December 22, 1995

Mr. George A. Hunger, Jr.
Director-Licensing, MC 62A-1
PECO Energy Company
Nuclear Group Headquarters
Correspondence Control Desk
P.O. Box 195
Wayne, Pennsylvania 19087-0195

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) FOR LIMERICK GENERATING STATION, UNITS 1 AND 2, IPEEE REVIEW (TAC NOS. M83636 & M83637)

Dear Mr. Hunger:

On June 26, 1995, PECO Energy submitted in accordance with Generic Letter 88-20, Supplement 4, a request for review and approval of the Limerick Generating Station (LGS), Units 1 and 2, Individual Plant Examination of External Events (IPEEE) submittal and its associated documentation. The staff has reviewed your submittal for LGS and has determined that additional information, as stated in the enclosure, is needed by the staff to complete our review. The request for additional information was developed by our contractor, Energy Research, Inc., and reviewed by the NRC's "Senior Review Board."

We request that the licensee provide its response within 60 days, to support our review schedule. If you have any questions on the enclosed RAI, please contact me at 301-415-1447.

This requirement affects nine or fewer respondents, and therefore, is not subject to Office of Management and Budget review under P.L. 96-511.

Sincerely,
/S/
Frank Rinaldi, Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-352/353

Enclosure: RAI

cc w/encl: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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Mr. George A. Hunger, Jr.
PECO Energy Company

Limerick Generating Station,
Units 1 & 2

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REQUEST FOR ADDITIONAL INFORMATION

LIMERICK GENERATING STATION, UNITS 1 AND 2

INDIVIDUAL PLANT EXAMINATION OF EXTERNAL EVENTS (IPEEE)

Seismic Analysis

1. Limerick has been identified in NUREG-1407 as a plant belonging to the 0.3g focused-scope seismic margin assessment bin; hence, the reduced-scope evaluation at 0.15g, as performed in the LGS seismic IPEEE, does not conform to the review guidance in NUREG-1407 and Supplement 4 to Generic Letter (GL) 88-20. Accordingly:

   a. Provide a list of structures, systems, and components (including Safe Shutdown Equipment List (SSEL) items and containment systems equipment) that did not screen at 0.3g.

   b. Provide the basis for disposition of each such item at 0.3g. Indicate if the Severe Accident Risk Assessment (SARA) capacity calculations continue to be valid; discuss any other basis that has been used for component disposition, including any results of new calculations.

   c. Provide an evaluation of masonry/block walls that may influence the performance of success path components.

   d. Provide an evaluation of flat-bottomed tanks, as requested in NUREG-1407 and GL 88-20 for focused-scope plants.

2. Provide a list of "bad actor" relays which are installed in the preferred and alternate safe shutdown (SSD) paths for Limerick, including in your response all of the safe shutdown (SSD) frontline systems in Section 3.1.2.5.1 of your submittal, and SSD support systems identified in Section 3.1.2.5.2 of your submittal. For each "bad actor" relay identified, discuss the impact of malfunctions of the relay on integrity of the preferred and alternate shutdown paths.

3. The alternate shutdown success path uses Low Pressure Coolant Injection/Residual Heat Removal (LPCI/RHR) "C" and "D" loops for inventory control and the "B" loop for suppression pool cooling. Identify and explain how the LPCI/RHR system is used in the alternate shutdown path (indicating what trains of the system must operate in order for the alternate shutdown path to succeed), and explain how non-seismic failures were accounted for in this regard.

4. Provide a copy of the "Success Path Logic Diagram" (SPLD) which is referred to in Section 3.1.2.5.4.1 of the IPEEE submittal report.

5. List all shutdown-path-related non-seismic failures and human actions, together with their failure rates, noting any lack of redundancies. Also provide a discussion concerning the anticipated effects of the seismic

margin earthquake on rates of operator errors which may impact the integrity of the preferred and alternate success paths. Identify the locations at which operator actions must be performed.

6. Indicate to what extent the cabinet internals were checked for adequate installation, and provide the results of these checks.

7. Section 3.1.5.1 of the submittal references EPRI NP-7498 as providing the technical approach used for containment evaluation in the LGS seismic IPEEE. Please provide a copy of EPRI NP-7498.

8. NUREG-1407 requests an evaluation of seismic-fire interactions to consider: (i) seismic-induced fires, (ii) seismic actuation of fire suppression systems, and (iii) seismic degradation/failure of fire suppression systems. Examples of items found in past studies include (but are not limited to):

   · Unanchored CO_2 tanks or bottles
   · Sprinkler standoffs penetrating suspended ceilings
   · Fire pumps unanchored or on vibration isolation mounts
   · Mercury or "bad actor" relays in fire protection system (FPS) actuation circuitry
   · Weak or unanchored 480V or 600V (non-safety related) electrical cabinets in close proximity to essential safety equipment (i.e., as potential fire sources)
   · Use of cast iron fire mains to provide fire water to fire pumps

   NUREG-1407 suggests a walkdown as a means of identifying any such items.

   Please provide the related results of your seismic-fire interaction study. Provide guidelines given to walkdown personnel for evaluating these issues (if they exist).

9. Failure of room cooling has been identified as an important failure mode in past probabilistic risk assessment studies. However, in Table 3.1.2-1 ("Preferred and Alternate Shutdown Paths"), pump room cooling is not mentioned. Discuss the need for pump room cooling for High Pressure Coolant Injection (HPCI), Reactor Core Isolation Cooling (RCIC), and RHR for achieving and maintaining safe shutdown conditions for 72 hours, and discuss the extent to which pump room cooling considerations were addressed during the walkdowns.

10. Discuss the performance of containment cooling and hydrogen control systems at the 0.3g Peak Ground Acceleration (PGA) review level earthquake.

11. Discuss the ability of the preferred and alternate shutdown paths to respond to medium and large Loss of Coolant Accident (LOCAs) that may result from stuck-open safety-relief valves.

Fire Analysis

1. The submittal (Section 4.0) states that "quantification of fire induced safe shutdown system unavailability was obtained by propagating fire induced system failures through a modified Probalistic Safety Analysis (PSA) plant model." Identify which plant model was used (e.g., was it the LGS IPE plant model or some other?), and explain how the model was modified. In addition, discuss how this model was verified as accurately representing the plant configuration and its response to fire initiating events.

2. The submittal states (Section 4.0.2), "Fire-induced disabling of the control room Heating Ventilating and Air Conditioning (HVAC) is not assumed to result in loss of control room habitability. The control room is constantly manned, and a heating or cooling failure would be corrected in a timely manner according to the applicable procedure." Identify the fire areas from which a fire-induced disabling of the control room HVAC could occur and, comparing these scenarios with the applicable procedure, verify that the procedure steps would result in recovery of the control room HVAC system in time to prevent loss of habitability. Specify the criteria used to judge whether loss of habitability has occurred (e.g., a room temperature criterion). Further, demonstrate that no system or component failures would result from fire-induced loss of control room HVAC prior to loss of habitability. If such failures are possible prior to loss of habitability, demonstrate that the failures are recoverable or that their consequences can be adequately controlled by existing procedures.

3. The submittal states (Section 4.0.2), "Fire brigade response time is assumed to be equal to the manual fire suppression time." This assumption is not considered an acceptable approach. An assessment of manual suppression times must include: (a) time to detection, (b) brigade response time, and (c) extinguishment time. Provide the effect on the screening analysis by considering all of these components of fire suppression time.

4. The submittal states (Section 4.0.2), "For any analyzed fire only one worst-case spurious actuation or signal is postulated (with the exception of Hi-Low pressure interfaces). Operator actions and repairs may be available to correct the actuation or signal or redundant equipment may be utilized in order to provide the required safe shutdown function. The analysis of spurious operations is identical to that performed for Appendix R analyses." Explain how the "one worst-case spurious actuation or signal" is postulated (e.g., Is it based on failure modes and effects analysis, on expert judgment, or on some criteria?). Justify the implicit assumption that multiple failures are not possible or are unimportant, and explain the basis for any related evaluations.

5. The IPEEE submittal notes that a generic event tree was developed to represent the potential shutdown systems available and was used as a template for individual fire areas. The event trees were then modified to specifically model each unique set of systems categorized as successful and failed for each particular fire compartment. Provide a copy of the event tree (including definitions of all event tree top events), a listing of the conditional probability of all events in the tree, and a discussion of the bases for the quantification values used.

   Explain how initiating events other than an automatic or manual reactor trip (e.g., fire-induced loss of offsite power) were considered, including specifically how they were modeled.

6. The submittal states (Section 4.1.2), "Transient ignition sources were identified by calculating a generic number (see Section 4.4.1.2) which was used for all fire compartments at Limerick." This methodology is not consistent with the "FIVE" computer code, and is also not considered to be an acceptable Probabilistic Risk Assessment (PRA) practice. The generic number used in such an analysis must be shown to bound the probability of transient combustible fires in each compartment throughout the plant. Provide either a FIVE-consistent analysis or demonstrate that the generic number used in the IPEEE is bounding.

7. Provide the results of the walkdowns. In addition, address how the walkdowns ensured that cable routing information used in the fire IPEEE represents as-built information, and how the walkdowns evaluated possible dependence between the remote shutdown and control room circuitry (as provided for in NUREG-1407, Appendix C, Section C.3).

8. The study assumes that passive fire-barrier elements (e.g., walls, floors, ceilings, and penetration seals) are 100% reliable. Such an analysis is not valid unless the assumption is adequately justified and it can be demonstrated that there are no paths through the barrier for the spread of damage. Provide such justification and demonstration for high-hazard fire areas, such as: the turbine building, diesel generator rooms, cable spreading rooms, switchgear rooms, and lube oil storage areas.

9. The fire compartment interaction analysis (FCIA) is based on the assumption that fire barriers are effective as rated. For active fire barriers (e.g., a normally open fire door that gets closed by fusible link), the failure probability can be significantly high. Provide a list of compartments with active fire barriers, a description of the active barriers, and a discussion regarding qualitative screening of these (and their adjacent) compartments.

10. It is not considered technically justifiable that open hatchways in the reactor building are capable of containing hot gas and smoke spread. Provide an analysis of the effect on fire area multi-zone screening of considering the potential for hot gas and smoke spread.

11. Provide the details concerning the screening analyses of the following fire compartments (including the relative separation between potential combustible sources and critical equipment, as well as whether or not any non-IEEE 383 rated cabling is utilized):

    - Fire Compartment 1E - Recombiner Access Area
    - Fire Compartment 07 - 4kV Switchgear Corridor
    - Fire Compartment 22 - Unit 1 Cable Spreading Room
    - Fire Compartment 23 - Unit 2 Cable Spreading Room
    - Fire Compartment 44 - Unit 1 Safeguard System Access Area
    - Fire Compartment 45 - Unit 1 Control Rod Drive (CRD) Hydraulic Equipment Area
    - Fire Compartment 47 - Unit 1 Isolation Valve Compartment Areas
    - Fire Compartment 64 - Unit 2 Reactor Enclosure Cooling Water Equipment Area
    - Fire Compartment 67 - Unit 2 Safeguard System Access Area
    - Fire Compartment 68 - Unit 2 CRD Hydraulic Equipment Area
    - Fire Compartment 70 - Unit 2 Isolation Valve Compartment Area
    - Fire Compartment 87 A/B/C - Condensate Pump Rooms, Generator Equipment Areas, Operating Floor

12. With regards to the analysis described in Section 4.3.3 in your submittal, have any combustible fire barrier materials been used as the basis for establishing 20-ft-separation combustible-free zones? If so, has the analysis considered propagation of fire via combustion of these fire barrier materials? If not, please provide such an assessment for fire spread.

13. The submittal states, "Operator effectiveness in performing manual safe shutdown actions is not considered to be affected by areas which contain smoke and hot gases." This assumption is not considered to be acceptable. Please provide a description of any sequences for which credit has been taken for operator actions in the affected fire areas. Provide an assessment of the impact on area screening if no credit is given for operator recovery actions in an affected fire area.

14. Section 4.6.0 of the submittal states that "pre-cursor" events (such as mis-calibration of sensors) from the IPE models were used to derive the fire IPEEE PRA model. It is also assumed that all systems are available at the time of fire initiation (i.e., no test and maintenance unavailabilities were included). This practice could distort or mask important risk contributors. Provide an assessment of the impact on area screening if these factors are included in the analysis.

15. A listing of shared systems is not documented in the submittal. Provide a listing of shared systems (if any) and an analysis of dual-unit fire-induced core damage scenarios, including a discussion of whether or not additional fire compartments survive the screening analysis.