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RBG-46368

December 8, 2004

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Additional Information Regarding River Bend Station Fluence Calculations
Docket No. 50-458
License No. NPF-47

- References:
1. Amendment 114 to Facility Operating License No. NPF-47 (TAC No. MA6185), dated October 6, 2000, "Increase in Maximum Allowable Thermal Power to 3039 Megawatts Thermal," RBC-49387
 2. Letter from R. J. King to U.S. NRC Document Control Desk, dated May 9, 2003, Supplement to License Amendment Request (LAR) 2002-23, "Request for a Change to the Reactor Vessel Material Surveillance Program" RBG-46046
 3. Letter 2003-173 from the BWRVIP (Boiling Water Reactor Vessel and Internals Project) to the U.S. NRC Document Control Desk, dated June 10, 2003, "River Bend 183 Degree Surveillance Capsule Report"
 4. Amendment 136 to Facility Operating License No. NPF-47 (TAC No. MB6140), dated July 24, 2003, "Reactor Vessel Material Surveillance Program," RBC-50059
 5. Report Number MPM-904779, "Neutron Transport Analysis for River Bend Station," MPM Technologies, Inc., November 2004.
 6. Calculation No. QR-779-17, Revision 1, "Update to the Adjusted RTndt (ART) Values for the RBS Reactor Vessel Using Available BWRVIP ISP Data and Updated Fluence.
 7. "Nine Mile Point Nuclear Station, Unit No. 1 – Issuance of Amendment RE: Pressure-Temperature Limit Curves and Tables," (TAC No MB6687), October 27, 2003.

Dear Sir or Madam:

In the Reference 1 Safety Evaluation Report, the NRC staff approved the use of the River Bend Station (RBS) Pressure-Temperature (P-T) limit curves designated as 32 EFPY (effective full power years) curves, with a limitation that they only be used through 16 EFPY of operation. For continued operation beyond 16 EFPY, the staff required submittal of

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additional information regarding the adequacy of RBS fluence calculations or submittal of an amendment to the P-T limit curves.

In Reference 2, RBS committed to:

Perform new fluence analysis in accordance with the guidance of Regulatory Guide 1.190 and incorporate the reactor pressure vessel (RPV) surveillance capsule testing results/data that will be available in 2003 from the BWRVIP ISP. Based on the new fluence analysis and surveillance capsule data, evaluate the current P-T Limit Curves for their "As-Is" acceptance, or revise accordingly.

In June 2003, a report containing RBS surveillance capsule testing results (Reference 3) was submitted to the NRC. One of the conclusions in the report (see Section 7) is that reported fluence is significantly lower than the fluence used to calculate the current P-T limits.

The NRC approved changes (Reference 4) to the RBS Updated Safety Analysis Report (USAR) revising the reactor vessel surveillance program to incorporate the Boiling Water Reactor Vessel Internals Project Integrated Surveillance Program (BWRVIP ISP) into the licensing basis (USAR Section 5.3.1.6.1, "Compliance with Reactor Vessel Material Surveillance Program Requirements"). The Reference 4 Safety Evaluation restates the Reference 2 commitment and credits the commitment when concluding the changes are acceptable.

New updated fluence calculations for the RPV have been subsequently performed in accordance with the guidance of Regulatory Guide 1.190 (Reference 5). This analysis was performed consistent with the methods described in reference 7. Both RBS cycles 1 and 9 dosimetry was evaluated by this analysis resulting in average C/M ratios of 1.04 and 0.94 respectively. These results support the 17.8 % vessel fluence uncertainty determined by the fluence analysis. Using the new updated fluence analysis and the latest RPV surveillance capsule testing results/data available from the BWRVIP ISP as inputs, the current P-T Limit Curves (for use to 32 EFPY of operation) have been evaluated and found to be "Acceptable As Is" and do not need to be revised (reference 6). Thus, the 16 EFPY operating limit restriction on the current P-T Limit Curves is being removed and the full 32 EFPY operating period restored. The current P-T curves will not be revised at this time.

Reference 6 updates the Adjusted Reference Temperature (ART) and evaluates impacts to the current P-T Limit Curves using the new updated fluence analysis for the RPV. The updated ART incorporates the new vessel surveillance material data available from the BWRVIP ISP testing results and satisfies the guidelines established in Reg. Guide 1.190. The calculation was developed to comply with Appendix G to 10CFR50 and with Reg. Guide 1.99, Rev. 2, as well as to implement the utility responsibilities outlined in Sections 3.2.5 and 3.2.6 of BWRVIP-102, and Section 6.1 of BWRVIP-86A. These documents also require an assessment and evaluation to determine the effects on plant operations (e.g., P-T Limits)

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based on review of updated or current reactor vessel material surveillance data and test results that are available through the BWRVIP ISP.

The calculation concludes that the limiting updated ART value (95.8° F) is lower than the limiting current ART value (102° F), which is the basis for the current RBS P-T Limit Curves. The ART evaluation applies to the RPV beltline region and estimates the effect on the integrity of the materials from neutron radiation embrittlement, which results in decreased fracture toughness over time. The evaluation shows that since the updated ART value is lower than the current ART value, the current P-T Limit Curves are not impacted and remain bounding (conservative) to the full 32 EFPY of operation for RBS. Therefore, the current P-T Limit Curves are Acceptable As-Is and do not need to be revised. The updated data and information is provided in the Attachment to this letter.

We are processing changes to incorporate the new information into our USAR and to remove the 16 EFPY operating restriction from our Technical Requirements Manual (TRM). These changes will be made under the RBS 10CFR 50.59 program.

There are no commitments in this letter. If you have any questions, please contact me at 225-381-4157.

Sincerely,



David N. Lorfing
Manager Licensing - Acting

DNL/wjf

Attachment

cc: U. S. Nuclear Regulatory Commission
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Attachment to RBG-46368

Updated Adjusted Reference Temperature (ART) Evaluation for the River Bend Reactor Vessel Beltline Materials at the 1/4Thickness and 3/4Thickness Locations Applicable to 32 EFY with Power Upgrades

Material Description		Chemical Composition		Initial RT _{NDT} (8)	Chemistry Factor (CF)	32 EFY Peak Fluence, n/cm ² (E>1.0 Mev.)			ΔRT _{NDT} , F at 32 EFY (4)		Φ _I	Φ _Δ Margin		ART _{NDT} , F at 32 EFY	
		Cu wt%	Ni wt%			Inside Wetted Surface (2)	1/4 T Location (3)	3/4 T Location (3)	1/4 T Location	3/4 T Location		1/4 T	3/4 T	1/4 T Location	3/4 T Location
Regulatory Guide 1.99, Revision 2, Position 1															
Plate	C3138-2 (8)	0.075	0.615	0	47.5	5.07E+18	3.50E+18	1.83E+18	33.7	26.0	0	16.9 13.0	33.7 26.0	67.5	52.1
Plate	C3054-1 (8)	0.085	0.685	-20	54.5	5.07E+18	3.50E+18	1.83E+18	38.7	29.9	0	17.0 14.9	34.0 29.9	52.7	39.8
Plate (1)	C3054-2 (7)	0.08	0.673	10	51.0	5.07E+18	3.50E+18	1.83E+18	36.2	28.0	0	17.0 14.0	34.0 28.0	80.2	65.9
Weld	492L4871/A421B27AE (8)	0.04	0.95	-60	54.0	5.07E+18	3.50E+18	1.83E+18	38.4	29.6	0	19.2 14.8	38.4 29.6	16.7	-0.8
Weld	492L4871/A421B27AF (8)	0.03	0.98	-50	41.0	5.07E+18	3.50E+18	1.83E+18	29.1	22.5	0	14.6 11.2	29.1 22.5	8.3	-5.0
Weld (1)	5P6756/0342 Tandem Wire Proc. (7)	0.084	0.938	-50	113.6	5.07E+18	3.50E+18	1.83E+18	80.7	62.3	0	28.0 28.0	56.0 56.0	86.7	68.3
Weld (1)	5P6756/0342 Single Wire Proc. (7)	0.084	0.938	-60	113.6	5.07E+18	3.50E+18	1.83E+18	80.7	62.3	0	28.0 28.0	56.0 56.0	76.7	58.3
Regulatory Guide 1.99, Revision 2, Position 2															
Weld (1)	5P6756/0342 Tandem Wire Proc. (7)	See note (7)	See note (7)	-50	165.85 (5)	5.07E+18	3.50E+18	1.83E+18	117.8	91.0	0	14.0 14.0 (6)	28.0 28.0 (6)	[95.8]	69.0
Weld (1)	5P6756/0342 Single Wire Process (7)	See note (7)	See note (7)	-60	165.85 (5)	5.07E+18	3.50E+18	1.83E+18	117.8	91.0	0	14.0 14.0 (6)	28.0 28.0 (6)	85.8	59.0

Attachment to RBG-46368 (continued)

Notes:

- 1) Material Heat from which surveillance specimens were taken.
 - 2) Calculated Peak Fluence (See Ref. 5 & 6).
 - 3) Attenuated Peak Fluence using Reg. Guide 1.99, Rev. 2 (See Ref. 5 & 6).
 - 4) Reg. Guide 1.99, R/2, Fluence Factor (FF) to determine ΔRT_{NDT} ($CF \times FF$) for all materials: $1/4t = 0.71$ and $3/4t = 0.548$ (See Ref. 6).
 - 5) Vessel and Surveillance-based CF Adjusted for the vessel beltline WELDS using the BWRVIP ISP surveillance data with the ratio procedure of Reg. Guide 1.99, R/2, Position 2 (See Ref. 6).
 - 6) Reduced terms for credible surveillance data, Ref. Reg. Guide 1.99, R/2, Position 2 (See Ref. 6).
 - 7) Plate - Chemical compositions based on Best Estimate Average Chemistry values for the vessel materials - Plate Heat C3054-2 (Cu = 0.08 %, Ni = 0.673 %) (See Ref. 6).
Production Welds - Chemical composition based on the Weld Best Estimate Coil Weighted Average Chemistry values for vessel production Weld Material - Heat 5P6756/0342 is Vessel Coil Weighted Average excluding surveillance data (Cu = 0.084 %, Ni = 0.938 %) (See Ref. 6).
Surveillance Welds - Chemical compositions based on the Best Estimate Vessel Average Chemistry values for the vessel Surveillance Weld Material - The chemistry values are from the average of all unique measurements of the available surveillance data sets for Weld Material Heat 5P6756 (Cu = 0.06 %, Ni = 0.93 %) (See Ref. 6).
 - 8) VESSEL Chemical Composition and Initial RT_{NDT} (See Ref. 6).
- [] Controlling value of the Adjusted Reference Temperatures (ART).