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TECHNICAL REPORT

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TECHNICAL EVALUATION REPORT

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#39

RADIOLOGICAL EFFLUENT RELEASE AND
RADIOLOGICAL ENVIRONMENTAL OPERATING REPORTS FOR 1983

NEW YORK POWER AUTHORITY
INDIAN POINT NUCLEAR GENERATING PLANT UNIT 3

TER-C5506-548

Prepared for

Nuclear Regulatory Commission
Washington, D.C. 20555

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FOREWORD

This Technical Evaluation Report was prepared by Franklin Research Center under a contract (NRC-03-81-130) with the U.S. Nuclear Regulatory Commission (Office of Nuclear Reactor Regulation, Division of Operating Reactors) for technical assistance in support of NRC operating reactor licensing actions. The technical evaluation was conducted in accordance with criteria established by the NRC.

1. INTRODUCTION

This technical evaluation report presents the review and summary of radioactive effluent releases and radiological environmental monitoring reports for the calendar year 1983 submitted by the Licensee of Indian Point Nuclear Generating Plant Unit 3 in accordance with plant Radiological Effluent Technical Specifications (RETS).

2. TECHNICAL SUMMARY

The review was conducted on the Licensee's 1983 Semiannual Radioactive Effluent Release Reports [1, 2] and Annual Radiological Environmental Operating Report [3].

2.1 PLANT-SPECIFIC BACKGROUND

The site of Indian Point Nuclear Generating Plant Unit 3 occupies 239 acres on which Indian Point Unit 1, currently in the process of being decommissioned, and Indian Point Unit 2, owned and operated by the Consolidated Edison Company of New York, are also located. The site is about 24 miles north of the New York City boundary line in the village of Buchanan in upper Westchester County of New York State. The unit-specific information pertinent to this review is as follows:

	Unit 3
Type of Reactor	PWR (Westinghouse)
Rated Power	3,025 MWth (1013 MWe)
Commercial Operation	August 30, 1976
RETS Implementation	January 1, 1985
Condenser Cooling Water System	Once-through to Hudson River
Major Gaseous Discharge Points	Plant vent and rooftop vents
Total 1983 Electricity Output	60.7 GWh
Average 1983 Unit Capacity Factor	0.7%

Diagrams of the liquid and gaseous effluent release systems are given in Appendix A. The site boundary/effluent release point map contained in the Licensee's ODCM is also reproduced in Appendix A.

During 1983, Indian Point Unit 3 remained shut down virtually the entire year for refueling, maintenance, and repair of the main generator.

2.2 RADIOACTIVE EFFLUENT RELEASES

A summary of the effluent release, solid waste shipment, effluent dilution, and dose impact data provided by the Licensee in the semiannual reports is presented in Table 2-1 and in the following paragraphs.

Liquid Effluent Releases

Several important aspects of the Licensee's 1983 liquid effluent releases are noted in the following:

- A total of 0.5436 curies of fission and activation products and 31.93 curies of tritium were released.
- A total of 822 GL* of water was used for dilution.
- The most abundant radioisotope among the fission and activation products was Fe-55 (57%).
- There were no abnormal releases reported during this period.

Gaseous Effluent Releases

The following are several important aspects of the Licensee's 1983 gaseous releases:

- Total gaseous releases included 560 curies of noble gases, less than 0.000066 curies of radioiodines, and 0.000087 curies of particulates.
- A total of 1.094 curies of tritium were released during the year.
- The most abundant in activity among radioisotopes released were Xe-133 (94%) for noble gases, I-131 (100%) for the radioiodines, and Fe-55 (33%) for the particulates.
- There were no abnormal releases reported during this period.

* 1 GL = 1 x 10^9 liters.

Table 2-1. Summary of Reported Effluent Releases/Exposures for 1983, Indian Point Nuclear Generating Plant Unit 3 (Data taken from Licensee's 1983 Semiannual Radioactive Effluent Release Reports)

I. ACTIVITY RELEASED

Liquid Effluents (Ci)	Gaseous Effluents (Ci)	Solid Wastes and Irradiated Fuel Shipments (Ci)
A. Fission and Activation Products Total : 0.5436 Co-60 : 0.1248 (23%) Cs-137: 0.0139 (3%) Fe-55 : 0.3117 (57%) Other : 0.0924 (17%)	A. Particulates Total : 0.000087 Cs-137: 0.0000026 (3%) Co-60 : 0.0000069 (8%) Fe-55 : 0.0000287 (33%) Other : 0.0000487 (56%)	A. Spent Resins, Filter Sludge, Evaporation Bottoms, etc. Total: 719
B. Tritium Total: 31.93	B. Tritium Total: 1.094	B. Dry Compressible Waste, Contaminated Equipment, etc. Total: 4.82
C. Dissolved and Entrained Noble Gases Total: 0.0813	C. Noble Gases Total : 560 Xe-133: 528 (94%) Others: 32 (6%)	C. Irradiated Components Control Rods, etc. --
D. Gross Alpha Total: Less than 0.00081	D. Iodines Total : Less than 0.000066 I-131 : (100%)	D. Others Total: 8.72
E. Batch Releases Number : 169 Total Time: 578 hrs	E. Batch Releases Number : 30 Total Time: 95 hrs	E. Disposal Site Barnwell, SC: 18 truck shipments Richland, WA: 5 truck shipments
F. Abnormal Releases None	F. Abnormal Releases None	

Table 2-1 (Cont.)
Summary of Reported Effluent Releases/Exposures for 1983,
Indian Point Nuclear Generating Plant Unit 3
(Data taken from Licensee's 1983 Semiannual Radioactive
Effluent Release Reports)

II. EFFLUENT DILUTION

A. Liquid Effluents

Circulation System	Circulation Flow Rate (GL/yr)	Discharge Mode	Dilution Volume (GL)
Once-through	946 (1st 6 months) 698 (2nd 6 months)	Batch and Continuous	822

B. Gaseous Effluents (Parameters for Maximum Doses - Continuous Release)*

X/Q (sec/m^3)	D/Q (m^{-2})	Location
--	--	--
--	--	--

III. MAXIMUM INDIVIDUAL DOSES

Liquid Effluents	Gaseous Effluents	Direct Radiation
A. Whole Body Dose	A. Whole Body Dose	Not available in the submittal [3]
0.0179 mrem (0.6%)**	0.0571 mrem (1.1%)**	
	B. Skin Dose	
	0.057 mrem (0.4%)**	
B. Organ Doses	C. Organ Dose	
0.0328 mrem (0.3%)** (Liver, adult)	0.1828 mrem (1.2%)** (bone)	

*NRC staff evaluation for 10CFR 50, Appendix I.
**Percent of 10CFR50, Appendix I design objective levels.

Solid Radioactive Waste Shipments

Information on the Licensee's shipments of solid radwaste to offsite locations is summarized as follows:

- A total of 32 m^3 of solid radwastes containing 719 curies of activity was shipped offsite; it consisted of spent resins, filters, sludges, evaporator bottoms, etc.
- A total of 280 m^3 with an activity of 4.82 curies was shipped offsite for the low-level wastes consisting of dry compressible wastes, contaminated equipment, etc.
- A total of 18 shipments were made by truck to the Barnwell, South Carolina burial site; 5 truck shipments were made to the Richland, Washington site.

2.3 RADIOLOGICAL DOSE IMPACT

As seen in Table 2-1, the reported dose impact to the maximum individuals in the unrestricted area (see Figure A-1, Appendix A) is in all cases well below the design objective levels of 10CFR50, Appendix I, and about 1% of these levels in the worst case.

A summary of the dose to the maximum individuals beyond the site boundary or in the unrestricted areas for the liquid and gaseous effluent releases is presented in the following paragraphs.

Liquid Effluent Dose

The following are the Licensee's reported annual doses:

- The whole body liquid dose is 0.0179 mrem (0.6% of the 10CFR50, Appendix I design objective level of 3 mrems).
- The critical organ was identified as liver, and the dose was 0.0328 mrem (0.3% of the 10CFR50, Appendix I design objective level of 10 mrems).

Gaseous Effluent Dose

The following gaseous effluent doses were reported by the Licensee:

- The whole body dose is 0.0571 mrem (1.1% of the 10CFR50, Appendix I design objective level of 5 mrems).

- The skin dose is 0.057 mrem (0.4% of the 10CFR50, Appendix I design objective level of 15 mrems).

- The critical organ was identified as bone and the dose is 0.1828 mrem (1.2% of the 10CFR50, Appendix I design objective level of 15 mrems).

2.4 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The report presents the data obtained from the analyses of a large number of environmental samples collected during 1983 for the Licensee's Environmental Radiological Surveillance Program. The monitoring program reported is summarized in Table 2-2.

Almost all of the Licensee's analysis results are at or below the minimum detectable concentration (MDC). The activity present above the detection limits in most of these routinely collected sample media was observed to be of natural and atmospheric origin, and in a few samples the activity detected could be related to operations at the site.

Particular emphasis in the program was placed on iodine-131 and air particulate monitoring. Highlights of the results can be summarized as follow:

- A total of 768 airborne samples and 24 milk samples were analyzed for iodine-131. In no case was iodine-131 detected: all measurements were below the iodine-131 MDC.

- Measurements were made on 768 air particulate samples covering both indicator and background stations. The average gross beta concentration for the year for all indicator stations was 0.015 pCi/m^3, nearly the same value as for all background stations.

- Analysis of samples of sediment showed small amounts of plant-generated radioisotopes.

- River, surface, drinking, and well water samples showed measurable tritium, and the maximum concentration was approximately 1540 pCi/L for a location near the vicinity of the plant discharge.

- There was no indication of a contribution to the radioactivity in fish (including shellfish) and food crops from the operation of the Indian Point plant.

2.5 CHANGES TO ODCM, PCP, AND RADWASTE TREATMENT SYSTEMS

There were no changes made by the Licensee to the PCP or to the radwaste treatment systems in the reports submitted by the Licensee for 1983.

Table 2-2. Outline of Environmental Monitoring Program, Indian Point Nuclear Generating Plant Unit 3

Sample Type	No. of Locations	Collection Frequency	Analysis Frequency	Type Analysis	Number of Analysis Performed in 1983
Air Particulate	(a)	Weekly	Weekly	Gross Beta	768
				Gamma Isotopic	768
			Monthly	Gamma Isotopic (Composite)	180
Airborne I-131	(a)	Weekly	Weekly	I-131	768
Surface Water	(a)	(a)	(a)	Gamma Isotopic	36
				Tritium	12
Well Water	(a)	(a)	(a)	Gamma Isotopic	24
				Tritium	24
Drinking Water	(a)	(a)	(a)	Gamma Isotopic	36
				Tritium	12
				I-131	36
River Water (Hudson)	(a)	(a)	(a)	Gamma Isotopic	24
				Tritium	8
Fish	(a)	(a)	(a)	Gamma Isotopic	12
Milk	(a)	(a)	(a)	I-131	24
				Gamma Isotopic	24
Sediment	(a)	(a)	(a)	Gamma Isotopic	24
TLD	(a)	(a)	(a)	Gamma Dose	--
Food Crops	(a)	(a)	(a)	Gamma Isotopic	2

a. Information not available in the submittal [3].

However, in the second 6-month semiannual report the Licensee reported changes to the ODCM. These changes are regarding environmental sampling locations contained in Section 4.0 of the ODCM.

2.6 INFORMATION CONTAINED IN LICENSEE'S REPORTS

The information contained in the Licensee's reports was compared with the Licensee's report commitments (see tables in Appendix B) for the Licensee's Annual Radiological Environmental Operating Report [3], and the two Semiannual Radioactive Effluent Release Reports [1, 2], respectively. A brief summary of the information is presented in the following paragraphs.

Annual Radiological Environmental Operating Report

In the Licensee's Annual Radiological Environmental Operating Report, the Licensee provided the results of the radiological environmental monitoring program surveillance.

Semiannual Radioactive Effluent Release Reports

The Licensee reported a radioactive effluent release summary for liquid and gaseous effluents and solid radioactive waste disposal, following the format of Regulatory Guide 1.21 [4].

The Licensee also reported the estimated doses and meteorological data in the form of joint frequency distributions.

3. CONCLUSIONS

The Licensee-reported effluent releases were well within their technical specifications limits. The reported 1983 dose impact to the maximum individuals in unrestricted areas was below the 10CFR50 Appendix I design objectives, reaching about 1% of these levels in the worst case.

Analyses of many hundreds of indicator and control samples from a well-designed radiological environmental monitoring program showed no measurable radioactivity in most of the samples outside of the site boundary that was attributable to the plant. Some samples of sediment and water showed the presence of low concentrations of radionuclides that were possibly due to plant-related operations.

During 1983, the Licensee made no changes to the PCP or to the radwaste treatment systems. However, changes were made to the ODCM for new environmental sampling locations.

The extensive measurement data in the 1983 reports provide substantive documentation to conclude that:

- The 1983 radioactive effluent release reports indicate no adverse effects to the environment and general public within the vicinity of the Indian Point plant.
- Data from the environmental radiological monitoring program during 1983 were within their respective expected normal range. The results of the data analysis show no abnormal environmental conditions that will cause adverse environmental effects from the operation of the plant.

4. REFERENCES

1. "Semiannual Radioactive Effluent Release Report - January 1 through June 30, 1983," Indian Point Nuclear Generating Plant Unit 3, New York Power Authority, 47 pages, Radioactive Releases/Doses and Meteorological Data (Available in NRC-PDR)

2. "Semiannual Radioactive Effluent Release Report - July 1 through December 31, 1983", Indian Point Nuclear Generating Plant Unit 3, New York Power Authority, 54 pages, Radioactive Releases/Doses and Meteorological Data (Available in NRC-PDR)

3. "Errata Sheets and Replacement Tables for Appendix D to the Indian Point Site 1983 Annual Radiological Environmental Operating Report," Indian Point Nuclear Generating Plant Units 1, 2, and 3, Consolidated Edison Company of New York, Inc., 20 pages (Available in NRC-PDR)

4. "Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants"
June 1974
USNRC, Regulatory Guide 1.21, Rev. 1

APPENDIX A

PLANT AND SITE DESIGN FEATURES

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The site boundary and unrestricted areas for the Indian Point plant are defined by Figure A-1, which is taken from Figure 5-3 of the Indian Point Unit 3 ODCM.

The liquid and gaseous effluent release systems for the Indian Point plant are recorded in Figures A-2 and A-3, which are taken from Figures 5-1 and 5-2 of the Indian Point Unit 3 ODCM.

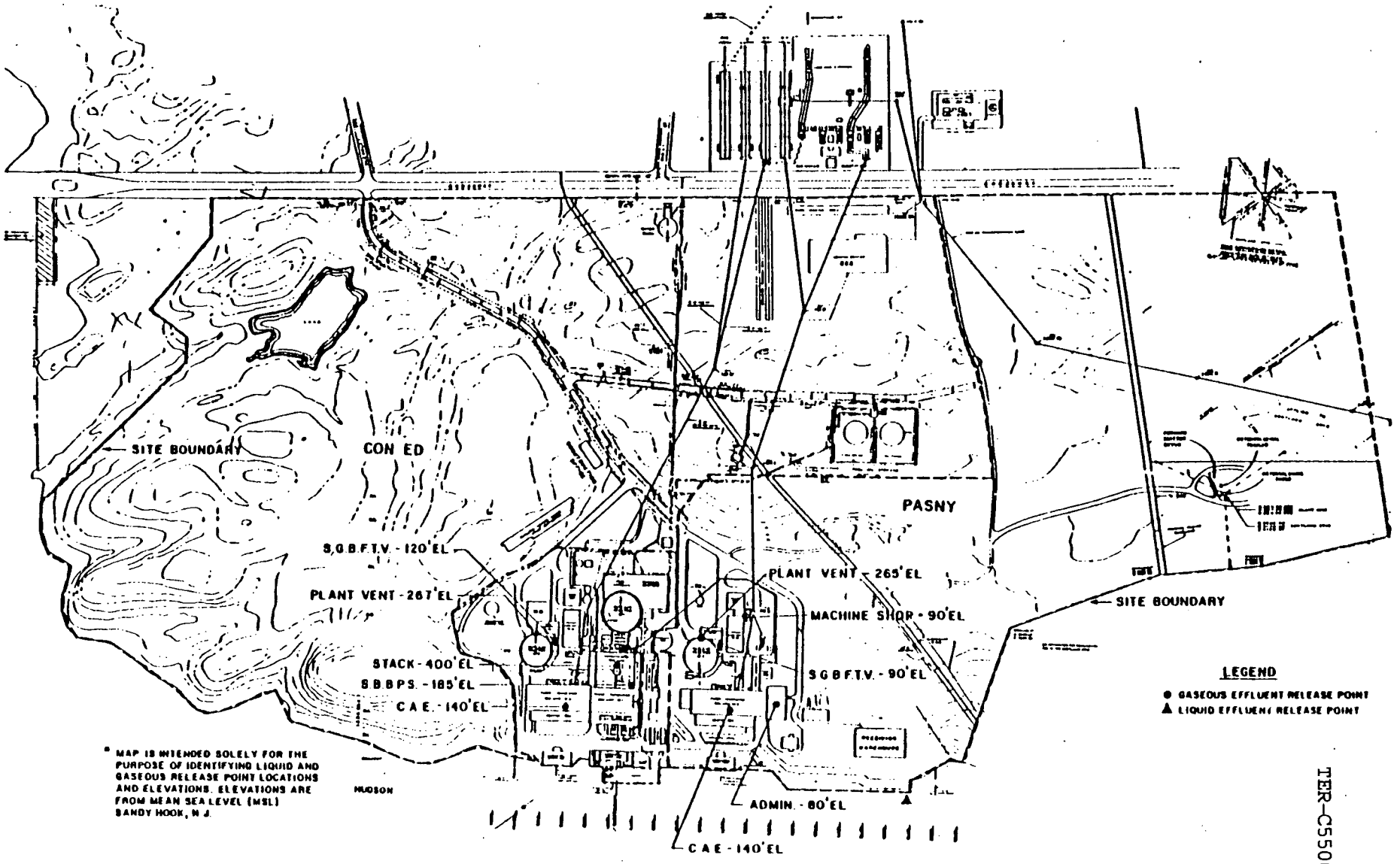

Figure A-1. Unrestricted Areas for Radioactive Gaseous and Liquid Effluents, Indian Point Nuclear Generating Plant Unit 3
(Taken from Figure 5-3 of the Indian Point Unit 3 ODCM)

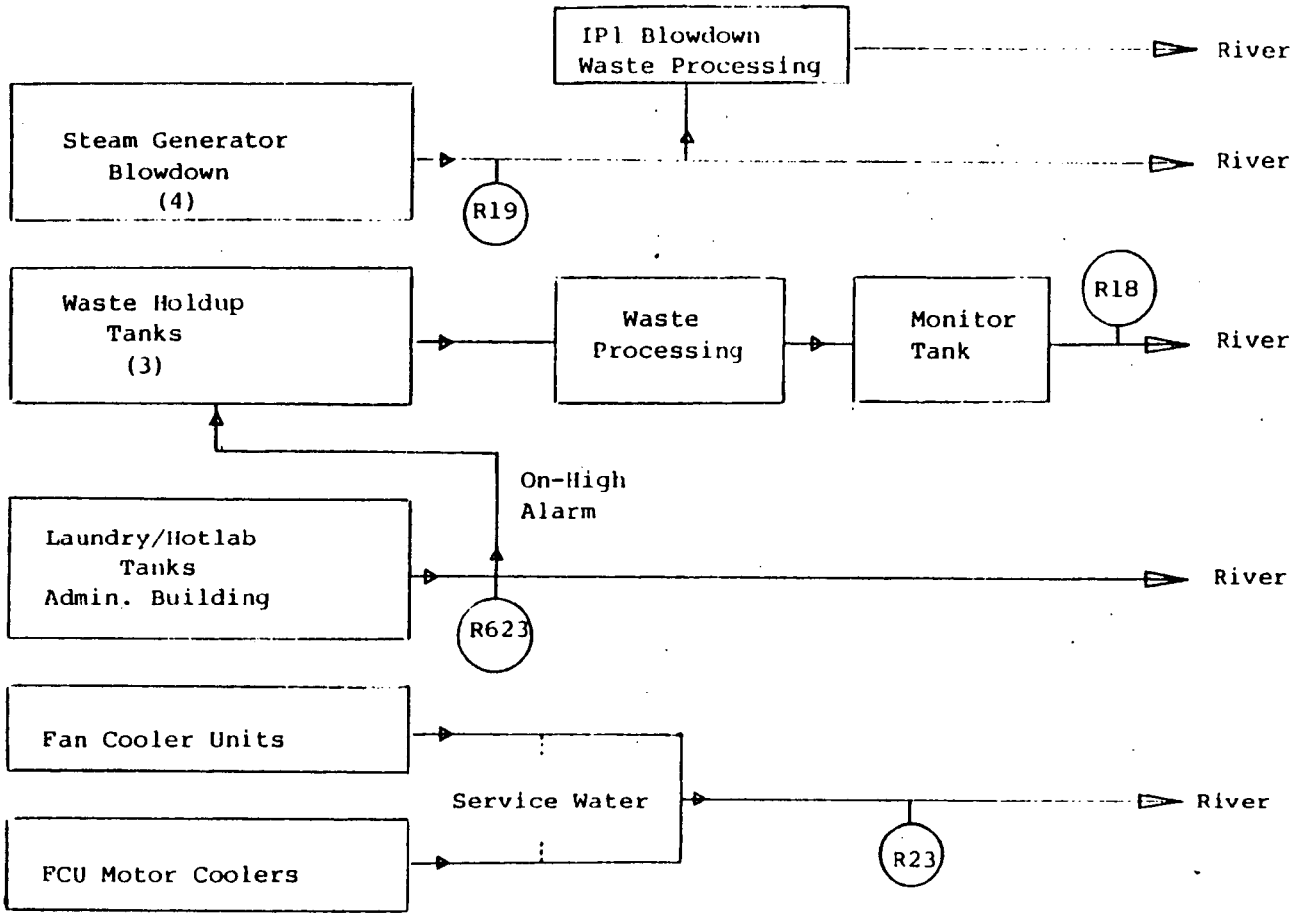

Figure A-2. Liquid Effluent Release Systems,
Indian Point Nuclear Generating Plant Unit 3
(Taken from Figure 5-1 of the Indian Point Unit 3 ODCM)

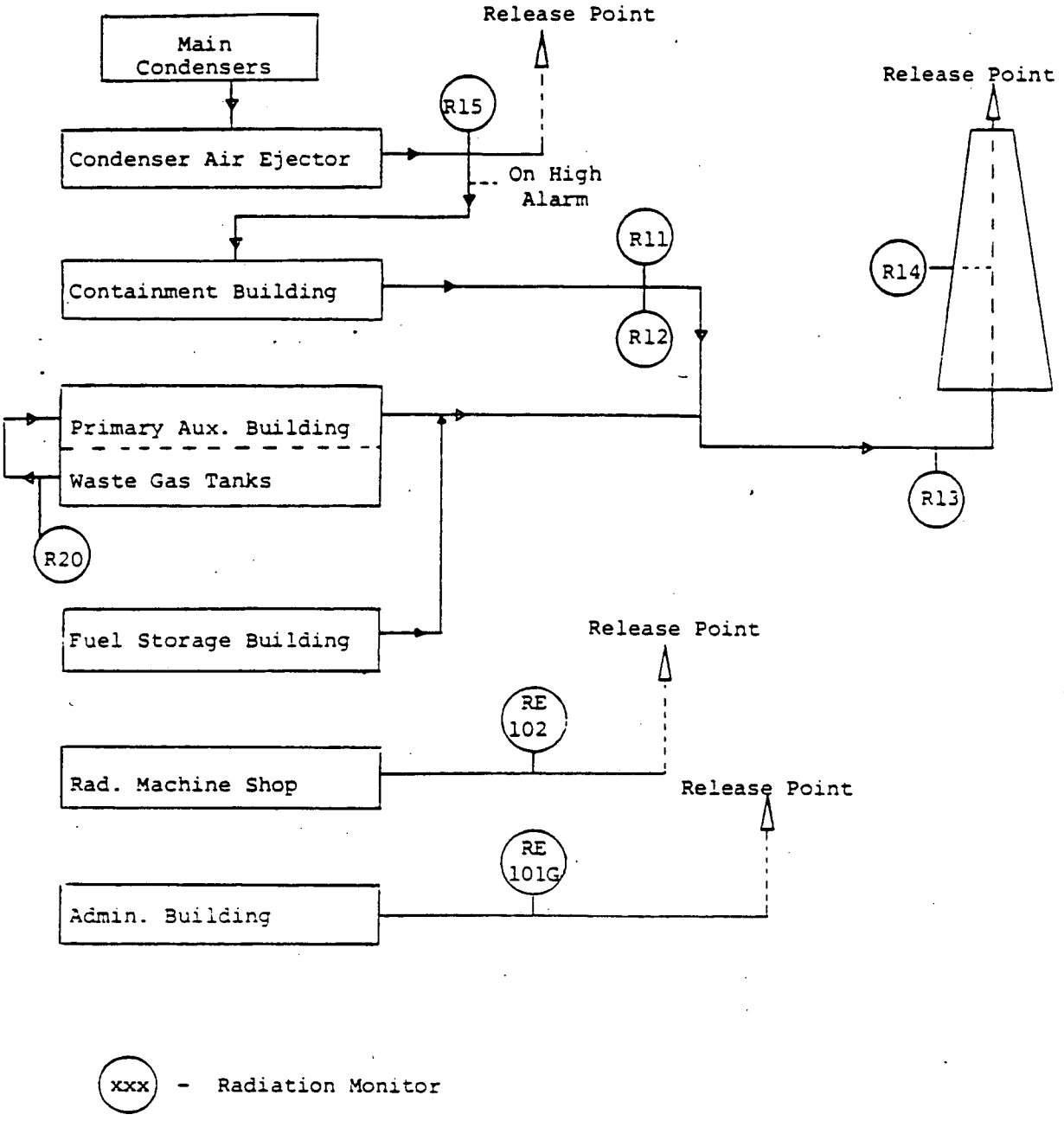

Figure A-3. Gaseous Effluent Release Systems,
Indian Point Nuclear Generating Plant Unit 3
(Taken from Figure 5-2 of the Indian Point Unit 3 ODCM)

APPENDIX B

TABLES OF LICENSEE-REPORTED COMMITMENTS

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Table B-1. COMMITMENTS OF ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT,* INDIAN POINT NUCLEAR POWER PLANT UNIT 3

Part I - Routine Reporting Requirements

Report Requirements	Technical Specifications -- LCO/Surveillance Licensee RETS No.	Specific Commitments	Report Commitments
A. Radiological Environmental Monitoring Program			
1. Monitoring Program	4.2.1	Conduct monitoring program specified in Tables 4.2-1 and 4.2-2	Summary description of the radiological environmental monitoring program
2. Sampling Locations	4.2.1	Generic sampling locations specified in Table 4.2-2	Sampling locations consistent with Table 4.2-2
3. Sampling and Collection Frequency	4.2.1	Sampling and collection frequency specified in Table 4.2-1	A frequency consistent with Table 4.2-1
4. Type and Frequency of Analysis	4.2.1	Type and frequency of analysis specified in Table 4.2-1	An analysis schedule consistent with Table 4.2-1
B. Radiological Environmental Monitoring Program Surveillance			
Monitoring Program	4.2.1	Environmental samples shall be collected and analyzed according to Table 4.2-1 at the location shown in Figures 4.2-1a and b and presented in Table 4.2-2. Analytical techniques used shall be such that the minimum practical detectable concentrations presented in Table 4.2-3 are achieved	1. Results of all radiological environmental samples taken shall be summarized and tabulated on an annual basis (5.6.1.a, Part B)

* The Annual Radiological Environmental Operating Report is to be submitted within 120 days after January 1 of each year. The report covers the operation of the unit(s) during the previous calendar year.

Note: Section and table numbers are from Appendix B to Technical Specifications.

Table B-1. COMMITMENTS OF ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT, INDIAN POINT NUCLEAR POWER PLANT UNIT 3 (Cont.)

Part I - Routine Reporting Requirements

Report Requirements	Technical Specifications -- LCO/Surveillance Licensee RETS No.	Specific Commitments	Report Commitments
B. Radiological Environmental Monitoring Program Surveillance			
Monitoring Program (Cont.)	4.2.1		2. If harmful effects or evidence of irreversible damage are detected by the monitoring, the licensee shall provide an analysis of the program and a proposed course of action to alleviate the problem (5.6.1.a, Part B) 3. Summaries, interpretations, and statistical evaluation of the results of the radiological environmental surveillance activities for the report period (5.6.1.a, Part B) 4. Comparison with preoperational studies, with operational controls as appropriate, and with previous environmental surveillance reports (5.6.1.a, Part B) 5. Assessment of the observed impacts of plant operation on the environment (5.6.1.a, Part B) 6. Summary of any individual results not available within a 120-day period for inclusion with the report. (Note: Supplementary report required in such a case as soon as results are available) (5.6.1.a, Part B)

Table B-1. COMMITMENTS OF ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT, INDIAN POINT NUCLEAR POWER PLANT UNIT 3 (Cont.)

Part I - Routine Reporting Requirements

Report Requirements	Technical Specifications -- LCO/Surveillance Licensee RETS No.	Specific Commitments	Report Commitments
C. Land Use Census			
D. Land Use Census Surveillance	4.2.1	A census shall be conducted at the beginning of each grazing season as specified in Section 4.2.1.3	Results of the land use census (5.6.1.a, Part B)
E. Interlaboratory Comparison Program			

Table B-1. COMMITMENTS OF ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT, INDIAN POINT NUCLEAR POWER PLANT UNIT 3 (Cont.)

Part II - Reporting Requirements Subject to Conditions

Report Requirements	Technical Specifications -- LCO/Surveillance Licensee RETS No.	Specific Commitments	Report Commitments
A. Radiological Environmental Monitoring Program			
1. Monitoring Program			
2. Potential Annual Dose			
B. Radiological Environmental Monitoring Program Surveillance			
Lower Level of Detection (LLD) Compliance			
C. Interlaboratory Comparison Program			

Table B-2. COMMITMENTS OF SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT,* INDIAN POINT NUCLEAR POWER PLANT UNIT 3

Part I - Routine Reporting Requirements

Report Requirements	Technical Specifications -- LCO/Surveillance Licensee RETS No.	Specific Commitments	Report Commitments
A. Radioactive Effluent Releases			
1. Effluent Release Summary Gaseous Liquid	10CFR50.36a, paragraph a(2)	Report specifying the quantity of each of the principal radionuclides released to unrestricted areas in liquid and gaseous effluents during the previous 6 months of operation	Summary of the quantities of radioactive liquid and gaseous effluents released and solid wastes shipped from the plant as outlined in Reg. Guide 1.21. Data shall be summarized on a quarterly basis in format of Appendix B (5.6.1.c)
2. Solid Waste	2.4.3	Measurements shall be made to determine or estimate the total curie quantity and prinipal radionuclide composition of all radioactive waste shipped offsite	Information required for solid waste shipped offsite shall be: a. total volume b. total curie quantity c. principal radionuclides (2.4.3, 5.6.1.c)
B. Radiological Dose and Impact Assessment			
C. Meteorological Data	5.6.1.c	Annual summary of meteorological data collected over previous year to be submitted within 60 days after January 1 and July 1 of each year	Summary of the meteorological conditions concurrent with the release of gaseous effluents during each quarter as outlined in Reg. Guide 1.21, Rev. 1, with data summarized on a quarterly basis following the format of Appendix B (5.6.1.c)

* Unless further specified, the Semiannual Radioactive Effluent Release Report is to be submitted within 60 days after January 1 and July 1 of each year. The report covers the operation of the unit(s) during the previous 6 months. A single submittal may be made for a multiple unit station. The submittal should combine those sections that are common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.

Note: Section and table numbers are from Appendix B to Technical Specifications.

Table B-2. COMMITMENTS OF SEMIANNUAL RADIOACTIVE EFFLUENT RELEASE REPORT,* INDIAN POINT NUCLEAR POWER PLANT UNIT 3 (Cont.)

Part II - Reporting Requirements Subject to Conditions

Report Requirements	Technical Specifications -- LCO/Surveillance Licensee RETS No.	Specific Commitments	Report Commitments
A. Monitoring Instrumentation			
1. Liquid Effluent			
2. Gaseous Effluent			
B. Radioactivity Inventory			
Liquid Holdup Tank	2.4.1.g	The maximum radioactivity to be contained in any liquid radwaste tank that can be discharged directly to the environs shall not exceed 10 Ci, excluding tritium and dissolved gases	
C. Radiological Environmental Monitoring Program			
1. Sampling Relocation			
2. Land Use Census			
D. Licensee-Initiated Changes to PCP/ODCM/Systems			
1. PCP			
2. ODCM			
3. Radioactive Waste Treatment Systems (major changes to liquid, gaseous, and solid waste)			
E. Unplanned Releases			
1. Liquid (not specified)			
2. Gaseous	2.4.2.f	Unplanned or uncontrolled active materials in gaseous effluents in excess of 5 curies of noble gas or 0.02 curie of radioiodine in gaseous form	Identify the cause and describe actions taken to prevent recurrence (2.9.2.4). (This is a 10-day report)

Summary of Findings from the Evaluation of
Indian Point Nuclear Generating Plant Unit 3
Radiological Effluent Release and
Radiological Environmental Operating Reports for 1983

#39

A summary of findings from the evaluation of the 1983 Radiological Effluent Release and Radiological Environmental Operating Reports for Indian Point Unit 3 is given as follows:

- The complete 1983 annual report which was sent by the Licensee (Consolidated Edison Company, owner of Unit 2) on April 30, 1984 was not available at the time of this writing. The Licensee sent errata sheets and replacement tables for Appendix D to the Indian Point site 1983 Annual Radiological Environmental Operating Report under a separate cover letter on September 10, 1984. Appendix D contains tabulated results of environmental samples only, and a review was performed on the basis of this information. Results of direct radiation (TLDs), land use census, quality assurance, collection and analysis frequencies of environmental samples, and preoperational data are not available in Appendix D.

- Doses are reported semiannually instead of quarterly.

- The Licensee has taken the MPC value of 2.55×10^{-3} uCi/cc for dissolved noble gases instead of 2×10^{-4} uCi/cc. (The Licensee stated in the semiannual report, "Since there is no limit stated for dissolved noble gases in 10CFR20, we have established a limit of 2.55×10^{-3} uCi/cc based on a dose calculation that has been provided to the USNRC inspectors.") However, in Table 2A of the second 6-month report, the percent of applicable limit for dissolved and entrained gases is calculated with an MPC value of 1.55×10^{-3} uCi/cc.

Note: Indian Point Unit 3 is a once-through cooling system (Reference NUREG-0020) as opposed to closed-cycle as reported in Charles R. Nichols' memo to Charles A. Willis about the station's discharge flow rates for liquid radwaste dilution.