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April 17, 1997

Mr. S. Singh Bajwa, Acting Director
Project Directorate I-1
Division of Reactor Projects - I/II
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: POTENTIAL UNANALYZED OPERATION OF NINE MILE POINT UNIT 1 WITH CORE SHROUD VERTICAL CRACKS

Dear Mr. Bajwa:

UCS reviewed the letter dated April 8, 1997, from Niagara Mohawk Power Corporation (NMPC) to the Nuclear Regulatory Commission (NRC) regarding the core shroud at Nine Mile Point Unit 1 (NMP-1). We have identified an apparent violation of Section 50.59 to Title 10 of the Code of Federal Regulations. Specifically, it appears that NMPC is proposing to operate NMP-1 without obtaining a necessary change to the technical specifications on reactor coolant chemistry.

Enclosure 8 to NMPC's submittal dated April 8, 1997, contained a non-proprietary version of GE Report No. GE-NE-523-B13-01869-043 Rev. 0, "Assessment of the Vertical Weld Cracking on the NMP1 Shroud." Page 9 of this GE document states:

> "The experience in BWRs has shown that IGSCC [intergranular stress corrosion cracking] initiation and growth is related to operating time. The initiation process is a stochastic process and with time the probability of cracking increases. This process can be accelerated if the water conductivity is higher because impurities aid crack initiation and accelerate crack growth. The characteristics of the coolant environment are also known to promote IGSCC on both the outside and the inside of the shroud."

Clearly, water chemistry is an important factor in controlling shroud weld cracking caused by IGSCC.

On page iii of the GE document, it is stated that a "bounding crack growth rate of 5×10^{-5} inches per hour" was assumed in the analysis. On page 11 of the GE document, this bounding crack growth rate is stated to be "characteristic of higher reactor water conductivity environments (~0.3 µS/cm)." On page iii of the GE document, the bounding crack growth is said to be conservative because of excellent water chemistry at NMP-1 (<0.1µS/cm).[1]

[1] According to a published conversion table, a seimen (S) can be converted to a mho by multiplying by 1.00. Therefore, all future references to conductivity will be in terms of µmho/cm for conformance with the NMP-1 technical specifications.

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NMPC's letter dated April 8, 1997, indicates that the enclosures, including the GE document, "establishes the acceptability of the as found vertical weld cracking for a minimum of 10,600 operating hours (above 200°F)."

The analysis supporting the proposed operating of NMP-1 with the core shroud vertical weld cracking appears to rely on reactor coolant chemistry limits that are significantly more limiting than the NMP-1 Technical Specifications. By letter dated July 14, 1993, the NRC issued Amendment No. 142 to the NMP-1 Operating License. Technical Specification 3.2.3 limits the reactor coolant conductivity to <2 μmho/cm with steaming rates less than 100,000 pounds per hour and to <5 μmho/cm with steaming rates greater than 100,000 pounds per hour.

Amendment No. 142 implemented some "cosmetic changes" (e.g., correction of typographical errors, repagination, etc.) to the NMP-1 Technical Specifications. The limits on reactor coolant chemistry remained unaffected by this amendment from the values implemented by issuance of Amendment No. 9 to the NMP-1 Operating License by NRC letter dated April 28, 1976.

Thus, the bounding crack growth rate assumed in GE's analysis appears to be based on reactor coolant chemistry limits that are over 10 times more restrictive than the NMP-1 Technical Specifications. It would seem that NMPC should obtain a license amendment before it operates NMP-1 with reliance on the 0.3 μmho/cm conductivity value.

According to the Bases for NMP-1 Technical Specification 3.2.3:

> "Materials in the primary system are primarily 304 stainless steel and the Zircaloy fuel cladding. The reactor water chemistry limits are established to prevent damage to these materials. Limits are placed on chloride concentration and conductivity. The most important limit is placed on chloride concentration to prevent stress corrosion cracking of the stainless steel."

Technical Specifications are intended to provide reasonable assurance that the facility can be operated safely. The core shroud crack growth rate analysis supports NMPC's conclusion that NMP-1 can be safely operated for a minimum of 10,600 hours with the identified cracking. Since the crack growth rate analysis relies on conductivity limits that are significantly more restrictive than the existing Technical Specification limits, it appears that an amendment is warranted.

NMPC could, of course, submit an evaluation of the crack growth rate using the reactor coolant conductivity limit in its current Technical Specifications. Based upon the qualitative analysis quoted from the GE document, it is reasonably assumed that the 10,600 hour minimum operating time could be significantly shortened. Without such an analysis, NMP-1 operation with reactor coolant conductivity above the 0.3 μmho/cm value assumed in the GE analysis represents an unanalyzed condition.

In any event, NMPC's restart of NMP-1 would seem to constitute a violation of Section 50.59 to Title 10 of the Code of Federal Regulations unless a license amendment is obtained to lower the Technical Specifications' limits on reactor coolant chemistry to the value assumed in the crack growth analysis or an analysis is performed of the crack growth rate at the current Technical Specifications' limit. The

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NRC should issue NMPC an order or a confirmatory action letter requiring that an amendment be obtained or an analysis be completed prior to restart of NMP-1.

UCS was unable to attend the public meeting in New York on April 14, 1997, due to the very short notice on the meeting's rescheduling from its original April 10, 1997, date. However, from discussions with individuals who were able to attend this meeting, it appears that the meeting produced three unanswered questions. UCS respectfully requests a formal response from the NRC to the following questions prior to the restart of NMP-1:

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?

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?

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?

UCS understands that NMPC is anxious to resume operation of NMP-1, but we feel that the reactor coolant chemistry issue should be resolved and the above questions should be formally answered before this plant can be restarted safely.

Sincerely,

David A. Lochbaum
Nuclear Safety Engineer