



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

Enclosure 1

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

PLANT SYSTEMS BRANCH

INTERIM COMPENSATORY MEASURES AND REQUEST FOR EXEMPTION

FROM 10 CFR PART 50, APPENDIX R, SECTION III.G REQUIREMENT

REGARDING HOT SHUTDOWN REPAIRS FOR A FIRE EVENT IN THE PLANT

QUAD CITIES, UNITS 1 AND 2

DOCKET NOS. 50-254 and 50-265

1.0 INTRODUCTION

On December 30, 1982, the NRC issued a Safety Evaluation Report (SER) relating to Sections III.G.3 and III.L of 10 CFR Part 50, Appendix R (alternative/dedicated shutdown capability for a reactor following a fire event in the plant) for Quad Cities, Units 1 and 2, wherein the staff concluded that the plant met the requirements of the above sections with regard to alternative shutdown capability. Subsequently, by letter dated December 18, 1984, Commonwealth Edison Company (the licensee) submitted an Appendix R reevaluation report stating that it was necessitated by Generic Letter 83-33, dated October 19, 1983 which defined NRC staff positions on certain Appendix R requirements. In the above submittal, the licensee identified the Interim Compensatory Measures (ICMs) needed to ensure safe shutdown of the plant following a fire event in the plant during the interim period (i.e., until the permanent hardware modifications are completed). The report additionally contained a request for exemption from specific III.G requirements relating to fire protection features for select areas. Based on a review of the submittal, the staff has determined that the safe shutdown capability including the alternative shutdown capability at the plant continues to be essentially the same as that described by the licensee in their earlier submittals. The staff has, therefore, determined that its earlier acceptance (December 30, 1982 SER) remains valid. The staff, however, sought information relating to fire-induced high impedance faults and electrical isolation deficiency concerns which can compromise safe shutdown capability, since these were not explicitly addressed in the reevaluation. The staff also requested additional information on the ICMs required to ensure safe shutdown capability in the interim period. By letters dated December 30, 1986, January 12, 1987, March 13, 1987, July 15, 1987, September 30, 1987, October 1, 1987, October 9, 1987, and November 20, 1987, the licensee provided their responses. In these submittals, the licensee proposed some manual operations including hot shutdown repairs to eliminate

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fire-induced electrical isolation deficiencies, spurious operations and high impedance faults. Also, the licensee requested exemptions from the Appendix R, Section III.G.1 requirement for performing repairs for achieving and maintaining hot shutdown, insofar as it is interpreted as disallowing such repairs. In the March 13, 1987 submittal, the licensee further stated that since all the needed safe shutdown hardware modifications had been completed, their corresponding ICMs would not be needed. Also, by the July 17, 1987 submittal, the licensee identified a few differences relating to the plant safe shutdown configuration as it exists now from what has been described in the earlier SER (December 30, 1982). For the reasons stated above, this SER addresses only differences from the earlier SER and the licensee's reevaluation relating to fire-induced electrical deficiency concerns, spurious operations concerns and high impedance faults concerns. Another SER, to be provided at a later date, will address technical exemptions requested in the reevaluation report related to fire protection features for specific plant areas.

2.0 EVALUATION

2.1 Spurious Operations and High Impedance Faults

In their submittals, the licensee stated that a fire in any one of certain plant areas could damage RHR system logic cables associated with safe shutdown equipment which, in turn, could result in spurious operations of RHR pumps and valves, diesel generators auxiliary equipment, four relief valves and one safety relief valve (SRV) and 4 KV breakers. Additionally, a fire event in any one of certain plant areas could also damage relief valve associated circuits resulting in their spurious operations. To eliminate these spurious operations, the licensee has proposed to deenergize applicable circuits by opening respective breakers at dc distribution panels located in Fire Areas (FA) TB-I and TB-III (Turbine Building Northern and Southern Zone Groups). For a fire, in either FA TB-I or TB-III, the licensee has proposed to deenergize the applicable circuits by pulling out control power fuses located in the applicable two of four panels in a timely manner (8 fuses within 30 minutes after scram for handling the RHR logic circuit concern and 10 fuses within 10 minutes after scram for handling the Relief Valves concern). All four panels, of which two of the panels (one for each unit) contain 8 fuses each and the other two panels (one for each unit) contain 10 fuses each, are located outside FAs TB-I and TB-III and are easily accessible following a fire event in either FA TB-I or TB-III.

Regarding fire-induced high impedance faults (faults in circuits supplying power to non-safe shutdown loads from a common power source that supplies power also to safe shutdown loads) which can affect power supply to safe shutdown loads, the licensee stated that plant safe shutdown procedures require the operator to shed all non-safe shutdown loads from common power buses by tripping manually the associated breakers in a timely manner. Additionally, these procedures require pulling out the 125 V dc control power fuses for electrically operated breakers associated with non-safe shutdown loads that are supplied power by 480 V or 4 kv switchgear common buses. This task will be performed prior to tripping applicable breakers as a precaution against their possible

spurious closures. The licensee pointed out that such fuse pulling would be performed either within 30 minutes or 3 hours after scram depending upon whether such actions are required before initiating reactor water makeup (30 minutes) or suppression pool cooling (3 hours).

With regard to the fuse pulling operations mentioned above, the licensee stated that applicable control power fuses are easily identifiable, readily accessible, easy to remove, under periodic surveillance, and that their removal would not involve any significant operator hazard. The licensee further stated that the plant shutdown procedures include operator instructions to perform the above tasks in a timely manner.

Based on the above, the staff finds the licensee's proposed manual actions, i.e., tripping the applicable breakers and pulling out the applicable fuses in a timely manner for handling spurious operation and high impedance fault concerns, to be acceptable. The staff further recommends that the licensee's request for exemptions from the Appendix R, Section III.G.1 requirement for performing the above mentioned hot shutdown repair, i.e., fuse pulling for achieving and maintaining hot shutdown, be granted.

2.2 Electrical Isolation Deficiency

The licensee has identified three control circuits vulnerable to a fire-induced electrical isolation design deficiency (i.e., a fault on a remote circuit blowing a fuse common to both local and remote control circuits, prior to isolation of the needed hot shutdown circuit), which could compromise the ability to transfer the needed hot shutdown circuit to local control. These three control circuits are associated with engine starting controls for the Unit 1, Unit 2 and swing diesel generators. The licensee stated that, for these circuits, all applicable blown fuses would be replaced in a timely manner (within 30 minutes) and no more than four blown fuses, at any one time, would require such replacement. The licensee has committed to: 1) maintain replacement fuses and fuse pullers under surveillance in proximity of the engine starting controls for the diesel generators, 2) provide emergency lighting in these areas, and 3) provide manpower (as needed) to facilitate fuse replacements in a timely manner. The licensee further claimed that the circuits involved are low voltage control circuits and the fuses, though rated at 15 amperes, will actually carry much less current. Therefore, fuse replacement will not pose any undue operator hazard.

Besides the aforementioned circuits, the licensee has also identified a few 125 VDC control power circuits, associated with four specific 480V breakers, which are only singly fused. If the common control power fuses of these breakers are damaged by fire, plant shutdown procedures will require any of these breakers that are open to be manually closed within 30 minutes using a jacking handle stored in the vicinity of applicable 480V switchgear.

Based on all of the above, the staff has determined the licensee's proposed manual closing of applicable breakers and hot shutdown repairs, (i.e.,

fuse replacement) meet the intent and purpose of IE Information Notice No. 85-09, "Isolation Transfer Switches and Post-Fire Shutdown Capability", dated January 31, 1985, and are, therefore, acceptable. The staff further recommends that the licensee's request for exemption from Appendix R, Section III.G.1 requirement for performing aforementioned hot shutdown repairs (i.e., fuse replacement) for achieving and maintaining hot shutdown be granted.

2.3 Differences with December 30, 1982 SER

In the July 17, 1987 submittal, the licensee identified the differences in the safe shutdown configuration as it exists now at the plant from what has been described in the earlier SER dated December 30, 1982. The licensee additionally provided supporting justification for these differences in the above submittal and other submittals referred to in this SER. These differences are listed below:

1. Backup water supply source for the safe shutdown makeup pump will be provided by the Fire Water System (FWS) instead of the Service Water System as originally indicated in the earlier SER Section 3.1.2. Based on their hydraulic evaluation on the adequacy of the FWS, the licensee has concluded that the system can simultaneously meet the maximum fire demand and supply cooling water to the safe shutdown makeup pump room cooler, and also provide backup water supply source for the safe shutdown makeup pump at later times when needed.
2. RHR flow indication instrumentation included as being available during a fire event, in Section 3.1.5 of the earlier SER, is not considered as necessary diagnostic instrumentation. However, during torus cooling, the needed diagnostic instrumentation will be provided by suppression pool temperature indication and RHR pump discharge pressure indication.
3. Earlier SER Section 3.3 indicated there will be no need for hot or cold shutdown repairs for achieving and maintaining safe shutdown. However, as indicated in Sections 2.1 and 2.2 of this SER, there may be hot shutdown repairs (i.e., fuse pulling and/or fuse replacement) depending upon the fire event. Cold shutdown repairs may also be needed for certain fire events (these are described in Section 2.4 of the licensee's December 18, 1984 submittal).
4. The plant does not have documentation for breaker/fuse coordination for all instrumentation and power circuits as implied in the earlier SER Section 3.4.1. However, plant safe shutdown procedures include operator instructions for shedding non-safe shutdown loads from common power sources, and for fuse pulling when needed to handle high impedance faults associated with certain common power sources. These insure all the safe shutdown loads in a given bus are free of fire induced faults whenever the bus is utilized to power safe shutdown loads.

Based on the above, the staff has determined there is reasonable assurance that these differences will not compromise the safe shutdown capability of the plant and are, therefore, acceptable.

3.0 CONCLUSION

The staff concludes that the licensee's proposed approaches for resolving the fire-induced concerns (i.e., spurious operations identified in this SER, high impedance faults, and electrical isolation deficiency) are acceptable. Consequently, the staff recommends that the licensee's exemption requests to allow conducting aforementioned hot shutdown repairs (i.e., fuse pulling and/or fuse replacement), for achieving and maintaining hot shutdown, be granted. Furthermore, the staff concludes that the differences between the present safe shutdown configuration at the plant from what has been described in the December 30, 1982 SER, with regard to those items listed in Section 2.3 of this SER, are acceptable.