NATHAN M. NEWMARK
CONSULTING ENGINEERING SERVICES

1114 CIVIL ENGINEERING BUILDING
URBANA, ILLINOIS 61801

13 July 1967

Dr. Peter A. Morris, Director
Division of Reactor Licensing
U. S. Atomic Energy Commission
Washington, D.C. 20545

Re: Indian Point Nuclear Generating Unit No. 3
Consolidated Edison Company of New York, Inc.
Docket No. 50-286

Dear Dr. Morris:

We are transmitting herewith questions and comments by Dr. W. J. Hall and myself concerning the application for Indian Point Nuclear Generating Unit No. 3.

Indian Point Unit No. 3 is to be a pressurized water reactor with a thermal output of 3025 MWt, and a gross electrical output of 1005 MWe. The design is essentially the same as for Indian Point Unit No. 2. The unit will be built adjacent to nuclear reactor Units No. 1 and 2. The containment structure is a reinforced concrete cylinder with domed roof and base mat. The unit is to be founded on hard limestone, apparently the same foundation material on which Unit No. 2 is set. It is noted that there are no faults in the region of this unit.

Our questions and comments follow.

1. It is noted on page 1-16 and page 5-6, and again in Appendix A, that the design earthquake recommended by the applicant is 0.10g horizontal ground acceleration and 0.05g vertical ground acceleration. The maximum earthquake for no loss of function (safe shut-down) is to correspond to 0.15g horizontal ground acceleration and 0.10g vertical acceleration. These values are similar to those used for Indian Point Unit No. 2. However, we wish to await the evaluation by the U. S. Coast & Geodetic Survey before making further comment on these values. It does seem somewhat unusual that the ratio of the vertical to horizontal earthquake excitation is one-half for the design earthquake and two-thirds for the maximum earthquake. The applicant may wish to offer supporting evidence on this point. Spectra are shown in Figs. 5-7 and 5-8 for the design earthquake. The shape of these spectra, patterned after the spectra in TID 7024, appear acceptable, although we have no spectra for the maximum earthquake for examination. It would be desirable to have such spectra prepared for review, or a statement by the applicant that they are similar to those for the design earthquake.

2327

2. With regard to the design of the containment structure, the statement is made as follows: "For earthquakes having a horizontal acceleration of 0.1g and a vertical acceleration of 0.05g acting simultaneously at zero period, the plant is designed to have no loss of function of systems important to safeguards, although in some cases, the stresses may reach or slightly exceed yields." It is assumed that this discussion refers to the design earthquake in view of the earthquake level cited.

Subsequently, on pages 5-9 through 5-11, discussion of the load factor approach is given, and on page 5-11 comment is made that the "loading combinations concurrent with these temperature effects may cause local stresses in the outside horizontal and vertical bars to reach yield, however, as local yielding is reached, any further load is transferred to the unyielded elements. At the full yield condition, the magnitude of final load resisted across a horizontal and vertical section remains identical to that which would be carried if the temperature affects were not considered."

We should like to have further explanation of these statements, both with regard to the design earthquake and the maximum earthquake. Is there a deformation limit to which the design is to be made? We are concerned about the degree of yielding that might occur. There is some question about the last statement particularly, for upon reduction of temperature and/or loadings, if significant yielding had occurred, it would not be expected that the structure would return to its original condition. In other words, it would appear that some type of deformation criteria should be employed in the design for the maximum earthquake.

Elaboration on how the vertical and lateral shears will be carried for both earthquake design situations is desired, with a discussion of the appropriate design criteria.

3. On page 5-8 there is a discussion of the various types of reinforcing to be used in the dome, cylindrical walls, and base mat, namely that corresponding to ASTM Designation A432-65, having a yield point of 60,000 psi. We note that no mention of welding is made there, but we should like to caution that there be no tack welding permitted for the A432 bars, since this will possibly make them susceptible to brittle fracture.

4. On pages 5-21 and 5-22 a very brief discussion is given of the large penetrations. We should like to have more information as to how the analysis for the penetrations will be made.

5. On page 5-23 a table of damping values is given, and we are in concurrence with the values given therein. We should like confirmation that these values will be employed for both the design and maximum earthquake.

6. On page 5-33 there is an indication that pre-operational tests will be made. We should like to be advised of the instrumentation program, both as to the measurements that are to be made at the time of this pressure

test and any measurements that will be monitored over the life of the structure.

7. We find very little comment concerning the design of the piping systems for the earthquake forces. One comment in this connection is on page A-6 of Appendix A wherein it is noted in item 4 as follows: "(2) in mechanical components and piping systems, stresses will be limited to 120% of the stress limits normally allowed under code rules of; (3) in piping system, the hangers, which are normally installed to limit deflection for proper drainage, will be designed to limit stresses below the yield strength; (4) on rotating equipment, the stresses associated with the seismic load are an insignificant item...." We should like to have further comment on the piping design, both as to how it will be carried out and the deformation limits to which the design will be made. The value of 120% on the stress limit is not a rational limit, for this gives no indication of the amount of deformation that will occur or that will be permitted. It would be helpful to have some indication of the amount of deformation that would be associated with any overstressing, since this is a much more meaningful measure than a mere overstress value.

It is to be noted that the Third Supplement for Indian Point Unit No. 2 indicated that a ductility factor of 2 was to be used in the design of all Class I vessels and piping.

We should also like to have comment as to whether the criteria to be employed will be different for the design and maximum earthquake.

8. We find no mention concerning the design of cranes, and should like further comment on this matter.

9. No mention of a stack is made. We assume from Fig. 2-2 that the discharge duct indicated therein takes the place of a stack. Is this correct?

10. We should appreciate having comments on the water intake structure, since this may be a Class I structure, as well as the piping systems involved in conducting the water for cooling purposes.

11. In connection with meeting the no loss-of-function criteria as outlined on page A-6 of Appendix A, it is noted that there shall be no loss of function for components that are necessary to bring the plant to a safe shut-down condition, and further that this implies that rotating equipment will not freeze, pressure vessels will not rupture, supports will not collapse under the load, systems required to be leak tight will remain leak tight, and components required to respond actively (such as valves and relays) will respond actively. We should appreciate having further information on the design criteria of critical valves, relays, and controls that insures that they will function properly under earthquake loading.

Respectfully submitted,

N. M. Newmark

N. M. Newmark

bjw

cc: W. J. Hall


RECEIVED
JUL 14 1993