UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
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April 25, 2002

EA-02-067

Carolina Power & Light Company
ATTN: Mr. James Scarola
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SUBJECT: SHEARON HARRIS NUCLEAR POWER PLANT - NRC INSPECTION REPORT 50-400/02-07; PRELIMINARY WHITE FINDING

Dear Mr. Scarola:

On December 29, 2001, the NRC completed an inspection at your Harris Nuclear Power Plant. The inspection findings were documented in NRC inspection report 50-400/01-05, which was issued on January 28, 2002. Section 1R13.2 of Report 50-400/01-05 discusses a failure of foreign material exclusion controls that your staff identified when several pieces of foreign material were discovered in the containment sump suction piping to the A residual heat removal (RHR) system pump. Using the significance determination process (SDP), this finding was preliminarily determined to be White (i.e., a finding with low to moderate increased importance to safety, which may require additional NRC inspection) as indicated in the enclosed SDP Phase III Summary, because the foreign material would affect train A of low pressure and high pressure recirculation.

During the SDP Phase I review, the NRC determined that a single train of a mitigating system had been inoperable beyond its Technical Specification (TS) allowed outage time, indicating a Phase II evaluation was warranted. The Phase II SDP results were found to be inconsistent with the licensee's full scope model in that the difference between the core damage frequencies was greater than an order of magnitude and the dominant accident sequences were not the same. Therefore, a Phase III analysis was conducted.

This finding does not represent a current safety concern because of the extent of condition review you performed as part of the root cause evaluation to identify other piping where foreign material could exist, the additional piping inspections you performed, and the prompt removal of the foreign material you found.

One apparent violation of TS 6.8, Procedures and Programs, Section 6.8.1 was identified concerning the implementation of Maintenance Management Manual Procedure MMM-011, Cleanliness and Housekeeping, Section 5.3, Preventing Contamination During Maintenance, which contains requirements to prevent the entry of foreign objects into plant systems and

components. Adequate foreign material exclusion controls were not implemented for the RHR system when on October 8, 2001, foreign material of a size to affect pump performance (greater than the containment sump screen openings) was identified in the containment sump suction piping to the A RHR pump. As a result, during the operating cycle from April 15, 2000, to September 22, 2001, Unit 1 was operating in Modes 1, 2 and 3 on numerous occasions with the A RHR pump inoperable for greater than 72 hours without implementing the action requirements of TS 3/4.5.2, Emergency Core Cooling Subsystems. This apparent violation is being considered for escalated enforcement action in accordance with the "General Statement of Policy and Procedure for NRC Enforcement Actions - May 1, 2000" (Enforcement Policy), NUREG-1600.

Before the NRC makes a final decision in this matter, we are providing you an opportunity to request a Regulatory Conference where you would be able to provide your perspectives on the significance of the issue, the bases for your position, and whether you agree with the apparent violation. If you choose to request a Regulatory Conference, we encourage you to submit your evaluation and any differences with the NRC evaluation at least one week prior to the conference in an effort to make the conference more efficient and effective. If a conference is held, it will be open for public observation. The NRC will also issue a press release to announce the conference.

Please contact Mr. Brian Bonser at (404) 562-4560 within seven days of the date of this letter to notify the NRC of your intentions. If we have not heard from you within ten days, we will continue with our significance determination and enforcement decision and you will be advised by separate correspondence of the results of our deliberations on this matter.

Since the NRC has not made a final determination in this matter, a Notice of Violation is not being issued at this time. In addition, please be advised that the characterization of the apparent violation may change as a result of further NRC review.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Loren R. Plisco, Director
Division of Reactor Projects

Docket No.: 50-400
License No.: NPF-63

Enclosure: SDP Phase III Summary

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SDP Phase III Summary

SRA Analysis Number: HAR 0202
Analysis Type: SDP Phase III
Inspection Report #: 50-400/01-05
Plant Name: Harris
Unit Number: 1
Enforcement Action #: EA-02-067

I. Background

As excerpted from the licensee's LER 01-03 on the performance deficiency:

On October 8, 2001, at approximately 11:30 a.m., with the Harris Nuclear Plant (HNP) defueled for refueling outage (RFO)10, work was being performed on 1SI-310, "Containment Vessel (CV) Sump To Residual Heat Removal Pump 1A-SA Downstream Isolation Valve", to repair a body-to-bonnet leak. During the removal of the valve from the valve body, one of the two mechanics performing the maintenance observed a 6.5 inch long by 5/16 inch wide cable tie lying inside the piping near the seating ring for the valve. 1SI-310 is one of two valves in-series that open to provide a suction path from the containment recirculation sump to the 1A-SA residual heat removal (RHR) pump upon entering the recirculation mode due to an accident involving the loss of reactor coolant system (RCS) inventory to the containment.

The mechanics proceeded with the removal of the valve from the valve body and began to search to ensure that no other material was in the line. The mechanics discovered a small piece of triangular shaped (longest sides about 3.5 by 2.5 inches and about 5/16 inches thick) rubber-type (polymer) material further downstream of 1SI-310 toward the RHR pump. They later found a large mostly rectangular shaped piece (dimensions of about 5 by 20 by 3/16 inches) of the rubber-type material. The mechanics removed all of the foreign material they found and placed 1SI-310 valve bonnet back on the valve as a foreign material exclusion (FME) boundary and reported what they found to management. Management initiated a root cause investigation for the event.

Additional piping inspections requested by the Root Cause Investigation (RCI) team discovered additional rubber pieces, two pieces of metal, and some small elastic particles in the A RHR and the A containment spray (CS) systems. All foreign material was removed and system piping was inspected by a video camera. A past operability determination of the A RHR system resulted in the system being inoperable with the debris in the piping. A separate operability determination concluded that CS system operability was not affected. The redundant containment recirculation sump for 1B-SB train was also inspected and no significant debris was found in that sump or the suction lines for the 1B-SB RHR pump or 1B-SB CS pump. Laboratory analysis, and RCI team research could not determine the exact time or the event that introduced this foreign material. Five entry

opportunities were identified from plant construction (1987) to time of discovery in RFO-10 (2001).

The five potential opportunities for introducing the foreign material are listed chronologically below.

1. Material left in the piping during construction.
2. Work on 1A-SA RHRP in 1991 (RFO-3), to repair leaking pump seal.
3. Removal of 1SI-310 in 1991 (RFO-3) to remove foreign material from piping.
4. Material introduced from the refueling water storage tank (RWST) due to dropped material during manual boration of the tank and other work requiring the man-way access hatch to be opened.
5. Work in the Containment Recirculation sump in 1997 (RF0-7) and 1998 (RF0-8).

One of these (introduction from RWST - #4) has been eliminated. Two others (left from construction and 1SI-310 removal in RFO-3 - #1 & 3) are less probable, since both were cleaning activities designed to remove foreign material. The two remaining potential sources are the most probable. These are: the work on 1A-SA RHR pump in 1991 (RFO-3), to repair leaking pump seal and the work in the Containment Recirculation sump in 1997 (RF0-7) and 1998 (RF0-8). The root cause of this event is poor work practices with respect to FME control.

Based on an engineering analysis of all of the material discovered, only the larger pieces of rubber material challenged the operability of the associated safety system train. The debris would have impacted only the 1A-SA RHR train. Based on engineering analysis with vendor assistance, the larger pieces of rubber material could potentially have moved to the impeller of the 1A-SA RHR pump if the plant was aligned to the containment recirculation sump on 1A-SA train side. This could occur following an accident that involved a loss of inventory in the RCS and resulted in injection of the RWST inventory to the point where containment recirculation was required. The rubber material could potentially restrict flow through the suction of the RHR pump so that at high flow demand conditions, the pump would not be able to develop rated head and flow. This could result in loss of pumping capacity at high flow demand conditions and could eventually result in pump failure. The RHR pump would not be able to perform its design function under Large Break Loss of Coolant Accident (LBLOCA) conditions and would also be degraded - and therefore inoperable for Small Break LOCA (SBLOCA) events. However, it was determined for probabilistic safety analysis input by engineering with pump vendor support, that the pump would reasonably be expected to pump at a degraded capacity. This amount of flow would help mitigate the consequences of some events such as a SBLOCA.

Performance Deficiency - Inadequate maintenance work practices (improper work methods used in the performance of the task), workmanship, and substandard cleanliness by maintenance personnel. This led to foreign material on the suction side of the A RHR pump and down stream of the containment sump in the area of valve 1SI-310. The

material included one large piece of rubber, some tie wraps, and some smaller pieces of rubber.

Exposure Time - one year; for purposes of this analysis the year will be from 10/8/00 - 10/8/01

Date of Occurrence - Probably 1991 or 1997/98

II. Safety Impact:

Preliminary White

III. Risk Analysis/Considerations

Assumptions

1. The foreign material will only affect the A train RHR pump and would not affect the LP injection function. The low pressure recirculation (LPR) and high pressure recirculation (HPR) functions are assumed lost and not recoverable.

2. When HPR conditions are initiated it is assumed that plant operators will attempt to maximize flow at least until the function is fully established and shown to meet EOP flow requirements. Therefore, it is assumed that the debris will be drawn into the pump impeller region. Also, although the HPR function is not considered recoverable, it will not be lost immediately. There is a lack of reasonable confidence that the pump could operate for an extended period of time - a fail to run condition vs. fail to start. Engineering analysis from the licensee indicates there would be no more than 60% impeller blockage. Pump efficiency would decrease; hydraulic loads and vibration increase. The pump will be able to provide 200 gpm to the CSIP and 550 gpm for RHR recirculation flow for some undetermined period of time. The increased vibration and reduced expected flow will provide operators the necessary indications of the degraded operation. This allows an additional success path by removing the pump from service and re-starting charging/safety injection (CSIP) injection with the RWST being re-filled. This task can be accomplished via a number of methods and is partially procedurialized, personnel would be available and adequate time would be available to establish this configuration. In some instances special equipment would be needed to accomplish the re-fill evolution but that equipment is readily available onsite. Re-filling the RWST is a task well within the capabilities of any operating crew. The non-recovery failure probability of 1E-1 will be used, based upon licensee information reviewed and considered appropriate in Attachment 1.

3. The LBLOCA, MBLOCA & SBLOCA initiating event frequencies from NUREG/CR-5750, " Rates of Initiating Events at U.S. Nuclear Power Plants: 1987 - 1995," of 4E-6/yr, 4E-5/yr & 5E-4/yr respectively will be used.

4. The surrogate for the performance deficiency will be basic event LMVSI310TS, "MOV 1SI-310 CNMT SUMP TO RHR PUMP A FAIL TO OPEN" with a nominal failure probability of 1.32E-2/demand.

5. When the initiating event is loss of DC, a recovery action associated with the motor driven pump on A side will be credited. Loss of DC fails the ability to close the pump's breaker from the control room. Operators are trained and capable of manually closing the breaker from the breaker cubicle in a few minutes. A non-recovery term of 5E-2 will be used, based upon licensee information reviewed and considered appropriate in Attachment 1.

6. Given a failure of the 6.9 KV Bus 1B-SB, the plant will be required to shutdown within 4 hours (at the end of 4 hours the battery will deplete). If the motor driven auxiliary feedwater pump A is out of service for test or maintenance. Plant personnel will return the pump back into service. A non-recovery failure probability of 1.4E-1 will be used, based upon licensee information reviewed and considered appropriate in Attachment 1.

7. For this performance deficiency the dominant accident sequences do not include loss of offsite power. For the initiating events of earthquake, tornado, external flood and high winds/hurricane LOSP is the dominant sequences. Therefore, based upon a review of the licensee's IPEEE information, these initiating events are considered to have a minimal affect on increasing the CDF and will be excluded from quantification. The fire external event risk contribution will be quantified.

PRA Model used for basis of the risk analysis: Licensee's full scope model with alterations to account for different LOCA frequencies (NUREG/CR-5750 used) and recovery credit included. For external events consideration the dominant cutsets from the internal events results were used as the framework with new initiating event frequencies developed from IPEEE information & a previous fire protection finding dealing with the Thermo-lag wall.

Significant Influence Factor(s) [if any]: The possibility of the pump continuing to operate beyond the mission time with suction side obstructions.

IV. Calculations - SEE EXCEL SPREADSHEET FOR ACTUAL CALCULATIONS - summary provided below:

DOMINANT INTERNAL EVENTS ACCIDENT SEQUENCES	2.24E-06	
LARGE BREAK/MEDIUM BREAK LOCA	2.24E-07	
S2 LOCA	2.24E-07	
S1 LOCA	2.37E-07	
TOTAL DELTA CDF FOR INTERNAL EVENTS		2.93E-06
FIRE BATTERY SMALL	8.90E-08	
FIRE BATTERY LARGE	8.90E-08	

FIRE LOSS OF IA	1.79E-08	
FIRE TOTAL LOSS OF MFW	3.75E-08	
FIRE 6.9 KV SMALL	1.64E-06	
FIRE 6.9 KV COMPARTMENT	8.20E-07	
TOTAL DELTA CDF FOR EXTERNAL EVENTS		2.69E-06
TOTAL DELTA CDF		5.62E-06

V. Conclusions/Recommendations - Risk increase over the base case was > 1E-6

VI. References

Phase I Screening Sheets
Excel Spread Sheet
Attachment 1, Development of HRA values from licensee documents

Analyst: W. Rogers Date: 3/28/02 Reviewed By: R. Bernhard Date: 3/28/2002