U. S. ATOMIC ENERGY COMMISSION
REGION I
DIVISION OF COMPLIANCE

Report of Inspection

CO Report No. 247/71-5

Licensee:	Consolidated Edison Company Indian Point No. 2 (IP-2) License No. CPPR-21 Category B
Dates of Inspection:	March 2, 3 and 4, 1971
Dates of Previous Inspection:	February 5, 10 and 11, 1971

Inspected by: L. B. Higginbotham, Radiation Specialist — 5/21/71 Date

Reviewed by: N. C. Moseley, Sr. Reactor Inspector — 5/21/71 Date

Proprietary Information: None

PURPOSE

An announced inspection was made at the Indian Point nuclear power station on the above listed dates. This was the second inspection made to examine the radiation protection and chemistry programs and the installation of waste disposal and radiation monitoring systems to determine if (1) the installation of radioactive waste and radiation monitoring systems are as described in the FSAR and (2) if the organization and procedural controls are adequate to provide for the health and safety of plant workers and the general public.

SCOPE

Following is a summary outline of the scope of the inspection.

1. Organization and administration

2. Training and indoctrination

3. Procedures

4. Radioactive liquid waste systems

    a. Comparison with FSAR commitments
    b. Provisions for monitoring liquid waste streams
    c. Adequacy of sampling and monitoring systems
    d. Calibration of radiation monitors, tanks and flows
    e. Limits for release of waste
    f. Method used to show compliance with limits
    g. Operating limits related to treatment systems

5. Radioactive gaseous waste systems

    a. Comparison with FSAR commitments
    b. Provisions for monitoring gaseous waste streams
    c. Collection of representative samples
    d. Calibration of monitors, sample collectors and flows
    e. Limits for release of waste
    f. Method used to show compliance with limits
    g. Treatment systems

6. Solid waste systems

    a. Comparison with FSAR commitments
    b. Control of personnel exposure, contamination control
    c. Control of storage
    d. Procedures and administrative controls for packing, storing and shipment

7. Radiation and process monitoring systems and equipment

    a. Comparison of system with FSAR commitments
    b. Adequacy, calibrations, functions
    c. Preoperational testing

8. Personnel monitoring and exposure control

    a. Program and procedures, records
    b. Radiation and contamination survey and control
    c. Access to controlled areas

9. Instrumentation and equipment

   a. Types and quantities of survey, monitoring and counting instruments
   b. Calibrations, quality controls

10. Environmental Monitoring

   a. Program and procedures, records
   b. Instrumentation and equipment

SUMMARY

Noncompliance/Nonconformance Items - None

Safety Items - None

Design Changes - None

Unusual Occurrences - None

Enforcement Matters - None

Status of Previously Reported Problems - None

Other Significant Items -

The following items were identified during the inspection and were noted for further review within Compliance. They were not discussed during the management interview at the completion of the inspection; however, after review within Compliance they were discussed in detail during a meeting with licensee representatives at CO:HQ on April 30, 1971.

1. Sampling liquids from tanks and pipes (D.2). Apparent deficiencies exist in sampling points when compared to guidance criteria of ASTM D 510-68.

2. Capabilities of liquid waste disposal system (D.3). Apparent deficiencies exist in the system when reviewed against recent experience at an operating facility with a similar waste system.

3. Monitoring of gaseous waste effluents (D.5). Apparent deficiencies exist in monitoring systems when compared to guidance criteria of ANSI N.13-1969. In addition, there are no provisions for continuous monitoring of halogens and particulates in the stack effluent.

4. Charcoal filters in the containment purge system (D.6). The absence of containment purge charcoal filters is of possible significance in reducing iodine releases when reviewed against recent information from an operating facility which has experienced fuel failures with resultant iodine concentrations in containment.

Persons Contacted

Mr. G. Leibler, Supervising Engineer (Nuclear Plant Health Physicist)
Mr. J. Mooney, Assistant Supervising Engineer
Mr. P. Gaudio, Assistant Supervising Engineer
Mr. J. Higgins, Chemist
Mr. J. Kelly, Chemist

Management Interview (Before Compliance review of significant items)

The results of the inspection areas related to organization, administration, training, indoctrination, procedures, installation of waste systems and related preoperational testing were discussed with Mr. G. Leibler and Mr. J. Makepeace of Con Ed. The items discussed at this time and noted for followup review and inspection were the completion of testing of waste disposal systems, functional testing of radiation monitoring systems, and efficiency testing of filtering systems in gaseous waste and containment air systems. The test procedures for these systems had been reviewed by CO:I, however, they had not been completed at the time of the inspection.

After the Compliance review of the significant items list mentioned above, a meeting was held at CO:HQ with licensee representatives on April 30, 1971 to discuss the results of the review. The principal representatives at this meeting were:

Mr. William Cahill, Vice President, Engineering, Con Ed
Mr. J. Prestelle, Manager, Nuclear Power Generation, Con Ed
Mr. L. Trosten, Con Ed legal representative

Mr. D. Muller, DRL
Mr. K. Kniel, DRL

Mr. J. P. O'Reilly, CO:HQ
Mr. N. C. Moseley, CO:I
Mr. L. Higginbotham, CO:I
Mr. G. L. Madsen, CO:I

Westinghouse was represented by design engineers who participated in discussion of certain items related to waste disposal systems.

DETAILS

A. Organization and Administration

The inspector reviewed the proposed organization, duties and the responsibilities for the radiation protection and chemistry staff as outlined in the answers to Question 12.1, Section 12, Volume V of the FSAR. These items were reviewed and discussed with the Supervising Engineer (Health Physics) and his staff and the station chemist.

The present staff has considerable background and experience from operation of Indian Point Unit No. 1 (IP-1)* and their responsibilities are expanded to include administration of the health physics and chemistry programs for IP-2. The physical layout and proximity of the two plants affords the use of a single access point to controlled areas of both plants and the use of the staff to administer for both is reasonable. There were no significant deficiencies found in this area of review.

B. Training and Indoctrination

The inspector reviewed the training and indoctrination outlined in the answer to Question 12.1, Section 12, Volume V of the FSAR and the resumes of the supervisory staff given in answers to Question 13.4, Section 13, Volume V. The training, experience and background of the staff was discussed with the Supervising Engineer (Health Physics) and a member of the chemistry staff.

There were no significant deficiencies found in this area of review. Personnel have experience and background which should enable them to analyze and correct health and safety problems arising during plant operation.

C. Procedures

Radiological control and radiation protection procedures were examined and compared with commitments made in Section 12.3 of the FSAR and Section 6.7 of the proposed Technical Specifications. The inspector reviewed written procedures which outline general controls and guidelines for radiological health and safety, general operating procedures for radiation monitoring and waste disposal, procedures for operator action and response to radiation alarms by continuous monitors, specific procedures for radiation protection and radiological controls and specific procedures for sampling and analysis of radioactive wastes.

---

*See resumes of the Supervising Engineer and Assistants in answers to Question 13.4, Section 13, Volume V of the FSAR.

There were no significant deficiencies found in this area of inspection. The sampling and analysis schedule for chemical/radiochemical parameters of plant systems has been prepared to ensure completion of pertinent surveillance requirements of the proposed Technical Specifications. Limits and guides specified in these procedures reviewed are consistent with regulatory requirements.

D. Radioactive Waste Systems

An inspection of the systems was made to determine if their general installation, design and functions were as described in Section 11 of the FSAR. The inspector examined major components of the systems and reviewed the process, flow, instrumentation and controls with plant personnel who are cognizant of the system design and installation.

There were no significant deficiencies found in the area of inspection related to comparison of system installation and procedural controls with commitments of Section 11 of the FSAR and Section 3.9, "Effluent Release", of the proposed Technical Specifications. However, deficiencies were found in certain aspects of the waste systems when these were compared against (1) published guidance standards (ASTM, ANSI), and (2) identified deficiencies in similar equipment and systems at operating plants. The following summarizes those deficiencies in the waste systems which were identified in these categories.

1. Provisions to terminate a liquid waste release

This item pertains to the radiation monitor (gamma scintillation detector) on the discharge line of the waste system which has the function of closing a valve to terminate a waste release. The set point, i.e., the point at which the monitor functions to close the discharge valve, is chosen to preclude the release of concentrations of radioactivity which would exceed regulatory limits. The inspection identified an apparent deficiency in the control switch for the automatic valve. The control indicated that three positions were available; "closed", "automatic" and "open", the latter indicating that the automatic function could be bypassed. The inspector mentioned this item to Mr. J. Higgins (of Con Ed) who made note of the fact. In a later discussion with Con Ed production personnel the inspector learned that the matter had been called to the attention of Westinghouse who had replied in writing that the valve control function would be corrected. The inspector examined the Con Ed letter to Westinghouse and the reply. During later discussions with the licensee, the inspector was informed that to preclude an inadvertent "bypass" of the control valve by an operator placing the switch in the "open" position and not the "auto" position, Con Ed would modify the control whereby the "open" function would be a spring-loaded switch position.

2. Sampling liquids from tanks and pipes

The deficiency found in this area of inspection relates to criteria or standards published by the American Society for Testing and Materials (ASTM) in ASTM D 510-68. Section 11.g of this standard, which relates in general to obtaining representative samples for tests and analyses, states that nozzles to sampling cocks should be inserted into the pipe line or piece of equipment to such a depth as to prevent pipe surface sampling. The inspector could not verify or determine, by either discussion with Con Ed personnel or examination of the exterior of sampling lines, if sample points in liquid systems conformed to the referenced standard. In later discussions with Con Ed, Compliance made reference to the ASTM standard and indicated that there was a need for Con Ed to review the plant systems to determine what sampling points should conform to this criteria, e.g., those points from which samples are drawn for test and analysis to determine radioactive releases from the facility.

3. Capability of processing waste liquids generated in plant operation

The waste disposal system evaporator has a rated capacity of 2 gpm with a specified decontamination factor which will maintain radioactive liquid releases to approximately 25 millicuries/year. Recent experience at an operating facility with a similar waste system shows that the waste evaporator; (1) apparently cannot handle the volume of waste generated, (2) has not achieved the decontamination factors expected or estimated and (3) as a result, waste releases have exceeded design estimates by a considerable margin (by a factor of approximately 200).

4. Provisions for sampling, on a spot-check basis, normally uncontaminated air streams which are not monitored continuously

A source of airborne radioactivity identified in this category is the atmospheric vent from the steam generator blowdown tank; if primary to secondary system leakage occurs the blowdown water becomes contaminated to some extent (the levels dependent on the rate of leakage between systems) and is released to the discharge canal. The blowdown water is continuously monitored for radioactivity; section 3.9.C.7 of the proposed Technical Specifications states that "whenever there is indication of primary to secondary leakage and any steam generator is being blown down, the blowdown line monitor shall be operable, except that it may be inoperable for 48 hours provided samples shall be taken once per shift and analyzed for gross activity". This surveillance requirement is directed to monitoring of the blowdown water; the atmospheric vent from the blowdown is not continuously monitored.

Section 3.9.C.7 of the proposed Technical Specifications states that "during the first indication of primary to secondary leakage, a determination of the partition factor for the blowdown tank shall be made". [The licensee presented an evaluation of partition factors (response to Question 11.2, Section 11, Volume V of the FSAR) for iodine and calculated blowdown activities of iodine, krypton and xenon]. The inspector pointed out the requirement and need for appropriate monitoring of the blowdown tank atmospheric vent to Messrs. Higgins and Leibler (Con Ed HP and Chemistry staff) who made note of the fact and said that sampling would be done.

5. Location of sample probes in areas of uniform flow and well mixed air streams

This area of review is applicable to the containment/plant-vent particulate and gas monitor. The sampling probe in containment will probably be in an area of uniform mixing as the internal air circulating system is designed to mix and cool containment atmosphere. However, when this monitor is sampling the plant vent, the location of the sample probe is critical when determining its ability to collect a representative sample of the air stream. The probe is installed in the duct about 25 to 30 feet above the last input to the stack or vent in a straight vertical run of the vent duct, which is an acceptable location with relation to duct inputs. However, no velocity profile has been made to determine if the probe is installed in an area where a true representative sample is obtained.

In addition, the sample probe is a single, curved probe (approximately 5/8 inch O.D. with 0.035 walls) with the inlet in the center of the vent stack. The vent stack is rectangular, 4 feet x 7 feet in cross section. The deficiency in this installation arises from comparison of the design with criteria in American National Standards Institute (ANSI) publication ANSI N13.1-1969, "A Guide for Sampling Airborne Radioactive Materials in Nuclear Facilities". The referenced guide states that square and rectangular ducts should be sampled from points in the cross section representing approximately equal area. The number of sample withdrawal points should be 6 to 12 for ducts with cross section of 2 to 25 square feet and 20 withdrawal points for ducts of greater than 25 square feet cross section. The standard states further that fewer withdrawal points may be used if a study is made of the velocity profiles, etc., in the duct. As stated above, no velocity profiles had been made to determine optimum location of sampling probe(s) in the ventilation duct.

Another apparent design deficiency in the containment/vent particulate monitor relates to the relatively long sampling lines from the sample probe to the monitor and detector devices. The deficiency in this type of installation, i.e., long sampling lines, arises from the difficulty in determining the losses of portions of the sample in the line due to impaction and/or plateout of particulates and reactive gaseous activity such as halogens. The sample line leaves the vent duct, and goes to a straight vertical run down the side of the vent to the monitor, a distance of about 40 or 50 feet total. The bends made in the sample piping installation have a large radius and are smooth and regular; a feature which reduces some losses by impaction in 90^o turns. The sample line is installed on the outside of the duct without insulation which invites condensation in the line with the possibility of loss of a true representative sample.

In addition, there are no provisions for continuous monitoring of the vent duct for halogens and particulates. The particulate monitor mentioned previously can be switched from sampling containment atmosphere to the plant vent; it normally samples containment atmosphere. Continuous monitoring of the stack (or ventilation duct) is for noble gases only; 4 GM tube detectors placed within the duct air stream.

6. Treatment systems for gaseous wastes

An apparent deficiency identified in this area of inspection is the lack of charcoal filters in the containment purge system. The apparent need for halogen removal filters is shown by estimating the iodine-131 concentration in containment atmosphere which will result in the annual average release rate of iodine-131 during a purge of containment. The proposed Technical Specifications contain the calculated X/Q value for both IP-1 and IP-2 in the form to limit releases from the site to MPC levels as if only one plant was making a release.

$$\left(\frac{X}{Q}\right)_1 \sum_i \frac{Q1_i}{(MPC)_i} + \left(\frac{X}{Q}\right)_2 \sum_i \frac{Q1_i}{(MPC)_i} \leq 1.0$$

i = any isotope

Q = release rate in Curies/second

sub 1 and sub 2 = IP-1 and IP-2

MPC = uCi/cc = Ci/m^3

X/Q = dispersion coefficients in sec/m^3

Q/X = m^3/sec

X/Q for Unit 2 = 2.5×10^{-5}, Q/X = 4.0×10^4

Purge rate for Unit 2 = 5.5×10^4 cfm = 2.59×10^7 cc/sec

The Unit 2 release rate for iodine-131, considering the 1/700 reconcentration factor:

$$Q = MPC\ (Q/X) = 1.43 \times 10^{-13}\ Ci/m^3\ (4 \times 10^4\ m^3/sec)$$

$$= 5.72 \times 10^{-9}\ Ci/sec$$

$$= 0.0057\ uCi/sec$$

The concentration of iodine-131 in the purge exhaust of Unit 2 which would constitute a release at the annual average rate is:

$$\frac{0.0057\ uCi/sec}{2.59 \times 10^7\ cc/sec} = 2.2 \times 10^{-10}\ uCi/cc$$

This concentration is a factor of about 40 times more restrictive than the concentration allowed for 40 hour/week exposure of workers in restricted areas.