NATHAN M. NEWMARK
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING
URBANA, ILLINOIS 61801

12 February 1973

Mr. R. R. Maccary
Assistant Director for Engineering
Office of Technical Review
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

Re: Contract No. AT(49-5)-2667
Commentary
Final Report
Indian Point Nuclear Generating Unit No. 3
Consolidated Edison Company of New York, Inc.
AEC Docket No. 50-286

Dear Mr. Maccary:

Dr. N. M. Newmark and I have reviewed the Final Safety Analysis Report for the Indian Point Nuclear Generating Unit No. 3 and are transmitting herewith 8 signed copies of our Commentary and Final Report.

Since we have previously visited the Indian Point Nuclear 2 unit which is constructed along the same lines as Indian Point No. 3, it probably will not be necessary for us to visit this facility but we will await instructions from your personnel in this regard.

Sincerely yours,

W. J. Hall

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Enclosure

cc: N. M. Newmark

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NATHAN M. NEWMARK
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COMMENTARY
ON
STRUCTURAL ADEQUACY
OF THE
INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
AEC Docket No. 50-286

by W. J. Hall and N. M. Newmark

1. Introduction

This report is based on information presented in the Indian Point Nuclear Generating Unit No. 3 FSAR and the Supplements thereto (Ref. 1) and on discussions with personnel of the AEC Directorate of Licensing. Specific items are singled out for discussion herein, and no attempt is made to review the basis of the seismic design criteria as reported in our PSAR review for this plant (Ref. 2) or in our related FSAR review for Indian Point Nuclear Generating Unit No. 2 (Ref. 3).

2. Foundations

The major facility structures for Indian Point Nuclear Generating Unit No. 3 are described as being founded directly on competent bedrock, and on the basis of the information available to us the foundation conditions appear acceptable for the seismic hazards noted.

3. Seismic Design

Seismic Hazard

As noted on page 5.1.2-4, the dynamic analysis is to be carried out for a Design Basis Earthquake characterized by 0.15g maximum transient horizontal ground acceleration and for an Operating Basis Earthquake characterized similarly by a 0.1g maximum horizontal ground acceleration. For vertical excitation, an earthquake characterized by 0.10g maximum transient acceleration is to be employed for the DBE and 0.05g for the OBE.

Response Spectra

The response spectra employed in the seismic design of the plant are presented in Figs. A.1-1 and A.1-2. These response spectra are in accordance with the state-of-the-art applicable to the time that the PSAR and seismic design criteria were established, and on this basis are acceptable.

Damping

The damping values applicable to the design of the Indian Point 3 unit are presented in Table A.1-1 and when used in conjunction with the spectra noted are acceptable.

Seismic Analysis of Structures, Piping and Equipment

A general description of the procedures employed for seismic design is presented in Section 5 of the FSAR. The response spectrum approach was employed. It is indicated there that the containment structure was modeled as a simple cantilever in order to ascertain the moments and shear resulting from seismic excitation. Additional information concerning the details of the seismic analysis procedures is presented in the containment design report, specifically beginning on page 5A-26. Vertical seismic response and the effects of overturning were considered in the analysis.

For items other than the major structures, the general procedure employed in the dynamic analysis is described in Appendix A beginning on page A.3-10. It is indicated there that all Class I piping 6 inches in diameter or larger, together with the 2-inch diameter high-head safety injection lines, were dynamically analyzed for seismic response. Additional information is presented in the answer to Question 5.16, where there is listed for Class I piping and other auxiliary equipment the specific methods of analysis which were employed in the design. It is noted there and in the answer to Question 5.21 that equivalent static coefficients were used for the analysis design of piping less than 6-inch diameter. The answer to Question 5.36 states that the use of equivalent static coefficients is only employed for piping and equipment items after it has been demonstrated that such an approach, when checked against rigorous dynamic analyses, gives conservative results. This approach is in accordance with the state-of-the-art applicable to this design.

The answer to Question 5.20 indicates that floor response spectra were employed in the design of equipment and piping and the general approach analyzed in derivation of the floor response spectra is described in the Answer to Question 4.32.

Buried Piping

The design criteria applicable generally to buried piping or other piping located outside the containment structure appear on page A.3-9 and again in the Answer to Questions 5.19 and 5.35. On the assumption that the design approach did consider the problem of providing adequately for stresses and deformations at support points as suggested in the Answer to Question 5.35, we believe the approach to be adequate.

Design Stresses

The design stress approach employed for Class I structures is described in Section 5, and the stress tabulations presented in the containment report, Section 5A, are helpful in demonstrating the adequacy of the design approach employed for Class I structures.

For piping, the procedures associated with techniques outlined in Topical Report WCAP-7287 were employed, but the Answer to Question 4.29 indicates that only elastic analyses were used with the cited stress limits. This approach is in line with the state-of-the-art applicable to this design.

Class I Controls and Instrumentation

The general procedures to be employed in the design and review of critical controls and instrumentation are presented in the Answer to Question 5.29. On the assumption that criteria of the type described in Report WCAP-7397-L and Supplements thereto are applicable, we believe that the design procedures adopted for the critical controls and instrumentation will be acceptable.

REFERENCES

1. "Final Facility Description and Safety Analysis Report -- Indian Point Nuclear Generating Unit No. 3, Consolidated Edison Company of New York, Inc., Vol. 1-6 and Amendments 14-16, 19-21, 23 and Supplements 10 and 11", AEC Docket No. 50-286, 1971-72.

2. Newmark, N. M., W. J. Hall and A. J. Hendron, "Adequacy of the Structural Criteria for Indian Point Nuclear Generating Unit No. 3, Consolidated Edison Company of New York, Inc.", AEC Docket No. 50-286, 20 Dec. 1968.

3. Newmark, N. M. and W. J. Hall, "Report to the AEC Regulatory Staff -- Structural Adequacy of Indian Point Nuclear Generating Unit No. 2, Consolidated Edison Company of New York, Inc.", AEC Docket No. 50-247, August 1970.

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INDIAN POINT NUCLEAR GENERATING UNIT NO. 3
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AEC Docket No. 50-286

by

W. J. Hall and N. M. Newmark

After our review of the FSAR, including Supplements 1, 2, 5, 6, 7, 8 and Amendments 15, 16, 22, it is believed that the design of the Indian Point Nuclear Generating Unit No. 3 can be considered adequate in terms of provisions for safe shutdown for a Design Basis Earthquake of 0.15g maximum transient horizontal ground acceleration and capable otherwise of withstanding the effects of an Operating Basis Earthquake of 0.10g maximum horizontal ground acceleration.

Our review was based on consideration, among other things, of the design criteria and results of the analysis presented by the applicant for the foundations and the seismic design criteria including seismic hazard, response spectra, damping, seismic analysis, buried piping, design stresses, Class I controls and instrumentation.

We believe that the procedures used in the design and analysis are in accord with the state-of-the-art. It is our conclusion that the design incorporates an acceptable range of margins of safety for the hazards considered.

W J Hall

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