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ACCESSION NBR: 8105120312 DOC. DATE: 81/05/07 NOTARIZED: NO DOCKET # 05000387
 FACIL: 50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylvania
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 RECIP. NAME: GRIER, B.H. RECIPIENT AFFILIATION: Region 1, Philadelphia, Office of the Director

SUBJECT: Final deficiency report re mislocation of fuel support castings inside reactor pressure vessel, initially reported on 810303. Castings have been placed in proper locations & verified in accordance w/design drawings.

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50-387

May 7, 1981

Mr. Boyce H. Grier
Director, Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406



SUSQUEHANNA STEAM ELECTRIC STATION
FINAL REPORT OF A DEFICIENCY
INVOLVING THE MISLOCATION OF FUEL SUPPORT
CASTINGS
ERs 100450/100508 FILES 840-4/821-10
PLA-750

Dear Mr. Grier:

This letter serves to provide the Commission with a final report of a deficiency involving the mislocation of fuel support castings inside the Unit 1 Reactor Pressure Vessel. The deficiency was originally reported to NRC Region I Representative, Mr. L. Narrow, by Mr. A. R. Sabol of PP&L in a telephone conversation on March 3, 1981. During that conversation, Mr. Narrow was advised that the condition was being evaluated for reportability under the provisions of 10 CFR 50.55(e).

The deficiency involves the mislocation of four fuel support castings on the Unit 1 core plate. General Electric Installation and Service Engineering Division (GE/I&SE) Nonconformity Report 109 Rev. 2 documents the mislocation of the castings and requires action to correct the deficiency and prevent its recurrence.

The attachment to this letter contains a description of the problem; its cause, safety implications and significance, and the corrective actions taken and planned.

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Mr. Boyce H. Grier

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May 7, 1981

We trust the Commission will find the information forwarded by this letter to be satisfactory.

Very truly yours,,



N. W. Curtis
Vice President-Engineering & Construction-Nuclear

WHG/FLW:sab

Attachment

cc: Mr. Victor Stello (15)
Director-Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. G. McDonald, Director (1)
Office of Management Information & Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Gary Rhoads
U. S. Nuclear Regulatory Commission
P.O. Box 52
Shickshinny, PA 18655

DESCRIPTION OF THE PROBLEM

GE/I&SE issued Nonconformity Report #109 on January 28, 1981 documenting a possible discrepancy in the location of four fuel support castings on the Unit 1 core plate. The apparent error was discovered during a GE/I&SE Quality Control check of documentation supporting the actual installation of the castings against the GE design requirements.

The installation records for four fuel support castings, at core locations defined by coordinates 06-19, 06-47, 10-11, and 10-47, indicated that the referenced castings might have been installed at incorrect locations on the core plate. A visual inspection performed on March 17, 1981, as a result of the Nonconformity Report, confirmed that the castings were installed in incorrect locations.

CAUSE

A review of existing records for the installation of the Unit 1 fuel support castings indicates that the mislocation was caused by a lack of detailed installation instructions combined with inadequate in-process inspection of GE/I&SE Quality Control. A review of the GE/I&SE travelers pertinent to the installation and subsequent handling of the subject fuel support castings revealed the following sequence of events:

1. The original installation of the subject castings occurred on August 13, 1980.
2. The castings were removed on October 24, 1980 and placed in temporary locations in order to allow cleaning of guide tubes and control blades.
3. The castings were removed from the temporary locations on December 18, 1980 and installed on the core plate after installation of the guide tubes and control blades.
4. No GE/I&SE QA/QC involvement for the above actions was required in accordance with the controlling traveler.
5. A GE/I&SE QA audit of the documentation supporting the installations was required by the controlling traveler and was performed on January 21, 1981. The GE/I&SE Nonconformity Report #109 was originally issued on January 29, 1981.

It can be concluded that although a final documentation audit does exist by which incorrect installations of fuel support castings could be discovered, the lack of both QA/QC involvement and detailed instructions for the control of the installation activity was instrumental in allowing this deficiency to occur.

SAFETY, IMPACT AND SIGNIFICANCE

PP&L Nuclear Fuels department has determined that the mislocated fuel support pieces could allow two interior highly enriched fuel bundles to be fit with the smaller inlet flow orifices actually intended for the low powered peripheral

bundles, and two peripheral bundles to be fit with the larger orifices designed for the interior region of the core. Such a configuration could result in a substantial decrease in coolant flow through the two interior bundles and an increase in flow through the two affected peripheral bundles. Although reduced bundle coolant flow tends to have an adverse effect on fuel bundle steady state operating critical power ratio (CPR), scoping analyses indicate the void reactivity feedback effects sufficiently reduce bundle power levels to essentially compensate for the reduced flow; therefore, it is concluded there would be little impact on steady state operating CPR for the two interior bundles operating at reduced flow. Since the two affected peripheral bundles would be operating at relatively low power levels, CPR is not a concern for these bundles even under the conditions of increased flow.

The impact of mislocated fuel support pieces on the transient behavior of the affected interior bundles was also evaluated and it was determined that the degradation of CPR during the limiting Feedwater Controller Failure Transient is greater for conditions of decreased bundle flow. Should an affected bundle become the limiting bundle in the core, there is a possibility that it would be operating with inadequate CPR margin, thus posing a potential safety concern.

Besides the potential CPR problems discussed above, undetected mislocated fuel support pieces would likely cause additional fuel management problems which would be compounded in subsequent reload cycles. Because the plant process computer would be unable to accurately monitor the fuel bundles in the locations of the switched orifices, incorrect exposure histories would be accumulated by the process computer for those bundles. Even though the monitoring inaccuracies would exist during the initial cycle, the primary concern is with the reload cores where the affected fuel bundles with the incorrect exposure histories might be shuffled into "hotter" regions of the core. Since the process computer determines core thermal limit parameters (e.g., CPR and linear heat generation rate) based in part on fuel bundle exposure history, a non-conservative assessment of thermal margin might occur.

In addition to the process computer inaccuracies, anomalies in both core power distribution and reactivity might occur as a result of the affected fuel bundles thus achieving an exposure history different than that expected in the locations of the switched orifices. Such abnormal core conditions imply certain safety concerns, (e.g., excessive power peaking, inadequate shutdown margin), and can result in a power derate.

Based on our evaluation, we have concluded that the deficiency, if it had gone uncorrected, could have adversely affected safe operation of the plant.

CORRECTIVE ACTION TAKEN AND PLANNED

A visual inspection performed on March 17, 1981 confirmed that the four fuel support castings referenced on GE/I&SE Nonconformity Report #109 were mislocated as suspected. These incorrectly installed fuel support castings have since been placed in their proper locations and verified in accordance with design drawings.

Attachment of PLA-750

All Unit 1 fuel support castings have been physically checked to determine serial numbers for identification purposes and verified to be properly located as required by GE design drawings. The verification process was completed in April, 1981.

All future travelers required for the installation of Control Rod Blades, Guide Tubes and Fuel Support Castings will include QC mandatory hold points and additional Special Process Control Sheets to provide definitive installation instructions. The travelers will document core locations, serial numbers and group numbers when applicable.

These actions will preclude a similar discrepancy from recurring during future installations.