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SUBJECT: Submits info which is based on engineering rept NER-1M-048, "Fluence Analysis Rept for Boaqt Sample - Nine Mile Point Unit 1," in response to GL 94-03, "Intergranular Stress Corrosion Cracking of Core Shrouds in BWRs."

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June 30, 1998
NMP1L 1337

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

RE: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Subject: *Generic Letter 94-03, Intergranular Stress Corrosion Cracking of Core Shrouds in Boiling Water Reactors*

Gentlemen:

Niagara Mohawk Power Corporation's (NMPC) letter dated February 27, 1998 indicated that the final review of the core shroud fluence measurement results was planned after the evaluation of the reactor vessel material surveillance 210 degree vessel coupon dosimetry analysis was completed. The letter stated that this evaluation would verify the applicability of the high energy neutron spectrum assumed in the boat sample fluence measurements and that if any changes to the fluence measurement results were required, this information would be submitted to the NRC by April 30, 1998. In our letter dated April 30, 1998, NMPC informed the NRC that the 210 degree vessel coupon dosimetry analysis had not been completed and revised our commitment to submit the subject information by June 30, 1998. The purpose of this letter is to submit this information which is based on NMPC engineering report NER-1M-048, Fluence Analysis Report for Boat Sample - Nine Mile Point Unit 1.

The reactor vessel neutron exposure surveillance 210 degree capsule material was removed for analysis during Refueling Outage No. 14 (RFO-14), March 1997, and the results provided to you in report MPM-398675, Nine Mile Point Unit 1 210 Degree Surveillance Capsule Report, via our submittal dated March 31, 1998. That report provided the tabulation (Table 3-2) of the 210 degree copper, iron, and nickel dosimetry results. The conclusion reached in that report was that a consistent difference exists between the copper, iron and nickel dosimeters. The resolution of this difference was attributed to fuel cycle effects which may have invalidated the neutron transport results used to analyze the dosimeters. The report stated that the revised neutron transport analyses would be completed and the results submitted as part of the revised Pressure Temperature (P-T) curve Technical Specification Amendment Application. That Application was submitted on June 19, 1998. Attachment D to that submittal consisted of report MPM-59838, Pressure Temperature Operating Curves for Nine Mile Point Unit 1.

A018/0

The conclusion reached from the Cycle 12 neutron flux calculation is summarized in Section 3 of report MPM-59838. The review of the analysis of the 210 degree vessel surveillance dosimeters has concluded that four factors impact the core shroud vertical weld fluence analysis reports submitted in our letter dated February 27, 1998:

1) The Cycle 7 neutron transport calculation performed in 1984 was used for the core shroud boat sample analysis. The new (1998) neutron transport analysis discussed in Section 3 of MPM-59838 was performed using the latest transport cross sections and the fission spectrum. The MPM-59838 report concluded that in the most important energy range for fast flux values between 0.1 and 10 MeV, the differences were small. The spectral averaged dosimeter reaction cross sections for the iron, nickel and copper reactions above 1 MeV were found to differ by about 4 percent. This conclusion is applicable to the shroud boat sample calculation and, therefore, the newer cross sections can be expected to result in measured fluence values that are 4 percent higher.

2) The 210 degree capsule dosimeter was determined to be irradiated from reactor start-up to March 1997 for a total of 16.76 effective full power years (EFPYs) at 1850 MWt, which is identical to the core shroud boat sample irradiation time. The boat sample power history used a yearly power history for Cycle 1 through 11 and monthly for Cycle 12, for a total power history of 16.97 EFPY. The 210 degree capsule power history was determined based on monthly data from initial start-up and has been determined to be a more accurate accounting.

3) The comparison of the 210 and 300 degree capsules' dosimeter difference reported in Section 3.4.2 of MPM-59838 concluded that the difference between the nickel and iron reactions cannot be resolved by cycle differences in relative exposure of the peripheral bundles. The explanation provided is that the Cycle 12 axial flux profile is peaked higher above midplane in Cycle 12 than in the previous Cycle 7 neutron transport profile. It is postulated that the power shifted upward as Cycle 12 progressed and the flux at the midplane capsule location decreases as the cycle progresses. The relatively short lived half-life of the nickel monitor does indicate a drop off consistent with this explanation.

   The 300 degree capsule was removed in 1983 after exposure from start-up through mid-Cycle 7. The 300 degree capsule copper, iron and nickel were in good agreement at that time and did not exhibit a notable difference. The shroud boat sample analysis averaged the iron and nickel based on the 300 degree capsule copper, iron and nickel agreement and considered this average to not have any bias. The 210 degree capsule analysis has concluded that the nickel dosimeter was biased lower than the iron due to axial flux variations toward the end of Cycle 12.

   The shroud boat sample V10 was taken at an elevation approximately 63.7 inches above bottom of active fuel (BAF) or 8.3 inches below core midplane, and the V9 sample was taken 98.4 inches above BAF or 26.4 inches above core midplane. Review of the shroud boat sample analysis, Framatome Technologies Report 86-1266298-00 Table D-1 and D-2, shows that the V10 nickel/iron variation is slightly larger than the V9 variation by approximately 5 to 10 percent, which is consistent with the shift in the

axial profile causing the variation in the nickel and iron values. This observation is consistent with the explanation provided for the iron/nickel variation.

It is also noted that the V9 boat sample location of 26 inches above midplane is approximately the location of the peak axial flux as shown on Figure 3-3 of MPM-59838 and the azimuthal flux is predicted at approximately 17 degrees as shown on Figure 3-2. The best estimate of the V9 weld azimuthal location is 20 degrees. The new transport analysis confirms that the V9 boat sample was taken at the approximate peak axial and azimuthal flux location.

Based on this evaluation, the shroud boat sample fluence measurement should be based on iron and not the average iron and nickel.

4) MPM-59838 Section 3.4.2 concluded that the core midplane fast flux has decreased since the end of Cycle 7. Therefore, the copper reaction from the 210 degree capsule B was used for the exposure determination because this is the only reaction sensitive to fluence prior to the last 2 operating cycles. Since the V9 sample was taken at the approximate peak flux location, the copper/iron variation noted at midplane is considered to be less significant at this location compared to the vessel coupon midplane location. For the V9 sample, the flux based on iron is estimated to not have a bias. However, the V10 sample location is likely to exhibit a similar variation in flux as measured by iron since this sample is slightly below core midplane. For the V10 sample the flux is calculated based on iron and then adjusted based on the 210 degree capsule copper/iron ratio.

The following table adjusts the Framatome Technologies Report 86-1266298-00 Table D-1 and D-2 fluence calculation based on the following which are supported by the above discussions:

Table notes:

1. The V9 flux calculated based on iron only.
2. The V10 flux based on iron with a bias correction based on the 210 degree capsule copper/iron variation of (1.895/1.639 = 1.16).
3. Both the V9 and V10 flux increased by 4 percent to account for the new transport cross sections.
4. Fluence based on 16.76 EFPY as of March 1997 plus the projected end of current operating Cycle 13, April 5, 1999, estimated fluence (14,500 hours of operation).

Dosimeter	Revised flux based on Fe (data from Table D1 and D2 Report 86-1266298-00) (n/cm²/s)	Revised fluence as measured based on Fe + 4% (EFPY=16.97) (n/cm²)	Projected End of Cycle 13 fluence (note 4) (n/cm²)
Avg V9 Flat 1 & 2 Fe	6.2745E+11	3.49E+20	3.79E+20
Avg V9 MID 1 & 2 Fe	5.3170E+11	2.96E+20	3.21E+20
Avg V9 TIP 1 & 2 Fe	4.5385E+11	2.53E+20	2.74E+20
Avg V10 TIP 1 & 2 Fe	3.127E+11	2.01E+20 (note 2)	2.18E+20 (note 2)
Avg V10 MID 1&2 Fe	2.876E+11	1.85E+20 (note 2)	2.01E+20 (note 2)
Avg V10 FLAT 1&2 Fe	2.336E+11	1.50E+20 (note 2)	1.63E+20 (note 2)

In conclusion, the review of the 210 degree surveillance capsule dosimeter analysis and the associated neutron transport evaluation of the copper, iron and nickel variation has concluded that the core shroud boat sample analysis requires revision. The above table demonstrates that significant margin to the 5E+20 n/cm^2 fluence value exists based on these revised retrospective dosimetry flux estimates. Detailed Cycle 12 neutron transport analyses are expected to refine the understanding of the Fe, Ni, and Cu variation and reduce the uncertainty associated with the V9 and V10 fluence which is quoted in the Framatone Technologies Report 86-1266298-00. The projected EOC 13 maximum upper bound 95/95 uncertainty of +36% results in a peak V9 surface fluence of 5.15E+20 n/cm^2, and an average ID to mid-wall value of 4.4E+20 n/cm^2. The fluence at the V10 location, which is representative of the lower third of the V9 and V10 welds, remains below 3E+20 n/cm^2. With the exception of the V9 ID surface, the bounding fluence will remain below the 5E+20 n/cm^2 (E>1Mev) fluence threshold associated with the application of the NRC approved BWRVIP-14 2.2E-5 in/hr crack growth rate for the projected operating interval of 14,500 hours for Cycle 13. The NMP1 specific crack growth rate is not affected by the revised fluence estimates and the requested inspection interval of 14,500 hours remains valid.

Very truly yours,

Richard B. Abbott

Richard B. Abbott
Vice President - Nuclear Engineering

RBA/JMT/sc

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