STP
Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

February 27, 2014
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File: G25

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Response to Requests for Additional Information for the
Review of the South Texas Project, Units 1 and 2,
License Renewal Application – Set 25 (TAC Nos. ME4936 and ME4937)

References:
1. Letter from G. T. Powell, STPNOC, to NRC Document Control Desk, "License Renewal Application", dated October 25, 2010 (NOC-AE-10002607) (ML103010257)
2. Letter from NRC to STPNOC, "Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Set 25, dated November 19, 2012, (TAC Nos. ME4936 and ME4937)"(ML12311A438)
3. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Response to Requests for Additional Information for the South Texas Project License Renewal Application- Aging Management Program, Set 22, (TAC Nos. ME4936 and ME4937)", dated August 21, 2012, (NOC-AE-12002897) (ML12248A148)
4. Letter from D. W. Rencurrel, STPNOC, to NRC Document Control Desk, "Partial Response to Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Set 25 (TAC Nos. ME4936 and ME4937)", dated December 6, 2012, (NOC-AE-12002907) (ML12359A063)
5. Letter from G.T. Powell, STPNOC, to NRC Document Control Desk, "Supplement 1 to Request for NRC Staff to Suspend Safety Review of the South Texas Project License Renewal Application (TAC Nos. ME4936 and ME4937)", dated December 19, 2012, (NOC-AE-12002942) (ML12363A102)

By Reference 1, STP Nuclear Operating Company (STPNOC) submitted a License Renewal Application (LRA) for South Texas Project (STP) Units 1 and 2. By Reference 2, the NRC staff requests additional information for review of the STP LRA. By Reference 3, STPNOC provided a partial response and stated in Reference 4 that a response to the remaining requested information will be provided by February 28, 2014. STPNOC's response to the remaining requested information is provided in Enclosure 1 to this letter. Changes to LRA pages described in Enclosure 1 are depicted as line-in/line-out pages provided in Enclosure 2.

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One regulatory commitment in Table A4-1 of the LRA is revised and is provided in Enclosure 3. This letter does not contain any other regulatory commitments.

Should you have any questions regarding this letter, please contact either Arden Aldridge, STP License Renewal Project Lead, at (361) 972-8243 or Rafael Gonzales, STP License Renewal Project regulatory point-of-contact, at (361) 972-4779.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 27, 2014
Date

G. T. Powell
Site Vice President

RJG

Enclosures:
1. STPNOC Response to Requests for Additional Information
2. STPNOC LRA Changes with Line-in/Line-out Annotations
3. STPNOC Revised Regulatory Commitment

cc:
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Enclosure 1

STPNOC Response to Requests for Additional Information

**SOUTH TEXAS PROJECT, UNITS 1 AND 2,
REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE SOUTH TEXAS PROJECT, UNITS 1 AND 2, LICENSE RENEWAL APPLICATION SET 25 (TAC NOS. ME4936 AND ME4937)**

RAI A1-2: Follow-up on Operating Experience Implementation (3.0.5)

Background
By letter dated June 14, 2012, STP Nuclear Operating Company (STPNOC or the applicant) revised license renewal application (LRA) Section A1, which is part of the updated final safety analysis report (UFSAR) supplement, to provide a more detailed description of how operating experience will be reviewed on an ongoing basis to address operating experience concerning age-related degradation and aging management during the terms of the renewed licenses. This summary description identifies several enhancements that will be made to the existing Operating Experience Program and the Corrective Action Program.

Issue
LRA Section A4 describes the license renewal commitments and is also part of the UFSAR supplement. Commitment No. 41, as revised by letter dated June 14, 2012, addresses the enhancements that will be made to the Operating Experience Program and the Corrective Action Program and states that they will be implemented by December 31, 2014. LRA Section A1 describes the same enhancements but does not state an explicit implementation schedule. Therefore, the staff is unclear with respect to the applicant's intended implementation schedule.

In addition, the staff's position, as described in Final License Renewal Interim Staff Guidance, LR-ISG-2011-05, "Ongoing Review of Operating Experience," is that any enhancements to the existing operating experience review activities should be put in place no later than the date the renewed operating licenses are issued and implemented on an ongoing basis throughout the terms of the renewed licenses. The December 31, 2014, implementation schedule could be after issuance of the renewed operating licenses. As such, it is not clear how operating experience on age-related degradation and aging management will be considered during the terms of the renewed operation licenses prior to full implementation of the enhancements.

Request
Clarify the UFSAR supplement regarding the implementation schedule for the enhancements that will be made to the Operating Experience Program and the Corrective Action Program. If implementation will be after issuance of the renewed operating licenses, provide a justification and include any relevant practical considerations that would impact the implementation timeframe.

STPNOC Response:

Response provided in STPNOC letter dated December 6, 2012, from D. W. Rencurrel to NRC Document Control Desk, "Partial Response to Requests for Additional Information for the Review of the South Texas Project, Units 1 and 2, License Renewal Application – Set 25 (TAC Nos. ME4936 and ME4937)" (NOC-AE-12002907) (ML12359A063).

RAI 4.3.2.11-6: Follow-up RAI on STP CASS LBB Analysis (060A)

Background

The staff notes that the applicant's current position on the leak-before-break (LBB) evaluation of cast austenitic stainless steel (CASS) piping is that it is not a time-limited aging analysis (TLAA) for STP. Regarding the fracture mechanics calculation in the LBB evaluation of CASS piping, the applicant's response to Part 2 of request for additional information (RAI) 4.3.2.11-2 states:

> Although the fracture mechanics calculation considers aging of the material property, aging is not based on the plant life. Aging is based on the minimum material properties possible and the value used by the calculation will be the same whether the plant life is 40 years, 60 years, or 100 years. Therefore, fracture mechanics calculation is not a TLAA in accordance with 10 CFR 54.3(a) Criterion 3.

The response to Part 3 of RAI 4.3.2.11-2 cites a technical report from 1983 (Westinghouse Report WCAP-1046, "The Effects of Thermal Aging on the Structural Integrity of Cast Stainless Steel Piping for Westinghouse Nuclear Steam Supply Systems" as the basis for the saturated fracture toughness assumed in the analyses.

Issue

Considerable information has been developed since 1983 to provide improved understanding of thermal embrittlement of CASS materials by O. Chopra of Argonne National Laboratory, C. Faidy of Electricité de France, and others. See, for example NUREG/CR-4513, Rev. 1 (1994) "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems"); Appendix A of draft EPRI report 1024966 "Probabilistic Reliability Model for Thermally Aged Cast Austenitic Stainless Steel Piping"; and ASME paper PVP2010-25085 "Flaw Evaluation in Elbows Through French RSEM Code" by C. Faidy.

Although the RAI response states that the material property aging is based on the "minimum material properties possible," the RAI response does not provide justification to support that statement in light of additional information on thermal aging of CASS over the last 29 years, and, in particular, does not demonstrate that the aging after 60 years of operation is bounded by the thermal embrittlement saturation values assumed in the existing analysis.

Request

(1) Provide justification that the assumed saturated fracture toughness in the CASS LBB evaluations bounds the expected toughness at 60 years of operation, considering the information sources cited above and others as necessary.
(2) Specify the information sources used in response to Request (1).
(3) Given the response to request (1), identify any changes necessary to the disposition of the LBB analysis for CASS, for example to demonstrate that the analysis "remains valid for the period of extended operation" or the analysis "has been projected to the end of the period of extended operation."

STPNOC Response:

1. Provide justification that the assumed saturated fracture toughness in the CASS LBB evaluations bounds the expected toughness at 60 years of operation, considering the information sources cited above and others as necessary.

   The reactor coolant loop (RCL) leak-before-break facture mechanics analysis for STP is documented in Westinghouse report WCAP 10559, Technical Bases for Eliminating the Large Primary Loop Pipe Rupture as the Structural Design Bases for South Texas Project Units 1 and 2 . The reference material fracture toughness properties are shown to bound the fully-aged fracture toughness properties of the STP reactor coolant pressure boundary cast stainless steel by comparing the STP fracture toughness properties and chemistry data from the certified material test reports (CMTRs).

   The fracture toughness values were compared to the most recent data for the state of the industry and found to be conservative. The gas tungsten arc welds (GTAW) prepared with Types 308 stainless steel filler materials were compared against the results of NUREG/CR–6428, "Effects of Thermal Aging on Fracture Toughness and Charpy–Impact Strength of Stainless Steel Pipe Welds." The SA-351 Grade CF8A base metal was compared against the results of NUREG/CR-4513, "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems." The straight pipe segments are centrifugal castings and the elbows are static castings; therefore the material was conservatively assumed to be static–cast CF–8 steel with ferrite content greater than 15%. J_{max} defines the range of applicability of the data used and is not affected by the updated data.

2. Specify the information sources used in response to Request (1).

   The response to (1) specifically addresses the following documents:

   a. US NRC NUREG/CR–6428. *Effects of Thermal Aging on Fracture Toughness and Charpy–Impact Strength of Stainless Steel Pipe Welds.* Rev. 0. May 1996.

   b. US NRC NUREG/CR-4513. *Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems.* Rev. 1. May 1994.

   The response does not specifically address Appendix A of draft EPRI report 1024966 "Probabilistic Reliability Model for Thermally Aged Cast Austenitic Stainless Steel Piping" or ASME Paper PVP2010-25085 "Flaw Evaluation in Elbows Through French RSEM Code."

   Appendix A of draft EPRI report 1024966 "Probabilistic Reliability Model for Thermally Aged Cast Austenitic Stainless Steel Piping" is not addressed because:

   - The material in the EPRI report is CF8M whereas STP Reactor Coolant Loop (RCL) is CF8A.
   - The EPRI report cites NUREG/CR-4513 as the source of the fully aged material toughness properties.

ASME Paper PVP2010-25085 "Flaw Evaluation in Elbows Through French RSEM Code" is not addressed because:

- The material in the ASME paper is CF8M whereas STP Reactor Coolant Loop (RCL) is CF8A.
- The only comparable material in the ASME paper is that of elbow #3, based on the low Mo (Molybdenum) concentration. The J-integral calculated with a 0.2 mm crack extension based on the ASME Paper methods is bounded by the fracture toughness J_{IC} value used in the STP LBB analysis. A 0.2 mm crack extension was used because the ASTM Specification E 813–85 procedure defines J_{IC} as the intersection of the 0.2–mm offset line with the power–law fit (of the form $J = C\Delta a^n$).

3. Given the response to Request (1), identify any changes necessary to the disposition of the LBB analysis for CASS, for example to demonstrate that the analysis "remains valid for the period of extended operation" or the analysis "has been projected to the end of the period of extended operation."

   LRA Section 4.3.2.11 is revised to identify the fracture mechanics evaluation as a TLAA and disposition in accordance with 10 CFR 54.21(c)(1)(i). The position was changed because the fracture mechanics evaluation does consider the thermal embrittlement aging mechanism and is defined by the current operating term. As discussed in response #1 of this RAI, the material fracture toughness properties selected for use in the LBB analysis are sufficiently embrittled that they bound the amount of thermal embrittlement that will occur in 60 years. Therefore this TLAA is valid for the period of extended operation and is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

   Enclosure 2 provides a line-in/line-out markup of LRA Section 4.3.2.11, Section 4.3.2.11, and Appendix A3.2.1.11.

RAI B2.1.9-3d (021)

Background
RAI B2.1.9-3 and several follow-up RAIs have addressed aging management issues associated with coating degradation in the Essential Cooling Water (ECW) system. In the RAI response dated August 21, 2012, STP provided a comprehensive approach toward addressing this issue. The response states that the current inspection interval of 5 years is being increased to 6 years based on industry and STP operating experience, and that this interval aligns with vendor inspection guidance for in-service coatings and with the 6-year major equipment outage and inspection interval. The response also listed a new component type of "coatings," a new intended function of "maintain coating integrity," and a new aging effect requiring management of "loss of coating integrity."

Issue

1. Further understanding of the operating experience cited in the previous response is needed to validate the bases for increasing the inspection interval from 5 years to 6 years. NRC resident inspectors noted that, for most of the heat exchanger coating inspections they have witnessed, the coatings required at least some "touch-up", with the "turnaround" areas requiring more repair than other areas. In addition, the scope of STP's operating experience reviews is not clear, given that RAI response dated March 29, 2012, states that procedures need to be enhanced to require that protective coating failures be documented in the corrective action program,

2. The staff noted that the new "maintain coating integrity" intended function was not integrated into LRA Table 2.1-1, "Intended Functions: Abbreviation and Definitions."

Request

1. Provide a summary of the inspection results and repair efforts associated with the five sets of components (i.e., water boxes, coolers, and piping) discussed in RAI response dated August 21, 2012. Provide the approximate amount of missing coating material, including the number of locations requiring repair, and the range of repair sizes. Confirm that the operating experience reviews included inspection results and repair efforts beyond those captured in the corrective action program.
2. Ensure that the appropriate tables in the LRA have been updated to reflect the creation of a new intended function of a new component type with a new aging effect requiring management.

STPNOC Response:

1. STPs response to RAI B2.1.9-3 provided an overview of the site specific and industry operating experience identified during the preparation of the operating experience section of aging management program B2.1.9, Open-Cycle Cooling Water System program. That review assessed plant specific work orders and corrective action documentation and concluded that no significant age degradation was being experienced. Response to RAI B2.1.9-3a further clarified that the site specific operating experience review did not result in any condition reports documenting any coating failures resulting in cooling water heat exchanger tube blockage or fouling (NOC-AE-11002683, ML 11181A037, NOC-AE-12002854, ML12138A065).

   The inspection documentation was reviewed to address this RAI. The documents record the visually inspected as-found conditions such as: color change, erosion damage, decrease in thickness, cracking, mechanical damage, corrosion, delaminating, and blistering. The table below documents a summary of the historical conditions identified and repaired. More specific conditions, locations and repair sizes are not captured in the documentation, however, it is concluded from the existing operating experience documentation that the majority of the repairs are addressing minor corrosion and mechanical damage locations. STP has reasonable assurance that the 6 year inspection interval will be effective in identifying degradation conditions prior to any adverse impacts on the system as described in STPs responses to related questions in reference 3 of this letter.

Preventive Maintenance Review:

Component	Coating	PM#/WAN	PM Complete Date	Repair (Y/N)	Inspection Results
3V111VCH004 ESSENTIAL CHILLED WATER CHILLER Water Box Covers UNIT 12A	Belzona	97001684/127051	6/17/99	Y	3 small spots of corrosion in water box
	Belzona	97001684/189980	4/16/02	Y	Small area of coating damage
	Belzona	97001684/253315	10/26/04	Y	2 small areas of coating damage
	Belzona	97001684/304844	5/5/09	N	No Issues
3V111VCH005 ESSENTIAL CHILLED WATER CHILLER UNIT 12B	Belzona	97001685/127052	6/22/99	N	No Issues
	Belzona	97001685/187178	2/27/02	Y	Minor coatings damage on inlet waterbox
	Belzona	97001685/320810	5/14/08	Y	2 small areas of corrosion on return header
	Belzona	97001685/409295	1/16/13	Y	Minor corrosion on east channel head
3V111VCH006 ESSENTIAL CHILLED WATER CHILLER UNIT 12C	Belzona	97001690/127054	7/27/99	Y	2 small spots of superficial corrosion on channel head
	Belzona	97001690/189142	4/4/02	Y	Light areas of corrosion at corner of S waterbox
	Belzona	97001690/252566	5/25/05	Y	Minor coating damage on heads
	Belzona	97001690/316774	5/20/08	Y	Minor coating damage on inlet header
	Belzona	97001690/409649	1/25/13	N	No Issues
3V112VCH004 ESSENTIAL CHILLED WATER CHILLER UNIT 22A	Belzona	97001691/127055	2/2/99	Y	6 return header areas and 1 outlet area with minor coating damage
	Belzona	97001691/180004	11/6/01	Y	Minor coating damage
	Belzona	97001691/242779	5/18/04	Y	Small corrosion spots and minor coating damage
	Belzona	97001691/296318	1/20/09	Y	Minor coating damage on both heads
	Belzona	97001691/422418	5/9/13	N	No Issues

Component	Coating	PM#/WAN	PM Complete Date	Repair (Y/N)	Inspection Results
3V112VCH005 ESSENTIAL CHILLED WATER CHILLER UNIT 22B	Belzona	97001689/127053	1/14/99	Y	WO 383522 written to repaired minor corrosion on inlet cover
	Belzona	WO 383522	12/13/01	Y	repaired minor corrosion on inlet cover
	Belzona	97001689/182366	12/14/01	N	No Issues
	Belzona	97001689/214406	4/30/03	Y	Small amounts of corrosion on heads
	Belzona	97001689/282556	4/26/06	Y	Small indication of corrosion at corner of inlet head
	Belzona	97001689/363048	2/23/11	Y	Slight coating damage on inlet head
	Belzona	97001689/471825	10/31/13	Y	Required coating touchup
3V112VCH006 ESSENTIAL CHILLED WATER CHILLER UNIT 22C	Belzona	97001692/127056	1/18/99	N	No Issues
	Belzona	97001692/151418	5/8/01	Y	Small section of coating broken away from flange area of inlet and outlet area
	Belzona	97001692/231879	5/5/04	N	No Issues
	Belzona	97001692/299936	10/25/07	Y	Inlet and outlet heads minor coating damage
	Belzona	97001692/391453	2/28/13	Y	Minor corrosion on chiller heads
3Q151MHX0136 SDG LUBE OIL COOLER	Belzona	99000487/192745	5/17/01	Y	Minor coating damage to head
	Belzona	99000487/269869	3/17/06	Y	Small corrosion spot on head
	Belzona	99000487/299936	1/16/11	Y	Minor inlet and return waterbox coating touchup
3Q152MHX0136 SDG LUBE OIL COOLER	Belzona	99000489/177922	12/8/00	Y	Minor corrosion around head gasket area
	Belzona	99000489/249129	12/1/05	Y	Minor corrosion spots on cover
	Belzona	99000489/353052	6/9/10	Y	Minor corrosion spots

Component	Coating	PM#/WAN	PM Complete Date	Repair (Y/N)	Inspection Results
3Q151MHX0236 SDG LUBE OIL COOLER	Belzona	99000490/189565	10/13/00	Y	Minor corrosion around head
	Belzona	99000490/261849	5/20/05	Y	Minor coating damage to head
	Belzona	99000490/353204	1/20/10	Y	Minor corrosion south end cover
3Q152MHX0236 SDG LUBE OIL COOLER	Belzona	99000491/177923	5/3/03	Y	Minor corrosion
	Belzona	99000491/272198	4/27/06	Y	Minor coating damage
	Belzona	99000491/372285	5/18/12	Y	Minor corrosion on heads and covers
3Q151MHX0336 SDG LUBE OIL COOLER	Belzona	99000492/161256	7/28/99	Y	Minor corrosion on south end head
	Belzona	99000492/181132	5/4/01	Y	Minor coating spot repair
	Belzona	99000492/224263	5/26/05	Y	Minor coating damage on cover and flange
	Belzona	99000492/355325	12/6/09	Y	Minor coating damage
3Q152MHX0336 SDG LUBE OIL COOLER	Belzona	99000493/201551	6/6/02	Y	Minor corrosion on cover
	Belzona	99000493/290202	11/15/07	Y	South Channel Head has corrosion
	Belzona	99000493/392215	2/28/13	Y	Minor corrosion on inside cover
3Q151MHX0134 SDG JACKET WATER COOLER	Belzona	99000474/192744	5/17/01	Y	Minor coating damage to head
	Belzona	99000474/269868	3/17/06	Y	Minor corrosion on head
	Belzona	99000474/371684	1/16/11	Y	Minor coating repair on south cover
3Q152MHX0134 SDG JACKET WATER COOLER	Belzona	99000480/177919	12/8/00	Y	Minor corrosion on gasket surface area
	Belzona	99000480/249128	12/1/05	Y	Minor corrosion
	Belzona	99000480/353051	6/9/10	Y	Minor corrosion
3Q151MHX0234 SDG JACKET WATER COOLER	Belzona	99000483/189564	10/12/00	Y	Minor corrosion and crack in coating of head
	Belzona	99000483/260684	5/20/05	Y	Coating damage on heads
	Belzona	99000483/353203	1/20/10	Y	Minor coating repair south cover

Component	Coating	PM#/WAN	PM Complete Date	Repair (Y/N)	Inspection Results
3Q152MHX0234 SDG JACKET WATER COOLER	Belzona	99000484/203951	5/3/03	Y	Minor corrosion areas
	Belzona	99000484/272197	4/27/06	Y	Minor coating damage
	Belzona	99000484/372284	5/20/12	Y	Corrosion repairs
3Q151MHX0334 SDG JACKET WATER COOLER	Belzona	99000485/161255	7/28/99	Y	Corrosion areas on south cover
	Belzona	99000485/181131	5/4/01	Y	Spot repairs to coating
	Belzona	99000485/224262	5/26/05	Y	Minor corrosion
	Belzona	99000485/355324	12/6/09	Y	Slight coating damage south cover
3Q152MHX0334 SDG JACKET WATER COOLER	Belzona	99000486/201550	6/6/02	Y	Minor corrosion on cover
	Belzona	99000486/290201	11/15/07	Y	Minor corrosion spot on cover coating
	Belzona	99000486/392214	3/5/13	Y	Coating touchup on south cover
3Q151MDG0134 DIESEL GENERATOR #11 Intercooler Water Boxes	Belzona	91000720/90027472	2/18/91	N	No issues
		91000720//93000532	8/30/93	N	No issues
		94000812/94005336	3/7/95	N	Minor Rust
		94000812/95014107	6/1/96	N	Minor Rust
		DG325020	1/30/98	N	No issues
		99000476/383973	1/14/11	N	No issues
3Q152MDG0134 DIESEL GENERATOR #21 Intercooler Water Boxes	Belzona	91000629/9306120 WO 211039	11/26/93	N	No issues
		94000809/62604 CR 97-160	1/6/97	Y	Minor Rust
		9400809/94014546	10/26/95	N	Minor rust
		9400050/135489 WO 325041,203177,2031 76	2/4/99	N	No issues
		99000494/369200	6/12/10	N	No issues
3Q151MDG0234 DIESEL GENERATOR #12 Intercooler Water Boxes	Belzona	90000736/90027471	3/9/91	N	No issues
		90000736/93000135	10/1/93	N	No issues
		94000810/94005337	3/29/95	N	No issues
		94000810/95014001	11/11/96	N	No issues
		325021	2/2/98	N	No issues
		99000495/353205	1/20/10	N	No issues

Component	Coating	PM#/WAN	PM Complete Date	Repair (Y/N)	Inspection Results
3Q152MDG0234 DIESEL GENERATOR #22 Intercooler Water Boxes	Belzona	91000630/93036103	4/12/94	N	No issues
		94000808/94014528	10/15/95	N	Minor Rust waterbox head
		94000808/62603	11/19/96	N	No issues
		980000503/135418 WO 325038,325010, 325015	1/14/99	N	No issues
		99000496/348114	5/20/12	N	No issues
3Q151MDG0334 DIESEL GENERATOR #13 Intercooler Water Boxes	Belzona	9000737/90027470	1/24/91	N	No issues
		9000737/93000160	11/22/93	N	No issues
		94000811/94005338	3/30/95	N	No issues
		94000811/95014120	9/23/96	N	No issues
		WO 325022	2/12/98	Y	Minor corrosion spots
		99000497/329340 WO 500792	12/6/09	Y	Corrosion spots
3Q152MDG0334 DIESEL GENERATOR #23 Intercooler Water Boxes	Belzona	91000631/93036104	12/10/93	N	No issues
	Belzona	94000807/62602	1/20/97	N	Minor Zink Corrosion
	Belzona	99000498/314526 WO 462738	11/17/07	Y	Corrosion spots
	Belzona	99000498/419648 WO 471081	3/2/13	Y	Blistering on upper and lower heads
3Q151MDG0134 DIESEL GENERATOR #11 Intercooler Waterbox Interconnecting Piping	Plasticap	91000720/90027472	2/18/91	N	No issues
		91000720//93000532	8/30/93	N	No issues
		94000812/94005336	3/7/95	N	No issues
		94000812/95014107	6/1/96	N	No issues
		325020	1/30/98	N	No issues
		99000476/383973	1/14/11	N	No issues
3Q152MDG0134 DIESEL GENERATOR #21 Intercooler Waterbox Interconnecting Piping	Plasticap	91000629/9306120 WO211039	11/26/93	N	No issues
		94000809/62604 CR 97-160	1/6/97	Y	No issues
		9400809/94014546	10/26/95	N	No issues
		9400050/135489 WO 325041,203177,2031 76	2/4/99	N	No issues
		99000494/369200	6/12/10	N	No issues

Component	Coating	PM#/WAN	PM Complete Date	Repair (Y/N)	Inspection Results
3Q151MDG0234 DIESEL GENERATOR #12 Intercooler Waterbox Interconnecting Piping	Plasticap	90000736/90027471	3/9/91	N	No issues
		90000736/93000135	10/1/93	N	No issues
		94000810/94005337	3/29/95	N	No issues
		94000810/95014001	11/11/96	N	No issues
		325021	2/2/98	N	No issues
		99000495/353205	1/20/10	N	No issues
3Q152MDG0234 DIESEL GENERATOR #22 Intercooler Waterbox Interconnecting Piping	Plasticap	91000630/93036103	4/12/94	N	No issues
		94000808/94014528	10/15/95	N	No issues
		94000808/62603	11/19/96	N	No issues
		980000503/135418 WO 325038,325010,3250 15	1/14/99	N	No issues
		99000496/348114	5/20/12	N	No issues
3Q151MDG0334 DIESEL GENERATOR #13 Intercooler Waterbox Interconnecting Piping	Plasticap	9000737/90027470	1/24/91	N	No issues
		9000737/93000160	11/22/93	N	No issues
		94000811/94005338	3/30/95	N	No issues
		94000811/95014120	9/23/96	N	No issues
		99000497/329340	12/6/09	N	No issues
3Q152MDG0334 DIESEL GENERATOR #23 Intercooler Waterbox Interconnecting Piping	Plasticap	91000631/93036104	12/10/93	N	No issues
		94000807/62602	1/20/97	N	No issues
		99000498/314526	11/17/07	N	No issues
		99000498/419648	3/2/13	N	No issues

2. NRC question 2 was previously addressed and LRA Table 2.1-1 "Intended Functions" was updated in letter NOC-AE-11002763, ML11346A012 to include an intended function abbreviation of MCI "Maintain Coating Integrity". The affected LRA Sections utilizing this function are: LRA Table 2.3.3.9, LRA Table 2.3.3.20, LRA Section 3.3.2.1.9, LRA Section 3.3.2.1.20, LRA Table 3.3.2.9, LRA Table 3.3.2.20, Appendix A1.9, Appendix B2.1.9.

3. The suspension of STP Safety Review activities identified as reference 5 of this letter resulted in implementation activities being delayed. The schedule for Enhancements to the Open-Cycle Cooling Water System program procedures is revised to read "No Later than the date the renewed operating licenses are issued".

Enclosure 3 provides the line-in/line-out revision to LRA Table A4-1 Commitment No. 4.

Enclosure 2

STPNOC LRA Changes with Line-in/Line-out Annotations

List of Revised LRA Sections

RAI	Affected LRA Section
4.3.2.11-2a	Table 4.1-1
	Section 4.3.2.11
	Appendix A3.2.1.11
	Appendix B2.1.9

Table 4.1-1 List of TLAAs

TLAA Category	Description	Disposition Category(I)	Report Section
1.	**Reactor Vessel Neutron Embrittlement Analysis**	**N/A**	**4.2**
	Neutron Fluence Values	iii	4.2.1
	Pressurized Thermal Shock	ii	4.2.2
	Upper-Shelf Energy (USE)	ii	4.2.3
	Pressure-Temperature (P-T) Limits	iii	4.2.4
	Low Temperature Overpressure Protection	iii	4.2.5
2	**Metal Fatigue Analysis**	**N/A**	**4.3**
	Fatigue Management Program	N/A	4.3.1
	ASME III Class I Fatigue Analysis of Vessels, Piping and Components	N/A	4.3.2
	Reactor Pressure Vessel, Nozzles, Head, and Studs	i, iii	4.3.2.1
	Control Rod Drive Mechanism (CRDM) Pressure Housings and Core Exit Thermocouple Nozzle Assemblies (CETNAs)	i	4.3.2.2
	Reactor Coolant Pump Pressure Boundary Components	i, ii, iii	4.3.2.3
	Pressurizer and Pressurizer Nozzles	ii, iii	4.3.2.4
	Steam Generator ASME III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses	iii	4.3.2.5
	ASME III Class 1 Valves	ii, iii	4.3.2.6
	ASME III Class 1 Piping and Piping Nozzles	iii	4.3.2.7
	Response to NRC Bulletin 88-08: Intermittent Thermal Cycles due to Thermal-Cycle-Driven Interface Valve Leaks and Similar Cyclic Phenomena	ii	4.3.2.8
	Response to NRC Bulletin 88-11: Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification	iii	4.3.2.9
	High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factor	ii, iii	4.3.2.10
	Fatigue Crack Growth Assessments and Fracture Mechanics Stability Analyses for Leak-Before-Break (LBB) Elimination of Dynamic Effects of Primary Loop Piping Failures	i, iii	4.3.2.11
	Class 1 Design of Class 3 Feedwater Control Valves	i	4.3.2.12
	ASME Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals	iii	4.3.3

Table 4.1-1 List of TLAAs

TLAA Category	Description	Disposition Category[i]	Report Section
	Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)	iii	4.3.4
	Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in ANSI B31.1 and ASME Section III Class 2 and 3 Piping	i	4.3.5
	ASME Section III Fatigue Analysis of Metal Bellows and Expansion Joints	i, iii	4.3.6
3.	**Environmental Qualification (EQ) of Electric Equipment**	**iii**	**4.4**
4.	**Concrete Containment Tendon Prestress Analysis**	**iii**	**4.5**
5.	**Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis**	**N/A**	**4.6**
	Fatigue Waivers for the Personnel Airlocks and Emergency Airlocks	ii	4.6.1
	Fatigue Design of Containment Penetrations	i, iii	4.6.2
6.	**Other Plant-Specific Time-Limited Aging Analyses**	**N/A**	**4.7**
	Load Cycle Limits of Cranes, Lifts, and Fuel Handling Equipment Designed to CMAA-70	i	4.7.1
	In-service Flaw Growth Analyses that Demonstrate Structural Stability for 40 years	N/A	4.7.2
	TLAA for the Corrosion Effects in the Essential Cooling Water (ECW) System	iii	4.7.3
	Reactor Vessel Underclad Cracking Analyses	i	4.7.4
	Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis	i	4.7.5

[i] (i) 10 CFR 54.21(c)(1)(i), Validation: The analyses remain valid for the period of extended operation.
(ii) 10 CFR 54.21(c)(1)(ii), Projection: The analyses have been projected to the end of the period of extended operation.
(iii) 10 CFR 54.21(c)(1)(iii), Aging Management: The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.
N/A Not Applicable: Section heading or no TLAA. Disposition categories are not applicable.

4.3.2.11 Fatigue Crack Growth Assessments and Fracture Mechanics Stability Analyses for Leak-Before-Break (LBB) Elimination of Dynamic Effects of Primary Loop Piping Failures

Summary Description
A leak-before-break analysis eliminated the need to postulate longitudinal and circumferential breaks in the reactor coolant system primary loop piping, under a 10 CFR 50.12 exemption. Elimination of these breaks omitted the need to install pipe whip restraints in the primary loop and eliminated the requirement to design for dynamic (jet and whip) effects of primary loop breaks. The containment pressurization, emergency core cooling system, and environmental qualification large-break design bases were not affected.

NRC approval of the use of leak-before-break in the reactor coolant system primary loop piping was granted with STP SER, NUREG-0781, Supplement No. 2.

Analysis
The STP LBB analysis demonstrates that reactor coolant system primary loop pipe breaks are highly unlikely and need not be included in the design basis because flaws in reactor coolant system piping would have significant leaks for extended periods before developing into a large break. Such flaws would be detected by the reactor coolant pressure boundary leak detection system long before they become full size breaks.

Fatigue Crack Growth Analyses
The final LBB submittal for STP included a fatigue crack growth assessment for a range of materials at a high stress location bounding the primary coolant system. The submittal concluded that the effects of low and high cycle fatigue on the integrity of primary piping are negligible.

Fracture Mechanics Evaluation
The STP leak-before-break analysis for the primary loop, includes a fracture mechanics evaluation which depends on the crack initiation energy integral, J_{IN}. The primary coolant loops at STP are SA 351 Grade CF8A cast stainless steel, which at PWR operating temperatures is subject to time-dependent thermal embrittlement reducing the J_{IN} integral.

Thermal embrittlement effects depend logarithmically on time (more rapid initially, approaching a saturation value over time). The Westinghouse LBB analysis for the primary loop cites a study which determined the effects of thermal aging on piping integrity for a material at thermal embrittlement saturation. The fracture mechanics evaluation considers the thermal embrittlement aging mechanism and is defined by the current operating term. Therefore the fracture mechanics evaluation is a TLAA.

Effects of Power Uprate and Steam Generator Replacement on the LBB Analysis

The Westinghouse power uprate report determined that power uprate had no effects on the LBB analysis for the primary loop piping, the pressurizer surge line, or the accumulator lines. (The pressurizer surge line and the accumulator lines are addressed in Section 4.3.2.10 in the discussion on the increase in the CUF for break consideration.) Westinghouse determined that the conclusions of the previous LBB analysis for the reactor coolant piping, pressurizer surge line, and accumulator lines remain valid after steam generator replacement.

Disposition: Validation, 10 CFR 54.21(c)(1)(i) and Aging Management, 10 CFR 54.21(c)(1)(iii)

Aging Management of the Fatigue Crack Growth Analysis

The LBB analysis found that fatigue crack growth effects will be negligible. The basis for evaluation of fatigue crack growth effects in the LBB analysis will remain unchanged so long as the number of transient occurrences remains below the number assumed for the analysis of fatigue crack growth effects.

The Metal Fatigue of the Reactor Coolant Pressure Boundary program described in Section 4.3.1 and B3.1 ensures that the numbers of transients remain below the number actually experienced during the period of extended operation remain below the assumed number; or that appropriate corrective actions maintain the design and licensing basis by other acceptable means. The effects of fatigue will therefore be managed for the period of extended operation. This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii). Continuation of the 10 CFR 50.12 LBB exemption is therefore justified for the period of extended operation.

Validation of the Fracture Mechanics Evaluation

The material fracture toughness properties selected for use in the LBB analysis are sufficiently embrittled that they bound the amount of thermal embrittlement that will occur in 60 years. Therefore this TLAA is valid for the period of extended operation and is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

A3.2.1.11 Fatigue Crack Growth Assessments and Fracture Mechanics Stability Analyses for Leak-Before-Break (LBB) Elimination of Dynamic Effects of Primary Loop Piping Failures

A leak-before-break analysis eliminated the need to postulate longitudinal and circumferential breaks in the reactor coolant system primary loop piping. Elimination of these breaks omitted the need to install pipe whip restraints in the primary loop and eliminated the requirement to design for dynamic (jet and whip) effects of primary loop breaks. The containment pressurization, emergency core cooling system, and environmental qualification large-break design bases were not affected.

Aging Management of the Fatigue Crack Growth Analysis

The final LBB submittal for STP included a fatigue crack growth assessment for a range of materials at a high stress locations bounding the primary coolant system. The LBB analysis found that fatigue crack growth effects will be negligible. The basis for evaluation of fatigue crack growth effects in the LBB analysis will remain unchanged so long as the number of transient occurrences remains below the number assumed for the analysis of fatigue crack growth effects.

The Metal Fatigue of Reactor Coolant Pressure Boundary program, described in Section A2.1, ensures that the numbers of transients actually experienced during the period of extended operation remain below the assumed number; or that appropriate corrective actions maintain the design and licensing basis by other acceptable means. The effects of fatigue will therefore be managed for the period of extended operation. This TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Validation of the Fracture Mechanics Evaluation

The STP leak-before-break analysis for the primary loop, includes a fracture mechanics evaluation which depends on the crack initiation energy integral, J_{IN}. The material fracture toughness properties selected for use in the LBB analysis are sufficiently embrittled that they bound the amount of thermal embrittlement that will occur in 60 years. Therefore this TLAA is valid for the period of extended operation and is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

B2.1.9 Open-Cycle Cooling Water System

Program Description

The Open-Cycle Cooling Water (OCCW) System program manages loss of material and reduction of heat transfer for components in scope of license renewal and exposed to the raw water of the essential cooling water (ECW) and essential cooling water screen wash system. The program includes surveillance techniques and control techniques to manage aging effects caused by biofouling, corrosion, erosion, cavitation erosion, protective coating failures and silting in components of the ECW system, and structures and components serviced by the ECW system, that are in scope of license renewal. The program also includes periodic inspections to monitor aging effects on the OCCW structures, systems and components, component cooling water heat exchanger performance testing, and inspections of the other safety related heat exchangers cooled by the ECW System, to ensure that the effects of aging on OCCW components are adequately managed for the period of extended operation. The program also includes inspections of a sample of ECW piping for wall thickness prior to the period of extended operation. Subsequent inspections will be scheduled based on the results of the initial inspections. The plant specific configuration of the aluminum-bronze piping inserted inside the slip-on flange downstream of the CCW heat exchanger is inspected at a nominal 216 week interval. An engineering evaluation is performed after each inspection. If the calculated wear over the next inspection interval indicates that the aluminum-bronze piping wall will reduce to a thickness of less than minimum wall thickness plus margin (four years of wear at the actual yearly wear rate), then the pipe will be repaired or replaced in accordance with the corrective action program. Components within the scope of the OCCW System program are: 1) components of the ECW system that are in scope of license renewal and 2) the safety-related heat exchangers cooled by the ECW system: component cooling water heat exchangers, standby diesel generator (SDG) jacket water heat exchangers, (SDG) lube oil coolers, (SDG) intercoolers, essential chiller condensers, and component cooling water pump supplementary coolers. The program is consistent with STPNOC commitments established in responses to NRC Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Components.*

The surveillance techniques utilized in the Open-Cycle Cooling Water System program include visual inspection, volumetric inspection, and thermal and hydraulic performance monitoring of heat exchangers. The control techniques utilized in the Open-Cycle Cooling Water System program include (1) water chemistry controls to mitigate the potential for the development of aggressive cooling water conditions, (2) flushes and (3) physical and/or chemical cleaning of heat exchangers and of the ECW pump suction bay to remove fouling and to reduce the potential sources of fouling.

Coating installed to mitigate corrosion of the essential chiller water box covers, SDG jacket water coolers, SDG lube oil coolers, SDG intercooler water boxes and interconnection piping are inspected and tested to assure coating integrity. The coatings are visually inspected every six years, and tested after 12 years of service at a six year frequency. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council (SSPC) PA-2 and pull off adhesion test per ASTM D4541. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.

Additional measures used to manage loss of material due to selective leaching for aluminum bronze components in the ECW system are detailed in the plant-specific aging management program Selective Leaching of Aluminum Bronze (B2.1.37).

NUREG-1801 Consistency

The Open-Cycle Cooling Water System program is an existing program that, following enhancement, will be consistent with exception to NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

Exceptions to NUREG-1801

Program Elements Affected:

Preventive Actions (Element 2), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4)

NUREG-1801, Section XI.M20, Elements 2, 3 and 4, provide for a program of flushing and inspection to confirm that fouling and degradation of surfaces is not occurring. An exception is taken to flushing the ECW train cross-tie dead legs and inspecting the interior of these lines. Instead, the external surfaces of the cross-tie lines are included in the six month dealloying visual external inspection walkdowns. The cross-tie valves and piping are also included in the essential cooling water system inservice pressure test, which includes VT-2 inspections of these components. Measures used to manage loss of material due to selective leaching are detailed in the Selective Leaching of Aluminum Bronze program (B2.1.37). These inspections and tests provide confidence in the ability to detect leakage in the piping and valves. The cross-tie lines do not have an intended function and are not required for any accident scenario within the design basis of the plant. The cross-tie valves are maintained locked closed.

Enhancements

Prior to the period of extended operation, the following enhancements will be implemented in the following program elements:

Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)

Procedures will be enhanced to include visual inspection of the strainer inlet area and the interior surfaces of the adjacent upstream and downstream piping. Material wastage, dimensional change, discoloration, and discontinuities in surface texture will be identified. These inspections will provide visual evidence of loss of material and fouling in the ECW system and serve as an indicator of the condition of the interior of ECW system piping components otherwise inaccessible for visual inspection. Procedures will also be enhanced to include the acceptance criteria for this visual inspection.

Scope (Element 1), Parameters Monitored or Inspected (Element 3), Detection of Aging Effects (Element 4), and Monitoring and Trending (Element 5)

Procedures will be enhanced to require a minimum of 25 ECW piping locations be measured for wall thickness. Selected areas will include locations that are considered to have the highest corrosion rates, such as areas with stagnant flow.

Procedures will be enhanced to require an engineering evaluation after each inspection of the aluminum-bronze piping inserted inside the slip-on flange downstream of the CCW heat exchanger. The engineering evaluation will calculate wear over the next inspection interval using a margin of four years of wear at the actual yearly wear rate. Corrective action in accordance with the corrective action program will be initiated if the calculated wear indicates that the aluminum-bronze piping wall will reduce to a thickness of less than minimum wall thickness plus margin (four years of wear at the actual yearly wear rate).

Corrective Actions (Element 7)

Procedures will be enhanced to require loss of material in piping and protective coating failures be documented in the corrective action program. The resolution will include an engineering evaluation of the condition.

No later than the date the renewed operating licenses are issued ~~Prior to the next scheduled inspection in 2013~~ the following enhancements to coatings will be implemented

Parameters Monitored or Inspected (Element 3) and Detection of Aging Effects (Element 4)

Procedures will be enhanced to inspect and test coatings for loss of coating integrity. The coatings installed to mitigate corrosion of the essential chiller water box covers, SDG jacket water coolers, SDG lube oil coolers, SDG intercooler water boxes and interconnection piping are visually inspected every six years, and tested after 12 years of service at a six year frequency. The coating tests performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council (SSPC) PA-2, and pull off adhesion test per ASTM D4541. Coating inspections and tests are performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.

Operating Experience

Industry operating experience evaluations, Maintenance Rule Periodic Assessments, and OCCW component performance testing results have shown that the effects of aging are being adequately managed.

A review of the STP plant specific operating experience indicates that macrofouling, general corrosion, erosion corrosion, and cavitation erosion have been observed in aluminum bronze components.

In 2001, plant inspections of the ECW pumps revealed signs of flow erosion and corrosion on the pump internal and external surfaces. The pump vendor recommended application of Belzona coating to provide protection against erosion and corrosion and the coating was applied to the internal wetted surfaces of all ECW pumps. Use of Belzona has improved pump performance and service life of the components.

In May 2005, damage was discovered in the slip-on flange immediately downstream of the component cooling water heat exchanger 1B ECW return throttle valve. The damage was due to cavitation erosion. The corresponding locations in the other ECW trains were inspected. The damaged areas of all six trains were replaced or reworked in accordance with the applicable codes and piping specifications. A design modification was performed to coat the affected areas with Belzona, and PMs were generated to perform regular inspections. The use of Belzona for mitigating cavitation erosion has been successful in prolonging service life of the components.

The OCCW System program operating experience information provides objective evidence to support the conclusion that the effects of aging are adequately managed so that the structure and component intended functions are maintained during the period of extended operation.

NRC Generic Letter 89-13 was based on industry operating experience and forms the basis for the STP OCCW System program.

Conclusion

The continued implementation of the Open-Cycle Cooling Water System program will provide reasonable assurance that aging effects will be managed such that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Enclosure 3

Regulatory Commitments

A4 LICENSE RENEWAL COMMITMENTS

Table A4-1 identifies proposed actions committed to by STPNOC for STP Units 1 and 2 in its License Renewal Application. These and other actions are proposed regulatory commitments. This list will be revised, as necessary, in subsequent amendments to reflect changes resulting from NRC questions and STPNOC responses. STPNOC will utilize the STP commitment tracking system to track regulatory commitments. The Condition Report (CR) number in the Implementation Schedule column of the table is for STPNOC tracking purposes and is not part of the amended LRA.

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule

4	Enhance the Open-Cycle Cooling Water System program procedures to:
	• include visual inspection of the strainer inlet area and the interior surfaces of the adjacent upstream and downstream piping. Material wastage, dimensional change, discoloration, and discontinuities in surface texture will be identified. These inspections will provide visual evidence of loss of material and fouling in the ECW system and serve as an indicator of the condition of the interior of ECW system piping components otherwise inaccessible for visual inspection.
	• include the acceptance criteria for this visual inspection.
	• require a minimum of 25 ECW piping locations be measured for wall thickness prior to the period of extended operation. Selected areas will include locations considered to have the highest corrosion rates, such as areas with stagnant flow.
	• require an engineering evaluation after each inspection of the aluminum-bronze piping inserted inside the slip-on flange downstream of the CGW heat exchanger,
	    o require the engineering evaluation calculated wear over the next inspection interval using a margin of four years of wear at the actual yearly wear rate,
	    o require corrective action in accordance with the corrective action program be initiated if the calculated wear indicates that the aluminum-bronze piping wall will reduce to a thickness of less than minimum wall thickness plus margin (four years of wear at the actual yearly wear rate),
	• require loss of material in piping and protective coating failures be documented in the Corrective action program, and
	• require an engineering evaluation be performed when loss of material in piping or
		B2.1.9	Prior to the period of extended operation
			
			CR 10-23256

Table A4-1 License Renewal Commitments

Item #	Commitment	LRA Section	Implementation Schedule
	protective coating failures is identified. Enhance the Open-Cycle Cooling Water System program procedures to: • visually inspect every six years, and test after 12 years of service at a six year frequency the coating applied on the essential chiller water box covers, standby diesel generator (SDG) jacket water coolers, SDG lube oil coolers, SDG intercoolers and interconnection piping. The coating test performed are low voltage holiday test per ASTM D5162, dry film thickness test per ASTM D7091 and Steel Structures Painting Council (SSPC) PA-2 and pull off adhesion test per ASTM D4541, • require coating inspections and tests be performed by a qualified Nuclear Coating Specialist (NCS) as defined by ASTM D7108 or by Coatings Surveillance Personnel (CSP) under the technical direction of the NCS.		~~Prior to the next scheduled inspection in 2013~~ No Later than the date the renewed operating licenses are issued