact performance of a license renewal intended function. References like EPRI field guides will be used for acceptance criteria guidance. Excessive or abnormal conditions not meeting acceptance criteria are entered into the corrective action process based on evaluation results.

The staff confirmed that the "Acceptance Criteria" element satisfies SRP-LR A.1.2.3 criteria. The acceptance criteria element provides a basis for evaluation of the need for corrective actions to ensure that the structure or component intended function will be maintained during the period of extended operation. On this basis, the staff found the applicant's acceptance criteria program element acceptable.

Operating Experience. The applicant stated that the System Condition Monitoring Program has been effective in monitoring system performance and, as enhanced, provides reasonable assurance of effective management of aging effects from external visible aging mechanisms. The System Condition Monitoring Program is based on routine walkdowns by qualified system engineers. Walkdown progress is monitored monthly as an Engineering Department performance indicator with a goal of 90 percent completed as scheduled. Since data gathering began in May 2003, 100 percent of the monthly scheduled walkdowns through August 2004 were completed as scheduled. Numerous examples were noted where system engineers documented needed corrective actions through minor maintenance tasks, WOs, or Action Requests (entered into the site CAP). System Health Reports are maintained by system engineers as one way to track the progress of system performance, outstanding work, and results of operating experience reviews by the system engineers. Of 82 systems tracked by System Health Reports, all but three met or exceeded performance expectations as of September 2004.

The staff confirmed that the "Operating Experience" element satisfies SRP-LR A.1.2.3 criteria. Operating experience with the existing program shows that the System Condition Monitoring Program detects system degradation in a timely manner. On this basis, the staff found the applicant's operating experience program element acceptable.

The applicant credited the System Condition Monitoring Program with managing aging effects for structural components like concrete anchors and elastomers. The GALL report recommends the Structures Monitoring Program for management of these types of components. As documented in the audit and review report, the applicant was requested to discuss how the System Condition Monitoring Program addresses the GALL recommendations for the Structures Monitoring Program for managing aging effects of these components. The applicant stated that a number of components to be managed by the Structures Monitoring Program as recommended by the GALL Report was reassigned and inspected as part of the System Condition Monitoring AMP. For these components the ten attributes of both AMPs are compatible in that they address similar scope, preventive actions, parameters monitored or inspected, detection of aging effects, monitoring and trending, acceptance criteria, corrective actions, confirmation process, and administrative controls elements. On the basis of its review and the information provided by the applicant, the staff found that the System Condition Monitoring Program provides acceptable aging management for these structural components.

USAR Supplement. In LRA Section A2.1.32, the applicant provided the USAR supplement for the System Condition Monitoring Program. The staff reviewed this section and determined that the information in the USAR supplement adequately describes the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review and audit of the applicant's System Condition Monitoring Program, the staff concluded that the applicant demonstrated that the effects of aging will be adequately managed so intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concluded that it adequately describes the program, as required by 10 CFR 54.21(d).

3.0.4 Quality Assurance Program Attributes Integral to Aging Management Programs

Pursuant to 10 CFR 54.21(a)(3), a license renewal applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation.

Branch Technical Position IQMB-1, "Quality Assurance For Aging Management Programs," (SRP-LR Section A.2) provides the following guidance with regard to the quality assurance (QA) attributes of AMPs:

- SR SCs are subject to 10 CFR Part 50, Appendix B, requirements which are adequate to address all quality-related aspects of an AMP consistent with the CLB of the facility for the period of extended operation.
- For NSR SCs that are subject to an AMR, an applicant has an option to expand the scope of its 10 CFR Part 50, Appendix B program to include these SCs to address corrective actions, the confirmation process, and administrative controls for aging management during the period of extended operation. In this case, the applicant should document such a commitment in the USAR supplement in accordance with 10 CFR 54.21(d).

3.0.4.1 Summary of Technical Information in the Application

and

LRA Section A2, "Programs That Manage the Effects of Aging," states that the elements of corrective action, confirmation process, and administrative controls in the Quality Assurance Program apply to both SR and NSR SSCs subject to an AMR. In LRA Section B1.3, "Quality Assurance Program and Administrative Controls," the applicant described the quality attributes of the plant-specific AMPs. ~~In LRA Section B1.3, the applicant described the quality attributes common to all the plant-specific AMPs and is~~ summarized as follows:

them

- A single corrective actions process is applied regardless of the safety classification of the SC. Corrective actions are implemented through the initiation of an action request (AR) in accordance with plant procedures established in response to 10 CFR 50, Appendix B.
- Equipment deficiencies are corrected through the initiation of a work order (WO) in accordance with plant procedures. Although equipment deficiencies may initially be

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Pressure vessel ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E > 1 MeV) (Item Number 3.1.1-04)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	TLAA	This TLAA is evaluated in Section 4.2, Neutron Embrittlement of the Reactor Pressure Vessel and Internals
Reactor vessel beltline shell and welds (Item Number 3.1.1-05)	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor vessel surveillance	Reactor Vessel Surveillance Program (B2.1.29)	Consistent with GALL, which recommends further evaluation (See Section 3.1.2.2.3)
Westinghouse and B&W baffle/former bolts (Item Number 3.1.1-06)	Loss of fracture toughness due to neutron irradiation embrittlement and void swelling	Plant specific		Not applicable, PWR only
Small-bore reactor coolant system and connected systems piping (Item Number 3.1.1-07)	Crack initiation and growth due to SCC, intergranular SCC, and thermal and mechanical loading	Inservice Inspection; water chemistry; one-time inspection	ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program (B2.1.2); One-Time Inspection Program (B2.1.23); Plant Chemistry Program (B2.1.25)	Consistent with GALL, which recommends further evaluation (See Section 3.1.2.2.4)
Jet pump sensing line, and reactor vessel flange leak detection line (Item Number 3.1.1-08)	Crack initiation and growth due to SCC, intergranular stress corrosion cracking (IGSCC), or cyclic loading	Plant specific	ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program (B2.1.2); One-Time Inspection Program (B2.1.23); Plant Chemistry Program (B2.1.25)	Consistent with GALL, which recommends further evaluation (See Section 3.1.2.2.4)
Isolation condenser (Item Number 3.1.1-09)	Crack initiation and growth due to stress corrosion cracking (SCC) or cyclic loading	Inservice inspection; water chemistry		Not applicable (See Section 3.1.2.2.4)
Vessel shell (Item Number 3.1.1-10)	Crack growth due to cyclic loading	TLAA		Not applicable, PWR only
Reactor internals (Item Number 3.1.1-11)	Changes in dimension due to void swelling	Plant specific		Not applicable, PWR only

May want to add that jet pump sensing lines, inside the vessel are not in scope of license renewal.

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
(Alloy 600) Steam generator tubes, repair sleeves, and plugs (Item Number 3.1.1-18)	Crack initiation and growth due to PWSCC, outside diameter stress corrosion cracking (ODSCC), and/or intergranular attack (IGA) or loss of material due to wastage and pitting corrosion, and fretting and wear; or deformation due to corrosion at tube support plate intersections	Steam generator tubing integrity; water chemistry		Not applicable, PWR only
Tube support lattice bars made of carbon steel (Item Number 3.1.1-19)	Loss of section thickness due to FAC	Plant specific		Not applicable, PWR only
Carbon steel tube support plate (Item Number 3.1.1-20)	Ligament cracking due to corrosion	Plant specific		Not applicable, PWR only
Steam generator feedwater inlet ring and supports (Item Number 3.1.1-21)	Loss of material due to flow-corrosion	Combustion engineering (CE) steam generator feedwater ring inspection		Not applicable, PWR only
Reactor vessel closure studs and stud assembly (Item Number 3.1.1-22)	Crack initiation and growth due to SCC and/or IGSCC	Reactor head closure studs	Reactor Head Closure Studs Program (B2.1.28)	Consistent with GALL Report which recommends no further evaluation
CASS pump casing and valve body (Item Number 3.1.1-23)	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection	ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program (B2.1.2)	Consistent with GALL Report (See Section 3.1.2.1.1)
CASS piping (Item Number 3.1.1-24)	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS		Not applicable, MNGP does not have CASS piping

There are no CASS pump casings at MNGP

that the applicant had linked these AMR results with Item Number 3.1.1-23 in LRA Table 3.1.1 where the discussion states that, "This line item is not used at MNGP."

Therefore, the staff asked that the applicant resolve the LRA discrepancy linking AMR results for components in one table with an item number in another table while stating that the item number is not used at MNGP. In its response, dated August 11, 2005, the applicant stated:

> LRA Table 3.1.1, Item Number 3.1.1-23, should be revised to read, 'CASS components in the ESF systems subject to an environment that supports loss of fracture toughness due to thermal aging embrittlement were assigned to the ASME Section XI In-Service Inspection, Subsections IWB, IWC and IWD Program. Those CASS components that are subject to this aging effect/ mechanism are valves.'

Based on its review, the staff found the applicant's response to NRC Audit Item 3.1-18 acceptable because the components, material, aging effect, and AMP identified in the LRA are consistent with the GALL Report. The staff found that the applicant had appropriately addressed the aging management for these components. The staff's evaluation of the applicant's ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program is documented in SER Section 3.0.3.2.2.

On the basis of its review, the staff found that the applicant addressed the aging effects and mechanisms as identified in the GALL Report.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. On the basis of its review, the staff concluded that the AMR results, which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report; therefore, the staff concluded that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation Is Recommended

Summary of Technical Information in the Application. In LRA Section 3.1.2.2, the applicant provided further evaluation of aging management as recommended by the GALL Report for the reactor coolant system components. The applicant provided information concerning how it will manage the following aging effects:

Misleading sentence, four of the aging effects listed are only applicable to PWRs

- cumulative fatigue damage
- loss of material due to pitting and crevice corrosion
- loss of fracture toughness due to neutron irradiation embrittlement
- crack initiation and growth due to thermal and mechanical loading or stress corrosion cracking

and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.4 Crack Initiation and Growth Due to Thermal and Mechanical Loading or Stress Corrosion Cracking

The staff reviewed LRA Sections 3.1.2.2.4.1 through 3.1.2.2.4.3 against SRP-LR Section 3.1.2.2.4 criteria.

Insert the word "Section" between "ASME" and "XI".

In LRA Section 3.1.2.2.4.1, the applicant addressed crack initiation and growth due to thermal and mechanical loading or SCC in small-bore reactor coolant system and connected system piping less than nominal pipe size (NPS) 4-inch. The applicant stated that the aging effect is managed by AMP B2.1.2, ASME XI In-Service Inspection, Subsections IWB, IWC, and IWD, together with AMP B2.1.25, Plant Chemistry, and AMP B2.1.23, One-Time Inspection. The applicant further stated that ASME Section XI does not require volumetric examination of pipes less than 4-inch NPS and that the scope of the One-Time Inspection Program validates AMP effectiveness by verifying unacceptable degradation. The applicant stated that the aging effects monitored/inspected by its One-Time Inspection Program include crack initiation and growth and that this program includes one-time inspections to monitor a component's degradation using a variety of NDE methods.

SRP-LR Section 3.1.2.2.4, item 1 states:

> Crack initiation and growth due to thermal and mechanical loading or SCC (including intergranular stress corrosion cracking [IGSCC]) could occur in small-bore reactor coolant system and connected system piping less than NPS 4. The existing program relies on ASME Section XI ISI and on control of water chemistry to mitigate SCC. The GALL report recommends that a plant-specific destructive examination or a nondestructive examination (NDE) that permits inspection of the inside surfaces of the piping be conducted to ensure that cracking has not occurred and the component intended function will be maintained during the extended period. The AMPs should be augmented by verifying that service-induced weld cracking is not occurring in the small-bore piping less than NPS 4, including pipe, fittings, and branch connections. A one-time inspection of a sample of locations is an acceptable method to ensure that the aging effect is not occurring and the component's intended function will be maintained during the period of extended operation.

The staff reviewed LRA Section 3.1.2.2.4.1, Tables 3.1.2-1 through 3.1.2-5, and LRA Appendix B2.1.23, and confirmed that small bore, Class 1 piping in the head vent system and the reactor vessel instrumentation system is appropriately included in the applicant's One-Time Inspection Program.

The staff also reviewed the applicant's drawings of the RCS and connected systems and identified a number of small-bore, Class 1 pipe segments. The staff asked the applicant whether each of the segments is included in the One-Time Inspection Program. In its response, by letter, dated August 11, 2005, the applicant provided additional information including references to LRA table entries. The staff reviewed the applicant's response and concluded that

all Class 1 small-bore pipe segments are appropriately included in the applicant's One-Time Inspection Program.

As part of its response, the applicant stated that in Class 1, small-bore stainless steel piping, the aging effect managed by Plant Chemistry and One-Time Inspection is cracking due to SCC; however, in Class 1, small-bore carbon steel piping, the aging effect managed by the Plant Chemistry and One-Time Inspection Programs is loss of material due to corrosion. Because different examination techniques typically are required to detect the aging effect of cracking versus that of loss of material, the staff asked the applicant to justify why the Class 1, small-bore carbon steel piping was not managed for an aging effect of crack initiation and growth due to thermal and mechanical loading.

In its response, dated August 11, 2005, the applicant stated that it had performed an analytical evaluation to classify all Class 1 and 2 piping welds by failure potential based on methodology in EPRI Topical Report TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Revision B-A. Based on this evaluation, the applicant determined that it has no Class 1, small-bore carbon steel piping in an environment where cracking due to mechanical or thermal loading will occur. Consequently, one-time inspection of Class 1, small-bore carbon steel piping will focus on the loss of material, but not on the crack initiation and growth aging effect.

The staff reviewed the applicant's response together with the applicant's calculation providing the analytical basis for excluding cracking as an aging effect in Class 1, small-bore carbon steel piping. The staff noted that in SRP-LR Section 3.1.2.2.4, there is no distinction drawn between stainless steel and carbon steel piping, and that the purpose of the one-time inspection is to validate the absence of cracks that might not be detected by the ASME Section XI examinations required for small-bore piping. Because the applicant will perform a one-time inspection for cracking in stainless steel small-bore piping and use an appropriate methodology to exclude the aging effect of cracking in carbon steel small-bore piping, the staff found the applicant's programs for managing aging effects in Class 1, small-bore piping acceptable. The staff's evaluations of the applicant's ~~ASME Section XI, In-Service Inspection, Subsections IWB, IWC, and IWD Program, Plant Chemistry Program, and~~ One-Time Inspection Program are documented in SER Sections ~~3.0.3.2.2, 3.0.3.2.19, and~~ 3.0.3.1.4, ~~respectively.~~

is

Delete

Only applicable program is One-Time Inspection

On the basis of its review, the staff concluded that the applicant has met the SRP-LR Section 3.1.2.2.4.1 criteria for further evaluation. For those line items that apply to LRA Section 3.1.2.2.4.1, the staff found that the applicant's AMRs are consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation as required by 10 CFR 54.21(a)(3).

In LRA Section 3.1.2.2.4.2, the applicant addressed crack initiation and growth due to thermal and mechanical loading or SCC in reactor vessel flange leak detection lines and jet pump sensing lines.

SRP-LR Section 3.1.2.2.4, item 2 states:

> Crack initiation and growth due to thermal and mechanical loading or SCC (including IGSCC) could occur in BWR reactor vessel flange leak detection line

and BWR jet pump sensing line. The GALL report recommends that a plant specific aging management program be evaluated to mitigate or detect crack initiation and growth due to SCC of vessel flange leak detection line.

In LRA Section 3.1.2.2.4.2, the applicant stated that the jet pump sensing lines internal to the reactor vessel are not within the scope of license renewal, referring to the LRA's "Further Evaluation" description of "Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking" regarding management of the reactor vessel flange leak detection line and other small-bore reactor coolant system and connected system piping.

The staff noted that the jet pump sensing lines external to the vessel are small-bore piping and included in LRA Table 3.1.2-5 as piping and fittings made of stainless steel in a treated water environment with an aging effect of cracking due to SCC/intergranular attack (IGA). For this component, material, environment, and aging effect, the LRA stated that the applicable AMPs are the ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program, the One-Time Inspection Program, and the Plant Chemistry Program. This is consistent with the GALL Report recommendation for small-bore, stainless steel pipe in a reactor coolant water environment. Based on consistency with the GALL Report recommendations, the staff found the applicant's AMPs for these components acceptable as consistent with the GALL Report recommendations.

Although not Class 1,

For aging management of the reactor vessel flange leak detection line, the applicant, in LRA Section 3.1.2.2.4.2, stated that the aging effects/mechanisms for this component are the same as for other small-bore reactor coolant system and connected system piping. For these components, the applicable AMPs are the ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program together with the Plant Chemistry Program and the One-Time Inspection Program. As the reactor vessel flange leak detection line has the same material and environment and consequently the same aging effects as other Class 1 small-bore piping, the staff concluded that the AMPs that the applicant identified for this component are acceptable. Staff reviews and evaluations of the applicant's ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD Program, Plant Chemistry Program, and One-Time Inspection Program are documented in SER Sections 3.0.3.2.2, 3.0.3.2.19, and 3.0.3.1.4, respectively.

Delete

On the basis of its review, the staff concluded that the applicant has met SRP-LR Section 3.1.2.2.4.2 criteria for further evaluation. For those line items that apply to LRA Section 3.1.2.2.4.2, the staff found that the applicant's AMRs are consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation as required by 10 CFR 54.21(a)(3).

In LRA Section 3.1.2.2.4.3, the applicant addressed crack initiation and growth due to thermal and mechanical loading or SCC in the BWR isolation condenser. Because there is no isolation condenser, the staff found this aging effect not applicable.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

The staff reviewed LRA Section 3.1.2.2.5 against SRP-LR Section 3.1.2.2.5 criteria.

In LRA Section 3.1.2.2.5, the applicant stated that this aging effect applies to PWRs only.

SRP-LR Section 3.1.2.2.5 states that crack growth due to cyclic loading could occur in the reactor vessel shell and the reactor coolant system piping and fittings. SRP-LR Table 3.1-1 states that further evaluation for this aging effect is for PWR plants only.

The staff found this aging effect not applicable.

3.1.2.2.6 Changes in Dimension Due to Void Swelling

The staff reviewed LRA Section 3.1.2.2.6 against SRP-LR Section 3.1.2.2.6 criteria.

In LRA Section 3.1.2.2.6, the applicant stated that this aging effect applies to PWRs only.

Insert a space between "Table 3.1-1" and "states".

SRP-LR Section 3.1.2.2.6 states that changes in dimension due to void swelling could occur in reactor internal components. SRP-LR Table 3.1-1states that further evaluation for this aging effect is for PWR plants only.

The staff found this aging effect not applicable.

3.1.2.2.7 Crack Initiation and Growth Due to Stress Corrosion Cracking or Primary Water Stress Corrosion Cracking

The staff reviewed LRA Sections 3.1.2.2.7.1 through 3.1.2.2.7.3 against SRP-LR Section 3.1.2.2.7 criteria.

In LRA Sections 3.1.2.2.7.1 through 3.1.2.2.7.3, the applicant stated that this aging effect applies to PWRs only.

SRP-LR Section 3.1.2.2.7 states that crack initiation and growth due to SCC and PWSCC could occur (1) in PWR core support pads (or core guide lugs), instrument tubes (bottom head penetrations), pressurizer spray heads, and nozzles for the steam generator instruments and drains, (2) in PWR CASS reactor coolant system piping and fittings and pressurizer surge line nozzles, and (3) in PWR pressurizer instrumentation penetrations and heater sheaths and sleeves made of Ni alloys. SRP-LR Table 3.1-1 states that further evaluation for this aging effect is for PWR plants only.

The staff found this aging effect not applicable.

3.1.2.2.8 Crack Initiation and Growth Due to Stress Corrosion Cracking or Irradiation-Assisted Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.8 against SRP-LR Section 3.1.2.2.8 criteria.

In LRA Section 3.1.2.2.8, the applicant stated that this aging effect applies to PWRs only.

SRP-LR Section 3.1.2.2.8 states that crack initiation and growth due to SCC or IASCC could occur in baffle/former bolts in Westinghouse and B&W reactors. SRP-LR Table 3.1-1 states that further evaluation for this aging effect is for PWR plants only.

The staff found this aging effect not applicable.

3.1.2.3.2 Reactor Coolant System – Reactor Pressure Vessel – Summary of Aging Management Evaluation – Table 3.1.2-2

The staff reviewed LRA Table 3.1.2-2, which summarizes the results of AMR evaluations for the RPV component groups.

In LRA Table 3.1.2-2, the applicant stated that the aging effect of cumulative fatigue damage of Type 316NG stainless steel materials for the component type of nozzle safe end/CRDRL cap exposed to a reactor coolant water environment is not applicable and no AMP is specified. The LRA assigns note I to this item, indicating that the aging effect in the GALL Report for this component, material, and environment combination is not applicable. An additional note in the LRA states that the CRD hydraulic return nozzle was capped with a 4-inch diameter pipe cap in 1977, that the CRD return nozzle weld butter was removed and the weld preparation reclad with CrC (chromium carbide) to improve resistance to IGSCC, and that a new nozzle cap was installed in 1986. LRA Table 3.1.2-2 also states that the aging effect of crack initiation and growth due to SCC or IGSCC is also applicable for this component and that the aging effect is managed by the BWR SCC Program (AMP B2.1.10) and the Plant Chemistry Program (AMP B2.1.25).

The staff noted that the applicant's evaluation of this component refers to GALL Report, Volume 2 Item IV.A1.4-b, which is the CRDRL nozzle safe end. The GALL Report line item is based on an in-service CRDRL safe end that will routinely experience cyclic flow, not one effectively out of service by removal of the previously attached pipe and installation of a cap on the safe end. Capping the CRDRL safe end eliminated the cyclic flow environment to which the safe end had been exposed and thereby eliminated the potential for the aging effect of cumulative fatigue damage. In addition, review of operating experience since the CRDRL nozzle cap replacement in 1986 indicates that no new cracking has occurred at this location. Because there is no potential for cumulative fatigue damage from flow cycling at the capped CRDRL safe end and no new cracking has been detected at this location since the nozzle was capped, the staff found the applicant's statement that cumulative fatigue damage is not applicable for the CRDRL safe end cap in the RPV acceptable.

Delete Delete In-Service Inspection,

The applicant proposed to manage crack initiation and growth/SCC for the top head torus, flange, and dollar plate using the ASME ~~Code~~ Section XI, Subsections IWB, IWC, and IWD ~~In-Service Inspection~~ Program and Plant Chemistry Program. The material is identified as alloy steel (A533 Grade B Class and A508 Class 2) and clad (308/309).

The staff's review of LRA Section 3.1.2 identified an area in which additional information was necessary to complete the review of the applicant's results. The applicant responded to the staff's RAI as discussed below.

In RAI 3.1.2-1, dated September 28, 2005, the staff requested that the applicant identify which materials provide the pressure boundary function and provide the basis, including any operating experience, for concluding that these materials are susceptible to crack initiation and growth due to SCC.

In its response, by letter, dated October 28, 2005, the applicant responded that the base material provided the pressure boundary function and that operating experience identified in BWRVIP-74-A indicated the base material was susceptible to SCC. The staff reviewed this

may want to delete, steam dryer cracking is assumed to occur even if power uprate is not implemented.

cyclic loading of stainless steel material in the steam dryer exposed to a reactor coolant water or steam environment ~~at uprated power conditions~~.

On the basis of its review of the applicant's programs, aging effects, plant-specific, and industry operating experience, the staff determined that the applicant has demonstrated that the effects of aging will be adequately managed so intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.4 Reactor Coolant System – Reactor Recirculation System – Summary of Aging Management Evaluation – Table 3.1.2-4

The staff reviewed LRA Table 3.1.2-4, which summarizes the results of AMR evaluations for the REC system component groups.

In LRA Table 3.1.2-4, the applicant identified no aging effect for stainless steel fasteners, heat exchangers, manifolds, piping and fittings, pump casings, thermowells, and valve bodies exposed to a primary containment air environment.

In addition, no aging effects were identified for carbon steel and stainless steel components exposed to a lubricating oil environment. The staff's evaluation is documented in SER Section 3.1.2.3.

On the basis of its review of the applicant's programs, aging effects, plant-specific, and industry operating experience, the staff determined that the applicant has demonstrated that the effects of aging will be adequately managed so intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.5 Reactor Coolant System – Reactor Vessel Instrumentation – Summary of Aging Management Evaluation – Table 3.1.2-5

The staff reviewed LRA Table 3.1.2-5, which summarizes the results of AMR evaluations for the reactor vessel instrumentation component groups.

In LRA Table 3.1.2-5, the applicant identified no aging effect for stainless steel fasteners, manifolds, piping and fittings, restricting orifices, thermowells, and valve bodies exposed to a primary containment air environment. The staff's evaluation is documented in SER Section 3.1.2.3.

On the basis of its review of the applicant's programs, aging effects, plant-specific, and industry operating experience, the staff determined that the applicant has demonstrated that the effects of aging will be adequately managed so intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Conclusion. On the basis of its review, the staff found that the applicant appropriately evaluated AMR results involving material, environment, aging effects requiring management, and AMP combinations that are not evaluated in the GALL Report. The staff found that the applicant has demonstrated that the effects of aging will be adequately managed so intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Delete "high pressure core spray"

Based on the technical information provided in LRA Section 3.2 and review of the One-Time Inspection and Plant Chemistry Programs, the staff found that the applicant has appropriately addressed the aging effect/mechanism of loss of material due to general corrosion of pumps, valves, piping, and fittings associated with some of the ECCSs (HPC, RCI, ~~high-pressure core spray~~, low-pressure core spray, low-pressure coolant injection (RHR)) and lines to the suppression chamber and to the drywell and suppression chamber spray system for components in the ESF systems.

In LRA Section 3.2.2.2.2.2, the applicant addressed the loss of material due to general corrosion of components in the standby gas treatment, containment isolation, and emergency core cooling systems. The applicant stated that the aging effect is managed by the One-Time Inspection Program or the System Condition Monitoring Program.

SRP-LR Section 3.2.2.2.2.2 states that:

> Loss of material due to general corrosion could occur in the drywell and suppression chamber spray (BWR) systems header and spray nozzle components, standby gas treatment system components (BWR), containment isolation valves and associated piping, the automatic depressurization system piping and fittings (BWR), emergency core cooling system header piping and fittings and spray nozzles (BWR), and the external surfaces of BWR carbon steel components. The GALL Report recommends further evaluation on a plant-specific basis to ensure that the aging effect is adequately managed.

The applicant stated in LRA Section 3.2.2.2.2.2, that the aging effect is managed by AMP B2.1.23, the One-Time Inspection Program and/or by AMP B2.1.32, the System Condition Monitoring Program for an air/gas environment.

The LRA describes the One-Time Inspection Program as a new AMP. The scope of this new AMP includes activities to verify potential long incubation periods for certain aging effects on SCs. The environments applicable to this item are characteristic of long incubation periods (air/gas environments with the potential for moisture). The One-Time Inspection Program was evaluated by the staff and found acceptable for managing the aging effects of loss of material due to general corrosion. The evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.4.

The LRA describes the System Condition Monitoring program as an existing plant-specific program that manages aging effects for normally accessible, external surfaces of piping, tanks, and other components and equipment within the scope of license renewal. These aging effects are managed through visual inspection and monitoring of external surfaces for leakage and evidence of material degradation.

The staff considers visual inspection an examination technique capable of detecting loss of material due to various aging mechanisms (general or galvanic corrosion, etc.) on the exterior surface of components, and the staff considers a once per-year or per-refueling-outage examination frequency adequate for detection of this effect before loss of component function occurs. The staff's review found the System Condition Monitoring program acceptable for managing aging of general corrosion during the period of extended operation. The evaluation of the System Conditioning Monitoring Program is documented in SER Section 3.0.3.3.2.

Incorrect reference, "such as no flow conditions" The Plant Chemistry Program is credited for aging management in no flow conditions. The One-Time Inspection Program is used to verify the effectiveness of the Plant Chemistry Program

Inspection Program and Plant Chemistry Program. When applied in combination with the Plant Chemistry Program, the scope of the One-Time Inspection Program includes activities to verify the effectiveness of the Plant Chemistry Program, including a sample of components where the flow of water is low or stagnant conditions exist. Implementation of the One-Time Inspection Program and the Plant Chemistry Program to manage the aging effect provides added assurance that the aging effect is not occurring or that the aging effect is progressing very slowly, such that the component's intended function will be maintained during the period of extended operation.

with the potential for moisture

Delete

As documented in the audit and review report, the applicant stated that in some instances, the component within the scope of license renewal has an environment, which does not lend itself to benefits from the Plant Chemistry Program (~~low flow stagnant conditions, or~~ an air/gas environment). The staff determined that the use of the One-Time Inspection Program alone in certain cases, such as ~~no flow conditions~~, where the use of the Plant Chemistry Program was not a viable option, was acceptable. The staff concluded, based on MNGP technical procedures, that this is an appropriate aging management method based on the details of the program's sampling locations, frequencies, and corrective actions.

an air/gas environment with the potential for moisture,

The One-Time Inspection Program, or the combination of the One-Time Inspection Program and the Plant Chemistry Program, is used to manage the aging effect/mechanism of loss of material due to pitting and crevice corrosion for areas of stagnant flow. The One-Time Inspection Program and Plant Chemistry Program were evaluated by the staff as documented in SER Sections 3.0.3.1.4 and 3.0.3.2.19, respectively.

Delete "high pressure core spray"

The staff reviewed the applicant's programs credited for aging management for the materials, environment and aging effects/mechanisms. The pumps, valves, piping and fittings associated with some of the BWR ECCS piping and fittings (HPC, RCI, ~~high pressure core spray,~~ low pressure core spray, low pressure coolant injection (RHR)) and with lines to the suppression chamber and to the drywell and suppression chamber spray system are subject to local loss of material due to pitting and crevice corrosion. The aging mechanisms are managed by the One-Time Inspection Program or the Plant Chemistry Program and the One-Time Inspection Program.

In LRA Section 3.2.2.2.3.2, the applicant addressed loss of material due to pitting and crevice corrosion of components in the standby gas treatment, containment isolation, and emergency core cooling systems. The applicant stated the aging effect is managed by the One-Time Inspection Program, or the combination of the One-Time Inspection Program and Plant Chemistry Program.

SRP-LR Section 3.2.2.2.3.2 states that:

> Local loss of material from pitting and crevice corrosion could occur in the containment isolation valves and associated piping, and automatic depressurization system piping and fittings (BWR). The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

In LRA Section 3.2.2.2.3.2, the applicant stated that the One-Time Inspection Program is a new AMP. The scope of this new AMP is to include activities to verify potential long incubation

periods for certain aging effects on SCs. The environments applicable to this item are characteristic of long incubation periods (air/gas environments with the potential for moisture). This program is sometimes used by itself in locations where the Plant Chemistry Program will not be effective (such as air/gas or low flow/stagnant environments). The staff determined that the use of the One-Time Inspection Program alone in certain cases, such as no flow conditions, where the use of the Plant Chemistry Program was not a viable option, was acceptable.

The Plant Chemistry and One-Time Inspection Programs were evaluated by the staff and found acceptable for managing the aging effect of local loss of material from pitting and crevice corrosion that could occur in the containment isolation valves and associated piping, and automatic depressurization system piping and fittings. The staff's evaluation of the Plant Chemistry Program and One-Time Inspection Program are documented in SER Sections 3.0.3.2.19 and 3.0.3.1.4, respectively.

The staff evaluated both of these AMPs with respect to applications to the materials, environment, and aging effects. The applicant included an additional aging mechanism (galvanic corrosion) not consistent with the GALL Report (V.C.1-a/b, V.D2.1-e). The staff determined that the applicant was using a conservative approach for aging management by including this additional aging mechanism, and that this is consistent with the GALL Report for the aging effect.

On the basis of its review, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.2.2.2.3. For those line items that apply to LRA Sections 3.2.2.2.3.1 and 3.2.2.2.3.2, the staff determined that the applicant's AMRs are consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Local Loss of Material Due to Microbiologically Influenced Corrosion

The staff reviewed LRA Section 3.2.2.2.4 against the criteria in SRP-LR Section 3.2.2.2.4.

In LRA Section 3.2.2.2.4, the applicant addressed loss of material due to microbiologically influenced corrosion (MIC) of valves and associated piping in containment isolation.

SRP-LR Section 3.2.2.2.4 states that:

> Local loss of material due to microbiologically influenced corrosion (MIC) could occur in BWR and PWR containment isolation valves and associated piping in systems that are not addressed in other chapters of the GALL Report. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

Although the applicant does not use this line item at MNGP, the loss of material due to MIC is predicted for ESF system valve bodies and associated piping. The applicant credits a combination of the Plant Chemistry Program and the One-Time Inspection Program for the aging effect. The Plant Chemistry Program and One-Time Inspection Program were evaluated by the staff and found acceptable for managing aging of local loss of material ~~from pitting and crevice corrosion~~ that could occur in the containment isolation valves and associated piping,

may want to change this to MIC as stated in the beginning of this paragraph.

and automatic depressurization system piping and fittings. The evaluation of the Plant Chemistry Program and One-Time Inspection Program are documented in SER Sections 3.0.3.2.19 and 3.0.3.1.4, respectively.

The applicant's LRA is consistent with the GALL Report (V.C.1-a/b) for components, materials, environment and programs for managing aging for the containment isolation valves. Based on the information provided by the applicant, as noted in the LRA, the staff's review and audit found that the applicant's AMPs are acceptable for management of loss of material due to MIC for the containment isolation valves and associated piping.

On the basis of its review, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.2.2.2.4. For those line items that apply to LRA Section 3.2.2.2.4, the staff determined that the applicant's AMRs are consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.5 Changes in Properties Due to Elastomer Degradation

The staff reviewed LRA Section 3.2.2.2.5 against the criteria in SRP-LR Section 3.2.2.2.5.

In LRA Section 3.2.2.2.5, the applicant addressed the change in material properties of seals in the SGTS. The applicant stated that the aging effect is managed by the One-Time Inspection Program for the internal environment and the System Condition Monitoring Program for the external environment. The System Condition Monitoring Program is an existing plant-specific program.

SRP-LR Section 3.2.2.2.5 states that:

> Changes in properties due to elastomer degradation could occur in seals associated with the standby gas treatment system ductwork and filters. The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

The One-Time Inspection Program is a new AMP, the scope of which includes activities to verify potential long incubation periods for certain aging effects on SCs. The environments applicable to this item are characteristic of long incubation periods (~~air/gas environments with the potential for moisture~~). The One-Time Inspection Program was evaluated by the staff and found acceptable and consistent with the GALL Report for managing this aging effect. The evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.4.

The System Condition Monitoring Program is an existing plant-specific program that is based on system engineer monitoring, and it is used to manage the aging effect/mechanisms on system components in the ESF, including elastomer degradation of seals in the SGTS ductwork and filters. The staff reviewed the System Condition Monitoring Program and found it acceptable and consistent with the GALL Report for managing this aging effect/mechanism. The evaluation of the System Condition Monitoring Program is documented in SER Section 3.0.3.3.2.

Degradation of elastomers is caused by high temperature air or ozone.

concern during the period of extended operation; therefore, the staff concluded that there are no applicable aging effects requiring management for the component material and environment described in the preceding discussion.

3.2.2.3.1 Engineered Safety Features – Automatic Pressure Relief System – Summary of Aging Management Evaluation – Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes the results of AMR evaluations for the automatic pressure relief system component groups.

All line items in this table were consistent with the GALL Report or were included in the discussion in Section 3.2.2.3 above.

Combustible Gas Control System was deleted during first annual update

3.2.2.3.2 Engineered Safety Features – Combustible Gas Control System – Summary of Aging Management Evaluation – Table 3.2.2-2

The staff reviewed LRA Table 3.2.2-2, which summarizes the results of AMR evaluations for the combustible gas control system component groups.

All line items in this table were consistent with the GALL Report or were included in the discussion in Section 3.2.2.3 above.

3.2.2.3.3 Engineered Safety Features – Core Spray System – Summary of Aging Management Evaluation – Table 3.2.2-3

The staff reviewed LRA Table 3.2.2-3, which summarizes the results of AMR evaluations for the core spray system component groups.

In LRA Table 3.2.2-3, the applicant proposed to manage loss of material due to crevice corrosion, MIC, and pitting corrosion of copper alloys for ESF heat exchangers exposed to raw water environment using AMP B2.1.23, "Open-Cycle Cooling Water."

The OCCW System Program relies on the implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the raw water service water systems will be managed for the period of extended operation. This program manages the aging effects of metallic components in water systems (e.g., piping and heat exchangers) exposed to raw, untreated (e.g., service) water. The staff reviewed the OCCW System Program and found it to be acceptable and consistent with the GALL Report. The evaluation of the OCCW System Program is documented in SER Section 3.0.3.1.5. The staff determined that this AMP is adequate for managing this material-environment-aging effect.

In LRA Table 3.2.2-3, the applicant proposed to manage loss of material due to selective leaching of copper alloys for ESF heat exchangers in a raw water environment using AMP B2.1.30, "Selective Leaching of Materials."

The staff reviewed the applicant's Selective Leaching of Materials Program, and its evaluation is documented in SER Section 3.0.3.2.22. This new program includes a one-time visual inspection and hardness measurement of selected components susceptible to selective

leaching. The program will determine if selective leaching occurs for selected components. The staff determined that this AMP is adequate for managing this material-environment-aging effect.

On the basis of its review of the applicant's programs, aging effects, plant-specific, and industry operating experience, the staff determined that the aging effect of loss of material due to crevice corrosion, MIC, and pitting corrosion and loss of material due to selective leaching of copper alloys for ESF heat exchangers exposed to raw water environment in LRA Table 3.2.2-3 are effectively managed using the OCCW Program and the Selective Leaching of Materials Program.

respectively

3.2.2.3.4 Engineered Safety Features – High Pressure Coolant Injection System – Summary of Aging Management Evaluation – Table 3.2.2-4

The staff reviewed LRA Table 3.2.2-4, which summarizes the results of AMR evaluations for the HPC system component groups.

In LRA Table 3.2.2-4, the applicant proposed to manage heat transfer degradation and fouling of heat exchangers fabricated from copper alloy in lubricating oil (external)/treated water (internal) environments with AMP B2.1.23, One-Time Inspection Program, and in steam (external)/treated water (internal) environments using AMP B2.1.25, Plant Chemistry Program, combined with AMP B2.1.23, One-Time Inspection Program. The applicant also proposed to manage the loss of material due to crevice corrosion and pitting corrosion of heat exchangers fabricated from copper alloy in steam (external)/treated water (internal) environments, and MIC in a treated water (internal) environment using AMP B2.1.25, Plant Chemistry Program, combined with AMP B2.1.23, One-Time Inspection Program.

The staff reviewed the applicant's Plant Chemistry Program and the One-Time Inspection Program, and its evaluation of each is documented in SER Sections 3.0.3.2.19 and 3.0.3.1.4, respectively. The Plant Chemistry Program mitigates the aging effects on component surfaces exposed to water as the process fluid; chemistry programs are used to control water chemistry for impurities (e.g., chloride and sulfate) that accelerate corrosion or crack initiation and growth or ~~and~~ that cause heat transfer degradation due to fouling in select heat exchangers. This program relies on monitoring and control of water chemistry to keep peak levels of various contaminants below system-specific limits. The new One-Time Inspection Program is consistent with the recommendations of GALL AMP XI.M32, One-Time Inspection. This program will include measures to verify the effectiveness of the Plant Chemistry Program. This program will also confirm the absence of age degradation in selected components (e.g., flow restrictors, venturis, and small bore piping) within the scope of license renewal. The One-Time Inspection Program addresses concerns and provides confirmation for the potential long incubation period for certain aging effects on SCs. If system corrosion inhibitor concentrations are maintained within the limits specified by the chemistry program, the corrosion exhibited by the copper alloy in a closed system is adequately managed. The applicant has chosen a different combination of AMPs to manage the AERM. The staff found this combination adequate for managing this material-environment-aging effect and acceptable, because corrosion inhibitor concentrations are maintained within limits to inhibit corrosion of the copper alloy.

Corrosion inhibitors are not used by the Plant Chemistry Program, but by the Closed Cycle Cooling Water Program. The Plant Chemistry Program controls detrimental contaminants.

The staff's review of LRA Section 3.2 identified areas in which additional information was necessary to complete the review of the applicant's results. The applicant responded to the staff's RAIs as discussed below.

3.2.2.3.5 Engineered Safety Features – Primary Containment Mechanical System – Summary of Aging Management Evaluation – Table 3.2.2-5

The staff reviewed LRA Table 3.2.2-5, which summarizes the results of AMR evaluations for the primary containment mechanical system component groups.

All line items in this table were consistent with the GALL Report or were included in the discussion in Section 3.2.2.3 above.

3.2.2.3.6 Engineered Safety Features – Reactor Core Isolation Cooling System – Summary of Aging Management Evaluation – Table 3.2.2-6

The staff reviewed LRA Table 3.2.2-6, which summarizes the results of AMR evaluations for the RCI system component groups.

In LRA Table 3.2.2-6, the applicant proposed to manage heat transfer degradation and fouling of heat exchangers fabricated from copper alloy in a lubricating oil (external) environment with AMP B2.1.23, One-Time Inspection Program, and in treated water (internal) environment with AMP B2.1.25, Plant Chemistry Program, combined with AMP B2.1.23, One-Time Inspection Program. The applicant also proposed to manage the loss of material due to crevice corrosion, pitting corrosion, and MIC of heat exchangers fabricated from copper alloy in a treated water (internal) environment with AMP B2.1.25, Plant Chemistry Program, combined with AMP B2.1.23, One-Time Inspection Program.

The staff reviewed the applicant's Plant Chemistry Program and the One-Time Inspection Program, and its evaluation of each is documented in SER Sections 3.0.3.2.19 and 3.0.3.1.4, respectively. The Plant Chemistry Program mitigates the aging effects on component surfaces exposed to water as the process fluid; chemistry programs are used to control water chemistry for impurities (e.g., chloride and sulfate) that accelerate corrosion or crack initiation and growth or ~~and~~ that cause heat transfer degradation due to fouling in select heat exchangers. This program relies on monitoring and control of water chemistry to keep peak levels of various contaminants below system-specific limits. The new One-Time Inspection Program is consistent with the recommendations of GALL AMP XI.M32, One-Time Inspection. This program will include measures to verify the effectiveness of the Plant Chemistry Program. This program will also confirm the absence of age degradation in selected components (e.g., flow restrictors, venturis, and small bore piping) within scope of license renewal. The One-Time Inspection Program addresses concerns and provides confirmation for the potential long incubation period for certain aging effects on SCs. If system corrosion inhibitor concentrations are maintained within the limits specified by the chemistry program, the corrosion exhibited by the copper alloy in a closed system is adequately managed. The applicant has chosen a different combination of AMPs to manage the AERM. The staff found this combination adequate for managing this material-environment-aging effect and acceptable, because corrosion inhibitor concentrations are maintained within limits to inhibit corrosion of the copper alloy.

The response to RAI 3.2-1, discussed in SER Section 3.2.2.3.4, is generally applicable to the copper alloy components of the heat exchangers in the RCI system.

The staff found the applicant's response reasonable and acceptable because the lube oil coolers are monitored and tested in accordance with industry standards and NRC guidelines. In

Corrosion inhibitors are not used by the Plant Chemistry Program, but by the Closed Cycle Cooling Water Program. The Plant Chemistry Program controls detrimental contaminants.

addition, the applicant's operational experience supports the adequacy of its maintenance practices.

In LRA Table 3.2.2-6, the applicant proposed to manage the loss of material due to selective leaching of heat exchangers fabricated from copper alloy in a treated water (internal) environment using AMP B2.1.30, Selective Leaching of Materials.

The staff reviewed the applicant's Selective Leaching of Materials Program and its evaluation is documented in SER Section 3.0.3.2.22. This new program includes a one-time visual inspection and hardness measurement of selected components susceptible to selective leaching. The program will determine if selective leaching occurs for selected components. The staff found this program adequate for managing this material-environment-aging effect and acceptable.

3.2.2.3.7 Engineered Safety Features – Residual Heat Removal System – Summary of Aging Management Evaluation – Table 3.2.2-7

The staff reviewed LRA Table 3.2.2-7, which summarizes the results of AMR evaluations for the RHR system component groups.

In LRA Table 3.2.2-7, the applicant proposed to manage heat transfer degradation and fouling of heat exchangers fabricated from copper alloy in a lubricating oil (external) environment with AMP B2.1.23, One-Time Inspection Program, and in a raw water (internal) environment using AMP B2.1.23, Open-Cycle Cooling Water. The applicant also proposed to manage the loss of material due to crevice corrosion, MIC, and pitting corrosion of heat exchangers fabricated from copper alloy in a raw water (internal) environment using AMP B2.1.23, Open-Cycle Cooling Water.

The staff reviewed the applicant's One-Time Inspection Program, and its evaluation is documented in SER Section 3.0.3.1.4. The new One-Time Inspection Program consistent with the recommendations of GALL AMP XI.M32, One-Time Inspection Program, will confirm the absence of age degradation in selected components (e.g., flow restrictors, venturis, and small bore piping) within the scope of license renewal. The One-Time Inspection Program addresses concerns and provides confirmation for the potential long incubation period for certain aging effects on SCs. If system corrosion inhibitor concentrations are maintained within limits specified by the chemistry program, the corrosion exhibited by the copper alloy in a closed system is adequately managed. The staff found this program adequate for managing this material-environment-aging effect and acceptable, because corrosion inhibitor concentrations are maintained within limits to inhibit corrosion of the copper alloy.

The OCCW System Program relies on the implementation of the recommendations of GL 89-13 to ensure that the effects of aging on the raw water service water systems will be managed for the period of extended operation. This program manages the aging effects of metallic components in water systems (e.g., piping and heat exchangers) exposed to raw, untreated (e.g., service) water. The staff reviewed the OCCW System Program and found it acceptable and consistent with the GALL Report. The evaluation of the OCCW System Program is documented in SER Section 3.0.3.1.5. The staff has found this AMP adequate for managing this material-environment-aging effect and acceptable.

Corrosion inhibitors are not used by the Plant Chemistry Program, but by the Closed Cycle Cooling Water Program. The Plant Chemistry Program controls detrimental contaminants.

In LRA Table 3.2.2-7, the applicant proposed to manage the loss of material due to MIC, crevice corrosion, and pitting corrosion of RHR nozzles fabricated from copper alloy in a treated water (internal) environment with AMP B2.1.25, Plant Chemistry Program, combined with AMP B2.1.23, One-Time Inspection Program.

The staff reviewed the applicant's Plant Chemistry Program and the One-Time Inspection Program, and its evaluation of each is documented in SER Sections 3.0.3.2.19 and 3.0.3.1.4, respectively. The Plant Chemistry Program mitigates the aging effects on component surfaces exposed to water as the process fluid; chemistry programs are used to control water chemistry for impurities (e.g., chloride and sulfate) that accelerate corrosion or crack initiation and growth, ~~and~~ or that cause heat transfer degradation due to fouling in select heat exchangers. This program relies on monitoring and control of water chemistry to keep peak levels of various contaminants below system-specific limits.

The new One-Time Inspection Program consistent with the recommendations of GALL AMP XI.M32, One-Time Inspection will include measures to verify the effectiveness of the Plant Chemistry Program and also will confirm the absence of age degradation in selected components (e.g., flow restrictors, venturis, and small bore piping) within the scope of license renewal. The One-Time Inspection Program addresses concerns and provides confirmation for the potential long incubation period for certain aging effects on SCs. If system corrosion inhibitor concentrations are maintained within limits specified by the chemistry program, the corrosion exhibited by the copper alloy in a closed system is adequately managed. The applicant has chosen a different combination of AMPs to manage the AERM. The staff found this combination adequate for managing this material-environment-aging effect and acceptable, because corrosion inhibitor concentrations are maintained within limits to inhibit corrosion of the copper alloy.

In LRA Table 3.2.2-7, the applicant proposed to manage the loss of material due to selective leaching of heat exchangers fabricated from copper alloy in a raw water (internal) environment, and RHR nozzles fabricated from copper alloy in a treated water (internal) environment with AMP B2.1.30, Selective Leaching of Materials.

The staff reviewed the applicant's Selective Leaching of Materials Program and its evaluation is documented in SER Section 3.0.3.2.22. This new program includes a one-time visual inspection and hardness measurement of selected components susceptible to selective leaching. Because the program will determine if selective leaching occurs for selected components, the staff found this AMP adequate for managing this material-environment-aging effect and acceptable.

In LRA Table 3.2.2-7, the applicant contends that there are no aging effects associated with thermal insulation installed on heat exchangers and exposed to an indoor plant air environment. The staff concurred with the applicant's assessment and found the applicant's routine maintenance practices adequate to maintain the thermal insulation of the RHR heat exchangers effectively.

3.2.2.3.8 Engineered Safety Features – Secondary Containment System – Summary of Aging Management Evaluation – Table 3.2.2-8

The staff reviewed LRA Table 3.2.2-8, which summarizes the results of AMR evaluations for the secondary containment system component groups.

Corrosion inhibitors are not used by the Plant Chemistry Program, but by the Closed Cycle Cooling Water Program.
The Plant Chemistry Program controls detrimental contaminants.

Table 3.3-1 below provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.3, that are addressed in the GALL Report.

Delete

Table 3.3-1 Staff Evaluation for Auxiliary Systems Components in the GALL Report

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in spent fuel pool cooling and cleanup (Item Number 3.3.1-01)	Loss of material due to general, pitting, and crevice corrosion	Water chemistry and one-time inspection	~~Compressed Air Monitoring Program (B2.1.14)~~, One-Time Inspection Program (B2.1.23), Plant Chemistry Program (B2.1.25)	Consistent with GALL, which recommends further evaluation (See Section 3.3.2.2.1)
Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems (Item Number 3.3.1-02)	Hardening, cracking and loss of strength due to elastomer degradation; loss of material due to wear	Plant specific		Not applicable (See Section 3.3.2.2.2)
Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR) (Item Number 3.3.1-03)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	This TLAA is evaluated in Section 4.3, Metal Fatigue of the RPV and Internals, and Reactor Coolant Pressure Boundary Piping and Components and Section 4.9, Reactor Building Crane Load Cycles
Heat exchangers in reactor water cleanup system (BWR); high pressure pumps in chemical and volume control system (PWR) (Item Number 3.3.1-04)	Crack initiation and growth due to SCC or cracking	Plant specific		Not applicable (See Section 3.3.2.2.4)

This line item was not used at MNGP. The Fire Protection Program is applied to those components in the fire system associated with the diesel fire pump with the exception of the diesel engine fuel oil supply. The Fire Protection Program includes performance and condition monitoring of the diesel fire pump. Components in the diesel engine fuel oil supply are included in the Emergency Diesel Generators System. For these components, the aging effect is managed by the Fuel Oil Chemistry and One-Time Inspection Programs.

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in compressed air system (Item Number 3.3.1-19)	Loss of material due to general and pitting corrosion	Compressed air monitoring	Compressed Air Monitoring Program (B2.1.14)	Consistent with GALL Report which recommends no further evaluation
Components (doors and barrier penetration seals) and concrete structures in fire protection (Item Number 3.3.1-20)	Loss of material due to wear; hardening and shrinkage due to weathering	Fire protection	Fire Protection Program (B2.1.17)	Consistent with GALL Report which recommends no further evaluation
Components in water-based fire protection (Item Number 3.3.1-21)	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling	Fire water system	Fire Protection Program (B2.1.17), Fire Water System Program (B2.1.18)	Consistent with GALL Report (see Section 3.3.2.1.1)
Components in diesel fire system (Item Number 3.3.1-22)	Loss of material due to galvanic, general, pitting, and crevice corrosion	Fire protection and fuel oil chemistry	Fire Protection Program (B2.1.17), Fuel Oil Chemistry Program (B2.1.20), One-Time Inspection Program (B2.1.23)	Consistent with GALL Report which recommends no further evaluation
Tanks in diesel fuel oil system (Item Number 3.3.1-23)	Loss of material due to general, pitting, and crevice corrosion	Aboveground carbon steel tanks		Not applicable. MNGP does not have any above ground carbon steel tanks exposed to outdoor ambient conditions within the scope of License Renewal.
Closure bolting (Item Number 3.3.1-24)	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and SCC	Bolting integrity	Bolting Integrity Program (B2.1.4)	Consistent with GALL Report which recommends no further evaluation
Components in contact with sodium pentaborate solution in standby liquid control system (BWR) (Item Number 3.3.1-25)	Crack initiation and growth due to SCC	Water chemistry		Not applicable. At MNGP, the components exposed to sodium pentaborate solution are in an environment such that the components are not susceptible to SCC.

The applicant agreed to revise the Fire Protection AMP in the LRA to specifically address how it intends to credit the Fire Water System AMP with managing loss of material in water-based subsystems. The applicant also will provide revised AMR line items for which the Fire Water System AMP was inadvertently omitted for managing the aging effect of loss of material for copper alloy filters and strainers in a raw water environment.

In its letter, dated February 28, 2006, the applicant provided an update to LRA Table 3.3.2-9, adding the Fire Water System AMP to the Fire Protection AMP for managing the aging effect of loss of material for copper alloy filters and strainers in a raw water environment. In addition, the applicant amended the program description of the Fire Protection AMP to invoke the Fire Water System AMP for water-initiated aging effects related to the diesel fire pump water-based subsystem. Because the Fire Protection AMP credits the Fire Water System AMP for managing the aging effects of loss of material in water-based subsystems, the staff found the applicant's response acceptable. Therefore, the staff's concern described in RAI 3.3.2.1.9-3 is resolved.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing associated aging effects. The staff's review concluded that the AMR results, which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report; therefore, the staff concluded that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB ~~with the CLB~~ for the period of extended operation, as required by 10 CFR 54.21(a)(3).

Delete duplicated words

3.3.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.3.2.2, the applicant provided further evaluation of aging management as recommended by the GALL Report for the auxiliary systems components. The applicant provided information concerning how it will manage the following aging effects:

- loss of material due to general, pitting, and crevice corrosion
- hardening and cracking or loss of strength due to elastomer degradation or loss of material due to wear
- cumulative fatigue damage
- crack initiation and growth due to cracking or stress corrosion cracking
- loss of material due to general, microbiologically influenced, pitting, and crevice corrosion
- loss of material due to general, galvanic, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and biofouling
- crack initiation and growth due to stress corrosion cracking and cyclic loading

- reduction of neutron-absorbing capacity and loss of material due to general corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion

Staff Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in Section 3.3.2.2 of the SRP-LR. Details of the staff's audit are documented in the staff's audit and review report. The staff's evaluation of the aging effects is discussed in the following sections.

3.3.2.2.1 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Sections 3.3.2.2.1.1 and 3.3.2.2.1.2 against the criteria in SRP-LR Section 3.3.2.2.1.

In LRA Section 3.3.2.2.1.1, the applicant addressed loss of material due to general, pitting, and crevice corrosion of heat exchanger components in the auxiliary systems.

SRP-LR Section 3.3.2.2.1.1 states that ← Add a colon ":"

> Loss of material due to general, pitting, and crevice corrosion could occur in the channel head and access cover, tubes, and tubesheets of the heat exchanger in the spent fuel pool cooling and cleanup (system). The Water Chemistry program relies on monitoring and control of reactor water chemistry based on EPRI guidelines of BWRVIP-29 (TR-103515) for water chemistry in BWRs to manage the effects of loss of material from general, pitting or crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause general, pitting, or crevice corrosion. Therefore, verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the Water Chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In LRA Section 3.3.2.2.1.1, the applicant stated that the One-Time Inspection Program is applied in combination with the Plant Chemistry Program. The scope of this new AMP includes activities to verify the effectiveness of the Plant Chemistry Program, including a sample of components where the flow of water is low, or stagnant conditions exist. Implementation of the One-Time Inspection Program and the Plant Chemistry Program to manage the aging effect adds assurance that the aging effect does not occur or progresses very slowly such that the component's intended function will be maintained during the period of extended operation. The applicant stated that in some cases where the Plant Chemistry Program is not a viable option

In LRA Section 3.3.2.2.6, the applicant stated that MNGP is not designed with a reactor coolant pump (recirculation pump) oil collection system because these pumps are within the primary containment, which is inerted with nitrogen during normal operation.

On the basis of its review, the staff determined that the applicant has no components covered by SRP-LR Section 3.3.2.2.6. The staff found this aging effect not applicable.

3.3.2.2.7 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion and Biofouling

Should be "3.3.2.2.7"

The staff reviewed LRA Section 3.3.2.2.7 against the criteria in SRP-LR Section 3.3.2.2.7.

In LRA Section 3.2.2.2.7, the applicant addressed loss of material due to general, pitting, crevice corrosion, and MIC for components in the EDGs.

Should be "3.3.2.2.7"

SRP-LR Section 3.2.2.2.7 states that:

> Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling could occur on the internal surface of tanks in the diesel fuel oil system and due to general, pitting, and crevice corrosion and MIC in the tanks of the diesel fuel oil system in the EDG system. The existing AMP relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination in accordance with the guidelines of ASTM Standards D4057, D1796, D2709 and D2276 to manage loss of material due to corrosion or biofouling. Corrosion or biofouling may occur at locations where contaminants accumulate. Verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion/biofouling to verify the effectiveness of the program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In LRA Section 3.3.2.2.7, the applicant stated that its Fuel Oil Chemistry Program manages loss of material for all components wetted by fuel oil. The effectiveness of the Fuel Oil Chemistry Program is confirmed by the One-Time Inspection Program. The existing Fuel Oil Chemistry Program uses existing diesel oil system procedures that encompass the GALL Report program requirements. The Fuel Oil Chemistry Program mitigates and manages aging effects on the surfaces wetted by fuel oil in fuel oil storage tanks and associated components including the tank and other components supplying fuel to the diesel fire pump. The program includes (a) surveillance and monitoring procedures for maintaining fuel oil quality by controlling contaminants in accordance with applicable ASTM standards, (b) periodic draining of water from fuel oil tanks, (c) periodic or conditional visual inspection of internal surfaces or wall thickness measurements (e.g., by UT) from external surfaces of fuel oil tanks, and (d) one-time inspections of a representative sample of components in systems that contain fuel oil. The One-Time Inspection Program includes (a) determination of sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience, (b) identification of the inspection locations in the system or component based on the aging effect, (c) determination of the examination technique including acceptance criteria

May want to add NMC will visually examine the unclad boral coupon sample prior to extended operation. The coupon will be removed from the spent fuel pool for a brief period of time, visually examined, and then immediately returned to the spent fuel pool.

In LRA Section 3.3.2.2.10, the applicant stated that AMP B2.1.25, Plant Chemistry Program, manages the aging effects of loss of material and reduction of neutron-absorbing capacity of boral in a treated water environment due to crevice, galvanic, MIC, and pitting corrosion and the aging effect of cracking due to SCC by ensuring that corrosive ion concentrations do not exceed acceptable limits and by limiting the amount of impurities in the water. General corrosion is not applicable as boral/aluminum develops a strongly bonded oxide film with excellent corrosion resistance. The One-Time Inspection Program will verify the effectiveness of the Plant Chemistry Program by confirming the absence of aging effects on boral coupon samples stored in the spent fuel pool. Aging effects that could affect rack integrity or neutron absorption characteristics are not expected because none have been observed during coupon sample evaluations conducted over the past 20 years.

The staff's review determined that reduction of neutron-absorbing capacity and loss of material due to general corrosion will be managed by the Plant Chemistry Program, supplemented by the One-Time Inspection Program. The one-time inspection of boral coupon test specimens is to confirm that no significant aging degradation will occur and that the neutron-absorbing capability of the boral has not been reduced.

These AMPs are appropriate for the aging effects/mechanisms identified and assure effective management through the period of extended operation. The staff reviewed the Plant Chemistry Program and the One-Time Inspection Program and found them acceptable for managing aging degradation. The evaluations are documented in SER Sections 3.0.3.2.19 and 3.0.3.1.4, respectively.

On the basis of its review, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10. For those line items that apply to LRA Section 3.3.2.2.10, the staff determined that the applicant's AMRs are consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.11 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.11 against the criteria in SRP-LR Section 3.3.2.2.11.

In LRA Section 3.3.2.2.11, the applicant addressed loss of material due to general, pitting, crevice, and microbiologically influenced corrosion of underground (buried) piping and fittings in the emergency service water, emergency diesel generators, and fire systems.

SRP-LR Section 3.3.2.2.11 states that:

> Loss of material due to general, pitting, and crevice corrosion and MIC could occur in the underground piping and fittings in the open-cycle cooling water system (SW system) and in the diesel fuel oil system. The buried piping and tanks inspection program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an

In LRA Tables 3.3.2-1 through 3.3.2-18, the applicant indicated, via Notes F through J, that the combination of component type, material, environment, and aging effect requiring management does not correspond to a line item in the GALL Report, and provided information concerning how the aging effect will be managed. Specifically, Note F indicated that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicated that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicated that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicated that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicated that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that intended functions will be maintained consistent with the CLB during the period of extended operation. AMR results where no aging effects were identified in LRA Tables 3.3.2-1 through 3.3.2-18 are addressed in this section. Other line items not consistent with or not addressed in the GALL Report are addressed separately within each Table write-up. The staff's evaluation is discussed in the following sections.

Tables 3.3.2-1 through 3.3.2-18

The staff's review of LRA ~~Section 3.3.2.3~~ identified areas in which additional information was necessary to complete the review of the applicant's results. The applicant responded to the staff's general RAIs as discussed below.

In RAI 3.3.2.3-2, dated July 20, 2005, the staff noted that LRA Tables 3.3.2-6 and 3.3.2-8 identify heat transfer degradation due to fouling as an aging effect requiring management for copper heat exchangers (heat transfer and pressure boundary functions) in a lubricating oil environment. The applicant credited the One-Time Inspection Program with managing this aging effect. The One-Time Inspection Program verifies the effectiveness of an AMP and confirms the absence of an aging effect. For fouling of heat exchangers in a lubricating oil environment, mitigation of the aging effect depends on a lubricating oil monitoring program to maintain the integrity of the oil; therefore, the staff requested that the applicant identify an AMP to mitigate the effects of fouling in the heat exchangers during the period of extended operation and verify the effectiveness of that program with a one-time inspection.

In its response, by letter, dated August 16, 2005, the applicant stated:

> Table 3.3.2-6, Emergency Diesel Generators System (EDG) and Table 3.3.2-8, Emergency Service Water System (ESW) identify copper alloy heat exchanger tubes for both the EDG lube oil coolers and RHR Service Water (RSW) pump motor thrust bearing oil coolers, with lubricating oil as an external environment for these Auxiliary Systems.
>
> The NMC position concerning the potential aging effect of heat transfer degradation due to fouling in a lubricating oil environment is that degradation effects are insignificant for lubricating oil systems if the oil remains free of water and other contaminants. Under these conditions, lubricating oil systems and associated components have few, if any, significant aging effects. The purity of

staff requested that the applicant identify an AMP to manage hardening and loss of strength for rubber expansion joints in a raw water environment.

In its response, by letter, dated August 16, 2005, the applicant stated:

> Several EPRI Technical Reports and Industry handbooks were reviewed for aging of elastomers. A summary of the review is provided below.
>
> EPRI Report 1008035, 'Expansion Joint Maintenance Guide', Revision 1, May 2003, Table 5-4, rates elastomers against oxidation, tensile strength, and radiation. Elastomers, such as neoprene, natural rubber, Chlorobutyl, Buna-N, viton, and EPDM, are rated as good or better in the categories of oxidation, tensile strength, and radiation.
>
> EPRI Report NP-6608, 'Shelf Life of Elastomeric Components,' May 1994, Appendix A, provides curves that describe the change in physical properties for different elastomers as they undergo natural aging. The figures demonstrate that there is very little change in the hardness and tensile strength of elastomers over a 33 year period.
>
> EPRI Report NP-6408, 'Guidelines for Establishing, Maintaining, and Extending the Shelf Life Capability of Limited Life Items (NCIG-13)', May 1992, section 4.3.2, states that test results demonstrated Viton and Neoprene as having excellent weather resistance and are therefore UV resistant. Section 4.4.2 states that these elastomers are also highly resistant to ozone.
>
> The Parker O-Ring Handbook, Page 2-24, in a discussion about aging of rubber seals states, 'It is environment and not age that is significant to seal life, both in storage and actual service.' The following is a discussion of the role of environment on the aging of elastomers.
>
> EPRI 1003056, November 2001, 'Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 3, states 'For a complete discussion of the aging effects of typical elastomers used in nuclear plants, the applicant is referred to EPRI TR-114881, 'Aging Effects for Structures and Structural Components (Structural Tools)'. EPRI TR-114881 has been ~~superceded~~ by EPRI 1002950, 'Aging Effects for Structures and Structural Components (Structural Tools)', Revision 1', May 2003. This report discusses the three stressors: (1) Ultraviolet, (2) Thermal, and (3) Radiation listed below.
>
> (1) Ultraviolet: The Structural Tools state 'Rubber is decomposed by exposure to ultraviolet radiation. Ultraviolet radiation sources at nuclear plants include solar radiation and ultraviolet or fluorescent lamps. The deterioration of rubber is greatly accelerated in the presence of oxygen. Cracking and checking (splitting), which may occur when rubber is exposed to air and sunlight, are due mainly to reaction with ozone.' None of the elastomers in the scope of license renewal at MNGP are exposed to solar radiation. EPRI Report NP-6408, Section 4.3.2, states that UV on elastomers caused by artificial light is of little concern since the amount of

superseded

Delete

Based on its review, that staff found the applicant's response to RAI 3.3.2.3-7 acceptable, because (1) there are no stainless steel fasteners/bolting in the EDG and FIR Systems that are exposed to weather and (2) the aluminum flame arrestors in Table 3.3.2-6 and the copper alloy hose house supply valves in Table 3.3.2-9 are not subject to environments that promote pitting and crevice corrosion; therefore, aging management is not required for these components and the staff's concern described in RAI 3.3.2.3-7 is resolved.

In LRA Tables 3.3.2-1 through 3.3.2-18, the applicant identified line items where no aging effects were identified as a result of the aging review process.

Specifically, the applicant stated that no aging effects occurred when components fabricated from bronze, CASS, copper alloy, and stainless steel materials were exposed to air/gas (internal and external), concrete (external), dry air (internal), gas-halon (internal), gas-instrument air (internal), gas-nitrogen (internal), gas-refrigerant (internal), lubricating oil (internal and external), plant indoor air (internal and external), and primary containment air (external) environments. In addition, components fabricated from carbon steel, galvanized steel, and cast iron exposed to these same environments, with the exception of indoor air and primary containment air environments, have no aging effects. The applicant stated that material science evaluation of such materials in such environments found no aging effects for the components and materials. No aging effects are considered applicable to components fabricated from the above list of materials exposed to the above list of environments.

As shown in the *Metals Handbook*, Volume 13, Corrosion (American Society for Testing Metals), comprehensive tests over a 20-year period under ASTM supervision confirmed the suitability of copper alloys for atmospheric exposure. Additionally, because the gaseous internal environments to which components within the scope of license renewal may be subject include air, nitrogen, carbon dioxide, freon, and halon, industry experience shows copper piping exposed to an internal gaseous environment will be resistant to any age-related degradation; therefore, the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation.

As shown in the *Metals Handbook*, Volumes 1 and 13 (ASTM), both oxygen and moisture must be present to corrode steel. Experience has shown that general corrosion of steel (including carbon steel, alloy steel, gray cast iron, and galvanized steel) will only be applicable if it were exposed to outdoor or indoor environments that will promote condensation of water on the external surfaces of components; therefore, the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation.

As shown in *Metals Handbook*, Volumes 3 and 13 (ASTM), stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species (which will be reflective of indoor uncontrolled air or primary containment air inerted with nitrogen); therefore, the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation.

As shown in the *Metals Handbook*, Volumes 1 and 13 (ASTM), both oxygen and moisture must be present to corrode steel. Components are not subject to wetting if their surfaces remain oil-coated; therefore, steel (carbon or stainless) in a lubricating oil environment with no water pooling exhibits no aging effect and the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation.

system is adequately managed. The applicant has chosen a different combination of AMPs to manage the AERM. The staff review found this combination is adequate for managing this material-environment-aging effect and acceptable.

In LRA Table 3.3.2-5, the applicant proposed to manage loss of material due to selective leaching of copper alloy materials for component types of flow elements, piping and fittings, and valve bodies exposed to a treated water (internal) environment with AMP B2.1.30, Selective Leaching of Materials Program.

The staff reviewed the applicant's Selective Leaching of Materials Program and its evaluation is documented in SER Section 3.0.3.2.22. This new program includes a one-time visual inspection and hardness measurement of selected susceptible components to determine if selective leaching occurs. The staff determined that this AMP is adequate for managing this material-environment-aging effect.

On the basis of its review of the applicant's programs, aging effects, and plant-specific and industry operating experience, the staff determined that the aging effect of loss of material due to MIC and selective leaching of copper alloy material exposed internally to treated water environment in LRA Table 3.3.2-5 are effectively managed using the Plant Chemistry Program combined with the One-Time Inspection and the Selective Leaching of Materials Programs.

3.3.2.3.6 Auxiliary Systems – Emergency Diesel Generators System – Summary of Aging Management Evaluation – Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of AMR evaluations for the EDG system component groups.

The staff reviewed AMR line items for the EDG system, which experiences cracking due to SCC of copper alloy, carbon steel, and cast iron, fouling of copper alloy, and loss of ~~copper alloy material~~ for the following component types:

material for copper alloy

- piping and fittings
- fasteners and bolting
- flame arrestors
- gauges (flow, sight and level)
- heat exchangers
- pump casings
- tanks
- valve bodies
- heaters/coolers

For those components requiring staff review, the environments are listed below:

- exposed to weather (external)
- treated water (internal)
- lubricating oil (external)
- fuel oil (internal)
- treated water (external)

The staff's evaluation with respect to aging effects for stainless steel fasteners and bolting exposed to weather environment is discussed in RAI 3.3.2.3-7 in SER Section 3.3.2.3. The staff's evaluation with respect to aging effects for copper alloy flame arrestors exposed to weather environment is discussed in RAI 3.3.2.3-7 in SER Section 3.3.2.3. The staff's evaluation with respect to aging effects for rubber piping and fittings exposed to a plant indoor air and gas instrument air environments is discussed in RAIs 3.3.2.3-4 and 3.3.2.3-6 in SER Section 3.3.2.3. The staff's review of management of fouling of heat exchangers in a lubricating oil environments with the One-Time Inspection Program is discussed in RAI 3.3.2.3-2 in SER Section 3.3.2.3.

The applicant proposed to manage EDG system aging effects with the CCCW System Program, One-Time Inspection Program, and Fuel Oil Chemistry Program. The staff's evaluation of these programs is documented in SER Sections 3.0.3.2.12, 3.0.3.1.4, and 3.0.3.2.17, respectively.

material for copper alloy

The staff's review of plant-specific and industry operating experience found that cracking due to SCC of copper alloy, carbon steel, and cast iron, fouling of copper alloy, and loss of ~~copper alloy material~~ for EDG system component types are managed effectively by the CCCW System Program, One-Time Inspection Program, and Fuel Oil Chemistry Program.

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Based on the above evaluations, the staff found that applicant has identified the appropriate AMP for the materials and environment associated with the above components of the EDG system components.

In LRA Table 3.3.2-6, the applicant proposed to manage heat transfer degradation due to fouling of copper alloy materials for component types of heat exchangers exposed to a treated water environment with AMP B2.1.13, Closed-Cycle Cooling Water Program.

and heaters/coolers

In LRA Table 3.3.2-6, the applicant proposed to manage loss of material due to pitting and crevice corrosion, and MIC of copper alloy materials for component types including gauges (flow, level, and sight), heat exchangers, ~~manifolds, piping and fittings,~~ and valve bodies exposed to a treated water environment with AMP B2.1.13, Closed-Cycle Cooling Water.

Delete

The staff's review of the applicant's CCCW Program, and its evaluation is documented in SER Section 3.0.3.2.12. The CCCW Program includes (1) preventive measures to minimize corrosion and (2) periodic system and component performance testing and inspection to monitor the effects of corrosion and confirm performance of intended functions. Preventive measures include the monitoring and control of corrosion inhibitors and other chemical parameters like pH, in accordance with the guidelines of EPRI TR-1007820, Closed Cooling Water Chemistry Guideline, vendor recommendations, and plant operating experience.

As only minor changes were made to the CCCW System Program to implement EPRI TR-1007820, the program is also still in accordance with the EPRI Revision 0 guidelines identified in GALL AMP XI.M21 (i.e., EPRI TR-107396, Closed Cooling Water Chemistry Guidelines). Periodic inspection and testing to confirm function and monitor corrosion are also performed in accordance with EPRI TR-1007820, vendor recommendations, and industry and plant operating experience. If system corrosion inhibitor concentrations are maintained within the limits specified by the chemistry program, corrosion of the copper alloy in a closed system is

due to fouling, loss of material due to pitting and crevice corrosion, and MIC, and loss of material due to selective leaching of copper alloy or stainless steel materials exposed to a treated water (internal or external) or fuel oil environments in LRA Table 3.3.2-6 are effectively managed using the CCCW system, Selective Leaching of Materials, or Fuel Oil Chemistry Programs combined with the One-Time Inspection Program.

3.3.2.3.7 Auxiliary Systems – Emergency Filtration Train System – Summary of Aging Management Evaluation – Table 3.3.2-7

The staff reviewed LRA Table 3.3.2-7, which summarizes the results of AMR evaluations for the emergency filtration train system component groups.

The staff evaluation with respect to aging effects for elastomer ventilation seals exposed to air, gas, and plant indoor air environments is discussed in RAIs 3.3.2.3-4 and 3.3.2.3-6.

Based on the above evaluation, the staff found that the applicant has identified the appropriate AMP for the materials and environments associated with the above components in the emergency filtration train system.

In LRA Table 3.3.2-7, the applicant proposed to manage loss of material due to selective leaching of copper alloy materials for component types of chillers exposed to a wet air/gas (external) environment with AMP B2.1.30, Selective Leaching of Materials Program.

The staff reviewed the Selective Leaching of Materials Program and its evaluation is documented in SER Section 3.0.3.2.22. This new program includes a one-time visual inspection and hardness measurement of selected components susceptible to selective leaching to determine if selective leaching occurs.

On the basis of its review of the applicant's programs, aging effects, plant-specific, and industry operating experience, the staff determined that the aging effect of loss of material due to selective leaching of copper alloy material exposed externally to a wet air/gas environment is effectively managed using the Selective Leaching of Materials Program. On this basis, the staff found the applicant's program to manage loss of material due to selective leaching in LRA Table 3.3.2-7 is acceptable.

3.3.2.3.8 Auxiliary Systems – Emergency Service Water System – Summary of Aging Management Evaluation – Table 3.3.2-8

The staff reviewed LRA Table 3.3.2-8, which summarizes the results of AMR evaluations for the emergency service water system component groups.

The staff reviewed AMR line items for the emergency service water system. This system experiences fouling of copper alloy component type:

- heat exchangers

For those components requiring staff review, the environments are listed below:

- lubricating oil (external)

materials exposed to raw water, glycol corrosion-inhibited treated water (internal and external), and air/gas (internal) environments are effectively managed using the Fire Protection and the Fire Water System Programs. On this basis, the staff found management of heat transfer degradation due to fouling, loss of material due to general, galvanic, crevice, pitting corrosion, Delete ~~and~~ MIC, and loss of material due to selective leaching in LRA Table 3.3.2-9 acceptable.

3.3.2.3.10 Auxiliary Systems – Fuel Pool Cooling and Cleanup – Summary of Aging Management Evaluation – Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of AMR evaluations for the fuel pool cooling and cleanup component groups.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material due to crevice and pitting corrosion and MIC of copper alloy materials for component types of piping and fittings, and valve bodies exposed internally to a treated water environment with AMP B2.1.25, Plant Chemistry Program, combined with AMP B2.1.23, One-Time Inspection Program.

The staff reviewed the applicant's Plant Chemistry Program and the One-Time Inspection Program, and its evaluation of each is documented in SER Sections 3.0.3.2.19 and 3.0.3.1.4, respectively. The Plant Chemistry Program mitigates the aging effects on component surfaces that are exposed to water as the process fluid; chemistry programs are used to control water chemistry for impurities (e.g., chloride and sulfate) that accelerate corrosion or crack initiation and growth and that cause heat transfer degradation due to fouling in select heat exchangers. This program relies on monitoring and control of water chemistry to keep peak levels of various contaminants below system-specific limits. The new One-Time Inspection Program is consistent with the recommendations of GALL AMP XI.M32, One-Time Inspection and will verify the effectiveness of the Plant Chemistry Program. The One-Time Inspection Program addresses concerns and provides confirmation for the potential long incubation period for certain aging effects on SCs. The staff review determined that the Plant Chemistry Program supplemented by the One-Time Inspection Program is adequate for managing this material-environment-aging effect combination.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material due to selective leaching of copper alloy materials for component types of piping and fittings, and valve bodies exposed internally to a treated water environment with AMP B2.1.30, Selective Leaching of Materials Program.

The staff reviewed the Selective Leaching of Materials Program and its evaluation is documented in SER Section 3.0.3.2.22. This new program includes a one-time visual inspection and hardness measurement to determine if selective leaching occurs for selected susceptible components. The staff's program review found management of loss of material due to selective leaching in LRA Table 3.3.2-7 acceptable.

On the basis of its review of the applicant's programs, aging effects, plant-specific, and industry operating experience, the staff determined that the aging effects of loss of material due to crevice and pitting corrosion, MIC, and selective leaching of copper alloy material exposed to a treated water (internal) environment are effectively managed using Plant Chemistry combined with One-Time Inspection Programs, and the Selective Leaching of Materials Program. On this

Should be "B2.1.30"

In LRA Table 3.3.2-11, the applicant proposed to manage loss of material due to selective leaching of copper alloy materials for component types of chillers, gauges (flow, level, and sight), heaters/coolers, HVAC units, piping and fittings, and valve bodies exposed to treated water, treated water or steam (internal), and wet air/gas (external) environments with AMP B2.30, Selective Leaching of Materials Program.

The staff reviewed the Selective Leaching of Materials Program, and its evaluation is documented in SER Section 3.0.3.2.22. This new program includes a one-time visual inspection and hardness measurement to determine if selective leaching occurs for selected susceptible components. The staff's review found this AMP adequate for managing this material-environment-aging effect.

On the basis of its review of the applicant's programs, aging effects, plant-specific, and industry operating experience, the staff determined that the aging effect of loss of material due to pitting and crevice corrosion, MIC, and selective leaching of copper alloy material exposed to treated water (internal), treated water or steam (internal), and wet air/gas (external) environments is effectively managed using the CCCW System, One-Time Inspection, and Selective Leaching of Materials Programs. On this basis, the staff found that management of loss of material due to pitting and crevice corrosion, MIC, and selective leaching in LRA Table 3.3.2-11 is acceptable.

3.3.2.3.12 Auxiliary Systems – Instrument and Service Air System – Summary of Aging Management Evaluation – Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of AMR evaluations for the instrument and service air system component groups.

In LRA Table 3.3.2-12, the applicant proposed to manage loss of material due to crevice and pitting corrosion, and MIC of copper alloy materials for component types of gauges (flow, level, and sight) and valve bodies exposed to a treated water environment with AMP B2.13, CCCW System Program.

Should be "B2.1.13"

The staff reviewed the CCCW System Program, and its evaluation is documented in SER Section 3.0.3.2.12. The CCCW System Program includes (1) preventive measures to minimize corrosion and (2) periodic system and component performance testing and inspection to monitor the effects of corrosion and confirm performance of intended functions. Preventive measures monitor and control corrosion inhibitors and other chemical parameters like pH, in accordance with the guidelines of EPRI TR-1007820, Closed Cooling Water Chemistry Guideline, vendor recommendations, and plant operating experience. As only minor changes were made to the CCCW System Program to implement EPRI TR-1007820, the program is also still consistent with the EPRI Revision 0 guidelines identified in GALL AMP XI.M21 (i.e., EPRI TR-107396, Closed Cooling Water Chemistry Guidelines). Periodic inspection and testing to confirm function and monitor corrosion are also performed in accordance with EPRI TR-1007820, vendor recommendations, and industry and plant operating experience. The staff's review found this AMP adequate for managing this material-environment-aging effect.

In LRA Table 3.3.2-12, the applicant proposed to manage loss of material due to crevice and pitting corrosion, and MIC of copper alloy materials for component types of valve bodies exposed to a gas-compressed air environment with AMP B2.14, Compressed Air Monitoring Program.

Should be "B2.1.14"

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Oil coolers in AFW system (lubricating oil side possibly contaminated with water (Item Number 3.4.1-04)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion and MIC	Plant specific		Not applicable, PWR only (See Section 3.4.2.2.3)
External surface of carbon steel components (Item Number 3.4.1-05)	Loss of material due to general corrosion	Plant specific	System Condition Monitoring Program (B2.1.32)	Consistent with GALL Report, which recommends further evaluation (See Section 3.4.2.2.4)
Carbon steel piping and valve bodies (Item Number 3.4.1-06)	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	Flow-Accelerated Corrosion Program (B2.1.19)	Consistent with GALL Report which recommends no further evaluation
Carbon steel piping and valve bodies in main steam system (Item Number 3.4.1-07)	Loss of material due to pitting and crevice corrosion	Water chemistry	Plant Chemistry Program (B2.1.25); One-Time Inspection (B2.1.23)	~~Consistent with GALL Report which recommends no further evaluation~~
Closure bolting in high-pressure or high-temperature systems (Item Number 3.4.1-08)	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC	Bolting Integrity	Bolting Integrity Program (B2.1.4)	Consistent with GALL Report which recommends no further evaluation
Heat exchangers and coolers/condensers serviced by open-cycle cooling water (Item Number 3.4.1-09)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	This line item was not used at MNGP. See item 3.4.1-02	Not applicable (See Section 3.4.2.1.1)
Heat exchangers and coolers/condensers serviced by closed-cycle cooling water (Item Number 3.4.1-10)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Closed-cycle cooling water system		Not applicable. No heat exchangers serviced by closed-cycle cooling water
External surface of aboveground condensate storage tank (Item Number 3.4.1-11)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Above ground carbon steel tanks		Not applicable. MNGP condensate storage tanks are not within the scope of license renewal.

Emergency Diesel Generators System Oil Storage Tank external surface is managed by the Buried Piping and Tanks Inspection Program.

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
External surface of buried condensate storage tank and AFW piping (Item Number 3.4.1-12)	Loss of material due to general, pitting, and crevice corrosion and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection		~~Not applicable. MNGP has no buried condensate storage tanks or AFW piping.~~
External surface of carbon steel components (Item Number 3.4.1-13)	Loss of material due to boric acid corrosion	Boric acid corrosion		Not applicable, PWR only

The staff's review of the MNGP component groups followed one of several approaches. One approach, documented in SER Section 3.4.2.1, involves the staff's review of the AMR results for components in the steam and power conversion system that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in SER Section 3.4.2.2, involves the staff's review of the AMR results for components in the steam and power conversion system that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.4.2.3, involves the staff's review of the AMR results for components in the steam and power conversion system that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs that are credited to manage or monitor aging effects of the steam and power conversion system components is documented in SER Section 3.0.3.

3.4.2.1 AMR Results That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.4.2.1 the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the aging effects related to the steam and power conversion system components:

- Bolting Integrity Program (B2.1.4)
- Flow-Accelerated Corrosion Program (B2.1.19)
- One-Time Inspection Program (B2.1.23)
- Open-Cycle Cooling Water System Program (B2.1.24)
- Plant Chemistry Program (B2.1.25)
- Selective Leaching of Materials Program (B2.1.30)
- System Condition Monitoring Program (B2.1.32)

Staff Evaluation. In LRA Tables 3.4.2-1 through 3.4.2-5 the applicant provided a summary of AMRs for the steam and power conversion system components, and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further

3.4.2.2.4 General Corrosion

The staff reviewed LRA Section 3.4.2.2.4 against the criteria in SRP-LR Section 3.4.2.2.4.

In LRA Section 3.4.2.2.4 the applicant addressed loss of material due to general corrosion on the external surfaces of carbon steel and cast iron components of the steam and power conversion system in air/gas environments.

SRP-LR Section 3.4.2.2.4 states that:

> Loss of material due to general corrosion could occur on the external surfaces of all carbon steel structures and components, including closure bolting, exposed to operating temperature less that 212 °F. The GALL Report recommends further evaluation to ensure that this aging effect is adequately managed.

In LRA Section 3.4.2.2.4 the applicant stated that the loss of material for carbon steel and cast iron components in steam and power conversion systems is managed by the System Condition Monitoring Program. The System Condition Monitoring Program manages the aging effect on the external surfaces of carbon steel and cast iron components in air/gas environments. Management of the aging effect associated with certain components of the main condenser with the plateout and holdup of radioactive material intended function is not applicable as the main condenser structural integrity is demonstrated continuously during normal plant operation. As documented in its August 31, 2005, letter, the applicant stated that it will revise the LRA to eliminate reference to the pressure boundary function of the main condensers as this function is inappropriate for these components. The System Condition Monitoring Program is ~~a new~~ an existing plant-specific program that manages aging effects for normally accessible external surfaces of piping, tanks, and other components and equipment within the scope of license renewal through visual inspection and monitoring of external surfaces for leakage and evidence of material degradation. Implementation of the System Condition Monitoring Program to manage corrosion adds assurance that corrosion does not occur and that the aging effect progresses so slowly that the component's intended function will be maintained during the period of extended operation. The staff's review of the applicant's System Condition Monitoring Program is documented in SER Section 3.0.3.3.2.

On the basis of its review, the staff concluded that the applicant has met the criteria of SRP-LR Section 3.4.2.2.4. For those line items that apply to LRA Section 3.4.2.2.4, the staff determined that the applicant's AMRs are consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

The staff reviewed LRA Section 3.4.2.2.5 against the criteria in SRP-LR Section 3.4.2.2.5.

The applicant stated in LRA Section 3.4.2.2.5.2 that MNGP condensate storage tanks are not safety-related and therefore not within the scope of licensing renewal. The applicant also stated in LRA Section 3.4.2.2.5.2 that there are no underground condensate storage tanks at MNGP.

3.4.3 Conclusion

The staff concluded that the applicant provided sufficient information to demonstrate that the effects of aging for the steam and power conversion system components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable USAR supplement program summaries and concluded that they adequately describe the AMPs credited for managing aging of the steam and power conversion system, as required by 10 CFR 54.21(d).

3.5 Aging Management of Containments, Structures, and Component Supports

This section of the SER documents the staff's review of the applicant's AMR results for the containments, structures, and component supports components and component groups associated with the following systems:

- cranes, heavy loads, rigging
- diesel fuel oil transfer house
- emergency diesel generator building
- emergency filtration train building
- fire protection barriers commodity group
- hangers and supports commodity group
- HPC building
- intake structure
- miscellaneous SBO yard structures
- offgas stack
- offgas storage and compressor building
- plant control and cable spreading structure
- primary containment
- radioactive waste building
- reactor building
- structures affecting safety
- turbine building
- underground duct bank

For clarification, may want to change "HPC building" to "HPCI building".

3.5.1 Summary of Technical Information in the Application

In LRA Section 3.5 the applicant provided AMR results for the containments, structures, and component supports components and component groups. In LRA Table 3.5.1, "Summary of Aging Management Evaluations in Chapters II and III of NUREG-1801 for Structures and Component Supports," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the containments, structures, and component supports components and component groups.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience.

May want to add "Protective Coating Monitoring and Maintenance Program (B2.1.27)"

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel elements: vent header, drywell head, torus, downcomers, pool shell (Item Number 3.5.1-13)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	This TLAA is evaluated in Section 4.3, Metal Fatigue of the RPV and Internals, and Reactor Coolant Pressure Boundary Piping and Components and Section 4.6, Fatigue Analysis of the Primary Containment, Attached Piping, and Components
Steel elements: protected by coating (Item Number 3.5.1-14)	Loss of material due to corrosion in accessible areas only	Protective coating monitoring and maintenance	10 CFR 50, Appendix J Program (B2.1.1), Primary Containment In-Service Inspection Program (B2.1.26)	Consistent with GALL Report. Protective coating monitoring program is not relied upon for managing loss of material due to corrosion.
Prestressed containment: tendons and anchorage components (Item Number 3.5.1-15)	Loss of material due to corrosion of prestressing tendons and anchorage components	Containment ISI		Not applicable to MNGP Mark I Containment. There are no prestressed containment tendons and anchorage components.
Concrete elements: foundation, dome, and wall (Item Number 3.5.1-16)	Scaling, cracking, and spalling due to freeze-thaw; expansion and cracking due to reaction with aggregate	Containment ISI		Not applicable to MNGP Mark I Containment.
Steel elements: vent line bellows, vent headers, downcomers (Item Number 3.5.1-17)	Cracking due to cyclic loads or Crack initiation and growth due to SCC	Containment ISI and Containment leak rate test	10 CFR 50, Appendix J Program (B2.1.1), Primary Containment In-Service Inspection Program (B2.1.26)	Consistent with GALL Report, which recommends further evaluation (See Section 3.5.2.2.1)
Steel elements: Suppression chamber liner (Item Number 3.5.1-18)	Crack initiation and growth due to SCC	Containment ISI and Containment leak rate test		Not applicable to MNGP Mark I Containment

May want to add "but is credited for preventing degradation of coatings that could lead to the clogging of ECCS suppression pool suction strainers."

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel elements: drywell head and downcomer pipes (Item Number 3.5.1-19)	Fretting and lock up due to wear	Containment ISI		Not applicable to MNGP. Components not subject to relative motion.
Class I Structures				
All Groups except Group 6: accessible interior/exterior concrete & steel components (Item Number 3.5.1-20)	All types of aging effects	Structures Monitoring	Structures Monitoring Program (B2.1.31)	Consistent with GALL Report, which recommends further evaluation (See Section 3.5.2.2.2)
Groups 1-3, 5, 7-9: inaccessible concrete components, such as exterior walls below grade and foundation (Item Number 3.5.1-21)	Aging of inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	Plant-specific	None MNGP meets the criteria specified in the GALL Report.	Consistent with GALL Report, which recommends further evaluation (See Section 3.5.2.2.2)
Group 6: all accessible/ inaccessible concrete, steel, and earthen components (Item Number 3.5.1-22)	All types of aging effects, including loss of material due to abrasion, cavitation, and corrosion	Inspection of Water-Control Structures or FERC/US Army Corp of Engineers dam inspection and maintenance	Structures Monitoring Program (B2.1.31)	~~Consistent with GALL Report which recommends no further evaluation.~~
Group 5: liners (Item Number 3.5.1-23)	Crack initiation and growth from SCC and loss of material due to crevice corrosion	Water Chemistry Program and Monitoring of spent fuel pool water level	Plant Chemistry Program (B2.1.25), Primary Containment In-Service Inspection Program (B2.1.26), and System Condition Monitoring Program (B2.1.32)	Consistent with GALL Report which recommends no further evaluation.
Groups 1-3, 5, 6: all masonry block walls (Item Number 3.5.1-24)	Cracking due to restraint, shrinkage, creep, and aggressive environment	Masonry Wall	Structures Monitoring Program (B2.1.31)	Consistent with GALL Report, with enhancements in the Structures Monitoring Program to include Masonry Walls.

May want to add "Fire Protection (B2.1.17)"

May want to replace with "Consistent with GALL Report with enhancements in the Structures Monitoring Program to include RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants."

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Groups 1-3, 5, 7-9: foundation (Item Number 3.5.1-25)	Cracks, distortion, and increases in component stress level due to settlement	Structures Monitoring	Structures Monitoring Program (B2.1.31) only for the Fuel Oil Transfer House	Consistent with GALL Report (See Section 3.5.2.2.1)
Groups 1-3, 5-9: foundation (Item Number 3.5.1-26)	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures Monitoring	None MNGP meets the criteria specified in the GALL Report.	Consistent with GALL Report (See Section 3.5.2.2.1)
Groups 1-5: concrete (Item Number 3.5.1-27)	Reduction of strength and modulus due to elevated temperature	Plant-specific	None Concrete temperatures do not exceed GALL Report recommended limits	Consistent with GALL Report, which recommends further evaluation (See Section 3.5.2.2.1)
Groups 7, 8: liners (Item Number 3.5.1-28)	Crack Initiation and growth due to SCC; Loss of material due to crevice corrosion	Plant-specific		Not applicable. MNGP has no Group 7 (concrete tanks) or Group 8 (steel tanks) with liners
Component Supports				
All Groups: support members: anchor bolts, concrete surrounding anchor bolts, welds, grout pad, bolted connections, etc. (Item Number 3.5.1-29)	Aging of component supports	Structures Monitoring	Buried Piping & Tanks Inspection Program (B2.1.5), Primary Containment In-Service Inspection Program (B2.1.26), Structures Monitoring Program (B2.1.31), System Condition Monitoring Program (B2.1.32),	Consistent with GALL Report, which recommends further evaluation (See Section 3.5.2.2.3)
Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds (Item Number 3.5.1-30)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)		This TLAA is evaluated in Section 4.3, Metal Fatigue of the RPV and Internals, and Reactor Coolant Pressure Boundary Piping and Components

Insert:

"None

Members subjected to fatigue are accounted for by Code in their design."

May want to replace with:

"Consistent with GALL Report which recommends further evaluation (See 3.5.2.2.3)."

fatigue analyses were not part of their original design bases. Specifically, components requiring aging management for cracking due to cyclic loading include drywell penetrations, drywell penetration sleeves, and associated dissimilar metal welds. These components are designed to stress levels without requiring fatigue analyses and thus fine cracks are unlikely to occur; therefore, existing requirements for leak rate testing pursuant to the 10 CFR 50 Appendix J Program and surface inspections pursuant to the Primary Containment In-Service Inspection Program are adequate to detect cracking due to cyclic loading.

The applicant also listed components associated with primary containment that require aging management for crack initiation and growth due to SCC, specifically the stainless steel vent line bellows and drywell penetration bellows. The GALL Report states that weld Examination Categories E-B (pressure retaining welds, visual VT-1 examination method) and E-F (dissimilar pressure retaining welds, surface examination method) for vent line and other penetration bellows assemblies are warranted for the extended period of operations.

The applicant stated that its operating history on bellows replacements is limited to bellows X-16B. Leakage was identified during local leak rate testing and not from cracks observed during a visual examination. The leakage was identified at the outer-most bellows from a small failure underneath the outer-most collar of the expansion joint. No cracks in the weld metal were identified. Industry operating history has identified cracks of the bellows but none in the weld metal. Welds for bellows assemblies are in a sheltered, non-corrosive environment. Additionally, bellows assemblies are located outside primary containment in an air/gas environment with temperatures not expected to exceed threshold limits for stress corrosion cracking. Because of the nonaggressive environmental exposures and plant-specific and industry operating histories, the applicant stated that weld examinations utilizing optional Examination Categories E-B and E-F are not warranted. The applicant stated that existing requirements for visual examinations, in accordance with ASME Section XI (Subsection IWE), Examination Category E-A, and Appendix J leak rate testing Examination Category E-P should be sufficient to detect cracking of the bellows assemblies.

The applicant concluded that implementation of these programs to manage aging effects adds assurance that the aging effects do not occur or progress so slowly that the component's intended function will be maintained during the period of extended operation.

The staff's reviews of the applicant's Primary Containment In-Service Inspection Program and the 10 CFR 50 Appendix J Program are documented in SER Sections 3.0.3.1.6 and 3.0.3.2.1, respectively. These programs were found acceptable for managing cracking due to cyclic loading and SCC in accessible areas.

Should be "cyclic"

The staff reviewed industry operating experience on cracking of containment penetrations (including penetration sleeves, penetration bellows, and dissimilar metal welds) due to ~~cycling~~ loading and SCC and found it to be similar to the applicant's operating experience. The staff concluded that the applicant appropriately addressed further evaluation of this aging effect.

On the basis of its review, the staff concluded that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.7. For those line items that apply to LRA Section 3.5.2.2.1.7, the staff determined that the applicant's AMRs are consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately

May want to add: "aging effects for lubrite or similar materials are not significant and although no aging management is required, the"

ensure proper functioning during postulated environmental conditions; therefore, the staff requested that the applicant incorporate an examination of the accessible portion of the lubrite bearings in an appropriate AMP.

In its response, by letter, dated October 28, 2005, the applicant stated:

> Industry guidance provided in EPRI-1002950, Aging Effects for Structures and Structural Components, Revision 1 dated August 2003 for lubrite or similar material states that, 'An extensive search of industry operating experience did not identify any instances of lubrite plate degradation or failure to perform its intended function.' Additionally EPRI states that, 'Lubrite material resists deformation, has a low coefficient of friction, resists softening at elevated temperatures, absorbs grit and abrasive particles, is not susceptible to corrosion, withstands high intensities of radiation, and will not score or mar. Lubrite products are solid, permanent, completely self lubricating, and require no maintenance for the design life of the product. The lubrite lubricants used in nuclear applications are designed specifically for the environments to which they are exposed.'
>
> Review of the MNGP pipe support and MC component support drawings where Lubrite or similar material was used reveals that the sliding surfaces are sandwiched between plates, and therefore, inaccessible for inspection. Plant specific operating experience found no evidence of age-related degradation for Lubrite or similar material during support overhaul activities, and no pipe or pipe support failures attributed to the inability of sliding surface material to function as designed.

However, the applicant stated that supports in LRA Table 3.5.2-6 incorporating the use of lubrite or similar materials are inspected by the ASME Section XI, Subsection IWF Program.

The staff's review found the applicant's response to RAI 3.5.2-9 acceptable. The staff recognized the operating experience with the use of lubrite bearings and found the applicant's approach to inspect them under its ASME Section XI, Subsection IWF program acceptable. Therefore, the staff's concern described in RAI 3.5.2-9 is resolved.

Add the word "experience" after "operating"

On the basis of its review of the applicant's programs, aging effects, and plant-specific and industry operating, the staff determined that management of loss of material due to MIC, pitting, and crevice corrosion of stainless steel materials for supports for ASME Class MC components (i.e., vent header column support pins exposed to treated water environment) in LRA Table 3.5.2-6 is effectively managed using the ASME Section XI, Subsection IWF Program.

3.5.2.3.7 Structures and Component Supports – HPC Building – Summary of Aging Management Evaluation – Table 3.5.2-7

The staff reviewed LRA Table 3.5.2-7, which summarizes the results of AMR evaluations for the HPC building component groups.

All line items in this table were consistent with the GALL Report or were included in the discussion in Section 3.5.2.3 above.

All line items in Table 3.5.2-13 in a treated water environment (submerged) are managed by the Plant Chemistry Program, in addition to the MNGP Primary Containment In-Service Inspection Program, and in many cases, are also managed by a third program, 10 CFR 50, Appendix J. Therefore, the applicant asserted this RAI is not applicable to MNGP.

Additionally, the MNGP Primary Containment In-Service Inspection Program includes activities that perform periodic visual inspections by divers (when the torus is not drained) and by engineers (when drained) for submerged components, including their support members, bolted connections, and welds. Components inspected include such items as T-quenchers, SRV piping and supports, ECCS strainers, vent header supports, catwalk supports, and other submerged piping and supports not included in the IWE, VT-3 inspection. Inspections are conducted periodically at intervals not to exceed five (5) years. The MNGP Primary Containment In-Service Inspection Program manages aging effects for visible degradation such as deformation, cracks, corrosion, loose bolts, etc.

May want to consider removing this sentence. All submerged (treated water) components include at least two (2) AMPs.

The staff's review found the applicant's response to RAI 3.5.2-10 acceptable. Table 3.5.2-13 includes a number of submerged items (items 7, 9, 12, and 15) where the PCP has been identified as the only AMP. The response indicates that the applicant plans to use the Primary Containment ISI Program and the 10 CFR Part 50, Appendix J Program, as appropriate, for managing aging of components in these line items. The staff found the applicant's approach in managing the aging of these components acceptable; therefore, the staff's concern described in RAI 3.5.2-10 is resolved.

In RAI 3.5.2-11 dated September 28, 2005, the staff noted that for a number of items in Table 3.5.2-13, 10 CFR Part 50, Appendix J Program had been identified as the AMP to manage aging. Option B of Appendix J will permit the applicant to conduct Type B leakage rate tests of penetrations at 10-year intervals; therefore, the staff requested that the applicant address the plant-specific process (e.g., test frequency and operating experience) credited with managing degradation and leak tightness of the pressure boundary penetrations including vent bellows.

In its response, by letter, dated October 28, 2005, the applicant stated:

> Type B tests, which are conducted at performance-based intervals not exceeding 120 months (plus an extension of 15 months if required by the refueling schedule), are performed to assess leakage through individual penetration isolation barriers other than valves. Pursuant to NEI 94-01, air lock tests must be performed at intervals not exceeding 30 months and at other times as determined by air lock use. Also, bolted access-way cover seals are always tested following end-of-outage closures of the access-ways. The default interval between Type B tests is 30 months. The interval may be extended to 60 months following two (2) consecutive tests with results that meet performance leakage acceptance criteria and to 120 months following three (3) consecutive tests that meet these criteria. The interval reverts to the default interval following a test failure.

This paragraph appears to be out of place. May want to consider moving this paragraph to the bottom of page 3-293.

On the subject of lubrite plates, the applicant explained:

> Lubrite material incorporated into radial beam seat connections is used inside drywell to connect platform steel to the drywell shell. The beam seat Lubrite plate is sandwiched between larger steel plates which overhang it, and therefore, inspection is not possible. These beam seats are well over 20 feet from the reactor pressure vessel and outside the bioshield wall. This is the only application of Lubrite type material in use inside the drywell where the higher gamma radiation levels are expected. According to EPRI-1002950 the only aging effect for Lubrite is change in material properties, and only if Lubrite is exposed to at least 10^4 Rads. Radiation levels outside the bioshield wall at the perimeter of the drywell would be significantly less that the EPRI threshold limit. All other Lubrite type material applications are outside the drywell where radiation levels would typically be significantly less than inside the drywell.

The staff's review found the applicant's response to RAI 3.5.1-12 acceptable. The applicant clarified its intention and approach in managing the line item components. The staff found the applicant's aging management of lubrite materials acceptable; therefore, the staff's concern described in RAI 3.5.2-12 is resolved.

The staff's review of the applicant's programs, the aging effects, and plant-specific and industry operating experience determined that the aging effect of loss of material due to MIC, pitting, and crevice corrosion of stainless steel material exposed to a treated water environment is managed effectively by the Plant Chemistry Program, the Primary Containment In-Service Inspection Program, and the 10 CFR 50, Appendix J Program. On this basis, the staff found the applicant's management of loss of material due to MIC, pitting, and crevice corrosion in primary containment acceptable.

3.5.2.3.14 Structures and Component Supports – Radioactive Waste Building – Summary of Aging Management Evaluation – Table 3.5.2-14

The staff reviewed LRA Table 3.5.2-14, which summarizes the results of AMR evaluations for the radioactive waste building component groups.

All line items in this table were consistent with the GALL Report or were included in the discussion in Section 3.5.2.3 above.

3.5.2.3.15 Structures and Component Supports – Reactor Building – Summary of Aging Management Evaluation – Table 3.5.2-15

The staff reviewed LRA Table 3.5.2-15, which summarizes the results of AMR evaluations for the reactor building component groups.

The staff also reviewed LRA Section 3.5.2.1.15 which identified the materials, environments, AERMs, and AMPs for the reactor building component group. The staff conducted its review, described below, in accordance with SRP-LR Section 3.5 and the GALL Report.

Should be "3.5.2.1.15"

The applicant has proposed to manage the reduction of neutron absorbing capacity and loss of material due to corrosion of Boral with the Plant Chemistry Program in conjunction with a One-Time Inspection.

The applicant stated that the Plant Chemistry Program manages the aging effects of Boral in a treated water environment due to crevice, galvanic, MIC and pitting corrosion, and the aging effect of cracking due to SCC by ensuring that corrosive ion concentrations do not exceed acceptable limits and by limiting the amount of impurities in the water. The applicant further stated that plant test results and industry experience indicate that use of the Plant Chemistry Program during the period of extended operation will continue to manage the loss of neutron absorption capacity aging effect effectively. The One-Time Inspection Program is applied for added assurance that aging effects do not occur.

The staff's review of LRA Table 3.5.2-15 and LRA Section 3.5.2.3.15 identified areas in which additional information was necessary to complete the review of the applicant's results. The applicant responded to the staff's RAIs as discussed below.

In RAI 3.5.2.1.15-1 dated August 18, 2005, the staff requested that the applicant provide details of the plant's Boral Coupon Surveillance Program.

In its response, by letter, dated September 16, 2005, the applicant stated

> ...The program placed seven sets of coupons in the fuel pool to be removed on a periodic basis and tested for degradation. To date, six of the seven coupon sets have been removed and tested and no degradation has been found (see response to RAI 3.5.2.1.15-3 for test results). Testing methods include physical observations; neutron attenuation tests; weight, specific gravity, dimensional checks; and analysis for boron content. The final (seventh) coupon set will be removed and tested before the period of extended operation to satisfy the requirement for a one-time inspection. No further testing is proposed during the period of extended operation pending acceptable results from the final inspection.

The applicant's election not to continue coupon testing into the period of extended operation is based partly on the results of the six previously tested coupons, which represent over 20 years of operating experience.

In response to staff RAI 3.5.2.1.15-3, dated September 16, 2005, the applicant provided test results for the past coupon inspections indicating that all coupons have retained the required level of neutron absorption capability with no discernable degradation.

Additional information was required to complete the staff's evaluation for the aging management of Boral. The applicant will not be testing Boral coupons into the period of extended operation. For this reason, the staff requested that the applicant provide details on its ability to identify a potential aging effect in the plant's Boral. Because no testing of actual Boral samples will be conducted, the applicant must provide assurance that they will be capable of identifying and mitigating any degradation of Boral over the period of extended operation.

consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.3 Conclusion

The staff concluded that the applicant provided sufficient information to demonstrate that the effects of aging for the containments, structures, and component supports system components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff also reviewed the applicable USAR supplement program summaries and concluded that they adequately describe the AMPs credited with managing aging of the containments, structures, and component supports, as required by 10 CFR 54.21(d).

3.6 Aging Management of Electrical and Instrumentation and Controls

This section of the SER documents the staff's review of the applicant's AMR results for the electrical and instrumentation and controls (I&C) components ~~and component groups~~ Delete associated with the following ~~systems:~~ Delete

- electrical penetrations commodity group
- fuse holders commodity group
- non-environmental qualification (EQ) cables and connections commodity group
- offsite power/SBO recovery path commodity group

3.6.1 Summary of Technical Information in the Application

Delete

In LRA Section 3.6 the applicant provided AMR results for the electrical and I&C components ~~and component groups~~. In LRA Table 3.6.1, "Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical Components," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the electrical and I&C components ~~and component groups~~ Delete

Delete

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.6.2 Staff Evaluation

The staff reviewed LRA Section 3.6 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for the electrical and I&C components that are within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

4.2.3.2 Staff Evaluation

The staff reviewed LRA Section 4.2.3, pursuant to 10 CFR 54.21(c)(1)(ii), to verify the analyses have been projected to the end of the period of extended operation.

that is

The peak fluence at the RPV wall is 5.17 x 10^{18} n/cm^2 (E>1.0 MeV) for 54 EFPY of operation. Based on this fluence value, the previous reflood thermal shock analysis of the RPV is not bounding for the period of extended operation. The original analysis has been superseded by an analysis for BWR-6 RPVs applicable to the MNGP BWR-3 RPV.

MNGP

The BWR-6 RPV analysis applies to MNGP as it uses a bounding main steam line break event and an RPV thickness similar to that of the RPV. This analysis assumes end-of-license (EOL) material toughness, which in turn depends on the EOL ART. The critical location for the fracture mechanics analysis is at 1/4T RPV thickness. For the main steam line break event, the peak stress intensity occurs approximately 300 secs after initiation of the event. The analysis shows that at that point in the thermal shock event, the temperature of the vessel wall at 1.5 inches deep (1/4T depth for the BWR-6 RPV) is approximately 400 °F. For the MNGP vessel, the 1/4T depth is 1.26 inches.

The staff's review of LRA Section 4.2.3 identified an area in which additional information was necessary to complete the review of the applicant's neutron fluence evaluation. The applicant responded to the staff's RAI as discussed below.

In RAI 4.2-4, dated September 28, 2005, the staff requested that the applicant provide the fracture toughness (peak stress intensity value) required to prevent fracture of the RPV due to reflood thermal shock.

In its response, dated October 28, 2005, the applicant identified the maximum applied stress intensity for the thermal shock event as 103 ksi-in$^{1/2}$. Fracture toughness at approximately 300 seconds after initiation of the event was estimated to be 200 ksi-in$^{1/2}$. In its response, the applicant stated:

> Paper G1/5, 'Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident,' Ranganath, S., Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 1979, defines the basis for this evaluation. As noted in the MNGP LRA submittal, the BWR/6 example in the paper referenced above bounds the conditions at the MNGP. This was demonstrated in the submittal by comparison of the parameters for the BWR/6 case versus the plant-specific MNGP case. As shown in the submittal, the plant-specific temperature at 1/4T depth into the vessel wall was determined to be 370 °F at 300 seconds into the thermal shock event. It was also stated that using the highest 60 year Adjusted Reference Temperature (ART), the beltline material reaches upper shelf (200 ksi-in$^{1/2}$) at 261°F. Since this temperature is significantly lower than 370°F, it is assured that the beltline material remains at upper shelf at 300 seconds into the thermal shock event. Figure 5 of 'Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident,' Ranganath, S., Fifth International Conference on Structural Mechanics in

Reactor Technology, Berlin, Germany, August 1979, Paper GI/5, further demonstrates that at 300 seconds into the thermal shock event and at 1/4T depth into the vessel wall, the maximum applied stress intensity is 103 ksi-in$^{1/2}$. Therefore, there is sufficient margin to prevent fracture due to reflood thermal shock.

On the basis of its review, the staff found the applicant's response to RAI 4.2-4 acceptable, because the applicant demonstrated that the beltline materials will have adequate fracture toughness (applied stress intensity is less than upper shelf fracture toughness) at 300 seconds into the event through the period of extended operation. The revised analysis demonstrates that the reflood thermal shock analysis of the RPV applies for the extended period of operation. Therefore, the staff's concern described in RAI 4.2-4 is resolved.

4.2.3.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of reflood thermal shock analysis of the RPV in LRA Section A3.1. On the basis of its review of the USAR supplement, the staff concluded that the summary description of the applicant's actions to address the reflood thermal shock analysis of the RPV is adequate.

4.2.3.4 Conclusion

The staff concluded that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), regarding the reflood thermal shock analysis of the RPV and that the analysis has been projected to the end of the period of extended operation. The staff also concluded that the USAR supplement contains an appropriate summary description of this TLAA evaluation, sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.2.4 Reflood Thermal Shock Analysis of the RPV Core Shroud

4.2.4.1 Summary of Technical Information in the Application

In LRA Section 4.2.4, the applicant summarized the evaluation of the reflood thermal shock analysis of the RPV core shroud for the period of extended operation. Radiation embrittlement may affect the ability of RPV internals, particularly the core shroud, to withstand a low-pressure coolant injection thermal shock transient. The analysis of core shroud strain due to reflood thermal shock is a TLAA because it is part of the CLB, supports a safety determination, and is based on the calculated lifetime neutron fluence.

4.2.4.2 Staff Evaluation

The staff reviewed LRA Section 4.2.4, pursuant to 10 CFR 54.21(c)(1)(ii), to verify the analyses have been projected to the end of the period of extended operation.

The RPV core shroud was evaluated for a low-pressure coolant injection reflood thermal shock transient considering embrittlement effects of a 40-year radiation exposure (32 EFPY). The core shroud receives the maximum irradiation on the inside surface opposite the midpoint of the fuel centerline. The total integrated neutron flux at the end of 40 years of operation was

Prior to License Renewal

2.7×10^{20} n/cm^2 (greater than 1 MeV). The maximum thermal shock stress in this region is 155,700 psi, equivalent to 0.57 percent strain. This strain range of 0.57 percent was calculated at the midpoint of the shroud, the zone of highest neutron irradiation.

However, using the approved fluence methodology discussed in SER Section 4.2.2, the applicant revised the analysis for the period of extended operation by calculating the 54 EFPY fluence at the most irradiated point on the core shroud to be 3.84×10^{21} n/cm^2. The applicant indicated that the measured value of percent elongation for stainless steel weld metal is 4 percent for a temperature of 297 °C (567 °F) with a neutron fluence of 8×10^{21} n/cm^2 (greater than 1 MeV), while the average value for base metal at 290 °C (554 °F) is 20 percent. The calculated strain range of 0.57 percent represents a considerable margin of safety relative to measured values of percent elongation for annealed Type 304 stainless steel irradiated to 8×10^{21} n/cm^2 (greater than 1 MeV). Because the measured value of elongation bounds the calculated thermal shock strain amplitude of 0.57 percent, the calculated thermal shock strain at the most irradiated location is acceptable considering the embrittlement effects for a 60-year operating period.

The revised analysis demonstrates that the reflood thermal shock analysis of the RPV core shroud applies for the extended period of operation and satisfies 10 CFR 54.21(c)(1)(ii), because the applicant provided additional data to justify operation to a higher neutron fluence to the end of the period of extended operation.

4.2.4.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of reflood thermal shock analysis of the RPV core shroud in LRA Section A3.1. On the basis of its review of the USAR supplement, the staff concluded that the summary description of the applicant's actions to address the reflood thermal shock analysis of the RPV core shroud is adequate.

4.2.4.4 Conclusion

The staff concluded that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the reflood thermal shock analysis of the RPV core shroud has been projected to the end of the period of extended operation. The staff also concluded that the USAR supplement contains an appropriate summary description of this TLAA evaluation, sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.2.5 RPV Thermal Limit Analysis: Operating Pressure – Temperature Limits

4.2.5.1 Summary of Technical Information in the Application

In LRA Section 4.2.5, the applicant summarized the evaluation of the RPV thermal limit analysis: operating P-T limits for the period of extended operation. The RPV thermal limit analysis provides operating P-T limits and is dependent on the ART. The ART is the value of (initial RT_{NDT} + ΔRT_{NDT} + margins for uncertainties) at a specific location. Neutron embrittlement increases the ART. Thus, the minimum metal temperature at which an RPV is allowed to be pressurized increases. The ART of the limiting beltline material is used to correct the beltline

circumferential welds at 32 and 64 EFPY. The neutron fluence at the clad-weld (inner) interface was used for this evaluation.

Since the staff analysis discussed in the BWRVIP-74 report is generic, the applicant submitted plant-specific information to demonstrate that the MNGP RPV beltline materials meet the criteria specified in the report. To demonstrate that the MNGP RPV has not become embrittled beyond the basis for the relief, the applicant, in LRA Table 4.2.6.1, compared 54 EFPY material data for the limiting MNGP circumferential weld with that of the 64 EFPY reference case in Appendix E of the staff's SER on the BWRVIP-05 report. The MNGP material data included amounts of copper and nickel, chemistry factor, the neutron fluence, ΔRT_{NDT}, initial RT_{NDT}, and mean RT_{NDT} of the limiting circumferential weld at the end of the renewal period. The staff has verified the data for the copper and nickel contents and the initial RT_{NDT} values for the MNGP circumferential beltline weld material by comparing them with the corresponding data in the NRC Reactor Vessel Integrity Data Base. The 54 EFPY mean RT_{NDT} value for the MNGP circumferential beltline weld is 47.4 °F. The staff checked the applicant's calculations for the 54 EFPY mean RT_{NDT} values for the limiting MNGP circumferential welds using the data presented in LRA Table 4.2.6.1 and found them accurate. This 54 EFPY mean RT_{NDT} value for MNGP is bounded by the 64 EFPY mean RT_{NDT} value of 70.6 °F used by the NRC to determine conditional failure probability of a circumferential weld in a Chicago Bridge and Iron (CB&I) fabricated RPV. The 64 EFPY mean RT_{NDT} value from the staff SER dated July 28, 1998, is for a CB&I weld, because CB&I welded the circumferential welds in the RPV. Because the 54 EFPY mean RT_{NDT} value is less than the 64 EFPY value from the staff SER dated July 28, 1998, the staff concluded that the MNGP RPV conditional failure probability is bounded by the NRC analysis.

The applicant stated that the procedures and training used to limit cold over-pressure events will be the same as those approved by the NRC when MNGP requested relief for the current license period. A request for relief during the period of extended operation will be submitted to the NRC prior to the period of extended operation.

SER Table 4.2.6-1 summarizes the results of the staff's evaluation regarding the RPV circumferential weld examination relief.

Table 4.2.6-1 Effects of Irradiation on RPV Circumferential Weld Properties for MNGP

Value	CB&I 64 EFPY	MNGP 54 EFPY
Cu (%)	0.10	0.10
Ni (%)	0.99	0.99
Fluence x 10^{19} (n/cm^2)	1.02	0.52
ΔRT_{NDT} (°F)	135.6	113
RT_{NDT} (°F)	-65	-65.6
Mean RT_{NDT} (°F)	70.6	47.4
INSERT New Row CF	134.9	138.5

2000, letter from Mr. J. Strosnider, NRC, to Mr. C. Terry, BWRVIP Chairman. The staff performed a generic analysis using Pilgrim as a model for BWR RPVs. The staff analysis identified as Mod 2 the vessel failure frequency will be 5.02×10^{-6} at a mean RT_{NDT} at the vessel inside surface of 114 °F.

LRA Table 4.2.7-1 compared 54 EFPY material data for the limiting RPV axial weld with that of Mod 2 from the staff's SE in the March 7, 2000, letter. The MNGP material data included copper and nickel amounts, chemistry factor, neutron fluence, ΔRT_{NDT}, initial RT_{NDT}, and mean RT_{NDT} of the limiting axial weld at the end of the renewal period. The applicant calculated, and the staff confirmed, that the limiting axial weld mean RT_{NDT} at the inside surface at the expiration of the extended operating period is 47.4 °F. Because the mean RT_{NDT} at the vessel inside surface for the limiting axial weld is less than the value in the staff's Mod 2 analysis, the failure frequencies for the MNGP RPV will be less than 5×10^{-6} per reactor year of operation at the end of the period of extended operation; therefore, this analysis is acceptable.

SER Table 4.2.7-1 summarizes the results of the staff's evaluation regarding the RPV axial weld failure probability.

Table 4.2.7-1 Effects of Irradiation on RPV Axial Weld Properties for MNGP

Value	Mod 2	MNGP 54 EFPY
Cu (%)	0.219	0.10
Ni (%)	0.996	0.99
Fluence x 10^{19} (n/cm^2)	0.148	0.52
ΔRT_{NDT} (°F)	116	113
RT_{NDT} (°F)	-2	-65.6
Mean RT_{NDT} (°F)	114	47.4
Probability of a failure event (NRC)	5.02×10^{-6}	Note 1

Note 1. If the plant-specific mean ΔRT_{NDT} is less than the mean ΔRT_{NDT} associated with the limiting case study, the staff concludes that probability of failure for the plant-specific axial weld under review will be less than the conditional probability of failure value for the limiting axial weld in the limiting case study.

4.2.7.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of RPV axial weld failure probability in LRA Section A3.1. On the basis of its review of the USAR supplement, the staff concluded that the summary description of the applicant's actions to address the RPV axial weld failure probability is adequate.

INSERT
New Row CF 138.5

Delete the word "Code"

The staff reviewed the information in the LRA and noted that the austenitic stainless steel components exposed to a neutron fluence greater than 5 x 10^{20} n/cm^2 (E >1 MeV) are considered susceptible to IASCC. These RPV internal components include the top guide, the shroud, and the incore instrumentation dry tubes and guide tubes. The staff reviewed the fluence calculations for the RPV and verified that other RPV internal components (e.g., the core plate) are not expected to exceed a neutron fluence of 5 x 10^{20} n/cm^2 and thus considered not susceptible to IASCC. In the LRA, the applicant stated that the aging effects from IASCC of these RPV components are managed by three aging management programs: B2.1.2, ASME ~~Code~~ Section XI In-Service Inspection, Subsections IWB, IWC, and IWD; B2.1.12, BWR Vessel Internals; and B2.1.25, Plant Chemistry. The applicant stated that implementation of these three AMPs will manage the aging effects due to IASCC such that RPV internal components will continue to perform their intended functions consistently with the licensing basis for the period of extended operation.

The staff reviewed other applicant documents pertaining to the RPV, BWRVIP documents, and EPRI topical reports applying to generic RPVs. The staff observed that, while fluence level was the primary contributor to IASCC, additional factors also contributed, or increased component susceptibility to IASCC. The staff observed that BWRVIP-41, "BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines," states that materials like austenitic stainless steel used in jet pumps are not greatly susceptible to IASCC due to the low fluence levels in the annulus region. The staff also observed that the June 5, 2001, SER that accepted BWRVIP-41 stated that materials in a non-oxygenated environment are also not greatly susceptible to IASCC, which becomes a concern only when cracks are already present in a component. Thus, the SER stated, when an applicant can show that cracks have not occurred in components, loss of fracture toughness from IASCC will not be a significant aging effect.

The staff asked the applicant to clarify its actions regarding the above additional factors. As to the aggressive oxygenated environment, the applicant responded that it had implemented hydrogen water chemistry in 1989, which reduces the oxidizing environment of the reactor coolant system by injecting excess hydrogen to combine with free oxygen produced by radiolysis. The dissolved oxygen content of feedwater is regulated to 20-50 ppb during power operation, which minimizes corrosion potential. The staff reviewed historical data from the water chemistry program and verified the low dissolved oxygen content.

In a letter, dated June 10, 2005, the applicant stated that, in addition to those examinations required by the ISI program, which includes all pertinent examinations required by the BWRVIP program, it will examine the top guide grid high fluence locations using the EVT-1 visual examination method. In the same letter, the applicant committed to inspections of 10 percent of these locations within 12 years. The staff reviewed the applicant's operational experience and observed that, to date, it has inspected 25 percent of the high-fluence locations of the top guide grid and detected no evidence of cracking.

The staff reviewed the fluence calculations for the RPV internals and observed that there was a factor of 30 percent that was added to the calculated fluence level results. The staff asked the applicant to clarify the purpose of this added factor. The applicant stated that this factor was added for conservatism.

The staff reviewed the RPV components for IASCC, considering that (1) these components were composed of a material that was identified in BWRVIP-41 as not highly susceptible to

Delete the word "Code"

IASCC, (2) these components are in a non-aggressive, low dissolved-oxygen environment, so, as stated in the SER, the susceptibility of these components to IASCC is reduced, (3) no evidence of cracks has been detected in the RPV inspections to date, so as stated in the SER, significant loss of fracture toughness will not result, and (4) the fluence calculations that determined the three RPV components susceptible to IASCC add a factor of 30 percent, for conservatism. The staff concluded that the applicant's AMP's B2.1.2, ASME ~~Code~~ Section XI In-Service Inspection, Subsections IWB, IWC, and IWD; B2.1.12, BWR Vessel Internals; and B2.1.25, Plant Chemistry Program, will adequately manage the aging effects from IASCC for the period of extended operation.

During the audit and review, the staff identified an additional issue that required further clarification by the applicant. The applicant has committed to perform additional top guide examinations within the first 12 years of the period of extended operation; however, there is no commitment to perform examinations during the remaining period of extended operation, nor a commitment as to what the applicant will do if any RPV examination detects an indication. In RAI 4.1-1, the staff requested that the applicant describe its actions for the remainder of the period of extended operation.

In its response, by letter dated November 22, 2005, the applicant stated that inspection of a sampling of top guide high-fluence locations (i.e., where fluence exceeds 5.0×10^{20} n/cm^2) will be performed consistent with the lower plenum inspection and flaw evaluation guidelines described in BWRVIP-47. Ten percent of the total high-fluence population will be inspected within 12 years, with a minimum of 5 percent inspected within the first six years. If flaws are detected, inspection of an additional 5 percent of the total high-fluence population will be completed. This process will be repeated until no new flaws are detected. Any flaw exceeding inspection limits will be evaluated and necessary corrective actions made that may include, but are not limited to accept as-is, accept as-is with required periodic re-inspection, or remove indication by metal removal. All corrective actions will be performed in accordance with approved procedures. Indication mapping and sizing will be documented for use in industry resolution of any related concerns. Re-inspection scope and frequency during the entire period of extended operation will depend on initial inspection results, as well as on related industry experience. Therefore, the staff concluded this TLAA is acceptable and consistent with the GALL Report, and the staff's concern described in RAI 4.1-1 is resolved.

4.4.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of IASCC in LRA Section A3.5. On the basis of its review of the USAR supplement, the staff concluded that the summary description of the applicant's actions to address the IASCC is adequate.

4.4.4 Conclusion

The staff concluded that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the aging effects from IASSC on the intended function(s) will be adequately managed for the period of extended operation. The staff also concluded that the USAR supplement contains an appropriate summary description of this TLAA evaluation, sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.5 Effects of Reactor Coolant Environment

4.5.1 Summary of Technical Information in the Application

In LRA Section 4.5, the applicant summarized its evaluation of the effects of reactor coolant environment for the period of extended operation. The applicant evaluated the impact of the reactor coolant environment on the locations addressed in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components." The applicant evaluated the impact of the reactor water environment on the fatigue life of the locations identified in NUREG/CR-6260. The applicant's evaluation indicated that the environmental fatigue usage for all locations is less than the allowable limit of 1.0 for the period of extended operation. The applicant concluded that the effects of environmentally assisted fatigue were shown to be acceptable through the period of extended operation.

4.5.2 Staff Evaluation

The staff reviewed LRA Section 4.5, pursuant to 10 CFR 54.21(c)(1)(ii), to verify the analyses have been projected to the end of the period of extended operation.

The applicant stated that the FMP will continue during the period of extended operation to assure that design cycle limits are not exceeded. The applicant's FMP tracks transients and cycles of RCS components with explicit design transient cycles to assure that these components remain within their design bases. Generic Safety Issue (GSI)-166, "Adequacy of the Fatigue Life of Metal Components," raised concerns about the conservatism of the fatigue curves used in the design of the RCS components. Although GSI-166 was resolved for the current 40-year design life of operating components, the staff identified GSI-190, "Fatigue Evaluation of Metal Components for 60-year Plant Life," to address license renewal. The NRC closed GSI-190 in December 1999, concluding:

> The results of the probabilistic analyses, along with the sensitivity studies performed, the iterations with industry (NEI and EPRI), and the different approaches available to the licensees to manage the effects of aging, lead to the conclusion that no generic regulatory action is required, and that GSI-190 is closed. This conclusion is based primarily on the negligible calculated increases in core damage frequency in going from 40 to 60-year lives. However, the calculations supporting resolution of this issue, which included consideration of environmental effects, and the nature of age-related degradation indicate the potential for an increase in the frequency of pipe leaks as plants continue to operate. Thus, the staff concluded that, consistent with existing requirements in 10 CFR 54.21, licensees should address the effects of coolant environment on component fatigue life as aging management programs are formulated in support of license renewal.

The staff compared the usage factors provided by the applicant with those in NUREG/CR-6260 for the older vintage BWR. NUREG/CR-6260 identified several locations for which the environmental usage factor was projected to exceed 1.0: the core spray nozzle safe end, the feedwater nozzle, the feedwater line reactor core isolation cooling (RCIC) tee connection, and the residual heat removal (RHR) return line tee.

May want to replace with - consideration: the reactor vessel shell, the recirculation system RPV nozzles,

Section 4.5

The environmental fatigue usage for the core spray nozzle (safe end) in LRA ~~Table 4.5.1~~ is much lower than the fatigue usage of the core spray nozzle (without environmental effects) in LRA Table 4.3.1-1. Relocate paragraph and start with : The staff also noted that...

The staff's review of LRA Section 4.5 identified an area in which additional information was necessary to complete the review of the effects of the reactor coolant environment. The applicant responded to the staff's RAI as discussed below.

In RAI 4.5-1, dated June 21, 2005, the staff requested that the applicant provide the basis for the reported usage factors in Table 4.5.1. In addition, the staff requested that the applicant discuss the calculation of the F_{en} multipliers used for each of the NUREG/CR-6260 locations.

In its response, dated August 16, 2005, the applicant stated that the fatigue usage reported in LRA Table 4.3.1-1 for the core spray nozzle is based on cycle counting, whereas, the environmental usage factor in Table 4.5.1 is based on a detailed stress analysis. During a followup discussion on September 1, 2005, the applicant stated the fatigue usage in Table 4.3.1-1 resulted from considering all load cycles at the maximum stress and the usage factor in ~~Table 4.5.1~~ resulted from separating the individual load cycles by stress level. The staff found this explanation reasonable.

LRA Section 4.5

The applicant indicated that hydrogen water chemistry (HWC) was used at MNGP. The NUREG/CR-6260 components were evaluated for a high oxygen environment without HWC. Oxygen concentration has a significant impact on the fatigue life of carbon and low alloy steel components. HWC lowers the oxygen concentration in BWRs in order to reduce the stress corrosion cracking (SCC) potential of stainless steel components. The reduced oxygen concentration significantly reduces the environmental impact on the fatigue life of carbon and low alloy steel components compared to equivalent NUREG/CR-6260 carbon and low alloy steel components.

1986

NUREG/CR-6260 identified high environmental fatigue usage at the stainless steel core spray nozzle safe-end. The applicant replaced the core spray safe-ends in ~~1980~~. The applicant stated that the replaced core spray safe-ends are carbon steel. Because the applicant uses HWC, the environmental impact on the fatigue usage of the carbon steel safe-ends is insignificant; therefore, the staff concluded that the applicant's calculated environmental fatigue usage for the core spray nozzle safe-ends is reasonable and acceptable.

May want to delete

feedwater nozzle and the feedwater line RCIC tee connection

cladding removal

Because the applicant uses HWC, usage factors for the feedwater nozzle and the feedwater line RCIC tee connection are not directly comparable to the NUREG/CR-6260 values. The applicant stated that it had evaluated these locations in detail recently for environmental fatigue. The applicant ~~also~~ stated that the environmental factors for the evaluations considered both the times HWC had and had not been in operation. Since the feedwater nozzle ~~replacement~~ in ~~1980~~, its lower environmental factor reflects its greater operating exposure to HWC. Considering the applicant's use of HWC and ~~replacement~~ of the feedwater nozzle in ~~1980~~, the reported environmental factors are reasonable; therefore, the staff found the applicant's evaluation of the environmental fatigue usage of the feedwater nozzle and the feedwater line RCIC tee connection acceptable.

1977

1977

cladding removal

The applicant also evaluated the RHR piping tapered transition and RHR return line tee in detail for environmental fatigue. The RHR return line tee was the bounding fatigue usage location.

May wan to add summary statements for RPV and recirc. nozzles

Since the RHR return line tee was replaced in the 1980s, it will be subject to fewer years of service than the component evaluated in NUREG/CR-6260. In addition, the environmental fatigue criteria for the stainless evaluations in NUREG/CR-6260 were independent of temperature. Later criteria in NUREG/CR-5704 found that the environmental effect on fatigue usage is insignificant at temperatures less than 200° centigrade. The staff noted that RHR shutdown cooling initiates at less than 200° centigrade. Considering the items discussed above, the applicant's environmental fatigue usage of the RHR return line tee is reasonable. Therefore, the staff found the applicant's evaluation of the environmental fatigue usage of the RHR return line tee is acceptable.

Based on its review, the staff found the applicant's response to RAI 4.5-1 acceptable because the applicant reasonably evaluated the environmental impact on the fatigue life of RCPB components for the period of extended operation; therefore, the staff's concern described in RAI 4.5-1 is resolved.

4.5.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of effects of reactor coolant environment in LRA Section A3.7. On the basis of its review of the USAR supplement, the staff concluded that the summary description of the applicant's actions to address the effects of reactor coolant environment is adequate.

4.5.4 Conclusion

The staff reviewed the applicant's TLAA regarding the effects of reactor coolant environment, as summarized in LRA Section 4.5, and concluded that the applicant had provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation. The staff also concluded that the USAR supplement contains an appropriate summary description of this TLAA evaluation, sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.6 Fatigue Analyses of the Primary Containment, Attached Piping, and Components

The Mark I containment consists of a freestanding steel containment drywell, vent system, and steel pressure suppression chamber (torus). Large-scale testing of the Mark III containment and in-plant testing of Mark I primary containment systems identified additional hydrodynamic loads not considered in the original containment design. The Mark I Owners Group initiated the Mark I Containment Program to develop a generic load definition and structural analysis techniques. The staff evaluation of the generic load definition and structural assessment techniques is in NUREG-0661, "Safety Evaluation Report, Mark I Containment Long Term Program, Resolution of Generic Technical Activity A-7," July 1980. The Mark I Containment Long Term Program evaluation of hydrodynamic loads included fatigue analyses of the torus and vent system and of the torus attached piping.

The containment liner plates, penetration sleeves (including dissimilar metal welds), and penetration bellows may be designed in accordance with the ASME B&PV Code, Section III requirements. If a plant's code of record requires a fatigue analysis, it may be a TLAA and must

To support the conclusion that the GE design curves apply to Type 304 stainless steel, the applicant presented stress relaxation data from the BWRVIP-99 Report, "Crack Growth Rates in Irradiated Stainless Steels in BWR Internal Components," and from J.P. Foster and Halden. The GE design curve predicts higher relaxation levels (i.e., lower fraction of load remaining) than observed from the Foster and Halden data and is thus conservative compared to this data.

The analysis included the impact of test temperature and neutron flux on stress relaxation:

> More than 80 percent of the tests, shown in Figure 1, were conducted at a temperature of 550°F and a majority of these were conducted in an operating BWR environment. The other tests, were conducted at either 570 or 600°F which is expected to produce more relaxation. Since such a large portion of the data was conducted at typical BWR operating conditions, the data temperature is considered fully representative of the core plate bolts.
>
> While the cumulative fluence information was available as part of the original test reports and the GE Design Curve documentation, the flux conditions were not directly available. Many of the tests were associated with springs which had reached fluences ranging from 8×10^{20} to 8×10^{21} n/cm^2. Based on a reasonable exposure time, the flux will be expected to range from 7×10^{12} to 9×10^{13} n/cm^2/s. The fluxes defined for two of the smaller sets of test data were 2.7×10^{14} and 2×10^{17} n/cm^2/s, respectively. Review of the data over these four orders of magnitude showed no discernable flux dependence; however, the neutron flux levels were at least 100 times higher than that experienced by the core plate bolts. As described above, the temperature data are representative for use in the core plate bolt evaluation. The neutron flux data, however, was measured in specimens subject to fluxes ranging from 1×10^{13} to 2×10^{17} n/cm^2/s, which is higher than the 8.5×10^{9} n/cm^2/s average flux experienced by the core plate bolts themselves. Given the large range of higher flux for which the properties are the same, the impact of the lower flux to which the bolts are exposed is viewed as negligible.

Based on the analysis and supporting data, the staff agreed with the applicant that the GE design curves apply to Type 304 stainless steel used in the core plate bolts.

Based on the GE design curves and a neutron fluence of 2.2×10^{19} n/cm^2 (E > 1.0 MeV), the applicant determined that the amount of stress relaxation at the end of the period of extended operation would be 8 percent. This neutron fluence was calculated using a procedure which is in accordance with the guidance in Regulatory Guide 1.190 and corresponds to the maximum fluence applicable to the bolts at the end of the period of extended operation.

The applicant also performed a plant-specific analysis to show that the axial and bending stresses in the core plate hold-down bolts, considering the loss of preload (8 percent) at the end of the period of extended operation, will not exceed the ASME B&PV Code Section III allowable Pm (membrane) and Pm+Pb (membrane+bending) stresses. The analysis was based on the assumption that sufficiently high frictional forces, resulting from the preload forces in the bolts and ~~the postulation of a high~~ coefficient of static friction between the rim and the support surfaces, will be induced between the core plate rim and the shroud support to prevent sliding of the core plate under design basis loading resulting from maximum horizontal and vertical seismic and accident loads. Under this scenario, no bending stresses are induced in the hold-down bolts. The only stresses sustained by the hold-down bolts are axial, resulting from

test data

the preload and the vertical loading (differential pressure and seismic) on the plate. These stresses were shown to be considerably lower than the ASME Section III allowable Pm stress.

The staff evaluated this analysis and concluded that the postulated coefficient of static friction was not applicable under the reactor fluid operating environment, ~~and was probably considerably lower, based on~~ coefficients of friction ~~which had been applied under similar application. A smaller coefficient of static friction permits sliding of the core plate under horizontal acceleration, and induces bending stresses in the bolts. This analysis was, therefore, found not acceptable.~~

due to other

data indicating that a lower value may be appropriate.

Inspection and flaw evaluation guidelines of BWR core support plates were previously submitted to the NRC in BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines," December 1996. Appendix A of this report contains a prototypical core plate hold-down bolt analysis under representative horizontal and vertical seismic and accident loading conditions. The analysis was based on a finite element analysis of the core plate and the hold-down bolts, and did not credit friction between the core rim and the shroud support. This analysis demonstrated that the mean axial and axial+bending stresses in the hold down bolts meet the ASME Section III bolt stress criteria in the report under typical accident loading. The staff reviewed this report and found it acceptable for referencing in LRAs, by letter dated September 6, 2000. Therefore, the staff requested that the applicant perform an analysis, consistent with the methodology used in Appendix A of BWRVIP-25, and demonstrate that the bolt axial and bending stresses meet the ASME Section III Pm and Pm+Pb stress criteria in the report.

By letter dated February 27, 2006, the applicant provided GE technical report GE-NE-0000-0050-5900P, "Comparative Evaluation of the Monticello Core Plate Rim Hold-down Bolts and BWRVIP-25, Appendix A Analysis," February 2006. This analysis demonstrates that the MNGP mean axial and bending core plate hold-down bolt stresses, considering hold-down bolt stress relaxation, were bounded by the analysis approved in BWRVIP-25. However, the horizontal and vertical loads used in the analysis were considerably smaller than those used in the BWRVIP-25 analysis, resulting from the exclusion of certain accident loads, such as SRV hydrodynamic loads, that were considered in the BWRVIP-25 analysis. The staff requested that the applicant provide justification for the exclusion of these loads. In its response, dated March 31, 2006, the applicant stated that all applicable design basis accident loads specific to the MNGP core plate were applied, and also provided the horizontal and vertical accelerations at the core plate level. The applicant justified the exclusion of the hydrodynamic loads on the basis that these are not applicable to the MNGP vessel and internals since the MNGP is a BWR/3 Mark I design. The Mark I torus is structurally isolated from the containment by the use of flexible bellows, and the hydrodynamic loads due to SRV lift and LOCA are, therefore, not transmitted to the containment or the vessel. The staff found this justification reasonable and acceptable.

The BWRVIP-25 analysis is based on a finite element analysis of the core plate and hold-down bolts. It was originally performed to help utilities determine a strategy for core plate inspections, wherein conservative geometric conditions and bounding, postulated worst-case scenarios were considered. Due to the similarities in the MNGP and the BWRVIP-25 plates, the applicant/GE used data from the BWRVIP-25 core plate finite element analysis, an analytical procedure, and a comparison to the MNGP specific core plate and loads to extrapolate the BWRVIP-25 analysis to the MNGP core plate and hold-down bolts. The applicant showed that the mean core plate bolt axial and axial+bending stresses met the ASME Section III stress criteria in BWRVIP-25. However, the BWRVIP-25 analysis also indicated that not all hold-down

could

bolts are uniformly loaded under horizontal and vertical loading. Based on data shown in BWRVIP-25, the staff also determined that the axial+bending stresses in the highest loaded MNGP hold-down bolts exceed the Pm+Pb stress criterion of BWRVIP-25, but by an insignificant margin. However, the applicant's analysis also included bending stresses in the hold-down bolts due to core plate bowing, which were not considered in the BWRVIP-25 analysis. The staff evaluated the applicant's analysis, and concluded that it is acceptable, because it conforms with accepted structural analysis practice. Therefore, the staff's concern described in RAI 4.8-2 is resolved.

4.8.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of stress relaxation of rim hold-down bolts in LRA Section A3.6. In its letter, dated April 10, 2006, the applicant provided a revised USAR supplement description which summarized the results of the analysis provided in the GE technical report. On the basis of its review of the USAR supplement description provided in the applicant's letter, dated April 10, 2006, the staff concluded that the summary description of the applicant's actions to address the stress relaxation of rim hold-down bolts adequately describes the analysis described in the GE technical report.

4.8.4 Conclusion

The staff concluded that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), regarding the stress relaxation of rim hold-down bolts, that the analyses have been projected to the end of the period of extended operation. The staff also concluded that the USAR supplement contains an appropriate summary description of this TLAA evaluation sufficient to satisfy the requirements of 10 CFR 54.21(d).

4.9 Reactor Building Crane Load Cycles

4.9.1 Summary of Technical Information in the Application

In LRA Section 4.9, the applicant summarized the evaluation of the reactor building crane load cycles for the period of extended operation. The MNGP reactor building crane system consists of an 85 ton bridge crane. The crane is capable of handling the drywell head, reactor vessel head, pool plugs and spent fuel pool shipping cask. A refueling service platform, with necessary handling and grappling fixtures services the refueling area and the spent fuel pool. The reactor building crane system has been modified to incorporate redundant safety features which were not a part of the original design. The modification consists of a new trolley with redundant design features and a capacity of 85 tons on the main hook with redundancy features and an auxiliary 5 ton capacity hook. This modification was implemented for handling heavy loads both during refueling operations and during operations involving the offsite shipment of spent fuel. Such offsite shipments of fuel can take place when the plant is operating or shut down. The redundant crane has been installed to reduce the probability of a heavy load drop to the category of an incredible event. NUREG-0612 suggests that cranes should be designed to meet the applicable criteria and guidelines of Chapter 2-1 of ANSI B30.2-1976, Overhead and Gantry Cranes, and of Crane Manufactures Association of America (CMAA)-70, Specifications for Electric Overhead Traveling Cranes. The reactor building crane, manufactured prior to the issuance of CMAA-70 and ANSI B30.2, was designed to meet Electric Overhead Crane Institute (EOCI) 61. Since the evaluation used as a basis, an expected number of load cycles over the 40-year life of the plant, reactor building crane load cycles are a TLAA.

identified

4.9.2 Staff Evaluation

The staff reviewed LRA Section 4.9, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of extended operation.

In LRA Section 4.9 related to the reactor building crane load cycles TLAA, the applicant ~~contended~~ that the current analysis of the fatigue life remains valid for the 60-year extended operating period. It is the staff's understanding that this crane will also handle spent fuel pool shipping casks. A refueling service platform with handling and grappling fixtures services the refueling area and the spent fuel pool.

The staff's review of LRA Section 4.9 identified an area in which additional information was necessary to complete the review of the applicant's results. The applicant responded to the staff's RAI as discussed below.

In RAI 4.9-1, dated July 20, 2005, the staff indicated concerns regarding the fatigue analysis for the reactor building crane. Therefore, the staff requested that the applicant provide a fatigue analysis associated with lifts of spent fuel casks and explain how the heavy load fatigue analysis in LRA Section 4.9 governs the TLAA.

In its response, dated August 16, 2005, the applicant stated:

> Section 4.9 of the LRA accounted for cycles due to anticipated lifts of spent fuel casks by the addition of heavy lift cycles. The current analysis conservatively assumed 1,120 cycles (for 40 years of operation) due to lifts of reactor building shield blocks and plugs, the reactor vessel head, the drywell vessel head, the steam separator assembly, and the steam dryer assembly. The difference between 1,120 to 2,000 cycles identified in Section 4.9 includes consideration of additional spent fuel cask lifts, as well as additional current design basis lifts attributable to the license renewal period of extended operation.
>
> The reactor building crane is currently being upgraded from 85 tons to 105 tons in anticipation of spent fuel cask duty. Crane calculations are being performed in accordance with CMAA 70-1975, which identifies stress ranges and allowable cycles. Preliminary calculations demonstrate that the maximum stress range for the upgrade design is less than the allowable stress range for the most severe crane classification operating up to 100,000 cycles. The remaining crane components are being designed with a 5:1 safety factor, which assures that the fatigue threshold for 100,000 cycles will not be exceeded. Assuming that offloading of fuel to a spent fuel storage facility must begin with the next refueling outage at a rate equal to fuel replenishments, as well as spent fuel pool offloading due to decommissioning activities, the total number of additional cycles is not expected to exceed 120. This includes the conservative consideration that both cask placement for acceptance of spent fuel and removal of the loaded cask to the spent fuel transfer vehicle are at fully loaded conditions. This results in a total number of cycles, at maximum load for 60 years of operation, of 1,800 out of 70,000 allowable cycles identified in the LRA.
>
> The crane upgrade calculations have not been completed. Upon completion of the modification analysis, an evaluation will be made to determine the effect, if any, on Section 4.9. If the results are not bounded by the current LRA

Letter was dated March 16, 2005

APPENDIX B

CHRONOLOGY

This appendix contains a chronological listing of the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC) staff and the Nuclear Management Company, LLC (NMC), and other correspondence regarding the NRC staff's reviews of the Monticello Nuclear Generating Plant (MNGP) (Docket No. 50-263) license renewal application (LRA).

~~March 24, 2005~~	Letter from T. Palmisano, Nuclear Management Company, LLC to the NRC Transmitting Application for Renewed Operating License for the Monticello Nuclear Generating Plant (ADAMS Accession No. ML050880241)
March 24, 2005	NRC Press Release-05-053: NRC Announces Availability of License Renewal Application for Monticello (ADAMS Accession No. ML050830481)
March 31, 2005	Letter from P.T. Kuo, NRC, to T. Palmisano, NMC, Acknowledging the Receipt and Availability of the LRA for MNGP (ADAMS Accession No. ML050900052)
April 6, 2005	Notice of April 20, 2005 Meeting for the NRC to Describe the License Renewal Process (ADAMS Accession No. ML050960308)
April 14, 2005	NRC Press Release-III-05-016: NRC Staff Schedules Public Meeting for April 20 to Discuss License Renewal Process for Monticello Nuclear Generating Plant (ADAMS Accession No. ML051040142)
April 25, 2005	Notice of May 11, 2005 Meeting Between the NRC and NMC to Discuss the LRA for MNGP (ADAMS Accession No. ML051150221)
May 5, 2005	Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding the Application for Renewal of the Operating License for MNGP (ADAMS Accession No. ML051260029)
May 9. 2005	Letter from J. Davis, NRC, to M. Askin regarding maintenance of reference material at the Monticello Public Library for the MNGP LRA (ADAMS Accession No. 051300167)
May 9, 2005	Letter from J. Davis, NRC, to A. Wittmann regarding maintenance of reference material at the Buffalo Public Library for the MNGP LRA (ADAMS Accession No. 051300195)
May 12, 2005	NRC Press Release-05-081: NRC Announces Opportunity for Hearing on Application to Renew Operating License for MNGP (ADAMS Accession No. ML051320170)