APR 23 1973

Richard C. DeYoung, Assistant Director
for Pressurized Water Reactors
Directorate of Licensing

INDIAN POINT NUCLEAR GENERATING UNIT NO. 3, DOCKET NO. 50-286

Plant Name: Indian Point Nuclear Generating Unit #3
Licensing Stage: OL
Docket Number: 50-286
Responsible Branch and Project Manager: PWR#1, H. Specter
Requested Completion Date: 4/23/73
Applicant's Response Date Necessary for Completion of Next Action
Planned on Project: N/A
Description of Response: Safety Evaluation Report
Review Status: Complete

The FSAR submitted by the applicant, including Amendment 31, Supplement 16, has been reviewed and evaluated by the Mechanical Engineering Branch, Directorate of Licensing. The appropriate sections of the Safety Evaluation are enclosed.

DKT # 50-286

The applicant has verbally agreed to provide documentation for the following items:

Section 3.6 - Revise the response to Question 4.30 to provide clarification of the applicants criteria for postulating pipe break location and orientation.

Section 3.7.4 - A description of the Seismic Instrumentation planned to meet the intent of Safety Guide 12.

Section 3.9.1 - Revise the response to Question 4.31 to provide a description of the program planned to perform preoperational piping dynamic effects tests.

This documentation should be received and reviewed prior to the ACRS meeting.

Original signed by
R. R. Maccary

8111240239 730423
ADOCK 05000286

R. R. Maccary, Assistant Director
for Engineering
Directorate of Licensing

OFFICE ▶	L:MEB	L:MEB	L:AD/E			
SURNAME ▶	HLB HLBrammer:jm	JPKnight	RRMaccary			
DATE ▶	4/21/73	4/23/73	4/23/73			

Form AEC-318 (Rev. 9-53) AECM 0240 GPO c43-16-81465-1 445-678

cc w/encl:
S. H. Hanauer, DRTA
J. M. Hendrie, L
D. B. Vassallo, L
H. Specter, L
J. P. Knight, L
H. L. Brammer, L

cc w/o encl:
A. Giambusso, L
W. G. McDonald, L

DKT File
L Rdg File
L MK B File

OFFICE ▶						
SURNAME ▶						
DATE ▶						

3.7 Seismic Design

3.7.1 Seismic Input

The seismic design response spectra curves were presented in the PSAR and approved prior to the issuance of the construction permit for the Indian Point Nuclear Generating Unit No. 3. The modified earthquake time histories used for component equipment design are adjusted in amplitude and frequency to envelope the response spectra specified for the site. We and our seismic consultants conclude that the seismic input criteria proposed by the applicant provides an acceptable basis for seismic design.

3.7.2 Seismic System Analysis

3.7.3 Seismic Subsystem Analysis

Modal response spectrum multi-degree-of-freedom and normal mode-time history methods are used for the analysis of all Category I structures, systems and components. The vibratory motions and the associated mathematical models account for the soil-structure interaction and the coupling of all coupled Category I structures and plant equipment. Governing response parameters have been combined by the square root of the sum of the squares to obtain the modal maximums when the modal response spectrum method is used. The absolute sum of responses is used for closely spaced frequencies. Horizontal and vertical floor spectra inputs used for design and test verification of structures, systems and components were generated by the normal mode-time history method. Torsional loads

3.6 Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping

The applicant has provided adequate pipe whip restraints to protect against postulated breaks, both longitudinal and circumferential at specified locations within the reactor coolant pressure boundary and in the main steam and feedwater systems. The applicant has provided protection against pipe whip in accordance with the criteria proposed by the Regulatory Staff in the Regulatory Guide "Protection against Pipe Whip Inside Containment", now under preparation. The piping/support systems have been dynamically analyzed by the time-history method for each postulated break. We find this criteria to be acceptable.

have been adequately accounted for in the seismic analysis of the Category I structures. Vertical ground accelerations were assumed to be 2/3 of the horizontal ground accelerations and the horizontal and vertical effects were combined simultaneously. Constant vertical load factors were employed only where analysis showed sufficient vertical rigidity to preclude significant vertical amplifications in the seismic system being analyzed.

The following consultant was requested to review and evaluate the seismic design criteria proposed by the applicant with reference to structures, systems and components.

Nathan M. Newmark, Consulting Engineering Services
Urbana, Illinois

We and our consultant have reviewed the FSAR and applicable amendments and find the seismic system and subsystem dynamic analysis methods and procedures proposed by the applicant to be acceptable.

3.7.4 Criteria for Seismic Instrumentation Program

The type, number, location and utilization of strong motion accelerographs to record seismic events and to provide data on the frequency, amplitude and phase relationship of the seismic response of the containment structure corresponds to the recommendations of Safety Guide 12.

Supporting instrumentation will be installed on Category I structures, systems, and components in order to provide data for the verification of the seismic responses determined analytically for such Category I items. A plan for the utilization of the acquired seismic data will be developed.

We conclude that the Seismic Instrumentation Program proposed by the applicant is acceptable.

3.9.1 Dynamic System Analysis and Testing

The applicant has designated Indian Point 2 as the prototype plant from which preoperational vibration test results are applicable in evaluating the design adequacy of the reactor internal structures of the Indian Point 3 plant. Thus only the confirmatory test in accordance with Safety Guide 20 will be conducted on Indian Point 3. The vibration test of Indian Point 2 has been completed. The testing results were documented in the Topical Report WCAP-7879. The final evaluation of this report has been completed. We find that Indian Point 2 is acceptable to become a prototype plant.

The reactor internals of Indian Point 3 were designed to withstand the dynamic effects of the postulated accident, a simultaneous occurrence of loss-of-coolant due to coolant pipe rupture near the nozzle and the safe shutdown earthquake. The applicant has referenced the topical reports WCAP-7822 and WCAP-7950. The final evaluation of report WCAP-7822 has been completed. We find the report is acceptable and applicable to Indian Point 3. The report WCAP-7950 is currently undergoing evaluation by the Mechanical Engineering Branch, Directorate of Licensing. A review of the Indian Point 3 application can therefore be expedited as a post-operating license item when WCAP-7950 has been reviewed. Additional information may be required as the result of the topical evaluation.

In accordance with the provisions of USAS B31.1.0, which requires piping to be arranged and supported to minimize vibration, a vibration operational test program to verify that the piping and piping restraints within the RCPB have been designed to withstand dynamic effects due to valve closures, pump trips, etc. will be performed during startup and initial operating conditions. The proposed tests and the associated actions, e.g., pump trips and valve actuations, that will be used in this program will be similar to the transients experienced during reactor operation and will provide an acceptable basis for conducting the vibration operational test program.

3.9.2 <u>ASME Code Class 2 and 3 Components</u>

All safety related systems, components and equipment outside of the reactor coolant pressure boundary will be seismic Class I and will be designed to sustain normal loads, anticipated transients and the Operational Basis Earthquake within the appropriate code allowable stress limits and the Design Basis Earthquake within stress limits which are comparable to those associated with the emergency operating condition category of current component codes. We consider that these stress criteria provide an adequate margin of safety for Category I systems and components outside of the RCPB which may be subjected to seismic loadings.

3.10 Seismic Qualification of Category I Instrumentation and Electrical Equipment

A seismic qualification program for all Category I instrumentation and electrical equipment was implemented to confirm that (1) this equipment will function properly during the safe shutdown earthquake and the post-accident operation, and (2) the support structures for this equipment are adequately designed to withstand the seismic disturbance. The operability of the instrumentation and electrical equipment were ensured by testing. The design adequacy of their supports were ensured by either analysis or testing. The applicant has referenced Topical Report WCAP-7397-L and supplement. The final evaluation of this report has been completed. We find the referenced topical is acceptable and applicable to Indian Point 3.

4.0 Reactor

4.2 Mechanical Design of Reactor Vessel Internals

For normal design loads of mechanical, hydraulic and thermal origin, including anticipated plant transients and the operational basis earthquake, the reactor internals were designed to the stress limit criteria of Article 4 of the ASME Boiler and Pressure Vessel Code Section III, 1965 Edition.

For the loads calculated to result from a loss-of-coolant accident (LOCA), the Safe Shutdown Earthquake (SSE) and the combination of these postulated events, the reactor internal components were designed to the criteria in Section 14.3.3 of the FSAR and to the criteria submitted in Topical Report WCAP-7822, "Indian Point Unit No. 2 Reactor Internals Mechanical Analysis for Blowdown Excitation" which was referenced in the FSAR. These criteria are consistent with comparable code emergency and faulted operating condition category limits and the criteria which have been accepted for all recently licensed plants. We find these criteria acceptable. The dynamic analyses of the Indian Point Nuclear Generating Unit No. 3 reactor internals are discussed in Section 3.9.1, "Dynamic System Analysis and Testing."

5.2.1 Design of Reactor Coolant Pressure Boundary Components

Components of the reactor coolant pressure boundary will be seismic Class I and will be built to meet the requirements of the Codes and Standards specified in 10 CFR 50.55a, except that the pumps are designed to an equivalent acceptable standard. The stress limit criteria specified for the normal and upset operating condition categories of the applicable codes will apply for normal loads, anticipated transients and the Operational Basis Earthquake. Under the loads calculated to result from the Design Basis Accident, the Design Basis Earthquake and the combination of these postulated events, the components of the reactor coolant pressure boundary will be designed to the applicable emergency and faulted operating condition limits of the appropriate codes, or where explicit limits are not provided in the codes, to the criteria of Appendix A of the FSAR. The criteria of Appendix A as modified by supplement 12 are consistent with comparable current code criteria. We find these criteria to be acceptable for components of the reactor coolant pressure boundary.