50.55(e)

Duquesne Light

435 Sixth Avenue
Pittsburgh, Pennsylvania
15219

(412) 456-6000

AUG 31 1981

2DLC 4223

United States Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, PA 19405

ATTENTION: Mr. Boyce H. Grier, Director

SUBJECT: Beaver Valley Power Station - Unit No. 2
Docket No. 50-412
Possible Discrepancies Between Design Calculations and Drawings Released for Construction
Significant Deficiency Report No. 81-02

Gentlemen:

Pursuant to the requirements of 10CFR50 55(e), the "Final Report on Possible Discrepancies Between Design Calculations and Drawings Released for Construction" is attached for your review. If you have any questions concerning this report, we are available to meet with the USNRC personnel at their convenience.

Duquesne Light Company

By E. J. Woolever
E. J. Woolever

Enclosure

WFR/baf

cc: Mr. V. Stello, Director (15)
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, DC 20555

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Final Report
on
Control Room Extension
at
Beaver Valley Power Station - Unit No. 2

1.0 SUMMARY

During a review of the structural design calculations for the Control Room Extension for Significant Deficiency Report No. 80-07, "Seismic Calculations for Category I Structures", potential significant deficiencies were found to exist in certain reinforced concrete supporting members when all design load conditions are considered. Construction of the structural work for this structure is nearly complete while the mechanical and electrical work is in the early stages.

2.0 IMMEDIATE ACTION TAKEN

Upon discovery of the potential significant deficiencies, a thorough investigation was started to review the calculations and drawings for this structure and is presently underway.

Since this problem was construed to be a possible reportable significant deficiency pursuant to 10CFR50.55(e) (1) (ii), the U. S. Nuclear Regulatory Commission (NRC) was notified orally on April 16, 1981. An "Initial Interim Report" was sent to the USNRC on May 15, 1981.

3.0 DEFICIENCY

The Control Room Extension is the Control Room for BVPS-2 and is located adjacent to the Control Room for BVPS-1.

The Control Room Extension is separated from the BVPS-1 Control Room by a 4 in shake space. The Control Room Extension structure is a reinforced concrete structure with a 4 ft-6 in thick mat located at elevation 707 ft-6 in. The walls and roof are constructed of 2 ft-0 in thick concrete. The structure has two intermediate floors, one main operating room floor at elevation 735 ft-6 in and another cable spreading area floor at elevation 725 ft-6 in. The floors are supported by interior beams, which are framed in to exterior walls and interior columns. The structure was designed in the period 1972-73 and constructed in the period 1973-74.

A complete review of the design has indicated a discrepancy between the reinforcing steel required by the calculations for certain beams and that shown on the drawings, and possible stresses beyond SAR/ACI code allowables, under some of the loading conditions of Section 15.2.4.1 of the PSAR. This review of the Control Room Extension structure for all loading conditions has identified the following deficiencies that could exist in the structure design if left uncorrected:

Control Room Extension

a. Roof-Elevation 751 ft-11 in

The Control Room Extension roof is a 2 ft-3 in thick reinforced concrete slab supported by the computer room walls, the exterior walls and three reinforced concrete beams spanning approximately 67 ft in the north-south direction. The western most of the three concrete beams, could be stressed beyond code allowable limits when subjected to the factored loads concurrent with the Operating Basis Earthquake:

$$U=1.4D + 1.7L + 1.9OBE$$

b. Operating Floor-Elevation 735 ft-6 in

The operating floor is a 1 ft-0 in thick reinforced concrete slab supported by interior concrete beams. These beams could be stressed beyond code allowable limits when subjected to the total factored design dead and live loads. Seismic loading would add to the overstress.

c. Cable Spreading Floor-Elevation 725 ft-6 in

The cable spreading floor is a 1 ft-0 in thick reinforced concrete slab supported by interior concrete beams. These beams could be stressed beyond code allowable limits when subjected to Seismic loadings.

d. Southwest Corner of Slab at Elevation 735 ft-6 in

The southwest corner of the reinforced concrete slab cantilevers from the exterior walls of the Control Room Extension at this location. This area could be stressed beyond code allowable limits when subjected to the factored loads concurrent with the Operating Basis Earthquake:

$$U=1.4D + 1.7L + 1.9OBE$$

As a result of our review of the Control Room Extension calculations, a review of all Unit No. 2 calculations done by the designers who performed the Control Room Extension calculations was undertaken. This included portions of the Containment Structure, Main Steam Valve House and Cable Vault, Cable Tunnel and the Alternate Intake Structure. This review indicated an inadequacy in the calculations for the electric Cable Tunnel located between the Control Room Extension and the Auxiliary Building.

The underground tunnel is a box-shaped concrete structure with two open ends through which cable trays run between the Control Room Extension and the Auxiliary Building. It is supported on a 3 ft-0 in thick mat whose top elevation is Elevation 712 ft-6 in. Reinforced concrete walls, 2 ft-0 in thick extend up from the mat along the tunnel periphery to support a reinforced concrete roof, 2 ft-6 in thick with a top of roof elevation of elevation 733 ft-0 in. The

plant ground elevation is 735 ft-0 in above the tunnel. Upon completing a review of the cable tunnel structure for all loading conditions the following deficiencies could exist in the design if left uncorrected:

Cable Tunnel

a. Mat-Elevation 712 ft-6 in

The unsupported west end of the concrete foundation mat could be stressed beyond code allowable limits when subjected to the Probable Maximum Flood of Elevation 730 ft-0 in.

b. Roof-Elevation 733 ft-0 in.

The roof girder supporting the west end of the tunnel could be stressed beyond code allowable limits when subjected to the total design dead and live loads. Seismic loading would add to the overstress.

4.0 ANALYSIS OF SAFETY IMPLICATIONS

The overstress identified in the Control Room Extension Roof, the Southwest Corner of Slab at Elevation 735 ft-6 in and in the interior concrete beams supporting the slabs at Elevation 725 ft-6 in could occur only under the factored load condition associated with the OBE (U=1.4D + 1.7L + 1.9OBE) but no overstress would occur under the DBE loading condition (U=1.0D + 1.0L + 1.0DBE) (PSAR Section 15.2.4.1).

The overstress in the Cable Tunnel Mat at Elevation 712 ft-6 in was due to the probable maximum flood load. The overstress was local and would not have led to any failure that would have jeopardized the safe operation of the plant.

In those cases where the overstress could occur under full factored dead load, live load, and OBE load and under unfactored dead, live and DBE load, some local structural distress and abnormal deflections would be expected but there is no reason to believe that significant structural failure could occur. The deficiencies with regard to interior concrete beams supporting the slabs at Elevation 735 ft-6 in, in the Control Room Extension and the Cable Tunnel Roof at Elevation 733 ft-0 in fall into this category.

5.0 CORRECTIVE ACTION TO REMEDY DEFICIENCIES

The modifications listed below will be made to the Control Room Extension and Cable Tunnel. With these modifications both structures will be in compliance with ACI Code allowables for all applicable loading conditions in accordance with the PSAR.

Control Room Extension

a. Roof Elevation 751 ft-11 in

Two steel columns will be placed under the concrete edge beam at the west end of the structure. These columns, between Elevation 735 ft-6 in and Elevation 746 ft-9 in will be designed to act as supports for the concrete edge beam under all future loads. These columns will be supported below Elevation 735 ft-6 in by columns extending between Elevation 734 ft-6 in and Elevation 720 ft-0 in.

b. Operating Floor-Elevation 735 ft-6 in

Seven steel columns will be provided to support interior concrete beams. The columns are located between Elevation 725 ft-6 in and Elevation 733 ft-6 in. The beams will be jacked up when the columns are installed, to relieve some of the existing stresses.

c. Cable Spreading Floor-Elevation 725 ft-6 in

Seven steel columns, located under the columns described in Item (b), and [illegible] columns along the east edge of the building will be provided to support the concrete beams supporting Elevation 725 ft-6 in. In some cases, the beams above will be jacked up when the columns are installed to relieve existing stresses, and in others, the columns will act only to support the beams for future loadings. These columns will carry all loads down to the mat at Elevation 707 ft-6 in.

d. Southwest Corner of Slab at Elevation 735 ft-6 in

A steel column will be provided to support this portion of the structure. The slab will be jacked up when the column is installed to relieve the existing stresses in the slab. The column will be located between Elevation 734 ft-6 in and Elevation 720 ft-0 in, and will be directly under one of the two columns described in Item (a) that will be installed to support the roof edge girder.

Cable Tunnel

a. Mat Elevation 712 ft-6 in and Roof Elevation 733 ft-0 in

Two steel columns will be installed along the west edge of the Cable Tunnel to support both the roof edge girders and the cable tunnel mat. The roof girder will be jacked up when the columns are installed to relieve the existing stresses.

6.0 COMPLETION OF MODIFICATIONS

Completion of all modifications is expected by September 30, 1981 with the exception of the added columns to support the Control Room Extension Roof Girder and the Southwest Corner of Slab at Elevation 735 ft-6 in. These are expected to be completed in early 1982.