Stephen B. Bram
Vice President

Consolidated Edison Company of New York, Inc.
Indian Point Station
Broadway & Bleakley Avenue
Buchanan, NY 10511
Telephone (914) 737-8116

April 8, 1988

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Second-Ten Year Interval ISI Program
Response to Request for Additional Information

Your February 9, 1988 letter requested additional information and/or clarification concerning IP-2's second-ten year interval inservice inspection program. Our response is contained in Attachment I. We believe that our answers are fully responsive to your questions as clarified by the NRC staff during our March 8, 1988 and April 4, 1988 conference calls.

Should you or your staff have any further questions, please contact Mr. Jude G. Del Percio, Manager, Regulatory Affairs.

Very truly yours,

Attachment

cc: Mr. William Russell
Regional Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1498

Ms. Marylee M. Slosson, Project Manager
Project Directorate I-1
Division of Reactor Projects I/II
U. S. Nuclear Regulatory Commission
Mail Stop 14B-2
Washington, DC 20555

Senior Resident Inspector
Nuclear Regulatory Commission
P. O. Box 38
Buchanan, NY 10511

A047
1/1

Attachment I

Response to NRC Request For Additional Information
IP-2's Second-Ten Year Inservice Inspection Program

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
April 8, 1988

NRC Item A:

The staff notes that the Licensee is not performing volumetric examination of any of the Class 2 piping welds in the RHR, Chemical and Volume Control, and Containment Spray Systems.

Paragraph 10 CFR 50.55a(b)(2)(iv) requires that ASME Code Class 2 piping welds in the Residual Heat Removal (RHR), Emergency Core Cooling (ECC), and Containment Heat Removal (CHR) systems shall be examined. These systems should not be completely exempted from inservice volumetric examination based on Section XI exclusion criteria contained in IWC-1220. Later editions and addenda of the Code require volumetric examination of Class 2 piping welds greater than or equal to 3/8 inch nominal wall thickness for piping greater than 4 inch nominal pipe size. The staff has previously determined that a 7.5% augmented volumetric sample constitutes an acceptable resolution at similar plants.

Verify that volumetric examination will be performed on at least a 7.5% sample of the Class 2 piping welds in the RHR, Chemical and Volume Control, and Containment Spray Systems and that the ISI Program Plan will be revised to include the 7.5% augmented volumetric samples.

Response:

We believe that our inservice inspection (ISI) program meets the requirements of 10 CFR 50.55a(b)(2)(iv) as currently promulgated. Our rational for not performing the volumetric examinations was based on the following.

Paragraph 10 CFR 50.55a(b)(2)(iv) requires that appropriate Code Class 2 pipe welds in the Residual Heat Removal (RHR), Emergency Core Cooling (ECC) and Containment Heat Removal (CHR) systems be examined. Moreover, 10 CFR 50.55a(b)(2)(iv) states that the extent of examination for these systems shall be determined by the requirements of paragraph IWC-1220 (plus other paragraphs and tables) in the 1974 Edition and Addenda through the Summer 1975 Addenda of Section XI (74 S/75 XI) of the ASME Code.

Paragraph IWC-1220 of 74 S/75 XI states that components satisfying certain specific conditions of IWC-1220 (a), (b), (c) or (d) need not undergo (surface or volumetric) examination. If these specific conditions are not met, then components in the RHR, ECC and CHR systems are required to be examined. At IP-2 these systems do meet those specific conditions and therefore volumetric examination of welds in the RHR, ECC and CHR systems is not required. This conclusion is primarily due to the application of the specific exemption provisions of paragraph IWC-1220. Surface examinations of Class 2 RHR piping is required because the piping has a less than 1/2 inch nominal wall thickness. Such examinations are conducted. In addition, these systems are leak-tested during system pressure tests.

However, to further assure the continued integrity of the RHR and Safety Injection (analogous to ECC) plant piping systems, we will augment our ISI program for the 1984-1994 interval to include volumetric examination of 7.5% of Class 2 piping welds in the RHR and Safety Injection systems, whose piping has a greater than or equal to 3/8 inch nominal wall thickness and is greater than 4 inches in nominal pipe size.

The CHR system piping wall thickness is less than 3/8 inch and therefore is not included in this augmented inspection scope. In addition, the Chemical and Volume Control System is not included because this system does not perform an emergency core cooling function and its piping is less than 4 inches in nominal pipe size. The integrity of these systems will continue to be assured by visual examinations for leakage during system pressure tests.

NRC Item B:

Address the degree of compliance with Regulatory Guide 1.150, "Ultrasonic Testing of Reactor Vessel Welds During Preservice and Inservice Examinations."

Response:

We have implemented Regulatory Guide 1.150 for reactor vessel examinations and our assessment of compliance is provided below. Because Regulatory Guide 1.150 is extensive, detailed and open to interpretation, the following paragraphs clarify how Regulatory Guide 1.150 is currently applied at IP-2. Our implementation of the document is based on Regulatory Guide 1.150 Revision 1, Appendix A, dated February 1988, in which the recommendations of the Electric Power Research Institute are adopted as an acceptable approach to the base document.

1.0 INSTRUMENT PERFORMANCE CHECKS

Paragraphs 1.1a and 1.1b recommend that records of the radiofrequency (RF) pulse waveform from a reference reflector be obtained for each search unit in a manner which will provide frequency-amplitude information. The procedures and equipment used for this process are required to be documented, and checks are to be made within six months prior to performing reactor vessel examinations.

The recommendations of paragraphs 1.1a and 1.1b are met via implementation of paragraph 1.2c of the Regulatory Guide. It is recommended therein that records of the RF pulse waveform be made before and after examining all welds that must be examined during one refueling outage. Photographic records of the RF pulse waveform are made during the calibration process, prior to reactor vessel examinations, and on-site after the reactor vessel examinations are completed. Results are documented in the reactor vessel examination data package.

1.2 FIELD PERFORMANCE CHECKS

Paragraph 1.2a recommends that RF waveforms, screen height and amplitude control linearity, and angle beam profile characterization be verified before and after examining all welds that must be examined during one refueling outage.

The recommendations of paragraph 1.2a are met with the exception of angle beam profile characterization, which is performed during the calibration sequence prior to reactor vessel examinations only. These measurements would be made after the examinations are completed only if significant reflectors are detected with a transducer.

Paragraph 1.2b recommends that the instrument sensitivity during performance of the amplitude control linearity verification be at the calibration sensitivity or at some point between the calibration sensitivity and the scanning sensitivity.

The recommendations of paragraph 1.2b are met. Amplitude control linearity verification is performed at the calibration sensitivity. These verifications are documented in the calibration data package.

Paragraph 1.2c recommends records of the RF pulse waveform from a reference reflector be obtained and recorded in an manner that will permit extraction of frequency-amplitude information.

The recommendations of paragraph 1.2c are met. Photographic records of the RF waveforms are collected for each transducer such that frequency-amplitude information can be extracted before the vessel examination, during the calibration sequence, and after the vessel examinations are completed. Results are documented in the reactor vessel examination data package.

Paragraph 1.2d recommends verification of screen height linearity in accordance with the requirements of Appendix I, Article 4, of Section V of the ASME Boiler and Pressure Vessel Code.

The recommendations of paragraph 1.2d are met. Screen height linearity is verified prior to the calibration sequence, and before and after each series of reactor vessel examinations performed in one refueling outage. These verifications are documented in the reactor vessel examination data package.

Paragraph 1.2e recommends verification of amplitude control linearity in accordance with Appendix II, Article 4, Section V of the ASME Boiler and Pressure Vessel Code.

The recommendations of paragraph 1.2e are met. Amplitude control linearity is verified prior to the calibration sequence, and before and after each series of reactor vessel examinations performed in one refueling outage. These verifications are documented in the reactor vessel examination data package.

The recommendations of paragraph 1.2f are met. Angle beam search units are characterized in terms of beam profile. This is accomplished by collecting sweep and transducer location data at 20 percent DAC (Distance Amplitude Curve) and 50 percent DAC limits during the calibration sequence. These characterizations are documented in the reactor vessel examination data package.

2.0 CALIBRATION

This paragraph recommends calibration be performed to establish the distance amplitude curve and that the sweep range calibration be in accordance with Article 4, Section V of the ASME Boiler and Pressure Vessel Code. Calibration confirmation is recommended before and after each examination, or each week the system is in use; whichever is less. Paragraph 2.0 also recommends, where possible, that the same calibration block be used for successive vessel examinations.

The recommendations of paragraph 2.0 are met. Calibrations for vessel examinations are established per Article 4, Section V of the ASME Boiler and Pressure Vessel Code, calibration confirmation is performed within specified intervals, and the same calibration blocks are used for successive examinations of the reactor vessel, where possible. Calibration data are documented in the reactor vessel examination data package.

Paragraph 2.1 recommends static calibrations when sizing is performed using static transducers. When signals are maximized during calibration, they should also be maximized during sizing. Reference hole detection should be shown at the scanning speed.

The recommendations of paragraph 2.1 are met. Manual calibrations and sizing are performed statically, signals are maximized during calibration and sizing, and manual scanning is performed at 2X to 5X the calibration level to assure reflector detection during the examination process.

Paragraph 2.2 provides recommendations, in the form of options, to assure adequate detection during mechanized scanning. Options include: 1) dynamic calibration using the scanning mechanism used for vessel examinations or a mechanism that duplicates critical parameters of the actual vessel scanner; 2) employing a calibration speed equal to or greater than the vessel scanning speed; and 3) developing correction factors between static and dynamic responses.

The recommendations of paragraph 2.2 are met. Calibration procedures specify that transducers are to be mounted on the array plate which will be used for the reactor vessel examinations. The array plate is manipulated on a device which simulates the motion of the actual reactor vessel inspection device. Distance-amplitude curves are developed statically and verified dynamically at or higher than the specified scanning speed for the vessel.

2.3 CALIBRATION CONFIRMATION

This paragraph provides recommendations concerning the performance of mid-shift or interim confirmations of calibration. The stability requirements of paragraph T-433, Article 4, Section V of the ASME Boiler and Pressure Vessel Code are referenced. When electronic simulators are used, it is recommended that target reflectors be used to supplement simulator checks. A minimum of two targets, separated by a distance representing 75 percent of maximum thickness, should be used for the supplementary checks. Written records of the calibrations should be developed for both the target reflector responses and the Code calibration block distance-amplitude curves for each transducer.

Finally, it is recommended that measures be taken to ensure environmental control of the calibrated electronics.

The recommendations of paragraph 2.3 are met. System calibration is confirmed, as a minimum, before and after each series of reactor vessel examinations performed with a particular transducer array plate. In addition, instrument stability is verified, as a minimum, once each shift using an Electronic Block Simulator (EBS). Complete ultrasonic system performance is confirmed using an array of cylindrical reflectors, called a Mechanical Calibration Transfer Standard. Responses from reflectors in the array are referenced to the distance-amplitude curves generated with the basic calibration blocks per Article 4, Section V of the ASME Boiler and Pressure Vessel Code. The design of the array allows at least a two point check of sweep and sensitivity. Typically, a minimum of three reflectors are selected for verification which appear at transit times representative of the primary reflectors in the basic calibration block. Written records are developed for the Electronic Block Simulator information, the target reflector responses, and the distance-amplitude-curves for each search unit/inspection channel combination. All instrumentation is protected from temperature, vibration, and shock via the trailer mounted control center which employs provisions for shock mounting and environmental control.

2.4 CALIBRATION BLOCKS

This paragraph recommends that calibration block designs comply with Article 4, Section V of the ASME Boiler and Pressure Vessel Code. When alternative or new blocks are used, a comparison of the acoustic response with blocks used previously is recommended. Block and reference reflector surfaces should be protected during storage and should not be modified between successive examinations. If blocks or reflector surfaces are modified in any way, these modifications should be documented.

The recommendations of this paragraph are met. Basic calibration blocks are designed per the requirements of Article 4, Section V of the ASME Boiler and Pressure Vessel Code. Block surfaces and surfaces of reference reflectors are protected, and block modifications are not permitted without prior approval and documentation.

3.0 EXAMINATION

This paragraph recommends that the scope and extent of the ultrasonic examinations performed comply with IWA-2000, Section XI of the ASME Boiler and Pressure Vessel Code. Furthermore, if electronic gating is used the entire required thickness should be within the gated region. If single gates are used, they should be capable of recording multiple indications within the gate. Finally, examinations should be conducted with a minimum of 25 percent overlap, based in the transducer element size.

The recommendations of paragraph 3.0 are met. The scope and extent of examinations performed are selected based upon IWA-2000, Section XI of the ASME Boiler and Pressure Vessel Code. Electronic gating, capable of detecting up to four indications appearing simultaneously within the range, is applied. Gates are set to include the entire examination volume, to the extent practical. Examinations are conducted with a minimum of 25 percent overlap based upon transducer element size. Typically a 50 percent scan overlap is applied.

Paragraph 3.1 provides recommendations for interrogation of the internal clad/base metal interface region of the reactor vessel. Procedures for examining this region should be capable of detecting the 2 percent, 90 degree corner reflector which penetrates the clad surface of the alibration block defined by Article 4, Section V of the ASME Boiler and Pressure Vessel Code. Alternative reflectors are permissible provided they are located in the clad/base metal interface region, do not exceed the maximum allowable defect size, and are demonstrated to provide equivalent or superior results. The volume of interest is defined as one inch of metal as measured perpendicular to the nominal location of the clad/base metal interface.

The recommendations of paragraph 3.1 are met by application of examination procedures for supplementing Code required examinations with techniques specifically intended to interrogate volumes of material within one inch of the clad/base metal interface when scanning vessel shell beltline region welds. Procedures provide for implementation of near-surface examination methods capable of identifying the clad side, 2 percent, 90 degree corner reflector in the basic calibration block specified in Article 4, Section V of the ASME Boiler and Pressure Vessel Code. Either 45 degree full node or shallow angle techniques may be used to comply with this recommendation.

Paragraph 3.2 recommends that beam angles selected to scan welds be based on the geometry of the weld/parent metal interface. In particular, welds identified in paragraph T-441.4.3, Article 4, Section V of the ASME Boiler and Pressure Vessel Code should be examined such that at least one beam angle is perpendicular, plus or minus 15 degrees, to the weld/parent metal interface. If this is not feasible, demonstration that unfavorably oriented flaws can be detected or use of alternative NDE techniques is recommended.

The recommendations of paragraph 3.2 are met. Beam angles are selected for examinations of nozzle-to-shell welds from the nozzle bores and the vessel flange-to-shell weld from the flange seal surface based on their ability to provide near-normal incidence to the weld/base metal interface. Ability to adhere to the plus or minus 15 degree tolerance suggested is dependent upon component geometry.

4.0 BEAM PROFILE

These recommendations are discussed in paragraph 1.2f of section 1.2.

5.0 SCANNING WELD/METAL INTERFACE

These recommendations are discussed in paragraph 3.2 of section 3.0.

6.0 RECORDING AND SIZING

This paragraph recommends that the capability to detect, record, and size flaws, defined by paragraph IWB-3500, Section XI of the ASME Boiler and Pressure Vessel Code, be demonstrated. The established measurement tolerance should be applied when sizing flaws which have been detected, and recorded during scanning.

The ability to detect, record and size flaws is demonstrated to the extent that calibrations are required by Article 4, Section V of the ASME Boiler and Pressure Vessel Code. Experience suggests procedures, equipment, and personnel utilized for these examinations are capable of detecting and recording reflectors which exceed the recording criteria defined in Article 4, Section V of the ASME Boiler and Pressure Vessel Code as augmented by Regulatory Guide 1.150. Experience is being developed with advanced sizing methods and automated data acquisition and recording equipment. Application of these emerging technologies will be considered in the event significant reflectors are detected.

Paragraph 6.1 recommends indications from geometric sources need not be sized. Recording should be at 50 percent DAC. Once sufficient information has been gathered to identify the origin of the geometric indication, further evaluation and recording are not required.

The recommendations of paragraph 6.1 are met. Indications which exceed the recording level are automatically identified on the remote inspection tool data printout in terms of amplitude, sweep position, and location in the vessel. Indications are investigated to determine their origin. The interpretation and its basis are documented in the vessel examination records.

6.2 INDICATIONS WITH CHANGING METAL PATH

This paragraph provides recommendations for the recording of indications which change metal path for a distance greater than that recorded from the calibration reflector. Reflectors at metal paths representing 25 percent and greater of the through-wall thickness of the vessel wall, as measured from the inner surface, should be recorded per Sections V and XI of the ASME Boiler and Pressure Vessel Code, and characterized at 50 percent DAC. Reflectors within the inner 25 percent of the vessel through-wall thickness should be recorded at 20 percent DAC. Characterization should be in accordance with methods demonstrated in paragraph 6.0. Indications sized to 20 percent DAC may have their size corrected by subtracting the beam width in the through-thickness direction, as based on data collected, from a calibration hole at a depth similar to that of the reflector. This size should be compared to the reflector size determined based on 50 percent DAC without beam spread correction. The size used for evaluation should be the larger size as determined by the two methods.

The recommendations of paragraph 6.2 are met. Valid angle beam indications at metal paths representing 25 percent and greater of the vessel through-wall thickness, measured from the inner surface, are recorded and characterized at 50 percent DAC regardless of indication travel. Valid angle beam indications within the inner 25 percent of the vessel wall thickness, measured from the vessel inner surface, are recorded at 20 percent DAC regardless of indication travel. If indications within the inner 25 percent of the vessel inner surface exceed 50 percent DAC, they are recorded at the 20 percent and 50 percent DAC limits. The size is determined by the larger of the 20 percent DAC size minus beam width, or 50 percent DAC without beam spread correction.

6.3 INDICATIONS WITHOUT CHANGING METAL PATH

This paragraph recommends that indications which do not change metal path and are within the outer 75 percent of the through-wall dimension be recorded only when any continuous dimension exceeds one inch. If such an indication falls within the inner 25 percent of the through-wall dimension it should be recorded at 20 percent DAC and evaluated at 50 percent DAC. A precautionary note is included which provides some guidance in determining whether a reflector is truly of the non-traveling variety.

The recommendations of paragraph 6.3 are met. Procedures employed do not discriminate between traveling and non-traveling indications during the recording process. Thus, valid angle beam indications at metal paths representing 25 percent and greater of the vessel wall thickness are recorded at 50 percent DAC, regardless of the extent to which they might be observed to travel. Valid angle beam indications within the inner 25 percent of the vessel wall thickness, as measured from the inner surface, are recorded at 20 percent DAC, regardless of the extent to which they might be observed to travel. When indications in the inner 25 percent of the vessel wall thickness exceed 50 percent DAC, they are recorded at the 20 percent and 50 percent DAC limits. The size is determined by the larger of the 20 percent DAC size minus beam width, or 50 percent DAC without beam spread correction.

6.4 ADDITIONAL RECORDING CRITERIA

This paragraph recommends supplementary recording criteria for reflectors which are reportable according to the Regulatory Guide. Reportable indications should be recorded at scan intervals no greater than one-fourth inch. The recorded information should include metal path and transducer location data for 20 percent DAC, 50 percent DAC, 100 percent DAC, and the peak amplitude locations, where applicable. Electronic gating systems shall provide on-line, reproducible, recorded information regarding metal path amplitude, and position of all indications exceeding a preset level, representing the minimum recording level required. Preferred methods are to employ multiple gates or a single gate for each channel with multi-indication recording capability.

The recommendations of this paragraph are met. Reportable indications are recorded at scan intervals of one-fourth inch, maximum. Recording procedures require collection and documentation of indication transit time and transducer location for 20 percent DAC, 50 percent DAC, 100 percent DAC, and peak amplitude locations, where applicable. Information presented automatically on the data printout include indication amplitude, sweep position, and location in the vessel. The gating system employed is capable of recording up to four indications which might appear in the gate simultaneously.

7.0 REPORTING OF RESULTS

This paragraph recommends that records obtained while following the recommendations of Regulatory positions 1.0, 2.0, 3.0, and 6.0 along with

any discussion and explanations be kept available at the site. Indications determined by Regulatory Positions 6.2 or 6.3 to exceed the allowable limits of Section XI of the ASME Boiler and Pressure Vessel Code should be reported as abnormal degradation of the reactor pressure boundary in accordance with the recommendations of Regulatory Position 2a(3) of Regulatory Guide 1.16.

The report of the ultrasonic examination should also include the best estimate of the tolerances in sizing flaws at the sensitivity specified in 6.0 and the basis for this estimate, a description of the technique used to qualify the effectiveness of the examination procedure, the best estimate of volumes not efficiently examined, and sketches of equipment and identification of reference points and necessary dimensions to allow a reviewer to follow the equipment's indication location scheme. Finally, if other volumetric techniques are used, they should be described in the final report.

The recommendations of paragraph 7.0 are met as described below. The reactor vessel final report includes records obtained per implementation of Regulatory Positions 1.0, 2.0, 3.0, and 6.0. Indications determined to exceed the allowable limits of Section XI of the ASME Boiler and Pressure Vessel Code are reported as required. The report of the ultrasonic examinations includes calibration records and procedures; estimates of volumes inaccessible due to geometry, access, etc.; descriptions and sketches of the remote examination system which explain its operation, critical reference points, and dimensions; and descriptions of alternative volumetric techniques, if applied. Estimates of error bands associated with flaw sizing are not provided as they are considered subjective in nature and not readily substantiated with quantitative data. As more experience is developed with use of advanced sizing methods and automated data acquisition equipment, estimates of this nature may be possible.

NRC Item C:

Address the degree of compliance with NUREG-0800, Section 3.6.1, "Plant Design for Protection Against Postulated Piping Failures in Fluid Systems Outside Containment."

Response:

As a result of discussions with NRC staff on March 8, 1988, we understand that the intent of question "C" was to request verification that our application of ASME Section XI requirements has not been precluded by possible measures taken to protect against piping failures in fluid systems outside containment. NRC staff reaffirmed our understanding of the intent of question "C" during our conference call on April 4, 1988.

We confirm that our application of ASME Section XI requirements has not been precluded by possible measures taken to protect against piping failures in fluid systems outside containment.