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SUBJECT: Informs that change to TS 3.2.3, "Coolant Chemistry" unnecessary.Response to three specific questions re core shroud analysis provided.

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April 25, 1997
NMP1L 1208

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: *Response to April 17, 1997 Letter from Union of Concerned Scientists to the NRC*

Gentlemen:

On April 17, 1997 the Union of Concerned Scientists (UCS) wrote to the NRC requesting that the restart of Nine Mile Point Unit 1 (NMP1) be delayed until implementation of a change to Technical Specification (TS) 3.2.3, "Coolant Chemistry." The UCS also requested formal responses to three specific questions regarding the core shroud analysis. For the reasons discussed below, a TS change is unnecessary. Niagara Mohawk's responses to the three specific questions are provided in Enclosure 1 to this letter.

No change to the reactor water conductivity TS is required because the information developed to support the analysis of the core shroud does not alter the basis for the TS. As indicated in Niagara Mohawk's petition for a Full Power Operating License, the basis for TS 3.2.3 is Regulatory Guide 1.56 (June 1973), "Maintenance of Water Purity in Boiling Water Reactors."

The purpose of the reactor water conductivity TS limits, as described in the Regulatory Guide, is to establish a conductivity level that indicates a significantly abnormal event. As discussed in the Regulatory Guide, "The probability of heat exchanger leakage, allowing some of these contaminants to enter the reactor water, is significant. Of particular concern is the main condenser which represents the major source of inleakage." The Regulatory Guide limit of 5 umho/cm for reactor water conductivity was selected based on the expected demineralizer outlet level exceeding the breakthrough effluent conductivity of 1 umho/cm, potentially caused by a failure in one of these inleakage sources.

The 0.3 umho/cm value referenced in our April 8, 1997, submittal is an average operating value that was assumed in the core shroud analysis and is administratively controlled to assure that the expected service life of the core shroud is as described in the analysis and does not have an immediate impact on operability of the core shroud.

Therefore, since the TS limits were established to indicate the immediate action necessary to mitigate tube ruptures in the condenser or other heat exchangers and were not based on any assumptions used in crack growth calculations, a change to the TSs is not required.

Although the TS require that actions be taken for the above described failures, it is also prudent to control conductivity levels for service life considerations. Accordingly, generic chemistry guidelines were issued by the Electric Power Research Institute (EPRI) in its document entitled, "BWR Water Chemistry Guidelines - 1996 Revision." These guidelines were incorporated into the Nuclear Division Directive on Chemistry (NDD-CHE) as good industry practice. The action levels and values listed in NDD-CHE are the guideline recommendations. Implementation of these guidelines will assure that the analysis assumptions for normal operating reactor conductivity are maintained. Further, the average normal operating conductivity levels for NMP1 are maintained below the EPRI guidelines and are typically in the range of .1 umho/cm over an operating cycle.

Very truly yours,

M. J. McCormick Jr.
Vice President - Nuclear Engineering

MJM/AFZ/cmk

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ENCLOSURE 1

RESPONSE TO UCS QUESTIONS IN APRIL 17, 1997 LETTER TO THE NRC NINE MILE POINT NUCLEAR STATION UNIT 1

Request for Information #1

As indicated by Figure 5-6, "V-9 Crack Depth after 10,600 Hours," in GE's Report GE-NE-B13-01869-043 Rev. 0 (contained in Enclosure 8 to NMPC's April 8, 1997, submittal), it is expected that nearly 24 inches of continuous through-wall cracking will be encountered. Is the crack growth rate after progressing through-wall the same as prior to becoming through-wall? Does through-wall cracking create the potential for vibrations that can increase the propagation rate?

Response #1

The crack growth rate in the length direction is still bounded by the 5×10^{-5} in/hr used in the analysis. Therefore, there is no fundamental difference in crack growth rate when the crack becomes through wall.

Postulated vibration would result from through wall bypass leakage, however, the predicted leakage rate from a potential through wall crack of this length is expected to be less than 10 gpm, less than 0.005% of the core mass flow. This has negligible impact on the potential for vibration. Therefore, the possibility of vibration resulting from a through crack will have no impact on the crack propagation rate.

Request for Information #2

As indicated by Appendix C, "Shroud Inspection Summary", in GE's Report GE-NE-B13-01869-043 Rev. 0 (contained in Enclosure 8 to NMPC's April 8, 1997, submittal) the heat affected zones (HAZs) for the vertical welds were inspected during the current refueling outage. There is no indication that areas other than the HAZs were examined. During the public meeting, the question of crack propagation beyond the HAZs was posed. Were areas outside the HAZs inspected? If not, why not? Have cracks propagated beyond the HAZs?

Response #2

The scope of the visual inspection included a range of between 2 to 6 inches on each side of the vertical and horizontal welds examined using the enhanced visual examination technique (EVT) (.5 mil camera resolution). The Heat Affected Zone (HAZ) which is relevant for shroud cracking is a region which encompasses the welding thermally sensitized region typically defined as .2 to .4

inches plus the region significantly influenced by the welding residual stresses plus the increased material sensitization from the neutron fluence. This region can encompass a region of approximately .8 to 1 inch from the weld fusion line. Based on this definition, approximately 2.5 inches of base metal was inspected on either side of each vertical weld both ID and OD. The total length inspected was approximately 1100 inches which includes the ID and OD surfaces of the V9, V10, V11 and V12 welds. The total area of base metal inspected was approximately 3300 sq inches. The actual base metal inspected was greater than the area of the HAZ.

The ultrasonic testing (UT) scans of the vertical welds includes an area of 2 to 3 inches of base metal over the entire length of the weld. The V9 and V10 weld UT inspection covered the entire length of the weld. The V9 and V10 therefore inspected volumetrically the same base metal as the EVT visual examinations. The UT equipment was configured to detect flaws oriented parallel to the weld.

The Niagara Mohawk submittal provided a characterization of the cracking identified on the vertical welds V9 and V10. The submittal enclosure 3 states that the "dominant cracking pattern on these vertical welds is effectively concentrated within the weld HAZ and predominately originates from the outer surface." The structurally significant cracking followed the regions where the weld residual stresses generate a stress pattern which drives the IGSCC cracks. As discussed above, extensive inspections were performed of the base metal and the inspections confirmed that the structurally significant cracking was confined to the heat affected zone of the vertical welds and the region dominated by the residual and fabrication related stress patterns through thickness.

In some instances cracking, which initiated in the HAZ, has propagated 1 to 2 inches outside the HAZ. Generally these indications are oriented circumferentially following a classic IGSCC random path. The EVT inspections followed these indications until the crack stopped. These cracks arrested within a few inches of the weld toe, which is consistent with IGSCC crack arrest when stress drops below threshold levels.

Shroud base metal inspections showed some locations where signs of fabrication lugs had been welded and subsequently removed and ground. These locations adjacent to the V9 and V10 welds were inspected visually and in some cases were also covered by the UT. The cracking noted in these regions was localized and the significance of the cracking orientation and length evaluated. As discussed in enclosure 3 of the Niagara Mohawk submittal, this crack behavior is consistent with the conditions noted on this weld which showed that significant grinding (cold work) had been performed along the entire weld seam. The crack arrest is consistent with the predicted drop in residual stresses. The cracks noted in the localized attachment locations do not propagate beyond these regions based on the inspections performed. Overall extensive grinding and potential for surface sensitization exists along the vertical V9 and V10 welds such that IGSCC crack initiation is possible. However, possible cracking to any significant depth or length resulting from this process is not considered credible, since surface sensitization does not create a stress which can drive a crack to any significant depth.

The cracking noted on the vertical welds is consistent with shroud cracking noted in the industry discussed in the BWRVIP core shroud inspection and evaluation document (i.e., IGSCC cracking

in and near the HAZ). In the industry, shroud cracking extending outside the HAZ has been documented and these cracks arrest after the stress field terminates.

__Request for Information #3__

Page iii of GE's Report GE-NE-B13-01869-043 Rev. 0 (contained in Enclosure 8 to NMPC's April 8, 1997, submittal) states that "no credit was taken for any portion of horizontal welds; it is assumed that each section of the shroud is a free standing cylinder." For the purposes of evaluating the integrity of the vertical welds, this appears to be a non-conservative assumption. If a horizontal weld were through-wall cracked its entire circumference except for two points that are 180 ° apart, then it is conceivable that forces acting on the shroud might tend to bow the shroud outward at the 90 ° and 270 ° locations since the intact weld portions would act to "pin" movement. If a vertical weld location coincided with these "bow" locations, the stress might be concentrated or higher than if the horizontal welds were totally non-existent as assumed in GE's analysis. Is GE's analysis non-conservative?

__Response #3__

Taking credit for some integrity of the H4 and H5 welds, it can be shown that through wall cracks in excess of the length of the V9/V10 welds can be tolerated. It is conservative to assume no credit for the circumferential welds since the allowable vertical crack length would then be smaller.

During normal operating conditions, the shroud, with the tie rod repair in place, is under a general state of axial compressive stress. As such, even with complete severance of the H4 and H5 welds, shroud integrity will still be maintained as the character of the flawed welds will not allow differential radial displacement.

Finally, since there is a net compressive force during normal operation, the bow of the type described in the question cannot occur.