January 11, 1988

Docket Nos. 50-387-388

Mr. Harold W. Keiser
Vice President
Nuclear Operations
Pennsylvania Power and Light Company
2 North Ninth Street
Allentown, Pennsylvania 18101

Dear Mr. Keiser:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION

RE: Susquehanna Steam Electric Station, Units 1 and 2

Our consultants, Brookhaven National Laboratory, have reviewed your Topical Report PL-NF-87-001 related to BWR Steady-State Core Physics Methods, dated March 31, 1987. The review indicates a need for additional information before we can complete the review.

Please provide answers to the enclosed set of questions within 30 days from the receipt of this request so that we can complete our action on your April 28, 1987 request in a timely fashion.

Sincerely,

/s/
Mohan C. Thadani, Project Manager
Project Directorate I-2
Division of Reactor Projects I/II

Enclosure:
As stated

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

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Enclosure:
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Mr. Harold W. Keiser
Pennsylvania Power & Light Company

Susquehanna Steam Electric Station
Units 1 & 2

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ENCLOSURE

QUESTIONS ON PENNSYLVANIA POWER & LIGHT COMPANY'S
TOPICAL REPORT PL-NF-87-001,
"QUALIFICATION OF STEADY-STATE CORE PHYSICS
METHODS FOR BWR DESIGN AND ANALYSIS"

CPM-2

1. What are the bases for the depletion steps, spatial mesh, energy groups (macro and 2-D), convergence and other parameters used in production calculations with CPM-2/MICBURN?

2. The 5 energy groups used for the 2-D calculations are somewhat coarse. Please comment.

3. How was the conversion from calculated power to Ba-140 concentrations performed for the CPM-2 rod-wise comparisons to the Quad Cities gamma-scan results?

4. The discussion in Section 2.3 needs more consistency in references to measured and calculated values of power, and Ba-140 and La-140 activities in terms of what quantities are compared and their bases.

5. Are the presently demonstrated accuracy and biases of CPM-2 calculations expected to hold for 9x9 and other advanced BWR bundle designs? Have any comparisons been made of CPM-2 to Monte Carlo calculations for 9x9 bundles of the type used in Susquehana Unit 2?

6. Have any trends (biases) been observed in the accuracy of pin-power and LPF predictions vs. elevation, void history, exposure, control, etc?

7. How do modifications to ENDF/B-III nuclear data other than those noted for U-238 compare to uncertainties in the basic data.?

8. The Quad Cities-1 EOC2 gamma scan data are essentially representative of all rods out operation. What are the implications relative to the accuracy with which CPM-2 calculates individual rod powers for normal rodded conditions, and what assurance is there that any presently observed conservative trends (biases) are universal, and bounding?

9. The CPM-2 comparisons to the γ-scan data are influenced by the accuracy of the SIMULATE-E predictions of local effects (e.g. burnup, void, control history) for the scanned bundles/elevations. Have the SIMULATE-E local errors been considered to assure that the CPM-2 results are representative?

SIMULATE-E

1. Does the data for assembly power peaking that is used in the calculation of fuel performance parameters (e.g. MLHGR, CPR) include all CPM-2 calculated statepoints (e.g. every burnup point and every nominal and off-nominal condition) or only a subset? If the latter, how are they selected to ensure conservatism?

2. a. What is the "flag" which signals the need for new normalization of the model adjustable input data parameters and/or radial and axial albedos?

   b. How often are albedo/normalization parameter changes typically made?

c. What is the basis for performing the normalizations when the code is used in a predictive mode for cores which differ significantly from those previously modeled?

3. Is the XN-3 correlation valid for 9x9 and other advanced design BWR bundles?

4. The TIP detector model in SIMULATE assumes that the response from each assembly is not affected by the presence of the other 3 surrounding the TIP. Has this assumption been tested; is it adequate?

5. While it is true that peripheral assemblies and top and bottom axial nodes are generally low power and hence not of safety concern, eliminating them from the scan comparisons seems to remove a potentially valuable source of information on the accuracy/adequacy of albedo and reflector boundary condition dependencies. Please comment.

6. Please explain why non-conventional definitions are used in the TIP and γ-scan comparisons. For example, it is not obvious why $\bar{T}$ is used in the denominator for determining the differences in the radial TIP comparisons.

7. Does PP&L intend to use PDQ-7 for applications significantly different from those for which benchmarking is provided in the report (e.g. core calculations)?

8. Do EPRI guidelines exist for the CPM-2 (cross section) - COPHIN - PDQ-7 calculational path? Are they followed by PP&L?

General

Have CPM-2/MICBURN, SIMULATE-E, FIBWR and the XN-3 correlation been reviewed and approved by the U.S. Nuclear Regulatory Commission?