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Docket No. 50-352

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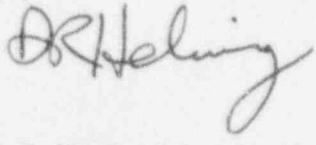
U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Limerick Generating Station, Unit 1
Special Report for Potential Non-compliance with Safe Shutdown Commitments

Attached is a Special Report which is being submitted to provide the NRC with a description of the sequence of events and decisions surrounding a potential non-compliance with safe shutdown commitments specified in the Limerick Generating Station (LGS) Updated Final Safety Analysis Report. The potential unavailability of the D12 4kV safeguards bus and associated loads required to support safe shutdown of the plant in the event of a fire in the Remote Shutdown Room (Fire Area 26) due to potential fire-induced damage to relay control cables was identified. This condition was originally considered reportable, and a notification was made to the NRC on August 10, 1994, at 1801 hours, in accordance with the requirements of 10CFR50.72(b)(1)(ii)(B) and LGS, Unit 1 Facility Operating License NPF-39, Condition 2.F. This condition was subsequently determined not to be reportable, and the previous notification was retracted at 1545 hours on September 9, 1994. The final resolution of this issue was discussed with the NRC Region I on September 9, 1994, at which time PECO Energy Company agreed to submit a Special Report to the NRC. Accordingly, the Special Report is provided in the attachment to this letter.

If you have any questions, or require any additional information, please do not hesitate to contact us.

Very truly yours,



GHS
cc: T. T. Martin, Administrator Region I, USNRC
N. S. Perry, USNRC Senior Resident Inspector, LGS

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ATTACHMENT

Limerick Generating Station, Unit 1

Special Report for Potential Non-compliance
with Safe Shutdown Commitments

On August 10, 1994, while performing work associated with the Individual Plant Examination of External Events (IPEEE) Fire Risk Analysis With Thermo-Lag Reduction Project, a discrepancy in the Limerick Generating Station (LGS) Safe Shutdown Analysis was identified by the Nuclear Engineering Division at PECO Energy Company's Nuclear Group Headquarters. The discrepancy involved a potentially unanalyzed safe shutdown cable 1BA11607D routed in raceway 1BG039 which is located in Fire Area 26, i.e., the Remote Shutdown Room. Although raceway 1BG039 was properly located on the raceway layout drawing as verified by plant walkdown, the safe shutdown database did not reflect its location. Therefore, previous safe shutdown analysis efforts did not consider postulated fire damage to cable 1BA11607D for Fire Area 26, and the effect of the fire damage was not analyzed to be mitigated. Safe shutdown cable 1BA11607D is part of a relay control scheme that normally functions to shed the non-safeguard loads from the D12 4kV safeguard bus during a Loss of Coolant Accident (LOCA) design basis event. As a result of this discrepancy, Non-Conformance Report (NCR) LG 94-00267 was initiated.

Safe Shutdown Method D, as described in the LGS Updated Final Safety Analysis Report (UFSAR), Appendix 9A, "Fire Protection Evaluation Report (FPER)," is used to achieve and maintain safe shutdown in the event of a fire in Fire Area 26. Shutdown Method D uses various systems and components, including but not limited to the B loop of the Residual Heat Removal (RHR) system, the B loops of the Emergency Service Water (ESW) and the RHR Service Water (RHRSW) systems, and reactor vessel water level and pressure instrumentation. Electrical power to these and other required loads is provided by the D12 4kV safeguards bus.

Safe shutdown analysis for a fire in Fire Area 26 demonstrates that, since cable 1BA11607D is unprotected, fire-induced damage to the cable could result in a hot short (i.e., a false LOCA signal) which would energize the 194x-116 and 194y-116 relays responsible for shedding the non-safeguards loads from the D12 4kV safeguards bus. Special Event (SE) procedure SE-8, Attachment D, "Safe Shutdown Method D," Rev. 13, which was in effect at the time of discovery of this condition, specified manual actions for operators to close tripped 4kV breakers after operating breaker control transfer switches at the local switchgear panels to re-establish the required loads on the D12 4kV bus in the event of a fire. However, the worst case effects of fire damage to this cable, including damage to affected relays, were conservatively assumed in the analysis of this condition, resulting in the inability to restore the required loads on the bus per procedure SE-8. This would result in the loss of systems and components required to support shutdown of the plant using Safe Shutdown Method D in the event of a fire.

LGS Facility Operating License NPF-39, Condition 2.C.(3).a requires that LGS maintain in effect all provisions of the approved fire protection program as described in the

UFSAR. UFSAR, Appendix 9A, Section 9A.5.3.26 states that in the event of a fire in Fire Area 26 "...Loss of these systems and components would prevent the use of Shutdown Methods A, B and C, but would not affect the operability of Shutdown Method D from the control room." On August 10, 1994, at 1705 hours, station personnel determined that LGS, Unit 1 was not in compliance with the UFSAR, Appendix 9A, in that a fire in the Remote Shutdown Room could result in the unavailability of the D12 4kV safeguards bus and associated loads required to support safe shutdown of the plant in the event of a fire due to fire-induced damage to relay control cabling. This condition was determined to constitute non-compliance with License Condition 2.C.(3).a, and the plant being in a condition that is outside of the design basis of the plant. Accordingly, a one hour notification was made to the NRC at 1801 hours, on August 10, 1994, in accordance with the requirements of 10CFR50.72(b)(1)(ii)(B). This notification also satisfied the 24 hour reporting requirement of License Condition 2.F.

As an immediate compensatory measure, an hourly fire watch patrol was established in the Remote Shutdown Room which is a one room fire area. An hourly fire watch patrol had already been established through the Auxiliary Equipment Room, with passage through the Remote Shutdown Room, since June 1992 as a compensatory measure in response to NRC Bulletin 92-01, "Failure of Thermo-Lag 330 Fire Barrier System to Maintain Cabling in Wide Cable Trays and Small Conduits Free From Fire Damage." Therefore, Fire Area 26 was already effectively being firewatched at the time this non-conforming condition was identified.

As an interim corrective action to ensure this was an isolated non-conformance, a drawing review followed by field walkdowns was initiated to verify the location of all safe shutdown raceways in the Remote Shutdown Room and the Auxiliary Equipment Room. No other non-conformances were identified. In addition, a re-analysis of Safe Shutdown Method D was initiated to determine actions necessary to resolve the NCR.

On August 18, 1994, a conference call was held between LGS and NRC Region I concerning this issue. The following actions were discussed: a complete listing of all equipment affected by a design basis fire in the Remote Shutdown Room as a result of the identified condition; the verification of all safe shutdown raceway locations in the Remote Shutdown Room and the Auxiliary Equipment Room for both Units 1 and 2 to determine if any other similar conditions existed; an analysis to determine an alternative safe shutdown method for a design basis fire in the Remote Shutdown Room (this action would also include determining the appropriate procedure revisions to implement the alternative shutdown method, and developing and conducting immediate operator training on the revised procedures); identification, evaluation and scheduling of the possible actions to correct the non-conforming condition (e.g., re-routing or wrapping cable 1BA111607D); and development of a strategy/justification for restart should Unit 1 shutdown prior to correcting the non-conforming condition, or implementing the alternative safe shutdown method.

On August 19, 1994, an action plan was provided to the onsite NRC Resident Inspectors. This action plan included the installation of Thermo-Lag material on the affected raceway as an additional interim corrective action. This action was pursued in parallel with the safe shutdown analysis to determine an alternative safe shutdown method, and identification and evaluation of other possible long term fixes.

On August 24, 1994, a detailed design analysis was completed to determine the actual effects of a design basis fire on cable 1BA11607D. The failure mechanisms were chosen to encompass all of the required faults to be analyzed for safe shutdown at all of the voltages present in Fire Area 26. All failures were determined to have no impact with the exception of a 125 VDC hot short. The 125 VDC hot short would energize the relays associated with the LOCA circuit in the D12 4kV switchgear, but would not cause physical damage to the relays.

A review of the LOCA control circuit determined that this circuit contains a time delay relay, 162-116, which, after a set time delay once energized under a LOCA condition, would open a set of interposing contacts that would allow the 194x-116 and 194y-116 relays to become de-energized, and therefore, would allow the 4kV bus breakers to be re-closed by the operators. The Safe Shutdown Engineer determined, at this point in time, that credit could not be taken for the hot short energizing the time delay relay for the duration required for the relay to perform its function to de-energize the 194 relays. Based on this determination, a review of procedure SE-8, Attachment D, Rev. 13, indicated that the manual actions contained in the procedure were insufficient to de-energize the 194 relays, and therefore, would not restore power to the required loads.

On August 26, 1994, the Plant Operations Review Committee (PORC) reviewed the NCR LG 94-00267 disposition and the associated 10CFR50.59 Review. The NCR disposition was use-as-is for cable 1BA11607D itself with recommendations for two revisions to procedure SE-8, Attachment D, as described below. These revisions were addressed by the 10CFR50.59 Review. In order to re-establish the required loads on the D12 4kV safeguards bus in the event of a fire-induced loss of the bus, the existing manual actions specified in procedure SE-8, Attachment D, should be revised to require the operator to pull fuse pair FU-15 from switchgear 10A116 cubicle 05. The addition of this manual action would isolate and de-energize the LOCA load shed control circuit if it became energized by a 125V DC hot short. This action would also provide protection against this logic circuit becoming energized any time after the breakers listed in procedure SE-8, Attachment D, Step 2.1.6 have been manually operated at the switchgear. Additionally, procedure SE-8, Attachment D should be revised to identify reactor vessel water level and pressure indication that would not be affected by a fire in Fire Area 26. This would provide additional assurance to the operators that other indication would be available in the main control room until manual action is performed to restore the normal indication powered by Division 2.

On August 30, 1994, procedure SE-8, Attachment D, was revised based on the NCR recommendations, Rev. 14 of the procedure was approved. This revision to procedure SE-8 was considered to bring LGS back into compliance with License Condition 2.C.(3).a, and eliminated the need to pursue the installation of Thermo-Lag fire barrier material on the affected raceway, or the evaluation of other long term solutions. However, re-evaluation of the safe shutdown analysis continued at this time.

Subsequently, on August 30, 1994, further consideration of the LOCA circuit indicated that credit for the duration of the hot short being sufficient to allow the time delay relay to time out was not required to mitigate the hot short. Specifically, if the fire-induced hot short was of sufficient duration to allow for the time delay relay to time out, the time delay relay would mechanically function to open the interposing contacts and de-energize the 194 relays. This determination was based on the fact that, since the relays would not be damaged by the fire-induced hot short, proper mechanical functioning of the relays could be expected. Likewise, if the hot short was not maintained for sufficient duration to allow the time delay relay to time out, the time delay relay would return to its normal de-energized state which would also open the interposing contacts and de-energize the 194 relays. Therefore, regardless of the duration of the hot short, the manual operator actions previously specified in Rev. 13 of procedure SE-8, Attachment D, could be performed to restore power to the D12 4kV safeguards bus and the required loads without the additional action of pulling the fuses to the LOCA circuitry.

At this point in time, however, a question still remained concerning whether the D124 load center transformer, required to provide power to the reactor vessel water level and pressure indication, would be restored based on the manual actions previously specified in procedure SE-8, Attachment D, Rev.13, or whether the additional actions included in Rev. 14 were required to restore this transformer. Investigation of this issue continued at this point in time.

On September 1, 1994, a meeting was held at LGS with NRC Region I representatives to provide a better understanding of the issue, to update the NRC on the progress of actions taken to date, and to determine what other actions LGS intended to pursue. The NRC understood at this time that LGS was in compliance with the commitments in the UFSAR based on the additional actions included in procedure SE-8, Attachment D. However, the NRC indicated that they would need to evaluate potential enforcement action for the non-compliance issue identified on August 10, 1994.

Subsequently, on September 6, 1994, a re-analysis of the D12 4kV circuits, and in particular, the D124 load center transformer circuit, by the Nuclear Engineering Division indicated that this transformer would indeed have been restored based on the manual actions previously specified in procedure SE-8, Attachment D, Rev. 13. This result was confirmed by an independent analysis on September 7, 1994.

This fact, coupled with the determination on August 30, 1994, concerning the time delay relay, resulted in the conclusion that procedure SE-8, Attachment D, Rev. 13, previously included adequate manual actions that would have ensured the capability to achieve and maintain safe shutdown in the event of a fire. Specifically, fire-induced damage to cable 1BA11607D could result in the trip of the D12 4kV safeguards bus. Procedure SE-8, Attachment D, Rev. 13, already provided for the manual actions to re-energize the D12 4kV bus. Therefore, the existing safe shutdown analysis, including the manual actions contained in SE-8 comply with our commitments contained in the UFSAR. As a result, non-compliance with License Condition 2.C.(3).a and a condition outside the design basis did not exist. The revisions made to procedure SE-8, Attachment D, on August 30, 1994, were subsequently reviewed and were determined to be acceptable. Those revisions provide enhancements to the procedure, such as regaining diesel generator overcurrent protection even though not required under safe shutdown design basis assumptions. Based on this conclusion, NCR LG 94-00267 was revised appropriately.

On September 9, 1994, PORC reviewed Rev. 3 of NCR LG 94-00267 and found the final disposition to be acceptable. This conclusion was subsequently discussed with NRC Region I representatives on September 9, 1994, at which time LGS agreed to submit this Special Report to the NRC to provide an overall description of decisions made and the actions taken relative to this issue. In addition, at 1545 hours, on September 9, 1994, the 1-hour non-emergency notification made on August 10, 1994, was retracted.