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TECHNICAL EVALUATION REPORT
REVIEW OF REVISION 4 TO
THE FIRE PROTECTION REVIEW REPORT
FOR SUSQUEHANNA STEAM ELECTRIC STATION
TAC NOS. M75910/M75911

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An Employee-Owned Company

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1.0 INTRODUCTION

1.1 PURPOSE OF REVIEW

This Technical Evaluation Report (TER) documents an independent review of Revision 4 to the Susquehanna Steam Electric Station (SES) Fire Protection Review Report submitted by Pennsylvania Power & Light Company (PP&L), the licensee, on December 29, 1989. This evaluation was performed with the following objectives:

- To assess if the Revision modifies previous conclusions made by the NRC.

- To evaluate changes or modifications to the licensee's fire protection program to ensure that licensing commitments are maintained.

This TER also documents an independent review of one of three new Deviation Requests from the requirements of 10 CFR 50 Appendix R which were included in Revision 4.

1.2 GENERIC BACKGROUND

General Design Criterion 3 (GDC 3), "Fire Protection," of Appendix A to 10 CFR 50 requires that structures, systems and components important to safety be designed and located to minimize, consistent with other safety requirements, the probability and effects of fires and explosions. GDC 3 also requires that fire detection and suppression systems of appropriate capacity and capability be provided and designed to minimize the adverse effects of fires on structures, systems and components important to safety. Additionally, fire fighting systems should be designed to ensure that their failure, rupture or inadvertent operation does not significantly impair the safety capabilities of these structures, systems and components.

Either the staff guidance contained in Branch Technical Position (BTP) CMEB 9.5-1 of NUREG 0800, "Standard Review Plan," or the combination of staff guidance

contained in Appendix A to BTP APCSB 9.5-1 and the technical requirements set forth in Appendix R to 10 CFR 50 define the essential elements of an acceptable fire protection program at nuclear power plants for demonstrating compliance with GDC 3. The purpose of the fire protection program is to ensure the capability to shut down the reactor and to maintain it in a safe shutdown condition and to minimize radioactive releases to the environment in the event of a fire. The above guidance implements the philosophy of defense-in-depth protection against the hazards of fire and its associated effects on safety-related equipment.

Licensees must detail their program in the Final Safety Analysis Report (FSAR), including plant design features, organization, and administrative controls. The FSAR must include a Fire Hazards Analysis (FHA), which describes plant design and equipment on an area-by-area basis. The FHA should identify fire area boundaries and demonstrate that a fire in any given area will not prevent the plant from safely shutting down. When any plant design feature deviates from regulatory guidance, it must be identified and demonstrated that the deviation does not adversely affect plant safety.

1.3 PLANT-SPECIFIC BACKGROUND

By letter dated December 29, 1989 the licensee submitted Revision 4 to their Fire Protection Review Report. This revision contained a number of changes both editorial and technical. In addition, this revision also contains three new deviation Requests. As a result of a preliminary review of this submittal, a Request for Additional Information (RAI) was sent by the staff to the licensee on July 30, 1991. The licensee responded to this RAI by letter dated August 29, 1991. This evaluation provides a review of Revision 4 to the Fire Protection Review Report including clarifications provided in the licensee's response to the RAI.

1.4 REVIEW CRITERIA

The criteria used in reviewing the licensee's submittal are based on the following NRC documents:

1. Appendix R to 10 CFR 50

2. Appendix A to APCSB 9.5-1

3. Generic Letter 86-10, "Implementation of Fire Protection Requirements," dated April 24, 1986.

2.0 EVALUATION

2.1 GENERAL

This section contains a review and evaluation of changes made in Revision 4 to the licensee's Fire Protection Review Report. Editorial changes and minor technical changes are not included in this evaluation. In addition, a review of the three new Deviation Requests are included in this section.

2.2 DISCUSSION AND EVALUATION OF CHANGES

The licensee added a statement in Section 3.3-3 on the relationship between transient events as discussed in Section 15, of their FSAR and fire induced transients. The reviewer was concerned that the licensee was taking credit for anticipating fire induced transients and therefore allowing an operator to take action prior to fire damage occurring. The licensee deleted this statement in their response to the RAI and replaced it with a statement that no adverse effects would be introduced from the effects of fire induced spurious signals which result in a transient both before and after a scram. This modification was found acceptable.

A discussion of the results of the licensee's analysis of multiple high impedance faults was included in the revision. The licensee concluded that no multiple high impedance fault concerns exist for safe shutdown buses at the plant. The NRC requested, in the RAI, this analysis to be submitted for review. Based on the review of this analysis it is concluded that the assumptions and approximations applied in the calculation were uniformly reasonable and sufficiently conservative to ensure conservative results. There were no apparent inconsistencies in the calculations and the calculations fully supported the conclusions stated by the licensee. A random sample of approximately ten percent of the branch circuit and bus calculations were checked in detail. No calculation errors or other deficiencies in implementation were noted. Therefore, based on the review of the analysis provided, the statement regarding multiple high impedance faults included in Revision 4 to the fire Protection Review Report is considered acceptable.

This revision included a discussion of the voice powered communication system which is used for post fire safe shutdown. This revision also provided a clarification that not all deluge systems in the plant can be manually activated from the Control Room. These changes were found acceptable.

A number of Deviation Requests were modified with a statement regarding the future updating of combustible loading information. The statement reads in part "The combustible loading durations specified in the Deviation Request will not be updated in the future since program commitments require that all modifications be evaluated to assure that additional combustibles are controlled to remain below the fire area fire resistance rating". The licensee was informed in the RAI that a review of modifications which only assures that the total combustible load within a fire area is less than the fire resistance of the fire area boundary is not acceptable because this method does not take into consideration localized combustibles nor does it consider that deviations may have been granted for a given area based on loading information provided in the fire hazards analysis. The licensee responded to this concern in their letter of August 29, 1991. The licensee stated that their fire protection program requires the arrangement and type of combustibles to be considered in the design process and requires that new designs must not invalidate the bases, and assumptions used in Deviation Requests. The licensee also stated that they intend to evaluate and revise Deviation Requests in the future for all information which describes the arrangement, location and type of combustibles, although they do not intend to revise the Deviation Request for minor changes in quantity of combustibles. It is acknowledged that revising Deviation Requests for minor changes in combustibles is not warranted. The licensee also appears to understand the need to assess future changes in combustibles for impact on previous conclusions. Therefore, based on the information provided in the licensee's response to the RAI, the changes related to future combustible loading modifications are considered acceptable.

Revision 4 contains a modification to Deviation Request No. 16 which pertains to lack of separation between Emergency Switchgear Room Cooling System Components. Specifically, Transfer Valves HV-08601 A/B and HV-08602A/B were added to the list of components not having separation as specified in Appendix R to 10 CFR 50.

This Deviation Request was previously approved on the basis of limited combustibles in the fire zones of concern in addition to the presence of detection and automatic suppression. Based on further review, it is determined that the addition of the new valves does not alter previous conclusions and Deviation Request 16 remains acceptable with the addition of the Transfer Valves.

Deviation Request No. 24 was modified with a change in the requirements for wrapping particular cables in the fire zones specified including no longer requiring fire wrap for one of the cables. This raised a concern that the licensee may be altering the basis for the original deviation. The licensee responded in their letter of August 20, 1991 that the cable in question was never intended to be wrapped in this one particular zone and that separation would be maintained by wrapping the associated cable which is identified in the Deviation Request. Based on this information and further review, it is concluded that the modifications to Deviation Request No. 24 are acceptable.

Deviation Request No. 26 has been modified to include RHR valve controls and control circuits. This deviation has been previously approved for lack of separation of Core Spray flow instruments in the fire zones of concern. The specific concern was that intervening combustibles existed in the area between the redundant components. The deviation was accepted based in part on the presence of detection and automatic suppression within the area of the intervening combustibles. After reviewing the configuration of the RHR valve controls and control circuits, the same conclusions can be made as in the original Deviation Request. Therefore, the addition of the RHR valve controls and control circuits to Deviation Request No. 26 does not alter the basis for approval and continues to be acceptable.

2.3 EVALUATION OF NEW DEVIATION REQUEST

Revision 4 also contained three new Requests for Deviation - Nos. 38, 39 and 40. Deviation Request No. 38 is reviewed below. Requests for Deviation Nos. 39 and 40 are concerned with 1-hour and 3-hour rated fire barriers. The staff is evaluating 1-hour and 3-hour rated fire barriers of SSES as part of a separate

action and directed SAIC not to include review of Deviation Request Nos. 39 and 40 as part of this TER.

2.3.1 Deviation Requested

A deviation is requested from Section III.G.2 of Appendix R to the extent that redundant raceways are not separated by a 3-hour rated barrier.

2.3.2 Discussion

The licensee has requested a deviation for Fire Zone 2-4G which is the Main Steam Pipeway in Fire Area R-2B in the Unit 2 Reactor Building. This request is included as Deviation Request No. 38 in Revision 4 to the Fire Protection Review Report. Fire Zone 2-4G contains safe shutdown cables for Division I and II equipment including circuits for the four Division II outboard main steam isolation valves (MSIVs) and for three of the four Division I inboard MSIVs. All of these cables are installed in conduit or metal-enclosed cable trays. The outboard MSIVs and their valve operators are located in this fire zone.

Fire Zone 2-4G does not contain installed suppression although it does contain fire detection. Fire hose reels and portable fire extinguishers are located in the immediate vicinity of the fire zone. In addition to the cables in the zone, other combustibles include lube oil contained within the valves. The fire zone is a high radiation area with the entrance door locked and access prohibited during normal plant operation. Therefore the possibility for the introduction of transient combustibles into this fire zone is limited.

The licensee states in their submittal that failure analysis for the MSIV cables of concern indicate that fire-induced hot shorts would have to occur on both the Division I and Division II cables to maintain the AC or DC solenoids energized and hold open both redundant MSIVs on a main steam line. Also, once the MSIVs have closed, multiple hot shorts on each MSIV's solenoids are required to reopen the valves. The licensee concludes that it is highly unlikely for the necessary fire damage to occur due to the limited combustibles in the fire zone and the physical separation of the cables.

2.3.3 Evaluation

Fire Zone 2-4G is not in compliance with Section III.G.2 of Appendix R because redundant trains of safe shutdown cables are located in the same fire area without adequate separation. In addition, there is no automatic suppression in the fire zone containing the redundant cables. However, combustible loading in the zone is low and the introduction of transient combustibles into the zone is limited due to the controlled access related to a high radiation area. The redundant cables of concern are either in conduit or in metal enclosed cable trays. Although no automatic suppression is located in the fire zone, detection is present and manual hose stations and portable extinguishers are located in the immediate area. If a fire were to occur, it would be expected that it would be detected in its incipient stages and the Control Room alerted to the situation. The Control Room Operators would notify the plant fire brigade who would then respond to the fire zone and control any postulated fire. Therefore, there is reasonable assurance that a fire in this fire zone would not be of a magnitude to damage redundant trains of safe shutdown cables associated with the MSIVs.

2.3.4 Conclusion

Based on the evaluation above, installing a 3-hour rate barrier between redundant trains of MSIV cables would not significantly increase reactor safety and therefore this deviation should be granted.

3.0 CONCLUSION

Based on a review of Revision 4 to the Fire Protection Review Report for Susquehanna Steam Electric Station, no changes were found which would adversely affect plant safety or modify previous staff conclusions. In addition, a review of Deviation Request No. 38 has found it to be acceptable.