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[redacted]

15 April 1999

Darl Hood
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Hood,

I have reviewed the inspection plan (Docket No. 50-220, DPR-63) submitted by Niagara Mohawk Power Corporation (NMPC) on 30 December 1998 regarding the current inspection of the core shroud at Nine Mile Point One (NM1). I have also read the NRC letter (TAC No. MA4491) dated 24 March 1999 authorizing that inspection plan. In this letter I would like to enumerate the shortcomings of that inspection plan and to present an addition to the inspection plan which would greatly increase our understanding of the extent of cracking in the shroud.

My understanding is that the goal of the core shroud inspection is to determine the present level of cracking in the core shroud, to compare this data with previous crack size measurements in order to estimate the present crack growth rate, and if possible to further isolate the root causes of the core shroud cracking. The current inspection plan will measure the present size of the cracks along all the accessible vertical welds. Assuming that the crack depth measurements are performed with the same level of accuracy as in the last measurement performed in 1997, then the data should be able to establish a crack growth rate with an accuracy much better than 10^{-5} inches/hour. This accuracy should be sufficient to determine whether the core shroud cracking poses a serious safety risk during the next fuel cycle. I would like to point out that even if the data indicates an acceptable crack growth rate, I strongly recommend that NMPC measure the crack size during subsequent RFO's to ensure that that safety level is maintained.

Enclosure 3

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In the current inspection plan the horizontal welds in the core shroud will not be inspected. The reason cited in the NMPC inspection plan and the NRC approval letter is that the shroud repair assembly (the tie-rods) will prevent any lateral motion of the core shroud plates and therefore the crack rate in the horizontal welds is irrelevant. The assumption is that even if those welds were completely cracked through-wall, the shroud plates would not suffer any lateral motion. However, this idea assumes that the shroud repair assembly is performing as expected. When it was installed in 1995, the shroud repair assembly was thought to replace the structural function of the horizontal welds. As was witnessed in the 1997 inspection, that initial design failed. Only in this inspection will we be able to determine if the second design has failed or not. If that design has failed then the shroud repair assembly has not structurally replaced the horizontal welds and the knowledge of the level of cracking in the horizontal welds is essential to ensure the public safety. In the current inspection the shroud repair assembly will be thoroughly inspected to ascertain its structural integrity. However if the shroud repair assembly is found to be below specification there is no contingency plan to then inspect the horizontal welds. The inspection plan assumes the result that the shroud repair assembly will be fully functional. This oversight is a major flaw in the inspection plan.

In addition, no fundamental safety system should exist without a backup. The shroud repair assembly is a fundamental safety system in that it prevents a lateral shift of the core shroud plates from impinging upon the core. If the shroud repair assembly were to fail then only the horizontal welds would prevent such a lateral shift. Without knowledge of the integrity of those welds we do not know if the backup system exists or what level of safety it provides.

Finally it is important in fully understanding the mechanism of cracking in BWR core shrouds to gather as complete a data set as is possible. The NM1 core shroud is only readily available for inspection during the RFO's every two years. Therefore it would be most reasonable to use this opportunity to gather data on the horizontal welds. To not inspect the horizontal welds because one assumes that one *might* not need the data, especially when having the data will enrich our understanding of the core shroud cracking, does not seem like a wise course of action. Even a UT

measurement on a few of the major welds, say H3, H5, H8, and H9, would be reasonable without too much additional expenditure of time by the inspection team.

While I am discussing the shroud repair assembly let me add one point about the tie-rod inspection. The tie-rods will undergo a visual inspection to see if they are at full tension and correctly positioned. At the end of that inspection the tie-rod nut will be tightened to the original installed torque. However if the tie-rods have lost tension it is important to assess what the operating tension was before restoring the tension to its installed value. By knowing the operating tension, one can assess whether the shroud repair assembly was performing as expected during plant operation.

In the NRC letter (page 2, next to last paragraph) you note that the fluence level in some parts of the core shroud will soon exceed the threshold value of 5×10^{20} n/cm^2. Above this threshold the bounding crack growth rate as assumed by the NRC is higher than the crack growth rate values currently assumed for safe operation of the plant. You then direct the NMPC to estimate the fluence level distribution through the upcoming operating cycle to assess if the increased crack growth rate might warrant future repairs. I submit to you that this strategy is problematic in that it relies on fluence estimates for the shroud without directly isolating the effect of fluence on the cracking mechanism in the NM1 core shroud.

In my letter of 25 March 1999, I showed that there is a strong correlation between the fluence profile and the crack profiles along welds V-9 and V-10. This correlation indicates that high energy neutron irradiation may be a significant driving force in the shroud cracking mechanism. If that were indeed the case then we might well expect cracks throughout the shroud and not just within the heat affected zones along the welds. It has been noted that the cracks along the shroud welds escaped operator detection until the welds were scanned with enhanced visual testing (EVT) and ultrasound testing (UT). It is also possible, since to my knowledge the shroud plates have not been inspected using these methods, that the plates may also harbor significant cracks. We may naturally assume that the worst wall cracking would be in the plates bounded by welds V-9 and V-10 where the fluence is highest. Therefore I recommend that the core shroud inspection be expanded to include a vertical scan along the two plates bounded by welds V-9 and V-10. Each scan should be

performed in an accessible region well separated from the heat-affected zone of the welds and far from known work-hardened regions. The scans should be done along the full vertical height of the plate and should be identical in method to the scans along V-9 and V-10. If cracks are discovered which penetrate more than 10% of the shroud wall, then those cracks should each be mapped along their length even if these cracks extent beyond the region originally designated for the scan.

The results of these scans could be used to ascertain the shroud wall cracking resulting from the neutron fluence. This knowledge could then be used to more accurately predict the extent of cracking at the end of the current operating cycle which would in turn determine whether repairs to the shroud were required.

Finally the data from the inspection should be made available to the public at least one week before the reactor is scheduled for restart. Allowing public access to the data will provide for independent analysis of the results which will raise public confidence in the safe operation of the reactor. Direct measurement of the crack size is the only reliable method of determining the crack growth rate. The central New York public has anxiously waited for the past two years to know for certain whether the core shroud is indeed safe. They deserve to know the answer from a source that they trust BEFORE the reactor is restarted. Public dissemination of the data at least one week before restart will provide the answer that the citizens of central New York deserve.

Thank you for your prompt attention to these matters.

Sincerely,

Steven Penn

Dr. Steven Penn

Cc: David Lochbaum, Union of Concerned Scientists

Paul Gunter, Nuclear Information and Resource Service

DATED: April 27, 1999

REQUEST FOR COMMENTS ON LETTER FROM DR. S. PENN REGARDING CORE SHROUD EVALUATIONS, NINE MILE POINT NUCLEAR STATION, UNIT NO. 1 (TAC NO. MA5085)

Docket File
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S. Little
D. Hood
OGC
ACRS
A. Blough, Region I
W. Bateman
C. Carpenter Jr.
R. Hermann

cc: Plant Service list

If you have questions regarding this letter, contact me by phone at (301) 415-3049 or by electronic mail at dsh@nrc.gov.

Sincerely,

ORIGINAL SIGNED BY:

Darl S. Hood, Sr. Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-220

Enclosures: 1. Dr. Penn's letter dated March 25, 1999
2. Dr. Penn's letter dated December 3, 1998
3. Dr. Penn's letter dated April 15, 1999

cc w/encls: See next page

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