

UNITED STATES GOVERNMENT

Memorandum

TO : Files
THRU: R. S. Boyd, Chief, Research & Power Reactor Safety Branch, DRL
DATE: June 17, 1966

FROM : K. Woodard, Research and Power Reactor Safety Branch
Division of Reactor Licensing

SUBJECT: MEETING WITH CON ED TO DISCUSS SEISMIC DESIGN OF THE INDIAN POINT II REACTOR STRUCTURE

50-247

On May 26, 1966, the staff met with representatives of Consolidated Edison to discuss the seismic design of the Indian Point Nuclear Generating Unit No. II. The following persons were present:

Newmark and Associates

W. J. Hall
N. M. Newmark

Westinghouse

Robert A. Wiesemann
G. A. Harstead
P. B. Haga
H. L. Russo

UE & C

John H. Hemsarh
R. O. Imhoff
David Rose
Sidney Barnes

Con Ed

C. F. Sowtar
E. G. Watkins
J. J. Grob
Roger McCullough, Consultant

U. S. A. E. C.

M. M. Mann, REG	M. Rosen, R&PRSB
R. L. Doan, DRL	K. Woodard, R&PRSB
E. G. Case, DRL	R. R. Maccary, DSS
R. S. Boyd, R&PRSB	F. P. Schauer, DSS
D. R. Muller, R&PRSB	M. Gaske, ACRS
P. E. Norian, R&PRSB	N. C. Moseley, CO

Prior to this meeting, Newmark and Associates requested that the applicant provide additional information in five areas concerning the design of the containment building. These questions were transmitted to the applicant on May 11, 1966, and persons present discussed these five topics (attached) as indicated below:

(Continued)



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- (1) The first item concerned the damping factors used in the earthquake response spectrum approach for the containment design. Dr. Newmark stated that, based on available data, damping factors should not exceed 2 percent of critical damping for the containment walls and concrete support structures and that 5 percent would be adequate for above ground concrete structures including shear wall and rigid frames. The applicant stated that the structures in question would be designed using the critical damping factors suggested by Dr. Newmark.
- (2) Dr. Newmark in this item requested a plot of the design earthquake spectra. The applicant presented a plot which was taken from TID-7094. Dr. Newmark said this plot appeared to be acceptable but that he would check it in detail with his own plot. The applicant restated its intention to assume a vertical earthquake acceleration of 0.05 g and a horizontal acceleration of 0.1g. Dr. Newmark stated that on the east coast, unlike earthquakes on the west coast, the vertical component is believed to be almost as great as the horizontal component. He appeared to have conceded that the difference was not great and that 0.05 g was a sufficient vertical component for this design.
- (3) The applicant was asked to clarify its design intentions with respect to the simultaneous action of both the vertical and horizontal earthquake force since no statements had been made in the application. The applicant stated that the vertical and horizontal forces could be considered to act simultaneously in the containment design.
- (4) Item 4 questioned the design criterion regarding safe shutdown under seismic loading. The applicant stated that there would be no loss of function of those components and systems vital to the safe shutdown of the plant under normal or accident conditions during an earthquake of magnitude 0.15 g horizontal and 0.1 g vertical. These forces are considered to act in addition to the internal design pressure. The possibility of limiting the deflection of those members which could exceed yield was discussed but no recommendations were made.
- (5) Item 5 concerned the containment liner and the method of fastening to the concrete wall. Dr. Hall stated that there had been some unfavorable experience with welding studs to 1/4 inch plate. He stated that fatigue failures had occurred after relatively few loading cycles. Dr. Hall recommended tests of the particular stud system to be used here. The applicant stated that KSM studs would be used, and it cited some references of tests which appeared to be outdated. The applicant indicated that testing would be planned to determine the adequacy of the studs to resist buckling and provide a reliable means of holding the plate to the containment wall thus reducing strain in the liner

(Continued)

which could cause increased leakage. Dr. Newmark was concerned that temperature effects on the liner and concrete could cause undesirable deformations. The applicant assured everyone that the temperature had been taken into account and testing would be done if there was serious question in this regard. The applicant stated that the liner carries some of the load in the dome. Since part of the building wall exterior must be back-filled with crushed rock to provide drainage, Dr. Newmark was concerned that the earthquake response of the building could be effected. The applicant stated that the filler material would not significantly restrict building response.

Following this discussion Dr. Newmark and Dr. Hall pursued several other areas of the design. The significant topics are discussed below:

- (1) The applicant stated that if calculation of the natural period of a particular piping system is difficult, the peak acceleration on the response spectrum plot is used.
- (2) The applicant stated all stresses in piping will be within allowable limits of the appropriate codes for the 0.1 g earthquake forces.
- (3) They are allowing the concrete to resist some shear force mostly at the base and spring line due to axial loading (tension).
- (4) The penetration design takes into account stiffening at the liner weld along with calculated deflections and temperature induced stresses.
- (5) The large equipment opening was discussed and Dr. Newmark wanted more details on how the rebars would be placed in this design.
- (6) The applicant stated that credit is taken for compression in rebars for seismic resistance. Dr. Newmark doubted that earthquake loads would be carried equally by diagonal rebars. G. Harstead of Westinghouse argued that if one diagonal rebar was in tension it would be acceptable to take credit for compression in the other rebar in the proposed manner. Dr. Newmark stated that cracking could occur and possibly foul up the reasoning in this regard.
- (7) The applicant stated that Raleigh's method of analyzing natural frequencies of structures was used in this design.

During this meeting it appeared that several areas of concern required further clarification in writing. K. Woodard requested this information by phone call to W. Cahill of Con Ed on June 3, 1966. These areas are listed below:

(Continued)

- (1) Liner stud testing and proof of compatability with design loads.
- (2) Effect of crushed rock backfill on building response.
- (3) Deformation limit on piping for no loss of function criteria.
- (4) Credit allowed for concrete to resist shear under all loadings.
- (5) Penetration design and assurance that leakage will not increase under accident conditions.
- (6) Placement of rebars at large opening and general design details.
- (7) Percentage of stress carried in diagonal rebars under all loadings.
- (8) Design of crane to resist earthquake loadings and effect of failure during any operation..

Con Ed is prepared to amend its application with additional information in these eight areas discussed above.

cc: N. Newmark
W. Hall
E. G. Case
K. Woodard
P. Norian
F. Schauer, DSS

MEMO ROUTE SLIP

Form AEC-93 (Rev. May 14, 1947)

See me about this.
Note and return.For reference.
For signature.For action.
For information.

TO (Name and unit) F. Grim, ACRS Room 1034-H 1717 H Street		INITIALS	REMARKS
		DATE	
TO (Name and unit)		INITIALS	REMARKS
		DATE	SUPPLEMENTAL FILE COPY
TO (Name and unit)		INITIALS	REMARKS
		DATE	CONSOLIDATED EDISON CO. OF N.Y., INC. Docket 50-247
FROM (Name and unit) <i>H. Steele</i> H. Steele Div. of Reactor Licensing		REMARKS	In accordance with your telephone request, forwarded herewith is a copy of Volume I, Description and Safety Analysis for a Conceptual Unit at Indian Point, dated Oct. 1, 1965.
PHONE NO. 7441	DATE 6/16/66		

MEMO ROUTE SLIP

Form AEC-93 (Rev. May 14, 1947)

See me about this.

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For signature.

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For information.

TO (Name and unit) James L. Proctor NOL Air-Ground Explosions Div., US NOL Silver Spring, Md.	INITIALS	REMARKS
TO (Name and unit)	DATE 20904	
TO (Name and unit)	INITIALS	REMARKS
TO (Name and unit)	DATE	SUPPLEMENTAL FILE COPY
TO (Name and unit)	INITIALS	REMARKS
TO (Name and unit)	DATE	CONSOLIDATED EDISON CO. OF N.Y., INC. Docket 50-247
FROM (Name and unit) Paul Norian Research & Power Reactor Safety Branch Div. of Reactor Lic.	REMARKS	Attached, for insertion in documents in your possession, are Errata Sheets (Revised 6-1-66) for the Preliminary Safety Analysis Report, and First Supplement thereto, for the Consoli- Dated Edison Company Indian Point Nuclear Generating Unit No. 2.
PHONE NO.	DATE 6/13/66	

MEMO ROUTE SLIP Form AEC-93 (Rev. May 14, 1947)		See me about this. Note and return.	For concurrence. For signature.	For action. For information.
TO (Name and unit) W. B. Cottrell, Director Nuclear Safety Information Center Oak Ridge National Laboratory P. O. Box Y Oak Ridge, Tenn. 37831	INITIALS DATE	REMARKS		
TO (Name and unit)	INITIALS DATE	REMARKS SUPPLEMENTAL FILE COPY		
TO (Name and unit)	INITIALS DATE	REMARKS CONSOLIDATED EDISON CO. OF N.Y., INC. Docket 50-247		
FROM (Name and unit) H. Steele Division of Reactor Licensing USAEC, Bethesda	REMARKS Transmitted herewith for your information are Errata Sheets (Revised 6/1/66) for the Preliminary Safety Analysis Report, and First Supplement thereto, for the Consolidated Edison Co. Indian Point Nuclear Generating Unit No. 2.			
PHONE NO.	DATE 6/13/66			

MEMO ROUTE SLIP Form AEC-93 (Rev. May 14, 1947)		See me about this.	For completion.	For action.
		Note and return.	For signature.	For information.
TO (Name and unit) R. Maccary Div. of Safety Standards Rm 532, Bethesda		INITIALS	REMARKS	
		DATE		
TO (Name and unit)		INITIALS	REMARKS	
		DATE	SUPPLEMENTAL FILE COPY	
TO (Name and unit)		INITIALS	REMARKS	
		DATE		
FROM (Name and unit) H. Steele <i>H Steele</i> DRL		REMARKS	CONSOLIDATED EDISON CO. OF N.Y., INC. Docket <u>50-247</u> Attached for your use are Errata Sheets (Revised 6/1/66) for the Preliminary Safety Analysis Report, and First Supplement thereto, for the Consolidated Edison Co. Indian Point Nuclear Generating Unit No. 2.	
PHONE NO.	DATE			
	6/13/66			

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	Note and return.	For signature.	For information.

TO (Name and unit) W. B. Cottrell, Director Nuclear Safety Information Center Oak Ridge National Laboratory P. O. Box Y Oak Ridge, Tenn. 37831	INITIALS	REMARKS

TO (Name and unit)	INITIALS	REMARKS
	DATE	

TO (Name and unit)	INITIALS	REMARKS
	DATE	SUPPLEMENTAL FILE COPY
		CONSOLIDATED EDISON CO. OF NEW YORK, INC. Docket 50-247

FROM (Name and unit) H. Steele <i>H. Steele</i> Division of Reactor Licensing USAEC, Bethesda	REMARKS Transmitted herewith for your use is Supplement 2 to the Preliminary Safety Analysis Report for the Consolidated Edison Company Indian Point Nuclear Generating Unit No. 2.
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PHONE NO.	DATE 6/7/66
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MEMO ROUTE SLIP Form AEC-93 (Rev. May 14, 1947)		See me about this. Note and return.	For concu... For signature.	For action. For information.
TO (Name and unit) Dr. George Parker Oak Ridge National Laboratory P. O. Box X Oak Ridge, Tennessee	INITIALS	REMARKS		
	DATE 37831			
TO (Name and unit)	INITIALS	REMARKS		
	DATE			
TO (Name and unit)	INITIALS	REMARKS		
	DATE			
Original signed by:		CONSOLIDATED EDISON CO. (Indian Point 2)		50-247
FROM (Name and unit) Roger S. Boyd Roger S. Boyd, Chief Research & Power Reactor Safety Branch, Div. of Reactor Licensing	REMARKS	Transmitted herewith for your use is the Second Supplement to the Preliminary Safety Analysis Report for the Consolidated Edison Company Indian Point Nuclear Generating Unit No. 2. The supplement contains answers to questions raised in the Commission's letter of May 11, 1966.		
	DATE USAEC 6/3/66			
PHONE NO. 7486	DATE			

**SUPPLEMENTAL
FILE COPY**



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TO (Name and unit) James L. Proctor NOL Air-Ground Explosions Division	INITIALS	REMARKS		
	DATE			
TO (Name and unit)	INITIALS			
	DATE			
TO (Name and unit)	INITIALS	REMARKS SUPPLEMENTAL FILE COPY		
	DATE			
FROM (Name and unit) Paul Norian USAEC - DRL BETH	REMARKS			
PHONE NO. 119-7476	DATE 6/2/66	No. 2, Docket No. 50-247. ←		