October 8, 1996

Mr. Robert G. Byram
Senior Vice President-Nuclear
Pennsylvania Power and Light
Company
2 North Ninth Street
Allentown, PA 19101

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE DESIGN OF THE CONCRETE PAD FOR THE DRY CASK STORAGE FACILITY

Dear Mr. Byram:

Recently, the Region I staff conducted an inspection of the construction and design activities related to the dry cask storage facility at Susquehanna Steam Electric Station, Units 1 and 2. As part of the scope of the inspection, the staff collected particular calculations for the design of the concrete pad on which the casks are to be stored and then provided them to the Office of Nuclear Reactor Regulation (NRR) staff for independent review. The NRR staff has reviewed the calculations and developed a set of questions related to their content and specific methodology (Enclosure).

It is requested that you provide a response within 30 days of receipt of this letter. The staff will utilize the information you provide in developing an input to the regional inspection report.

If you have any questions regarding this RAI, please contact me on (301) 415-1402.

Sincerely,
/S/
Chester Poslunsy, Senior Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-387/388

Enclosure: RAI

cc w/encl: See next page

DISTRIBUTION

Docket File	MO'Brien
PUBLIC	OGC
PDI-2 Reading	ACRS
SVarga	WPasciak, RGN-I
JStolz	
CPoslusny	

NRC FILE CENTER COPY

DFO1

OFFICE	PDI-2/PM	PDI-2/LA	PDI-2/D		
NAME	CPoslusny:rb	MO'Brien	JStolz		
DATE	10/8/96	10/8/96	10/8/96		

OFFICIAL RECORD COPY
DOCUMENT NAME: SUDRY.RAI

110173

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

October 8, 1996

Mr. Robert G. Byram
Senior Vice President-Nuclear
Pennsylvania Power and Light
Company
2 North Ninth Street
Allentown, PA 19101

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE DESIGN OF THE CONCRETE PAD FOR THE DRY CASK STORAGE FACILITY

Dear Mr. Byram:

Recently, the Region I staff conducted an inspection of the construction and design activities related to the dry cask storage facility at Susquehanna Steam Electric Station, Units 1 and 2. As part of the scope of the inspection, the staff collected particular calculations for the design of the concrete pad on which the casks are to be stored and then provided them to the Office of Nuclear Reactor Regulation (NRR) staff for independent review. The NRR staff has reviewed the calculations and developed a set of questions related to their content and specific methodology (Enclosure).

It is requested that you provide a response within 30 days of receipt of this letter. The staff will utilize the information you provide in developing an input to the regional inspection report.

If you have any questions regarding this RAI, please contact me on (301) 415-1402.

Sincerely,

Chester Poslunsy, Senior Project Manager
Project Directorate I-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket Nos. 50-387/388

Enclosure: RAI

cc w/encl: See next page

REQUEST FOR ADDITIONAL INFORMATION
ISFSI PAD ANALYSIS AND DESIGN
SUSQUEHANNA STEAM ELECTRIC STATION, UNITS 1 AND 2
CIVIL ENGINEERING AND GEOSCIENCES BRANCH

A. Geotechnical / Seismological Engineering:

1. Page 10 of 53 in PP&L Calc. EC-STRU-1037: In the table of low strain shear wave velocities given in Fig. 1A, there are arithmetic errors in calculating five out of eight lower bound shear wave velocity values, and two out of eight upper bound shear wave velocity values. (The lower and upper bound values are calculated by multiplying the best estimate shear wave velocities by 0.707 and 1.414 respectively to meet the Standard Review Plan (SRP) guidelines). Revise the ground motion amplification analyses and provide the ground motion acceleration spectra at the grade surface for the ISFSI site using the correct numbers for the three cases of shear wave velocity values.

2. Pages 11 and 12 of 53 (Figs. 1B and 1C) in PP&L Calc. EC-STRU-1037: Provide the source of the curves showing the variation of shear modulus and damping with strain.

3a. Page 51 of 53 in PP&L Calc. EC-STRU-1037: Section 6 Conclusions states that the potential for liquefaction is addressed in the geotechnical report (Reference 3 cited in PP&L Calc. EC-STRU-1037). However, the referenced geotechnical report does not contain any liquefaction evaluation. Provide the liquefaction evaluation for our review.

3b. Section 6 of PP&L Calc. EC-STRU-1037 also states that the liquefaction of the soil deposit at the nearby spray pond area is addressed in the Susquehanna FSAR Section 2.5.5.2.2.2. If this reference is intended to say that the two sites (i.e. Spray Pond and ISFSI pad sites) are similar, provide a detailed comparison of the soil profiles and maximum seismic acceleration response spectra for the ground surfaces of the two sites.

4. Sheet 2 of 14 In PP&L Calc..EC-STRU-1054 (which is cited as Reference 13 in PP&L Calc. EC-STRU-1037) states that dynamic soil properties, such as shear wave velocity, were obtained in Reference 2 (the geotechnical report cited in item 3a above) which, however, does not give any shear wave velocity information. Clarify if this is a typographical error, since References 3 and 4 cited on sheet 3 of 14 in PP&L Calc. EC-STRU-1054 provide the shear wave velocity. If it is not a typographical error, provide the shear wave velocity said to be given in Reference 2 cited in item 3a above.

ENCLOSURE

B. Structural Engineering:

1. It appears that an incorrect area (0.59 in^2) for the reinforcing steel was used to perform the calculation for the ACI crack control requirement in Reference 1, pages 47-49. Provide the crack control requirement calculation performed with the correct steel area (0.48 in^2).

2. For the ANSYS finite element computer code analyses for Basemat #1 and the Approach Slab (Reference 1):

   a) Provide a copy of each of the meshes including the dimensions used in the analyses.

   b) Describe the boundary conditions used, and indicate them in the meshes.

   c) Provide the material properties used in the analyses.

   d) Provide the magnitudes of the dead loads (DL), live loads (LL) and earthquake loads (EQL) used for loading Sequences 3 and 4 for Basemat #1 and the most critical loading sequence for the Approach Slab. Indicate their locations in the meshes.

   e) PP&L indicates that uniform EQLs were used in the calculations although the actual loads are not uniform. Provide the magnitudes of the actual, nonuniform EQLs.

   f) Explain how the interface between the basemat and soil and the soil material behavior were modeled in the analyses. Provide the basis for concluding that they accurately represent the real soil behavior and soil/structure interactions.

   g) Reference 2 indicates that the subgrade reaction (k_s=500 lb/in^3) was obtained from the California Bearing Ratio (CBR) test. Provide the engineering basis for calculating k_s from the CBR test, and discuss the accuracy of such a k_s.

   h) Page 21 of Reference 1 indicates that a k_s of 250 lb/in^3 was used in the final analysis. However, the ANSYS input file still shows a k_s of 500 lb/in^3 on pages of A3-54, A3-67 and A3-78 of the Reference. Clarify the discrepancy, and indicate whether the analysis results presented in Reference 1 are still valid.

   i) Indicate whether k_s was varied along the basemat and approach slab to reflect flexible foundation and soil interactions.

   j) Indicate whether the analysis results using the Winkler's method were confirmed by other methods (i.e, methods suggested in References 3, 4 and 5).

k) Provide the calculated moments, shears and displacements for the basemat and slab from the center to the edge of the structures in both (short and long) directions.

l) Reference 2 shows that the total and the differential settlements are estimated to be below 0.75 inch and 0.5 inch, respectively. Provide the settlement calculations that support these values.

m) The ANSYS analyses predict maximum deflections of 0.205 inch and 0.0752 inch for the Basemat #1 and Approach Slab, respectively. Are these total or differential deflections? Please discuss the soil and structure interactions with respect to the estimated and predicted displacements (Question B2(l) above), and the relationship assumed between the displacements and k_s of the Winkler's method calculation.

n) United Inspection Services, PP&L's contractor, recommends in Reference 2 that a 21-inch thick concrete slab be used. Discuss the factors considered which resulted in an 18-inch thick concrete mat in the final design.

REFERENCES

1. PP&L Calculation Package (CALC. NO.: 16-77.0200) submitted to NRC during the public meeting on September 12, 1996.

2. Foundation Investigation Report for ISFSI at Susquehanna, prepared by United Inspection Service, May 26, 1995.

3. "Foundation Engineering Handbook" edited by H.F Winterkorn and H.Y. Fang, Van Nostrand Reinhold Company, 1975.

4. B.M. Das, "Principles of Foundation Engineering", 3rd Edition, PWS-Kent Publisher, 1994.

5. "Design and Performance of Mat Foundation: State-of-the-Art Review", ACI-SP-152, 1995.