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1114 CIVIL ENGINEERING BUILDING
URBANA, ILLINOIS 61801

26 October 1972

Mr. Edson G. Case, Deputy Director
Office of the Director
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

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

Dear Mr. Case:

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 copies of our Draft Commentary and Draft Final Report. As you will note, there are several items remaining to be clarified before our reports can be finalized. We shall be pleased to discuss these items further with your staff as may be appropriate.

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

W. J. Hall

pg
Enclosure

cc: N. M. Newmark

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NATHAN M. NEWMARK
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26 October 1972

DRAFT

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. It would be our recommendation that the basis for establishing the equivalent seismic loads be requested of the applicant and reviewed, and it is our understanding that such information has been requested.

The answer to Question 5.20 indicates that floor response spectra were employed in the design of equipment and piping but the details of the derivation of the floor response spectra and the associated design levels have not been presented. It would be our recommendation that these items be reviewed for adequacy.

The comments just made for piping refer also to equipment. It is noted in the answer to Question 5.16 that various methods of analysis were employed for equipment, including multi-degree-of-freedom modal analysis procedures, as well as equivalent static load techniques. The comments made above about the equivalent static load techniques are equally applicable to equipment items, and should be reviewed further.

Buried Piping

The design criteria applicable to buried piping appear on page A.3-9 and again in the answer to Question 5.19. The approach with regard to stress analysis appears satisfactory but it is not clear that the design approach did consider, as it may have, the problem of providing for deformation at support points or where the pipe runs into rigid structures through penetration, etc. The applicant should be requested to provide additional information on this item.

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. The criteria outlined there are acceptable but it would be our suggestion that, for selected items of piping and equipment, tabulated stresses and/or other design criteria (for example, allowable deformations) be provided by the applicant for review.

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 and 19-21", 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 Comapny 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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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

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, with the exception of three items as follows for which additional information is needed from the applicant:

(a) Design procedures involving equivalent static coefficients for piping 6 inches and smaller, and certain items of equipment.

(b) Development of the floor response spectra for designing both piping and equipment.

(c) Design criteria for buried piping.