February 8, 2000

EA 2000-013

Mr. Oliver D. Kingsley
President, Nuclear Generation Group
Commonwealth Edison Company
ATTN: Regulatory Services
Executive Towers West III
1400 Opus Place, Suite 500
Downers Grove, IL 60515

SUBJECT: REPLY TO NON-CITED VIOLATION FOR NRC INSPECTION REPORT 50-373/99020; 50-374/99020 - LASALLE GENERATING STATION

Dear Mr. Kingsley:

This letter acknowledges the receipt of Commonwealth Edison's letter dated December 21, 1999, which replied to a non-cited violation contained in NRC Inspection Report 50-373/99020; 50-374/99020 for the LaSalle Generating Station. The non-cited violation addressed a design control issue for the anchor bolt stiffness values used in pipe support calculations. In the above letter, Commonwealth Edison contested the non-cited violation based on several factors, and stated that the letter's attachment provided the additional information requested by the NRC regarding the bases for the anchor bolt stiffness values.

The NRC staff reviewed your response and determined that it did not provide sufficient information to address our concerns. As your letter indicated, we recognize that the calculational study reviewed during our inspection did not represent the design basis for pipe support analysis at LaSalle. However, the study was your attempt to demonstrate that the original boundary assumptions used in the design basis calculations for support analyses at LaSalle were appropriate. In that regard, the study used anchor bolt stiffness values without adequately demonstrating the technical bases for these values. Furthermore, our understanding continues to be that the same anchor bolt stiffness values have been extensively used in pipe support baseplate analyses at LaSalle.

Your response stated that an anchor bolt displacement of less than 0.05 inches would allow the study's worst case hanger configuration to be modeled as a fully pinned condition. However, using the test data previously provided to us during our inspection, a 0.05 inch displacement would occur at an anchor bolt load approximately 50 percent greater than the allowable load. Since your response contained no new information regarding the load-displacement (or stiffness) behavior of the anchor bolts, we maintain that the technical bases for the anchor bolt stiffness values still have not been adequately demonstrated. Therefore, the non-cited violation remains valid.

We continue to have the fundamental question described in our November 2, 1999, letter to you relative to the appropriateness of modeling the structural attachments to baseplates as pinned connections. Anchor bolt stiffness and potential displacement is key to resolving the question. Your response stated that "it was appropriate to model these connections as pinned connections because the anchors can easily accommodate the displacement required to relieve the fixed end moment." Since this displacement issue is a critical element of your contention, please provide test data or other technical bases demonstrating that the required anchor bolt displacements noted above can be achieved without exceeding the allowable design loads.

As described in our November 2, 1999, letter, we continue to be concerned about the possible generic implications of the pipe support design assumptions and stress that this issue needs to be resolved in the near future. As discussed on February 1, 2000, between Mr. J. Benjamin, LaSalle Site Vice President, and Mr. J. Grobe, Region III Director of the Division of Reactor Safety, a public technical meeting to address pipe support design issues will be conducted by the Office of Nuclear Reactor Regulation. Additional specific questions about your pipe support design are contained in the enclosure to this letter. These issues were discussed during a February 1, 2000, telephone conference call between NRC headquarters and ComEd/LaSalle staff. This meeting should be coordinated through Ms. Donna Skay, NRC LaSalle Project Manager (301-415-1322). To support an effective meeting, please provide the information discussed above, respond to the questions in the enclosure, and provide any additional supporting information you desire within 30 days of the date of this letter.

If you have any questions regarding this matter, please contact Mr. Jack Grobe of my staff at 630-829-7901.

Sincerely,

Original Signed by James L. Caldwell

James L. Caldwell
Deputy Regional Administrator

Docket Nos. 50-373; 50-374
License Nos. NPF-11; NPF-18

Enclosure: As stated

cc w/encl:
D. Helwig, Senior Vice President, Nuclear Services
C. Crane, Senior Vice President, Nuclear Operations
H. Stanley, Vice President, Nuclear Operations
R. Krich, Vice President, Regulatory Services
DCD - Licensing
J. Benjamin, Site Vice President
J. Meister, Station Manager
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M. Aguilar, Assistant Attorney General
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ENCLOSURE

RAI FOR LASALLE PIPE SUPPORT ANCHOR ANALYSIS

1. Demonstration that Bending Moments for Anchor Bolts Analysis are Conservative

Calculation No. L-002424, Rev. 0, Page 12, is a flow chart for the semi-rigid analysis of a pipe support anchorage assembly at LaSalle. The pipe support anchorage assembly consists of a steel member and an anchorage. One end of the steel member is attached (welded) to a steel plate, and the plate is attached to concrete by concrete expansion anchor bolts. The other end of the steel member is attached to another steel member(s) or another anchorage. The semi-rigid analysis divides the pipe support anchorage assembly into two sub-structures at the junction of the base plate and the steel member. This technique is usually called "sub-structuring." The semi-rigid analysis is to solve the two sub-structures (an anchorage and a frame) separately for the angle of rotation at the cut location, which is common to both sub-structures, and set the two angles of rotations being equal as a condition to find the correct bending moment at the cut location. Your procedure was based on applying an assumed bending moment to the anchorage, and calculating a corresponding angle of rotation, θ, of the anchorage by a proprietary computer code APLAN. You used a computer code STADD-III, which is in the public domain, to analyze the frame with an hinged end subjected to external loads, in order to calculate an angle of rotation, θpin, at the junction of the steel member and the steel plate. You then concluded that the bending moment that you had assumed in the APLAN code analysis would be conservative, if θ is equal to or greater than θpin.

The staff finds that you did not perform the sub-structuring technique properly. The proper sub-structuring technique requires that the continuity be maintained at the cut location. Therefore, if there is a bending moment acting on the sub-structure of the anchorage at the cut location, the same bending moment must also apply to the frame at the same cut location to satisfy the continuity requirement. However, you did not apply that bending moment to the frame. Due to the omission of the bending moment acting on the cut location of the frame, the value of the θpin that you calculated may in some cases be less than the correct value had the bending moment been applied to the frame. Consequently, the bending moment that you had assumed or obtained through your sub-structuring technique may also be less than the correct bending moment had the sub-structuring technique been properly performed. Therefore, you are requested to demonstrate that your sub-structuring technique has yielded the correct or a conservative bending moment at the cut location for anchor bolts analysis, preferably with numerical examples.

2. Qualification of APLAN Code in the Calculation of the Rotational Stiffness of an Anchorage

APLAN code calculated the rotational stiffness of an anchorage being 86.3 kip-in/degree when a bending moment of 102.89 kip-in was applied to the anchorage (Calc. No. L-002379, Rev. 1, Page 9). APLAN code calculated the rotational stiffness of the same anchorage being 48.8 kip-in/degree when a bending moment of 17.72 kip-in was applied to the anchorage (Calc. No. L-002379, Rev. 0, Page 11). The rotational stiffness of the anchorage at the lower bending moment is about 57 percent of that at the higher bending moment. This relationship between applied bending moments and corresponding rotational stiffnesses of an anchorage is not supported by test data. Test data from connections of steel or concrete have indicated that the rotational stiffness of a connection (joint) will remain the same in a region with low bending moments and then start decreasing as bending moments increase. Therefore, we request a technical justification for the results obtained by the APLAN code.

3. Justification for Using the Lower Acceleration Values of Earthquakes for Support Analysis

You indicated that the acceleration values for support M09-VG01-0024X resulting from OBE are higher than that resulting from SSE (Calc. L-002291, Rev. 0, Page 8). You used the acceleration values of SSE for support analysis (Calc. L-002291, Rev. 0, Page 8). Provide your explanation as to why the OBE loads are higher than the SSE loads at the support location. Also provide your rationale for using the lower earthquake acceleration values for support analysis.