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EVALUATION TO ENSURE

ISOLATION OF RCS FLOW DIVERSION

IN THE EVENT OF A PLANT FIRE

DCC15.0-A REV. 1

_____	_____	_____	<i>R. J. Brunner</i>	_____
_____	_____	_____	<i>D. T. Kluskiak / G/C</i>	_____
3		<i>J. G. Schallenberg G/C</i>	<i>C. D. Steiner 8/23/89</i>	<i>D. P. Brunner 10/9/89</i>
2	<i>8-24-89</i>	<i>A. C. Simpson</i>	<i>W. B. Culp / G/C</i>	<i>Shyph (B)</i>
1	<i>11-23-87</i>	<i>John M. De Coste</i>	<i>Andrew Mitchell</i>	<i>Kenbacken (L)</i>
0	<i>6-23-87</i>	<i>John M. De Coste</i>	<i>Andrew Mitchell</i>	<i>Kenbacken (L)</i>
REVISION NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY

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1.0 Introduction

A review of the potential Appendix R non-compliances (Reference 4.1) showed that the Flow Diversion Valves, as identified on the Safe Shutdown Components List (Reference 4.5), appear as potential Appendix R non-compliances (i.e., "hits") in numerous fire zones. It was determined that the most efficient manner to address these hits was to review each of the cable hits at the same time and document the resolutions in an SEA. Toward this end EWR M70434 (Reference 4.2) was issued and workscope was developed for the Appendix R project. Evaluation criteria and methodology are included in FPRR Section 3.3.1.1 (Page 3.3-3) and 3.3.1.5 (Page 3.3-8) on high/low pressure interfaces including the postulation of spurious fire induced opening of a valve.

Specifically, the Flow Diversion Valves under review are as follows:

- a. RWCU Inboard and Outboard Isolation valves HV-G33-1F001 and HV-G33-1F004 (Unit 1) and HV-G33-2F001 and HV-G33-2F004 (Unit 2).
- b. Main Steam Line Drain Inboard and Outboard Isolation valves HV-B21-1F016 and HV-B21-1F019 (Unit 1) and HV-B21-2F016 and HV-B21-2F019 (Unit 2).
- c. Reactor Vessel Head Vent Inboard and Outboard Isolation Valves. HV-B21-1F001 and HV-B21-1F002 (Unit 1) and HV-B21-2F001 and HV-B21-2F002 (Unit 2).

The RWCU and MSL Isolation valves are normally open. The RV Head Vent Valves are normally closed during plant operation. For each of the above-mentioned six pairs of series isolation valves, it must be shown that at least one valve from each pair is assured closed for safe shutdown or that the loss of inventory through the high/low pressure interfaces will not be sufficient to prevent safe shutdown. This end will be achieved by identifying those cables for the Flow Diversion Valves that are of the same path as the required safe shutdown path of the fire zone in which the cable is routed. In such instances, recommendations will be made for achieving Appendix R, Section III.G.2 compliance.

NCR 89-0726 Rev. 0 (Reference 4.14) identified two flow diversion concerns. These concerns are in addition to those addressed previously in EWR M70434. The first of the two concerns had to do with RCIC & HPCI steam line drain valves HV-E41-1F028, HV-E41-1F029, HV-E41-2F028, HV-E41-2F029 HV-E51-1F025, HV-E51-1F026, HV-E51-2F025, HV-E51-2F026. Calc. SE-B-NA-038 Rev. 1 (Reference 4.11) determined that flow diversion through valves HV-B21-1(2)F016 & HV-B21-1(2)F019 would not affect safe shutdown. NPE-Sys. Engr., as documented in PLI-62134, evaluated the flow through the HPCI & RCIC steam line drain valves and determined that flow diversion through the HPCI or RCIC drain valves would not affect safe shutdown. However this analysis did not address fire zones where flow

diversion through the valves addressed by Calc. SE-B-NA-038 and the HPCI and RCIC drain valves could potentially occur. The NCR identified Fire Zone 0-26H (Control Room) as the only fire zone where this latter flow diversion could occur. The combined flow through these valves required further evaluation to determine their impact on safe shutdown.

The second NCR concern was flow diversion through the HPCI turbine steam admission valves, HV-E41-1F001 & HV-E41-2F001. The concern is that an Appendix R fire could cause the spurious opening of HPCI valve HV-E41-1(2)F001 and the spurious operation of HPCI Turbine Auxiliary Oil Pump 1(2) P213 resulting in the spurious operation of the HPCI Turbine which would create an unacceptable steam flow diversion path into the suppression pool. Specifically, the spurious operation of these components would result in a postulated steam flow from the reactor to the suppression pool which over the period of an hour, could raise the suppression pool temperature above the maximum limit for adequate cooling of the HPCI and RCIC turbine lube oil system which use the pumped fluid as the cooling media (Reference PLI-62134 attached to NCR 89-0726).

A secondary issue, not addressed in NCR 89-0726, Rev. 0, was identified during the review of steam flow diversion through valve HV-E41-1(2)F001 and the HPCI Turbine. This secondary issue results from an Appendix R fire scenario where the HPCI turbine is running (i.e. original flow diversion path through the HPCI turbine) and the HPCI pump discharge valve HV-E41-1(2)F006 spuriously opens which causes an additional flow diversion path from the condensate storage tank into the reactor vessel. With the additional postulation that this same fire damages the capability of the control components to terminate HPCI injection on high reactor water level, this scenario results in an overflowing of the reactor vessel such that the main steam lines are flooded with water and the HPCI turbine operation is stopped by the water in its steam supply line. This overflow condition poses two concerns. The first concern is when Path 1 or 3 are required for safe shutdown of either unit, as defined in PP&L drawing M-750, "Safe Shutdown Path by Fire Zone". For this condition, water in the steam lines while the reactor is still in a high pressure state, could jeopardize the operation or pressure integrity of the ADS SRV's which are required to achieve safe shutdown. The second concern is when this condition results from an Appendix R fire in a fire zone where Path 2 is required for safe shutdown of either unit, as defined in PP&L drawing M-750, "Safe Shutdown Path by Fire Zone". For this condition, the water in the steam supply piping to the RCIC turbine would jeopardize the required operation of the RCIC turbine in addition to the concern for the water in the main steam lines jeopardizing the SRV operation. Evaluation and resolution of the concerns associated with this secondary issue is outside the scope of EWR N90726, Rev. 0, and will be addressed in a subsequent evaluation initiated through NCR 91-0301.

2.0 Objective

The purpose of his evaluation is to ensure that, for a fire in any plant fire zone, at least one valve of each pair of Flow Diversion Valves is assured closed to preclude RCS blowdown. In those fire zones where this condition is not satisfied, the non-complaint cables and associated raceways will be identified and modifications proposed to alleviate the concern.

The purpose of this evaluation is also to document the analysis and resolution of the two flow diversion concerns identified in NCR 89-0726. The evaluation of the HPCI turbine steam admission valve concerns is covered in Appendix B to this SEA.

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3.0 Conclusions and Recommendations

In order to ensure the isolation of at least one valve for each pair of Flow Diversion Valves, the raceways listed in Tables 1 through 3 need to be protected commensurate with the requirements for the particular fire zone.

NCRs 87-0251 and 87-0252 (refer to Appendix A) have been issued to address the above-mentioned raceways that were not covered by NCRs 87-0177 and 87-0178. Note that SEA-EE-029 addresses that component and cable hit concerns for RWCU Isolation Valves HV-G33-1F004 (in Fire Zone 1-5D) and HV-G33-2F004 (in Fire Zone 2-5D).

All NCR dispositions involving the wrapping of raceways shall be implemented in accordance with the following DCP's: 88-3020A, 88-3020B, 88-3021A and 88-3021B.

NCRs 87-0465 and 87-0466 (refer to Appendix A) have been issued to ensure that the applicable SSES Plant Procedures (Reference 4.6) are revised to reflect recommended procedural changes concerning the Reactor Head Vent Valves identified in the process of conducting this analysis.

The conclusion to NCR 89-0726 Rev. 0 concern regarding the spurious opening of the RCIC & HPCI steam line drain valves, HV-E51-1F025, HV-E51-1F026, HV-E41-1F028, and HV-E41-1F029 (Unit 1) or HV-E51-2F025, HV-E51-2F026, HV-E41-2F028, HV-E41-F029 (Unit 2) in conjunction with the Main Steam line drain valves HV-B21-1F016 and HV-B21-1F019 (Unit 1) or HV-B21-2F016 and HV-B21-2F019 (Unit 2) in fire zone 0-26H, is that the flow diversion would not exceed the previously analyzed acceptable flow diversion quantity. The steam available from the previous analysis (Calc. SE-B-NA-038 Rev. 1) bounds this new Appendix R flow diversion concern. The additional flow input paths from the RCIC and HPCI steam line drain valves opening into the common return line will not increase the amount of the total flow diversion above the available steam flow. Safe shutdown is not affected by this flow diversion scenario. The NCR was dispositioned "use-as-is" for these valves.

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