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SUBJECT: Provides results of plant core shroud re-inspections conducted during Unit 1 9th refueling outage.

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SUSQUEHANNA STEAM ELECTRIC STATION
GENERIC LETTER 94-03: 9TH REFUELING AND
INSPECTION RESULTS FOR UNIT 1 CORE SHROUD
PLA-4552 FILE R41-2

Docket Nos. 50-387
and 50-388

References:
1) *PLA-4192 from R.G. Byram to Mr. C.L. Miller, "Initial Response to Generic Letter 94-03", dated August 24, 1994.*
2) *PLA-4239 from R.G. Byram to USNRC, "Supplemental Response to Generic Letter 94-03," dated December 22, 1994.*
3) *NRC Letter from C. Poslusny to R.G. Byram, "Staff Acknowledgment In Regard to PP&L's Supplemental Response to Generic Letter 94-03," dated May 3, 1995.*
4) *PLA-4320 from R.G. Byram to USNRC, "Generic Letter 94-03: Final Inspection Results For Unit 1 Core Shroud," dated May 25, 1995.*

This letter provides the results of the Susquehanna Steam Electric Station (SSES) Unit 1 core shroud re-inspections conducted during the Unit 1 9th refueling and inspection outage (U1-9RIO) pursuant to the NRC letter dated May 3, 1995 referenced above. This letter also provides our currently planned schedule for the re-inspections of both the Unit 1 and Unit 2 core shrouds in subsequent outages. The inspection of the Unit 1 core shroud horizontal welds was conducted in accordance with the guidelines as defined in the BWR Vessel Internals Project BWRVIP-07, "Guidelines for Reinspection of BWR Core Shrouds," EPRI TR-105747 dated February 1996.

If you have any questions, please call Mr. Robert D. Kichline at 610-774-7705.

Very truly yours,

A018 1/1

R.G. Byram

070053

Attachment: Inspection Results

FILE R41-2 PLA-4552
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copy: NRC Region I
Mr. K. Jenison, NRC Sr. Resident Inspector - SSES
Mr. C. Poslusny, Jr., NRC Sr. Project Manager - Rockville

U1-9th Refueling and Inspection Outage Core Shroud Re-inspection Results:

The Unit 1 core shroud was re-inspected using the same G.E. Tracker System used in the 1995 ISI Program. During this inspection cycle, approximately 50% of horizontal welds H1, H2, H4, H5, and H6b were re-inspected. Weld H3 was not re-inspected since it had not shown any cracking in the previous inspection and is a low stress weld. The 0-180 degree orientation of each of the above shroud welds (the worst portion of each weld) were re-inspected. Actually, only 82% of the 0-180 degree orientation of each shroud weld could be re-inspected due to interferences. However, as a conservative measure, those regions that could not be re-inspected were considered to be 100% cracked through-wall for analysis purposes.

As a result of the re-inspection, two analyses were performed. The first analysis was performed based upon projected growth of the cracks to the end of the next 18 month refueling cycle. This analysis calculated the projected safety factors for each weld at the Spring 1998 Unit 1 10th refueling and inspection outage. The results of these calculations were documented by both PP&L and Structural Integrity Associates (SIA) using the Distributed Ligament Length (DLL) and the ANSC computer programs respectively. The results showed a large margin remaining in the safety factors and, thus, substantiated the conclusion that the shroud is safe to operate for at least one additional cycle of operation.

The second analysis was performed for PP&L by SIA to determine if additional life of the Unit 1 core shroud could be projected beyond the end of the next operating cycle. The H4 weld was the only weld analyzed in the second analysis because it is the critical weld. The H4 weld has a high percentage of cracking and much of the weld was calculated to contain material that exceeded the 3E20 n/cm^2 fluence limit. Therefore, the H4 weld required the Linear Elastic Fracture Mechanics (LEFM) approach to calculate the safety factors. SIA used the ANSYS finite element program to calculate the H4 projected stress intensities and safety factors after two additional cycles of operation to the Spring 2000 refueling outage (the second operating cycle will be 24 months). The results of the analysis showed that the Upset stress condition produced stresses resulting in a factor of safety (FS) of 3.1, whereas the Faulted condition produced stresses resulting in a FS of 1.8. Passing values of FS are 2.78 for the Upset condition and 1.39 for the Faulted condition.

The results obtained above allow us to conclude that Unit 1 can be safely operated until Spring 2000 without performing additional inspections or repairs.

Projected Life of Unit 2 Core Shroud:

In the Fall of 1995, the Unit 2 core shroud was inspected, found to be cracked in various welds, and analyzed for safety factors. A re-evaluation was performed for the Unit 2 core shroud upon completion of re-inspection of the Unit 1 core shroud in Fall, 1996. Based upon the current ISI findings for Unit 1, an analysis was performed on the Unit 2 core shroud for projected crack size to Spring, 2001; i.e., after 5.5 years of crack growth from the Fall 1995 inspection. The results of this re-evaluation show that the Unit 2 core shroud maintains projected safety factors above the minimums beyond the year 2001. The critical weld for the Unit 2 case was the H6b weld. The load limit analysis showed that the H6b weld had a FS of 4.07 for the Upset stress condition and 2.62 for the Faulted condition. Passing values of FS are 2.78 for the Upset condition and 1.39 for the Faulted condition.

Re-Inspection Schedule for the Unit 1 and Unit 2 Core Shrouds:

Based upon the findings of the above analyses, it is concluded that the Unit 1 core shroud will have an acceptable safety margin for operation to the Spring 2000 refueling outage and the Unit 2 core shroud to the Spring 2001 refueling outage. Therefore, based on the previous inspections and the crack growth analyses, the following schedule of inspections is currently planned. An additional factor that will contribute to reduced crack growth will be the utilization of hydrogen water chemistry (HWC) which is scheduled to be implemented in the near future as indicated below. However, HWC was not considered as a crack growth reduction mechanism in developing this schedule.

Inspection/Cycle Chemistry

Unit	Outage Year	Prior Cycle Chemistry	Inspection
1	Spring 1995	NWC	Done
2	Fall 1995	NWC	Done
1	Fall 1996	NWC	Done
2	Spring 1997	NWC	No
1	Spring 1998	NWC/HWC	No
2	Spring 1999	NWC/HWC	Yes
1	Spring 2000	HWC	Yes
2	Spring 2001	HWC	Evaluate*
1	Spring 2002	HWC	Evaluate

Note: *NWC = Normal Water Chemistry*
HWC = Hydrogen Water Chemistry
NWC/HWC = indicates both mods of operation in that cycle

* This evaluation will be initiated after the Spring 2000 ISI for the Unit 1 core shroud and must take into account all the previous inspections and the effect of HWC on the observed crack. If cracking has been found to arrest, then additional life may be rationalized from the data and further analysis. If cracking has not arrested, then the current condition of the core shroud must be evaluated and an inspection and/or repair must be anticipated for the outage.

The above schedule is based on current criteria and information available. If changes in evaluation techniques or methodology become available via BWRVIP activities, they will be evaluated for their impact on the schedule.