July 28, 1988

Docket Nos. 50-277/278

Mr. William M. Alden
Director-Licensing
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Dear Mr. Alden:

SUBJECT: REQUEST FOR INFORMATION ON PECO REPORT "METHODS FOR PERFORMING BWR SYSTEMS TRANSIENT ANALYSIS," PECO-FMS-0004

The staff's Reactor Systems Branch has completed a review of the PECo response dated June 6, 1988 on this report. As a result the staff and its technical assistance contractor, International Technical Services, has identified additional information needed to complete the review. Therefore, we request that the additional information as identified in the enclosure be provided to enable us to continue our review.

/s/
Robert E. Martin, Project Manager
Project Directorate I-2
Division of Reactor Projects I/II

Enclosure:

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

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Robert Martin
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Project Directorate I-2
Division of Reactor Projects I/II

Enclosure:

Mr. William M. Alden
Philadelphia Electric Company

Peach Bottom Atomic Power Station,
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cc:

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ENCLOSURE

REQUEST FOR ADDITIONAL INFORMATION
PHILADELPHIA ELECTRIC COMPANY
TOPICAL REPORT PECO-FMS-0004

1.0 Qualification of RETRAN Computer Model

1. For the PECo version of the RETRAN computer model intended for Peach Bottom 2 and 3 reload analysis, justify: (i) the plant nodalization on a transient by transient basis; (ii) the use of the algebraic slip option for modeling void distribution in the core; (iii) the adequacy and accuracy of the use of the non-equilibrium pressurizer model; and (iv) the criteria used to determine the set of boundary conditions used to initialize the input deck. In addition, provide a summary and results of at least one operational transient which thoroughly exercises all components of the model, demonstrating that the RETRAN plant model is an appropriate best-estimate model and where appropriate, demonstrating that use of code models is conservative.

   In conjunction with the foregoing justification, (i) provide and describe in depth all parametric studies performed to justify the conclusion that the nodalization presented in Section 2.0 of PECO-FMS-0004 is either a best-estimate or a conservative representation of the plant, as the case requires; and (ii) since the algebraic slip model was not approved in the RETRAN SER, (1) provide an independent qualification of this model by comparison to applicable experimental data in both steady state and transient flow regimes; or (2) explain in depth the intended use of this model in licensing and operational transient analysis to assure conservative results despite the fact that it has not been qualified.

2. In using the built-in RETRAN separator model, carryover and carryunder fractions are held constant at levels based upon manufacturer's data. Justify the use of constant values for transient analysis. In addition, define what adjustments were necessary in order to use manufacturer's data in the RETRAN model (including steam separator carryover and carryunder, especially at the initial startup and operational transient simulation).

3. In using the non-equilibrium pressurizer model to account for non-equilibrium effects in the upper downcomer volume, a user limitation was placed on the use of the model that the steam-water interface must not cross either boundary of the volume during the transient being examined. The placing of this limitation does not address qualification of the model nor does it demonstrate that the model's results will be either best-estimate or conservative during such use. Demonstrate that the proposed use of the non-equilibrium pressurizer model for the upper downcomer volume (including the particular selection of input associated with that model) is either best-estimate or conservative as the case requires.

4. Model qualification presented in the subject topical report consists of three sets of startup tests to check best-estimate control system modeling. Without qualifying the best-estimate whole plant model, this best-estimate model was used to perform a licensing-type calculation. Explain what changes must be made to adapt the best estimate plant model (assuming it has been qualified as such) to the performance of the various licensing transients.

5. In Section 2.0 of PECo-FMS-0004, it is stated that the model presented is applicable to a wide range of transients with only "minor modifications to the model input" which are transient dependent. Provide a detailed list of what changes are necessary for each licensing and operational transient to be analyzed and a thorough explanation of why each such change is appropriate.

6. Explain the process used to determine the gap conductivity.

7. In reference to the computer codes used for the report, the licensee's versions of the codes (RETRAN, SIMULATE-E and SIMTRAN-E) were reportedly used. Document the differences between the PECo versions and the officially distributed versions.

8. Since only a limited amount of startup tests and operational transients were used for the model qualification (and much of them are for the control system benchmark), qualify the steam separator model, liquid level model, steam line model, bypass valve sizing, isolation condenser, etc., and assess and justify the uncertainty level (or bias) associated with each one of these models.

2.0 Start-up Tests

2.1 Feedwater System Transient Tests

9. Explain how the whole plant model is qualified on the basis of the results obtained by using a stand-alone model of the turbine-pump dynamics logic.

10. Explain why the 60% power test data for the change in NR level shows the hysteresis effect yet the RETRAN result does not.

2.2 Turbine Electro-Hydraulic Control Transient Tests

11. Explain why agreement between RETRAN and test data is much better at 100% power than at 25% power. Explain further why RETRAN control logic did not predict the hysteresis effect exhibited (Fig. 3-13) by the test data. Relate the response to the previous Question 10, if applicable.

2.3 Reactor Recirculation Transient Tests

12. Explain the divergence of the water level prediction from the data presented in Fig. 3-18 for the M-G set motor trip test. Explain further why the oscillatory behavior was not predicted by RETRAN.

13. Justify the fact that the RETRAN predicted recirculation drive flow (Fig. 3-20) is diverging in the non-conservative direction.

2.4 Peach Bottom Safety/Relief Valve Test

14. Explain why in a best-estimate base model which reportedly represents the typical plant parameters a conservatism was built in for the SRV flow. Were the valves not sized to yield the rated flow?

15. Explain why, although steam dome pressure was predicted well in the PV2C5 SRV lift test, the second peak in core flux was overpredicted by a factor of 2. Discuss, in depth, how the measured core fluxes differ from predictions and the relationship to the use of the algebraic slip model.

2.5 Peach Bottom Turbine Trip Test

16. Since plant data were used as input, how is rapid feedwater flow excursion simulated?

17. How did the measured control rod scram time and speeds used in the analysis differ from those normally modeled in the RETRAN base plant model generally used for the report?

18. Justify the fact that although the pressure distribution was predicted well for TT1, all the local neutron fluxes were

overpredicted by as much as a factor of 2. Discuss, in depth, how the measured core fluxes differ from predictions and the relationship to the use of the algebraic slip model.

3.0 Licensing Basis Transient Analysis

A turbine trip without bypass transient analysis which was identified by the NRC is presented. The results are compared with those obtained by Brookhaven National Laboratory using RELAP-3B during their audit of GE's ODYN computer code. Provide the following information on this licensing basis transient analysis.

3.1 Turbine Trip Without Bypass

19. What are the conservative assumptions incorporated into the best-estimate model presented in Section 2.0 of PECo-FMS-0004 to create a model suitable for a licensing-type calculation for this transient? For example, are there any modifications to the control system logic to convert the best-estimate (based upon the actual plant data) to a licensing-type model? Are these licensing conditions different from those normally used for Peach Bottom?

20. Explain why the initial core inlet subcooling is different from the other calculations (apparent in the lower portion of the core void profile in Fig. 4-3).

21. Explain why, although RETRAN had similar initial axial void distributions to the other codes used for analysis of the NRC specified test problem (Fig. 4-3), the transient data differed from both other codes (Fig. 4-6) while the core power was between that of the other two codes (Fig. 4-4). These differences, together with the differences in flux noted in Q.15 and Q.18 indicate that the local void distribution predicted by the RETRAN algebraic slip option may be inaccurate.