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Energy to Serve Your WorldSM

May 8, 2001

Docket Nos. 50-321
50-366

HL-6084

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Edwin I. Hatch Nuclear Plant
Deferral of Unit 2 RPV Surveillance Capsule Removal

Ladies and Gentlemen:

By transmittal of this letter, Southern Nuclear Operating Company (SNC) requests approval to defer the removal of the second Plant Hatch Unit 2 reactor pressure vessel (RPV) surveillance capsule for one operating cycle. Presently, the Unit 2 capsule is scheduled for removal during the upcoming Fall 2001 refueling outage planned to commence in mid September. Plant Hatch is a participant in the pending Integrated Surveillance Program (ISP) currently under NRC review, and as provided in the ISP, the Unit 2 capsule is scheduled for removal in 2004. Therefore, deferral of the capsule removal for one operating cycle is prudent based upon General Electric's analysis, which is provided as an enclosure to this letter. Additionally, in a subsequent Request for Additional Information to the BWR Vessel and Internals Project, the NRC suggested deferral of the Unit 2 capsule removal to enhance consistency between the capsule fluence and the target RPV 1/4T end-of-life fluence.

It should be noted that a deferral evaluation for the Plant Hatch Unit 2 Spring 2000 refueling outage was performed and provided to the NRC, as information only, in an SNC letter dated January 4, 2000. The capsule removal was deferred for one operating cycle pending approval of the ISP.

As delineated in an NRC letter to the BWR Vessel and Internals Project dated May 16, 2000, the NRC requested that future deferrals be submitted for review and approval. Accordingly, to support the Unit 2 Fall refueling outage, SNC seeks approval of the subject one-cycle deferral request no later than September 8, 2001.

Please contact this office if you have any questions.

Respectfully submitted,

H. L. Sumner, Jr.

OCV/sp

cc: (See next page.)

A008

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Enclosure: Deferral of Hatch Unit 2 Second Capsule Withdrawal Schedule
GENE-B13-02097-00-04

cc: Southern Nuclear Operating Company
Mr. P. H. Wells, Nuclear Plant General Manager
SNC Document Management (R-Type A02.001)

U.S. Nuclear Regulatory Commission, Washington, D.C.
Mr. L. N. Olshan, Project Manager - Hatch

U.S. Nuclear Regulatory Commission, Region II
Mr. L. A. Reyes, Regional Administrator
Mr. J. T. Munday, Senior Resident Inspector - Hatch

Enclosure

Edwin I. Hatch Nuclear Plant
Deferral of Hatch Unit 2 Second Capsule Withdrawal Schedule

GENE-B13-02097-00-04



GE Nuclear Energy

Engineering & Technology
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GENE-B13-02097-00-04
May 3, 2001

cc: DJ Bouchie
BJ Branlund

Mr. Ozzie Vidal
Southern Nuclear Operating Company
40 Inverness Center Parkway
Birmingham, AL 35242

SUBJECT: Deferral of Hatch Unit 2 2nd Capsule Withdrawal Schedule

Dear Mr. Vidal:

SUMMARY

The Hatch Unit 2 2nd reactor pressure vessel (RPV) surveillance capsule is scheduled to be removed during the Fall 2001 outage. SNOG would like to defer withdrawal of this specimen capsule for one operating cycle (until Spring 2003). A previous deferral evaluation was performed and the information was provided to the NRC, pending approval of the Integrated Surveillance Program (ISP). Hatch Unit 2 is currently slated to be a participant in the ISP, representing itself and two (2) other US BWRs. An implementation schedule is currently under review by the NRC. This schedule provides for the Hatch Unit 2 capsule to be withdrawn in 2004. Because the ISP schedule has not been finalized, it is prudent for Hatch Unit 2 to defer the withdrawal of their capsule in order to optimize the results obtained from this capsule. The purpose of this letter is to provide a justification for such a deferral.

Deferring the Hatch Unit 2 2nd capsule is acceptable for the following reasons: (1) The 1st capsule measured shift results were within the Regulatory Guide 1.99, Revision 2 (Reg. Guide 1.99) [1] predicted shift range and therefore, the 2nd capsule results are expected to be within the predicted range. (2) It is GE's experience that measured results for both 1st and 2nd capsules are within the Reg. Guide 1.99 predicted values when including the margin term. (3) The projected difference in measured shift between a 15 EFPY withdrawal (original requirement) and the requested deferred withdrawal is small and will not affect the operating capability of the plant.

The revised capsule withdrawal schedule addresses the NRC criteria [6] as follows:

- This deferral is consistent with the ISP plan submitted by the BWRVIP. In addition, it is an express outcome of the ISP as submitted.
- The data from the capsule would not be expected to provide Charpy shift values large enough (greater than 34°F for plate material and 56°F for weld material) to be distinguishable from the scatter inherent in the Charpy testing.
- The P-T curves currently licensed for up to 54 EFPY are not beltline limited at normal operating pressures. Therefore, the availability of capsule dosimetry results is not expected to have an impact on these curves.

Therefore, it is reasonable to extend the capsule withdrawal schedule for the Hatch Unit 2 2nd capsule at least until the NRC review of the ISP schedule has been completed.

INTRODUCTION/BACKGROUND

In response to requirements set forth in 10CFR50 Appendix H [2], nuclear plants must perform surveillance testing at periodic intervals to address issues relating to RPV fracture toughness. The key issue addressed by this testing is RPV embrittlement as a result of irradiation.

Surveillance testing is routinely performed by testing Charpy samples of base, weld, and heat affected zone (HAZ) metal which were installed in the RPV in surveillance capsules during vessel fabrication. Typically, a BWR vessel has three such capsules which are removed for testing at periodic intervals throughout the operating life of the plant. The specimens are removed and destructively tested at each of these intervals, and the results are used in conjunction with Reg. Guide 1.99 methodology [1] to adjust operating limits (pressure-temperature) curves as necessary to ensure protection from brittle fracture.

The BWRVIP is currently developing an Integrated Surveillance Program (ISP) that has been submitted to the NRC for review. The purpose of the ISP is to monitor radiation embrittlement of the U.S. BWR fleet reactor pressure vessels. As described above, currently each U.S. BWR has a surveillance program for monitoring the changes in RPV material properties due to neutron irradiation. Each BWR has its own surveillance program and the specimen selection, testing, analysis and monitoring is conducted on a plant-specific basis.

Although each plant has an existing program that meets 10CFR50 Appendix H [2], the materials for the ISP are specifically chosen to best represent the limiting plant and weld material for each plant using specimens from the BWR fleet and the Supplemental Surveillance Program (SSP).

Although the implementation schedule is not yet finalized, in the current revision of the ISP design, the Hatch Unit 2 surveillance capsules have been selected as representative specimens for their own RPV and two (2) other U.S. BWR RPVs.

METHODS AND ASSUMPTIONS

The Hatch Unit 2 1st capsule results demonstrate that the RPV materials are behaving well within the bounds set forth by Reg. Guide 1.99. The following table provides a comparison of the 1st capsule measured results [3] versus the Reg. Guide 1.99 predictions, both with and without the Margin term ($2\sigma_{\Delta}$, 34°F for plate material and 56°F for weld material).

Specimen	Measured Shift ⁽¹⁾ (°F)	Predicted Shift ⁽²⁾ (°F)	Predicted Shift + Margin ⁽²⁾ (°F)
Plate	3	10	44
Weld	0	13	69

⁽¹⁾ based upon the 1st capsule fluence of 2.3×10^{17} n/cm²

⁽²⁾ calculated per Regulatory Guide 1.99, Revision 2 [1]

The Hatch Unit 2 2nd capsule results are expected to fall within the bounds set forth by Reg. Guide 1.99. The following tables present 2nd capsule plate and weld material results from other BWRs to demonstrate typical BWR material behavior versus the Reg. Guide 1.99 predictions, both with and without the Margin term.

Plate Materials

Plant	Measured Shift (°F)	EFPY	Capsule Fluence ($\times 10^{17}$ n/cm ²)	Predicted Shift ⁽¹⁾ (°F)	Predicted Shift + Margin ⁽¹⁾ (°F)
BWR3	12	6	0.7	8	42
BWR3	78	15	6.6	48	82
BWR3	2	16	12.6	31	65
BWR4	53	11	2.8	35	69
BWR4	77	15	11.0	72	106
BWR4	15	13	5.0	22	56
BWR4	62	14	4.6	69	103

⁽¹⁾ calculated per Regulatory Guide 1.99, Revision 2 [1]

Weld Materials

Plant	Measured Shift (°F)	EFPY	Capsule Fluence (x10 ¹⁷ n/cm ²)	Predicted Shift ⁽¹⁾ (°F)	Predicted Shift + Margin ⁽¹⁾ (°F)
BWR3	4	6	0.3	5	61
BWR3	76	15	6.6	77	133
BWR3	95	16	12.6	64	120
BWR4	62	11	2.8	41	97
BWR4	16	15	11.0	13	69

⁽¹⁾ calculated per Regulatory Guide 1.99, Revision 2 [1]

Hatch Unit 2 is expected to achieve approximately 16.2 EFPY at the time of the Fall 2001 outage. Assuming 100% capacity, the plant will achieve approximately 17.7 EFPY at the time of the Spring 2003 outage. The Hatch Unit 2 2nd capsule predicted values [3] can be extrapolated to 15 EFPY which represents the original withdrawal schedule, 18 EFPY which represents the current withdrawal schedule, and 21 EFPY which will bound the requested interval of the one cycle deferral. It may be noted that, assuming 100% capacity, 21 EFPY also bounds the expected EFPY at the time of the Spring 2005 outage, during which time the capsule would be withdrawn based upon the ISP implementation schedule currently under review by the NRC. Withdrawal during the Spring 2005 outage is consistent with the ISP implementation schedule, and is an outcome of the ISP. The following extrapolation conservatively uses peak ID power uprate fluences previously calculated for Hatch Unit 2 [4].

Plate:	Copper Content	0.08%
	Nickel Content:	0.63%
	Chemistry Factor:	51
	6.58 EFPY fluence:	2.3x10 ¹⁷ n/cm ² [3]
	6.58 EFPY predicted shift:	10°F [3]
	6.58 EFPY predicted shift + margin:	44°F [3]
	15 EFPY fluence:	1.02x10 ¹⁸ n/cm ²
	15 EFPY predicted shift:	21.5°F
	15 EFPY predicted shift + margin:	55.5°F
	18 EFPY fluence:	1.22x10 ¹⁸ n/cm ²
	18 EFPY predicted shift:	23.4°F
	18 EFPY predicted shift + margin:	57.4°F
	21 EFPY fluence:	1.42x10 ¹⁸ n/cm ²
	21 EFPY predicted shift:	25.1°F
	21 EFPY predicted shift + margin:	59.1°F

Weld:	Copper Content	0.13%
	Nickel Content:	0.10%
	Chemistry Factor:	67
	6.58 EFPY fluence:	2.3×10^{17} n/cm ² [3]
	6.58 EFPY predicted shift:	13°F [3]
	6.58 EFPY predicted shift + margin:	69°F [3]
	15 EFPY fluence:	1.02×10^{18} n/cm ²
	15 EFPY predicted shift:	28.2°F
	15 EFPY predicted shift + margin:	84.2°F
	18 EFPY fluence:	1.22×10^{18} n/cm ²
	18 EFPY predicted shift:	30.7°F
	18 EFPY predicted shift + margin:	86.7°F
	21 EFPY fluence:	1.42×10^{18} n/cm ²
	21 EFPY predicted shift:	32.9°F
21 EFPY predicted shift + margin:	88.9°F	

It may be noted that the values for 6.58 EFPY in the above tables represents the data presented in [3]. The nickel content for the weld material reflects the latest information (0.10% vs. 0.12%) which has been used for the calculations for 15, 18, and 21 EFPY. It can be seen from the tables above that the difference in predicted shift between 15 EFPY representing the original capsule withdrawal schedule, 18 EFPY representing the current withdrawal schedule, and 21 EFPY representing the proposed deferred capsule withdrawal schedule is small (approximately 4°F and 5°F for plate and weld materials, respectively, between 15 and 21 EFPY). With small values of shift significantly less than those expected due to scatter, it is reasonable to defer withdrawal of the Hatch Unit 2 2nd capsule as provided for in the ISP implementation schedule in order to optimize the data obtained from this capsule.

The currently licensed 20 EFPY Pressure-Temperature (P-T) curves for Hatch Unit 2 are based upon a shift of 43.5°F [5]. As shown above, the 21 EFPY value of predicted shift is based upon conservative estimates of both EFPY and fluence (using peak ID instead of 1/4T). The value of shift represented in the 20 EFPY P-T curves is significantly greater than the conservatively calculated maximum predicted shift value of 34°F for the capsule materials at 21 EFPY. The expected shift at 21 EFPY for the plate material is less than 34°F, and less than 56°F for the weld material, which would not be distinguishable from the scatter inherent in the Charpy testing. The currently licensed P-T curves are not beltline limited at normal operating pressures. The difference between the 20 EFPY and 54 EFPY curves is approximately 10°F, and this shift occurs above 1200 psig for Curve A, and above 1300 psig for Curves B and C. Therefore, it is unlikely that capsule results will have an impact on the P-T curves for Hatch Unit 2, and it is reasonable to defer withdrawal of the 2nd capsule for one cycle.

RESULTS AND CONCLUSIONS

The BWRVIP is currently in the process of developing an Integrated Surveillance Program (ISP) for the BWR fleet. Although each plant has an existing program that meets 10CFR50 Appendix H [2], the materials for the ISP are specifically chosen to best represent the limiting plate and weld material for each plant using specimens from the BWR fleet and the Supplemental Surveillance Program (SSP). The Hatch Unit 2 capsules are currently included in the ISP. The ISP implementation schedule currently under review by the NRC provides for the Hatch Unit 2 capsule to be withdrawn in 2004. Therefore, it will be prudent to defer capsule removal of the Hatch Unit 2 2nd capsule until the NRC completes its review of the ISP implementation schedule.

Deferring the Hatch Unit 2 2nd capsule is acceptable for the following reasons: (1) The 1st capsule measured shift results were within the Reg. Guide 1.99 predicted shift range and therefore, the 2nd capsule results are expected to be within the predicted range. (2) It is GE's experience, in general, that measured results for both 1st and 2nd capsules are within the predicted Reg. Guide 1.99 predicted values when including the margin term. (3) The difference in expected measured shift between a 15 EFPY withdrawal (original schedule) and the requested deferred withdrawal is small and will not affect the operating capability of the plant.

The revised capsule withdrawal schedule addresses the NRC criteria [6] as follows:

- This deferral is consistent with the ISP plan submitted by the BWRVIP. In addition, it is an express outcome of the ISP as submitted.
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- The P-T curves currently licensed for up to 54 EFPY are not beltline limited at normal operating pressures. Therefore, the availability of capsule dosimetry results is not expected to have an impact on these curves.

Therefore, it is reasonable to extend the capsule withdrawal schedule for the Hatch Unit 2 2nd capsule at least until the NRC review of the ISP implementation schedule has been completed.

REFERENCES

- [1] "Radiation Embrittlement of Reactor Vessel Materials", USNRC Regulatory Guide 1.99, Revision 2, May 1988.
- [2] "Reactor Vessel Material Surveillance Program Requirements", Appendix H to Part 50 of Title 10 of the Code of Federal Regulations", December 1995.

- [3] T.A. Caine, "E.I. Hatch Nuclear Power Station, Unit 2 Vessel Surveillance Materials Testing and Fracture Toughness Analysis", GENE, San Jose, CA, May 1991, (GE Report SASR 90-104).
- [4] R.G. Carey, "Extended Power Uprate Evaluation Task Report for Edwin I. Hatch Plant Units 1 and 2 – Revised Impact on Vessel Fracture Toughness", GENE, San Jose, CA, March 1998 (GE Report GE-NE-A13-00402-9).
- [5] Amendment 163 to the Hatch Unit 2 Technical Specification, Section 3.4.9
- [6] Letter, JR Strosnider (NRC) to Carl Terry (BWRVIP), "BWR Integrated Surveillance Program (BWRVIP-78) (TAC No. M99894)", May 16, 2000

If you have any questions, please call me at (408) 925-5945 or Betty Branlund at (408) 925-1472. Our FAX number is (408) 925-1150.

Sincerely,

A handwritten signature in cursive script that reads "Lori Tilly".

Lori Tilly, Senior Engineer
Structural Mechanics & Materials