Entergy

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Patric W. Conroy
Licensing Manager

April 28, 2006

Re: Indian Point Units No 1, 2, 3
Docket Nos. 50-3, 50-247, 50-286
NL-06-045

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Stop O-P1-17
Washington, DC 20555-0001

Subject: 2005 Annual Radioactive Effluent Release Report

Dear Sir:

Enclosed is the 2005 Annual Effluent and Waste Disposal Report for Indian Point Unit Nos. 1, 2, and 3. Entergy Nuclear Operation, Inc. (Entergy) is submitting this report in accordance with Technical Specification 5.6.3 and Regulatory Guide 1.21.

Entergy Nuclear Operations, Inc. is making no new commitments in this letter.

Should you have any questions regarding this matter, please contact Mr. Patric W. Conroy, Licensing Manager, at (914) 734-6668.

Very truly yours,

Patric W. Conroy
Licensing Manager
Indian Point Energy Center

Enclosure: 2005 Annual Radioactive Effluent Release Report

cc: next page

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cc: Mr. Samuel J. Collins, Regional Administrator, NRC Region I
Mr. John P. Boska, Senior Project Manager, NRC NRR DORL
NRC Resident Inspector's Office, Indian Point 2
NRC Resident Inspector's Office, Indian Point 3
Chief, Compliance Section, New York State DEC, Division of Water
Regional Water Engineer, New York State DEC
Mr. Paul Eddy, NYS Department of Public Service
Mr. Robert Oliveira, American Nuclear Insurers
Mr. Robert Snyder, NYS Department of Health

ENCLOSURE TO NL-06-045

Indian Point Energy Center

2005 Annual Radioactive Effluent Release Report

ENTERGY NUCLEAR OPERATIONS, INC.
INDIAN POINT UNIT 1, 2, AND 3 NUCLEAR POWER PLANTS
DOCKET NOS. 50-03, 50-247, AND 50-286

Radioactive Effluent Release Report: 2005

Facility Indian Point Energy Center (Indian Point Units 1, 2, and 3)

Licensee Entergy Nuclear Operations, Inc (Entergy)

This information is provided in accordance with the requirements of Regulatory Guide 1.21. The numbered sections of this report reference corresponding sections of the subject Regulatory Guide, pages 10 to 12. This report includes effluent information from Indian Point units 1, 2, and 3. Since units 1 and 2 share effluent processing equipment, Technical Specifications, and Offsite Dose Calculation Manuals, all curies and dose attributed to unit 1 in this report are included in the totals identified for unit 2.

A. Supplemental Information

1. Regulatory Limits

Indian Point Energy Center is subject to limits on radioactive waste releases that are set forth in the Offsite Dose Calculation Manual, Parts I and II, per the Technical Specifications. ODCM Part I, also known as the Radiological Effluent Controls (or RECS) is prescribed by Technical Specifications, along with ODCM Part II (calculational methodologies).

2. Maximum Permissible Concentration

a) Airborne Releases

Maximum concentrations and compliance with 10CFR20 release rate limits are controlled by the application of Radiation Monitor setpoints, preliminary grab sampling, and conservative procedural guidance for batch and continuous releases. These measures, in conjunction with plant design, preclude approaching release rate limits, per the ODCM.

b) Liquid Effluents

Proximity to release rate and total release limits is controlled through the application of a calculated Allowed Diluted Concentration (ADC) and ALARA guidance with regard to dilution flow and maximum tank concentration. The ADC is used to determine a Radiation Monitor setpoint associated with an estimated amount of Beta activity, as well as the measured gamma activity. It is defined in each unit's ODCM as the basis for the release concentration limits, and applies to the applicable version of 10CFR20 to which the unit is licensed. Unit 2's limit is defined at the higher of the those limits specified in the OLD 10CFR20, while Unit 3 is limited to "EC*10" from the NEW Part 20. Unit 2's technical specifications are being updated for site integration.

Liquid effluents are further controlled by the application of proceduralized ALARA limits such as a MINIMUM dilution flow of 100,000 gpm required for batch discharges, and a maximum gamma concentration of 5E-5 uCi/ml (without gas or tritium) for these routine effluents.

3. Average Energy

The average energies ($\bar{E}$) of the radionuclide mixtures in releases of fission and activation gases were as follows:

Units 1 and 2:

1st Quarter	$\bar{E}_\beta$ =	2.44E-01 Mev/dis	$\bar{E}_\gamma$ =	2.69E-02 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	2.45E-01 Mev/dis	$\bar{E}_\gamma$ =	2.14E-02 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	2.16E-01 Mev/dis	$\bar{E}_\gamma$ =	5.32E-02 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	1.73E-01 Mev/dis	$\bar{E}_\gamma$ =	4.05E-02 Mev/dis

Unit 3:

1st Quarter	$\bar{E}_\beta$ =	1.64E-01 Mev/dis	$\bar{E}_\gamma$ =	5.39E-02 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	2.42E-01 Mev/dis	$\bar{E}_\gamma$ =	2.76E-01 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	3.56E-01 Mev/dis	$\bar{E}_\gamma$ =	8.75E-01 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	2.54E-01 Mev/dis	$\bar{E}_\gamma$ =	4.93E-01 Mev/dis

4. Measurements and Approximations of Total Radioactivity

a) Fission and Activation Gases

Analyses of effluent gases have been performed in compliance with the requirements of the RECS (ODCM Part I). In the case of isolated tanks (batch releases), the total activity discharged is based on an isotopic analysis of each batch with the volume of gas in the batch corrected to standard temperature and pressure.

Vapor containment purge and pressure relief (vent) discharges routinely total less than 150 hours/quarter in duration have been treated as batch releases. However, both types of releases from the Vapor Containment are performed randomly with regard to time of day and duration (release periods were not dependant solely on time of day or atmospheric condition). Therefore, determination of doses due to Vapor Containment releases includes the use of annual average dispersion data, as defined in NUREG 0133, Section 3.3.

At least one complete isotopic concentration analysis of containment air is performed monthly. This analysis is used in conjunction with a process monitor to obtain the isotopic mixture and quantification of each pressure relief. Isotopic analyses for each vapor containment purge are taken prior to and during the purge. This information is combined with the volume of air in each discharge to calculate the quantity of activity released from these discharges.

The continuous building discharges are based on weekly samples of ventilation air analyzed for isotopic content. This information is combined with total air volume discharged and the process radiation monitor readings to determine the quantity of activity from continuous discharges.

b/c) Iodines and Particulates

Iodine-131 and particulate releases are quantified by collecting a continuous sample of ventilation air on a Triethylenediamine (TEDA) impregnated, activated charcoal cartridge and a glass-fiber filter paper. These samples are changed weekly as required in the RECS. The concentration of isotopes found by analysis of these samples is combined with the volume of air discharged during the sampling period to calculate the quantity of activity discharged.

If no I-131 is identified in weekly vent samples, "N/D" is entered in Table 1A.

If I-131 is identified in any routine weekly sample, it is added to the table and other iodine isotopic concentrations are then determined on a 24-hour sample at least once per month. The concentration of each isotope is analytically determined by ratioing the activities with weekly media for I-131. This activity is combined with the volume of air discharged during the sampling period to calculate the quantity of activity discharged.

A compositing method of analyzing for gross alpha is used per the station ODCMs. When no Gross Alpha is identified for an entire quarter, "N/D" is entered in Table 1A.

d) Liquid Effluents

A sample of each batch discharge is taken and an isotopic analysis is performed in compliance with requirements specified in the RECS. Proportional composite samples of continuous discharges are taken and analyzed in compliance with the applicable RECS table, as well. Isotopic concentration data are combined with the information on volume discharged to determine the amount of each isotope discharged.

A compositing method of analyzing for gross alpha is used per the station ODCMs. When no Gross Alpha is identified for an entire quarter, "N/D" is entered in Table 2A.

Liquid Effluent volumes of waste released on Table 2A are differentiated between processed fluids (routine liquid waste and Unit 1's North Curtain Drain), and water discharged through monitored pathways identified in the ODCM, but NOT processed (SG Blowdown and Unit 1's Sphere Foundation Drain Sump). Because the unprocessed water may contain trace levels of Tritium, etc, it is included in the report, but the volumes are differentiated to prevent confusion regarding the total volume of waste released to the Hudson River. The curies reported, however, are totals of all liquid effluent, continuous and batch, whether processed or not.

5. Batch Releases

Airborne:

Unit 1 and 2 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2005
Number of Batch Releases		41	41	44	43	169
Total Time Period	(min)	2090	2050	2160	2510	8810
Maximum Time Period	(min)	144	90	132	131	144
Average Time Period	(min)	51.0	50.0	49.0	58.4	52.1
Minimum Time Period	(min)	1	9	2	3	1

Unit 3 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2005
Number of Batch Releases		38	42	17	23	120
Total Time Period	(min)	6410	13600	2930	4510	27400
Maximum Time Period	(min)	348	1445	251	325	1445
Average Time Period	(min)	169	323	172	196	228
Minimum Time Period	(min)	1	1	4	3	1

Liquid:

Unit 1 and 2 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2005
Number of Batch Releases		14	6	14	13	47
Total Time Period	(min)	1350	598	1460	1370	4780
Maximum Time Period	(min)	125	110	110	128	128
Average Time Period	(min)	96.4	99.7	104	106	102
Minimum Time Period	(min)	60	90	91	95	60

Unit 3 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2005
Number of Batch Releases		51	48	12	16	127
Total Time Period	(min)	5960	6680	5670	1830	20100
Maximum Time Period	(min)	136	1310	4420	128	4420
Average Time Period	(min)	117	139	472	114	159
Minimum Time Period	(min)	76	60	108	104	60

Average Stream Flow :

Hudson River flow information is obtained from the Department of the Interior, United States Geological Survey (USGS). These data are received after review from the USGS, approximately 18 months after initial data collection. This information is included in the effluents report as the data become available.

Estimated Average Stream Flows of the Hudson River at Indian Point:

Year	Quarter	Flow (cfs)
2003	Fourth	38133
2004	First	22367
2004	Second	22767
2004	Third	19133

6. Abnormal Releases

a) Liquid
Tritium and low levels of Strontium were discovered in onsite ground water in 2005. The effluent contribution from this ground water (broken up into storm drain and bedrock pathways) is discussed in Section H. Bounding dose calculations were performed, with the results added (separately) to total site effluent dose in Section E.

b) Gaseous
None

7. ODCM Reporting Requirements

The ODCM (RECS) requires reporting of prolonged outages of effluent monitoring equipment. Also required in this report is notification of any changes in the land use census, the Radiological Environmental Monitoring Program (REMP), or exceeding the total curie content limitations in outdoor tanks.

During this reporting period, the following ODCM required effluent monitoring equipment was out of service (OOS) for periods greater than 30 consecutive days:

Instrument	Period Out of Service	Details
Unit 1, Waste Distillate Storage Tank, #14 Level Instrument	Jan 01, @ 00:00 to Feb 14, @ 23:23	A disparity between readings from two instruments drove Operations to conservatively call them OOS while awaiting parts to replace one of the devices. Both devices passed their calibration tests in January, 2005. The slight difference in readings were investigated with regard to acceptable error tolerance. Ops Management concluded that one instrument's total error was substantially lower than the other and it was declared the primary means of indication, the other used as a compensatory backup. During this interval, tank release volumes were calculated using average pump discharge flow rate (from the ODCM-required flow rate meter) and the duration of the release.
R-62, Sphere Foundation Drain Sump Monitor	Oct 19, @ 03:45 to Dec 31, @ 24:00	The monitor was declared inoperable due to intermittent functionality during this time period, as a result of the age of equipment, significant troubleshooting, and delays in procuring parts. It was returned to service in Feb, 2006.

During this reporting period, no tank curie limits in outdoor tanks were exceeded.

The station ODCMs were updated to Revision 9 (Units 1 and 2) and Revision 17 (Unit 3) in the first quarter of 2005. The justification packages are included in Section G of this report.

There were no changes to the Process Control Programs during this reporting period.

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT RELEASE REPORT

B. GASEOUS EFFLUENTS

2005

TABLE 1A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005	Est. Total % Error
1. Total Release	Ci	9.86E-01	2.04E+00	3.81E+00	3.94E+00	1.08E+01	±25
2. Average release rate	uCi/sec	1.27E-01	2.59E-01	4.80E-01	4.96E-01	3.42E-01	

B. Iodines

1. Total Iodine-131	Ci	N/D	N/D	N/D	N/D	N/D	±25
2. Average release rate	uCi/sec	N/D	N/D	N/D	N/D	N/D	

C. Particulates

1. Total Release, with half-life > 8 days	Ci	3.73E-06	2.35E-06	N/D	2.31E-06	8.39E-06	±25
2. Average release rate	uCi/sec	4.80E-07	3.00E-07	N/D	2.90E-07	2.66E-07	
3. Gross Alpha	Ci	N/D	N/D	N/D	N/D	N/D	±25

D. Tritium

1. Total release	Ci	2.37E+00	2.44E+00	2.05E+00	6.42E-01	7.50E+00	±25
2. Average release rate	uCi/sec	3.05E-01	3.10E-01	2.58E-01	8.08E-02	2.38E-01	

N/D = None Detected

TABLE 1C
INDIAN POINT 1 and 2 CONTINUOUS GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005
Xe-133	Ci	N/D	N/D	6.74E-01	1.87E-04	6.74E-01
Xe-135	Ci	N/D	N/D	2.80E-01	N/D	2.80E-01
Total for Period	Ci	N/D	N/D	9.54E-01	1.87E-04	9.54E-01

2) Iodines						
I-131	Ci	N/D	N/D	N/D	N/D	N/D
I-133	Ci	N/D	N/D	N/D	N/D	N/D
I-135	Ci	N/D	N/D	N/D	N/D	N/D
Total for Period	Ci	N/D	N/D	N/D	N/D	N/D

3) Particulates						
Ni-63	Ci	3.73E-06	2.35E-06	N/D	2.31E-06	8.39E-06
Total for Period	Ci	3.73E-06	2.35E-06	N/D	2.31E-06	8.39E-06

N/D= None Detected

TABLE 1C
INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)
BATCH GASEOUS EFFLUENTS

Nuclides Released

1) Fission Gases

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005
Ar-41	Ci	1.60E-02	2.56E-02	3.21E-02	2.37E-02	9.74E-02
Kr-85	Ci	8.85E-01	1.87E+00	2.06E+00	1.21E+00	6.03E+00
Kr-85m	Ci	2.59E-05	2.94E-05	4.25E-03	1.46E-04	4.45E-03
Kr-87	Ci	1.28E-05	1.60E-05	1.51E-03	6.50E-05	1.60E-03
Kr-88	Ci	3.49E-05	4.01E-05	5.31E-03	1.90E-04	5.58E-03
Xe-131m	Ci	N/D	N/D	7.45E-03	3.71E-02	4.45E-02
Xe-133	Ci	8.51E-02	1.40E-01	6.92E-01	2.63E+00	3.55E+00
Xe-133m	Ci	1.23E-05	1.59E-05	5.00E-03	2.62E-02	3.12E-02
Xe-135	Ci	2.78E-04	3.31E-04	4.68E-02	1.31E-02	6.05E-02
Xe-135m	Ci	2.45E-05	3.27E-05	1.05E-03	9.71E-05	1.21E-03
Xe-138	Ci	5.91E-06	8.16E-06	1.32E-05	2.53E-05	5.26E-05
Total for Period	Ci	9.86E-01	2.04E+00	2.86E+00	3.94E+00	9.82E+00

2) Iodines

Not Applicable for Batch Releases

3) Particulates

Not Applicable for Batch Releases

TABLE 1A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005	Est. Total % Error
1. Total Release	Ci	3.27E+01	3.88E-01	2.60E-02	7.60E-02	3.32E+01	± 25
2. Average release rate	uCi/sec	4.21E+00	4.94E-02	3.27E-03	9.56E-03	1.05E+00	

B. Iodines

1. Total Iodine-131	Ci	1.41E-04	8.69E-06	N/D	N/D	1.49E-04	± 25
2. Average release rate	uCi/sec	1.81E-05	1.11E-06	N/D	N/D	4.74E-06	

C. Particulates

1. Total Release, with half-life > 8 days	Ci	N/D	N/D	N/D	N/D	N/D	± 25
2. Average release rate	uCi/sec	N/D	N/D	N/D	N/D	N/D	
3. Gross Alpha	Ci	N/D	N/D	N/D	N/D	N/D	± 25

D. Tritium

1. Total release	Ci	1.97E+00	3.01E+00	3.96E+00	2.26E+00	1.12E+01	± 25
2. Average release rate	uCi/sec	2.53E-01	3.82E-01	4.98E-01	2.84E-01	3.55E-01	

N/D = None Detected

TABLE 1C
INDIAN POINT 3 - CONTINUOUS GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005
Xe-133	Ci	6.80E+00				6.80E+00
Total for Period	Ci	6.80E+00	0.00E+00	0.00E+00	0.00E+00	6.80E+00

2) Iodines						
I-131	Ci	1.41E-04	8.69E-06	N/D	N/D	1.50E-04
I-133	Ci	1.16E-05	N/D	N/D	N/D	1.16E-05
I-135	Ci	N/D	N/D	N/D	N/D	N/D
Total for Period	Ci	1.52E-04	8.69E-06	N/D	N/D	1.61E-04

3) Particulates						
Total for Period	Ci	N/D	N/D	N/D	N/D	N/D

N/D= None Detected

TABLE 1C
INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)
BATCH GASEOUS EFFLUENTS

Nuclides Released

1) Fission Gases

	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005
Ar-41	Ci	3.72E-02	7.55E-02	1.74E-02	2.75E-02	1.58E-01
Kr-85	Ci	4.81E+00	1.32E-01	N/D	N/D	4.94E+00
Kr-85m	Ci	2.73E-02	7.39E-05	N/D	N/D	2.74E-02
Kr-87	Ci	N/D	N/D	N/D	N/D	N/D
Kr-88	Ci	1.88E-02	3.56E-05	N/D	N/D	1.88E-02
Xe-131m	Ci	1.50E-01	1.67E-03	N/D	2.58E-04	1.52E-01
Xe-133	Ci	1.86E+01	1.71E-01	8.56E-03	4.80E-02	1.88E+01
Xe-133m	Ci	3.67E-01	4.49E-04	N/D	3.00E-04	3.68E-01
Xe-135	Ci	1.87E+00	7.33E-03	N/D	6.85E-06	1.88E+00
Xe-135m	Ci	3.18E-02	N/D	N/D	N/D	3.18E-02
Total for Period	Ci	2.59E+01	3.88E-01	2.60E-02	7.60E-02	2.64E+01

2) Iodines

Not Applicable for Batch Releases

3) Particulates

Not Applicable for Batch Releases

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

C. LIQUID EFFLUENTS

2005

TABLE 2A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	8.54E-03	1.02E-02	1.45E-02	1.13E-02	4.45E-02	± 25
2. Average Diluted Conc	uCi/ml	2.01E-11	1.39E-11	1.66E-11	1.50E-11	1.60E-11	

B. Tritium							
1. Total Release	Ci	1.24E+02	3.89E+01	8.53E+01	7.32E+01	3.21E+02	± 25
2. Average Diluted Conc	uCi/ml	2.92E-07	5.29E-08	9.80E-08	9.76E-08	1.16E-07	

C. Dissolved & Entrained Gases							
1. Total Release	Ci	6.34E-05	N/D	N/D	5.97E-03	6.04E-03	± 25
2. AverageDiluted Conc	uCi/ml	1.49E-13	N/D	N/D	7.97E-12	2.17E-12	

D. Gross Alpha							
1. Total Release	Ci	8.73E-06	N/D	N/D	N/D	8.73E-06	± 25

E. Volume of Waste Released							
1. Processed (LW, NCD)	liters	2.99E+06	2.03E+06	1.60E+06	3.66E+06	1.03E+07	± 10
2. Unprocessed (SGBD, SFDS)	liters	6.93E+07	4.49E+07	3.95E+07	6.36E+07	2.17E+08	± 10

F. Volume of Dilution Water	liters	4.24E+11	7.36E+11	8.71E+11	7.50E+11	2.78E+12	± 10

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

CONTINUOUS RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005
Ni-63	Ci	1.26E-04	3.09E-04	N/D	1.38E-04	5.74E-04
Sr-89	Ci	N/D	1.16E-04	N/D	2.46E-04	3.62E-04
Sr-90	Ci	8.62E-05	1.85E-04	4.72E-05	3.24E-04	6.42E-04
Cs-137	Ci	2.85E-03	9.38E-03	4.44E-03	7.92E-04	1.75E-02
Total for Period	Ci	3.06E-03	9.99E-03	4.49E-03	1.50E-03	1.90E-02

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

BATCH RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005
Ag-110m	Ci	N/D	N/D	1.17E-05	N/D	1.17E-05
Co-57	Ci	1.42E-05	N/D	N/D	N/D	1.42E-05
Co-58	Ci	3.21E-04	3.22E-05	1.85E-04	1.19E-04	6.57E-04
Co-60	Ci	1.86E-04	2.29E-05	3.14E-04	3.23E-04	8.46E-04
Cr-51	Ci	N/D	N/D	N/D	8.52E-05	8.52E-05
Cs-134	Ci	6.60E-04	N/D	1.38E-04	2.24E-04	1.02E-03
Cs-137	Ci	1.03E-03	6.86E-06	3.65E-04	4.97E-04	1.90E-03
Mn-54	Ci	N/D	N/D	8.40E-06	2.64E-05	3.48E-05
Ni-63	Ci	1.76E-04	3.10E-05	2.19E-03	7.20E-04	3.12E-03
Sb-124	Ci	3.05E-04	N/D	3.01E-05	N/D	3.35E-04
Sb-125	Ci	2.76E-03	1.10E-04	6.75E-03	7.76E-03	1.74E-02
Te-123m	Ci	3.22E-05	N/D	N/D	N/D	3.22E-05
Total for Period	Ci	5.48E-03	2.03E-04	9.99E-03	9.75E-03	2.54E-02

Dissolved & Entrained Gas						
Xe-133	Ci	6.34E-05	N/D	N/D	5.92E-03	5.99E-03
Xe-133m	Ci	N/D	N/D	N/D	4.99E-05	4.99E-05
Total for Period	Ci	6.34E-05	N/D	N/D	5.97E-03	6.04E-03

TABLE 2A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2005	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	1.03E-02	1.39E-02	1.16E-03	4.76E-03	3.01E-02	± 25
2. Average Diluted Conc	uCi/ml	2.42E-11	1.90E-11	1.34E-12	6.35E-12	1.08E-11	

B. Tritium

1. Total Release	Ci	5.96E+02	9.07E+01	3.13E+01	2.33E+02	9.51E+02	± 25
2. Average Diluted Conc	uCi/ml	1.41E-06	1.23E-07	3.59E-08	3.11E-07	3.42E-07	

C. Dissolved & Entrained Gases

1. Total Release	Ci	6.65E-02	3.73E-04	5.40E-05	1.94E-03	6.89E-02	± 25
2. AverageDiluted Conc	uCi/ml	1.57E-10	5.08E-13	6.20E-14	2.59E-12	2.48E-11	

D. Gross Alpha

1. Total Release	Ci	N/D	N/D	N/D	N/D	N/D	± 25

E. Volume of Waste Released

1. Processed Fluids (Mon Tanks)	liters	1.31E+06	1.25E+06	3.12E+05	4.13E+05	3.29E+06	± 10
2. Unprocessed Fluids (SGs)	liters	1.72E+06	9.35E+07	2.13E+07	5.49E+06	1.22E+08	± 10

F. Volume of Dilution Water	liters	4.24E+11	7.34E+11	8.71E+11	7.49E+11	2.78E+12	± 10

TABLE 2B
INDIAN POINT 3 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2005)
BATCH and CONTINUOUS RADIOACTIVE LIQUID EFFLUENT

Batch Fission/Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	2005
Ag-110m	Ci	3.93E-04	1.53E-04	1.78E-05	3.49E-04	9.12E-04
Be-7	Ci	N/D	N/D	2.29E-05	9.78E-05	1.21E-04
Co-57	Ci	N/D	N/D	N/D	3.07E-06	3.07E-06
Co-58	Ci	1.47E-04	1.44E-03	4.40E-04	7.45E-04	2.77E-03
Co-60	Ci	1.00E-03	5.26E-05	N/D	8.87E-04	1.94E-03
Cr-51	Ci	N/D	2.62E-04	N/D	2.45E-05	2.87E-04
Cs-134	Ci	9.84E-04	2.73E-05	1.46E-05	5.66E-04	1.59E-03
Cs-137	Ci	1.43E-03	3.59E-05	3.96E-05	6.67E-04	2.18E-03
Fe-55	Ci	N/D	N/D	N/D	4.04E-04	4.04E-04
Fe-59	Ci	N/D	6.67E-06	N/D	N/D	6.67E-06
I-131	Ci	1.08E-05	N/D	N/D	N/D	1.08E-05
I-132	Ci	3.19E-05	N/D	N/D	N/D	3.19E-05
Mn-54	Ci	8.76E-06	2.06E-06	N/D	N/D	1.08E-05
Nb-95	Ci	N/D	1.65E-05	N/D	N/D	1.65E-05
Ni-63	Ci	1.56E-03	7.90E-05	2.15E-04	3.20E-04	2.17E-03
Sb-124	Ci	N/D	3.85E-04	N/D	N/D	3.85E-04
Sb-125	Ci	4.33E-03	1.05E-03	4.15E-04	6.93E-04	6.49E-03
Sn-113	Ci	2.05E-06	3.07E-06	N/D	N/D	5.12E-06
Te-123m	Ci	2.84E-04	1.25E-03	N/D	N/D	1.54E-03
Te-125m	Ci	N/D	9.18E-03	N/D	N/D	9.18E-03
Te-132	Ci	8.11E-05	8.46E-06	N/D	N/D	8.95E-05
Total for Period	Ci	1.03E-02	1.39E-02	1.16E-03	4.76E-03	3.01E-02

Dissolved and Entrained Gas (Batch)						
Kr-85	Ci	6.38E-03	N/D	N/D	1.69E-03	8.07E-03
Xe-131m	Ci	8.32E-04	N/D	N/D	N/D	8.32E-04
Xe-133	Ci	5.91E-02	3.67E-04	5.40E-05	2.46E-04	5.98E-02
Xe-133m	Ci	1.81E-04	N/D	N/D	N/D	1.81E-04
Xe-135	Ci	N/D	5.80E-06	N/D	N/D	5.80E-06
Total for Period	Ci	6.65E-02	3.73E-04	5.40E-05	1.94E-03	6.89E-02

Continuous Releases (SG Blowdown)						
H-3 (only)	Ci	1.56E-03	3.58E-03	1.48E-02	4.79E-03	2.47E-02

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

D. SOLID WASTE

2005

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms
LWS Resin — Plant Resin 8-120 — RCS Filters

Waste Class	Volume ft³	Volume m³	Curies Shipped	% Error (Ci)
A	4.12E+02	1.17E+01	9.58E+00	+/- 25%
B	5.44E+02	1.54E+01	7.09E+01	+/- 25%
C	3.61E+02	1.02E+01	9.15E+02	+/- 25%
All	1.32E+03	3.73E+01	9.96E+02	+/- 25%

Waste Stream : Dry Active Waste
DAW/Dirt;B-25 BOX — DAW 20' Sea Land — Scrap Metal 20' Sea Land

Waste Class	Volume ft³	Volume m³	Curies Shipped	% Error (Ci)
A	2.04E+04	5.78E+02	4.66E-01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.04E+04	5.78E+02	4.66E-01	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume ft³	Volume m³	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Other Waste — Combined Package — Turbine Waste

Waste Class	Volume ft³	Volume m³	Curies Shipped	% Error (Ci)
A	3.96E+02	1.12E+01	1.80E-05	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	1.28E+03	3.62E+01	4.57E+00	+/-25%
All	1.68E+03	4.74E+01	4.57E+00	+/-25%

Waste Stream : Sum of All 4 Categories — Combined Packages:
DAW/Dirt; B-25 Box — DAW 20' Sea Land — LWS Resin — RCS Filters
Scrap Metal 20' Sea Land — Turbine Waste — Plant Resin 8-120

Waste Class	Volume ft³	Volume m³	Curies Shipped	% Error (Ci)
A	2.12E+04	6.00E+02	1.00E+01	+/-25%
B	5.44E+02	1.54E+01	7.09E+01	+/-25%
C	1.64E+03	4.65E+01	9.20E+02	+/-25%
All	2.34E+04	6.62E+02	1.00E+03	+/-25%

Combined Waste Type Shipment, Major Volume Waste Type Shown

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
1	Hittman Transport	Barnwell Waste Management Facility
4	Hittman Transport	Duratek, Inc. - GIC
6	Hittman Transport	GTS Duratek
8	RACE Logistics	RACE LLC.
5	Hittman Transport	Studsvik Processing Facility
2	R & R Trucking Inc.	Studsvik Processing Facility

Resins, Filters, and Evap Bottoms
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	7.058%	6.76E-01
Mn-54	0.132%	1.26E-02
Fe-55	12.195%	1.17E+00
Co-57	0.038%	3.62E-03
Co-58	0.159%	1.53E-02
Co-60	5.183%	4.97E-01
Ni-63	30.836%	2.96E+00
Sr-90	0.077%	7.34E-03
Ag-110m	0.005%	4.39E-04
Sb-125	1.621%	1.55E-01
Cs-134	15.031%	1.44E+00
Cs-137	23.456%	2.25E+00
Ce-144	4.198%	4.02E-01
Pu-238	0.003%	2.47E-04
Pu-239	0.001%	1.37E-04
Am-241	0.003%	3.23E-04
Cm-242	0.000%	3.75E-05
Cm-243	0.004%	3.54E-04

Resins, Filters, and Evap Bottoms
Waste Class B

Nuclide Name	Percent Abundance	Curies
Fe-55	0.030%	2.15E-02
Co-60	0.511%	3.62E-01
Ni-63	5.458%	3.87E+00
Sr-90	0.099%	6.99E-02
Cs-137	92.753%	6.57E+01
Ce-144	1.147%	8.13E-01
Pu-238	0.000%	2.49E-04
Pu-239	0.001%	3.65E-04
Am-241	0.001%	6.19E-04
Cm-243	0.000%	1.59E-05

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Resins, Filters, and Evap Bottoms
Waste Class C

Nuclide Name	Percent Abundance	Curies
H-3	0.001%	1.18E-02
C-14	0.009%	8.40E-02
Mn-54	0.902%	8.25E+00
Fe-55	6.427%	5.88E+01
Co-57	0.173%	1.59E+00
Co-58	10.738%	9.83E+01
Co-60	4.601%	4.21E+01
Ni-59	0.000%	2.14E-03
Ni-63	18.567%	1.70E+02
Sr-89	0.000%	8.63E-08
Sr-90	0.031%	2.85E-01
Zr-95	0.000%	1.75E-05
Nb-95	0.000%	1.01E-07
Tc-99	0.000%	8.71E-04
Sb-125	0.342%	3.13E+00
Cs-134	26.438%	2.42E+02
Cs-137	31.018%	2.84E+02
Ce-144	0.745%	6.81E+00
Pu-238	0.000%	1.80E-03
Pu-239	0.000%	5.59E-04
Pu-241	0.007%	6.05E-02
Am-241	0.000%	4.56E-04
Cm-242	0.001%	6.54E-03
Cm-243	0.000%	2.34E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Resins, Filters, and Evap Bottoms
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.069%	6.88E-01
C-14	0.008%	8.40E-02
Mn-54	0.830%	8.27E+00
Fe-55	6.028%	6.00E+01
Co-57	0.160%	1.59E+00
Co-58	9.872%	9.83E+01
Co-60	4.315%	4.30E+01
Ni-59	0.000%	2.14E-03
Ni-63	17.751%	1.77E+02
Sr-89	0.000%	8.63E-08
Sr-90	0.036%	3.62E-01
Zr-95	0.000%	1.75E-05
Nb-95	0.000%	1.01E-07
Tc-99	0.000%	8.71E-04
Ag-110m	0.000%	4.39E-04
Sb-125	0.330%	3.28E+00
Cs-134	24.446%	2.43E+02
Cs-137	35.340%	3.52E+02
Ce-144	0.806%	8.03E+00
Pu-238	0.000%	2.30E-03
Pu-239	0.000%	1.06E-03
Pu-241	0.006%	6.05E-02
Am-241	0.000%	1.40E-03
Cm-242	0.001%	6.58E-03
Cm-243	0.000%	2.71E-03

Dry Active Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	0.368%	1.71E-03
C-14	0.471%	2.20E-03
Mn-54	0.903%	4.21E-03
Fe-55	34.986%	1.63E-01
Co-58	0.747%	3.48E-03
Co-60	41.988%	1.96E-01
Ni-63	12.197%	5.68E-02
Sr-90	0.076%	3.54E-04
Sb-125	2.293%	1.07E-02
Cs-134	0.694%	3.24E-03
Cs-137	1.994%	9.29E-03
Ce-144	2.665%	1.24E-02
Pu-238	0.013%	6.15E-05
Pu-239	0.007%	3.15E-05
Pu-241	0.553%	2.58E-03
Am-241	0.025%	1.15E-04
Cm-242	0.003%	1.40E-05
Cm-243	0.018%	8.37E-05

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.368%	1.71E-03
C-14	0.471%	2.20E-03
Mn-54	0.903%	4.21E-03
Fe-55	34.986%	1.63E-01
Co-58	0.747%	3.48E-03
Co-60	41.988%	1.96E-01
Ni-63	12.197%	5.68E-02
Sr-90	0.076%	3.54E-04
Sb-125	2.293%	1.07E-02
Cs-134	0.694%	3.24E-03
Cs-137	1.994%	9.29E-03
Ce-144	2.665%	1.24E-02
Pu-238	0.013%	6.15E-05
Pu-239	0.007%	3.15E-05
Pu-241	0.553%	2.58E-03
Am-241	0.025%	1.15E-04
Cm-242	0.003%	1.40E-05
Cm-243	0.018%	8.37E-05

Other Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	0.217%	3.90E-08
C-14	0.277%	4.99E-08
Mn-54	0.000%	0.00E+00
Fe-55	25.417%	4.57E-06
Co-58	1.006%	1.81E-07
Co-60	40.850%	7.34E-06
Ni-63	20.930%	3.76E-06
Sr-90	0.165%	2.96E-08
Sb-125	1.354%	2.43E-07
Cs-134	0.000%	0.00E+00
Cs-137	7.853%	1.41E-06
Ce-144	1.574%	2.83E-07
Pu-238	0.008%	1.37E-09
Pu-239	0.004%	7.10E-10
Pu-241	0.320%	5.75E-08
Am-241	0.014%	2.60E-09
Cm-242	0.001%	2.62E-10
Cm-243	0.010%	1.87E-09

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Other Waste
Waste Class C

Nuclide Name	Percent Abundance	Curies
H-3	0.381%	1.74E-02
C-14	0.488%	2.23E-02
Mn-54	0.782%	3.57E-02
Fe-55	34.685%	1.59E+00
Co-60	42.623%	1.95E+00
Ni-63	12.439%	5.69E-01
Sr-90	0.076%	3.46E-03
Sb-125	2.378%	1.09E-01
Cs-134	0.720%	3.29E-02
Cs-137	2.040%	9.32E-02
Ce-144	2.758%	1.26E-01
Pu-238	0.013%	6.14E-04
Pu-239	0.007%	3.17E-04
Pu-241	0.563%	2.57E-02
Am-241	0.025%	1.16E-03
Cm-242	0.003%	1.16E-04
Cm-243	0.018%	8.34E-04

Other Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.381%	1.74E-02
C-14	0.488%	2.23E-02
Mn-54	0.782%	3.57E-02
Fe-55	34.685%	1.59E+00
Co-58	0.000%	1.81E-07
Co-60	42.623%	1.95E+00
Ni-63	12.439%	5.69E-01
Sr-90	0.076%	3.46E-03
Sb-125	2.378%	1.09E-01
Cs-134	0.720%	3.29E-02
Cs-137	2.040%	9.32E-02
Ce-144	2.758%	1.26E-01
Pu-238	0.013%	6.14E-04
Pu-239	0.007%	3.17E-04
Pu-241	0.563%	2.57E-02
Am-241	0.025%	1.16E-03
Cm-242	0.003%	1.16E-04
Cm-243	0.018%	8.34E-04

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	6.748%	6.78E-01
C-14	0.022%	2.20E-03
Mn-54	0.167%	1.68E-02
Fe-55	13.252%	1.33E+00
Co-57	0.036%	3.62E-03
Co-58	0.186%	1.87E-02
Co-60	6.890%	6.92E-01
Ni-63	29.972%	3.01E+00
Sr-90	0.077%	7.70E-03
Ag-110m	0.004%	4.39E-04
Sb-125	1.652%	1.66E-01
Cs-134	14.366%	1.44E+00
Cs-137	22.460%	2.26E+00
Ce-144	4.127%	4.15E-01
Pu-238	0.003%	3.08E-04
Pu-239	0.002%	1.68E-04
Pu-241	0.026%	2.58E-03
Am-241	0.004%	4.38E-04
Cm-242	0.001%	5.16E-05
Cm-243	0.004%	4.38E-04

Sum of All 4 Categories
Waste Class B

Nuclide Name	Percent Abundance	Curies
Fe-55	0.030%	2.15E-02
Co-60	0.511%	3.62E-01
Ni-63	5.458%	3.87E+00
Sr-90	0.099%	6.99E-02
Cs-137	92.753%	6.57E+01
Ce-144	1.147%	8.13E-01
Pu-238	0.000%	2.49E-04
Pu-239	0.001%	3.65E-04
Am-241	0.001%	6.19E-04
Cm-243	0.000%	1.59E-05

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class C

Nuclide Name	Percent Abundance	Curies
H-3	0.003%	2.92E-02
C-14	0.012%	1.06E-01
Mn-54	0.901%	8.29E+00
Fe-55	6.568%	6.04E+01
Co-57	0.172%	1.59E+00
Co-58	10.685%	9.83E+01
Co-60	4.790%	4.41E+01
Ni-59	0.000%	2.14E-03
Ni-63	18.536%	1.70E+02
Sr-89	0.000%	8.63E-08
Sr-90	0.031%	2.89E-01
Zr-95	0.000%	1.75E-05
Nb-95	0.000%	1.01E-07
Tc-99	0.000%	8.71E-04
Sb-125	0.352%	3.24E+00
Cs-134	26.310%	2.42E+02
Cs-137	30.874%	2.84E+02
Ce-144	0.755%	6.94E+00
Pu-238	0.000%	2.42E-03
Pu-239	0.000%	8.76E-04
Pu-241	0.009%	8.63E-02
Am-241	0.000%	1.62E-03
Cm-242	0.001%	6.66E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.071%	7.07E-01
C-14	0.011%	1.09E-01
Mn-54	0.830%	8.31E+00
Fe-55	6.172%	6.18E+01
Co-57	0.159%	1.59E+00
Co-58	9.823%	9.83E+01
Co-60	4.508%	4.51E+01
Ni-59	0.000%	2.14E-03
Ni-63	17.725%	1.77E+02
Sr-89	0.000%	8.63E-08
Sr-90	0.037%	3.66E-01
Zr-95	0.000%	1.75E-05
Nb-95	0.000%	1.01E-07
Tc-99	0.000%	8.71E-04
Ag-110m	0.000%	4.39E-04
Sb-125	0.340%	3.40E+00
Cs-134	24.326%	2.43E+02
Cs-137	35.173%	3.52E+02
Ce-144	0.816%	8.17E+00
Pu-238	0.000%	2.98E-03
Pu-239	0.000%	1.41E-03
Pu-241	0.009%	8.88E-02
Am-241	0.000%	2.67E-03
Cm-242	0.001%	6.71E-03
Cm-243	0.000%	3.63E-03

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/- 25%
B	0.00E+00	0.00E+00	0.00E+00	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
All	0.00E+00	0.00E+00	0.00E+00	+/- 25%

Waste Stream : Dry Active Waste
Unit 3 DAW-20' Sealand Unit 3 DAW B-25

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.01E+04	5.70E+02	8.33E-01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.01E+04	5.70E+02	8.33E-01	+/-25%

Waste Stream : Irradiated Components

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	0.00E+00	0.00E+00	0.00E+00	+/-25%

Waste Stream : Other Waste Combined Packages

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	3.12E+03	8.84E+01	5.23E-01	+/-25%
B	1.56E+03	4.42E+01	7.27E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	4.68E+03	1.33E+02	7.79E+00	+/-25%

Waste Stream : Sum of All 4 Categories Combined Packages:
Unit 3 DAW-20' Sealand Unit 3 DAW-B25

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.32E+04	6.58E+02	1.36E+00	+/-25%
B	1.56E+03	4.42E+01	7.27E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	2.48E+04	7.02E+02	8.63E+00	+/-25%

Combined Waste Type Shipment, Major Volume Waste Type Shown

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
9	Hittman Transport	GTS Duratek Bear Creek Ops
1	Tri State Motor Transit	GTS Duratek Bear Creek Ops
4	Race Logistics	RACE LLC

Dry Active Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
Cr-51	6.341%	5.28E-02
Mn-54	0.532%	4.43E-03
Fe-55	8.210%	6.84E-02
Co-57	0.122%	1.01E-03
Co-58	47.970%	3.99E-01
Co-60	6.011%	5.00E-02
Ni-63	9.366%	7.80E-02
Zr-95	3.772%	3.14E-02
Nb-95	8.846%	7.36E-02
Ag-110m	0.073%	6.11E-04
Sb-124	3.180%	2.65E-02
Sb-125	3.667%	3.05E-02
Cs-134	0.711%	5.92E-03
Cs-137	1.200%	9.99E-03

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
Cr-51	6.341%	5.28E-02
Mn-54	0.532%	4.43E-03
Fe-55	8.210%	6.84E-02
Co-57	0.122%	1.01E-03
Co-58	47.970%	3.99E-01
Co-60	6.011%	5.00E-02
Ni-63	9.366%	7.80E-02
Zr-95	3.772%	3.14E-02
Nb-95	8.846%	7.36E-02
Ag-110m	0.073%	6.11E-04
Sb-124	3.180%	2.65E-02
Sb-125	3.667%	3.05E-02
Cs-134	0.711%	5.92E-03
Cs-137	1.200%	9.99E-03

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Other Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
Cr-51	11.776%	6.16E-02
Mn-54	0.363%	1.90E-03
Fe-55	2.491%	1.30E-02
Co-57	0.179%	9.39E-04
Co-58	68.735%	3.60E-01
Co-60	1.717%	8.98E-03
Ni-63	3.529%	1.85E-02
Nb-95	0.233%	1.22E-03
Sb-124	5.059%	2.65E-02
Sb-125	4.658%	2.44E-02
Cs-134	0.689%	3.60E-03
Cs-137	0.570%	2.98E-03

Other Waste
Waste Class B

Nuclide Name	Percent Abundance	Curies
Mn-54	0.782%	5.68E-02
Fe-55	17.631%	1.28E+00
Co-58	10.822%	7.86E-01
Co-60	13.096%	9.51E-01
Ni-63	18.696%	1.36E+00
Zr-95	10.485%	7.62E-01
Nb-95	24.526%	1.78E+00
Ag-110m	0.202%	1.46E-02
Sb-125	0.954%	6.93E-02
Cs-134	0.642%	4.66E-02
Cs-137	2.166%	1.57E-01

Other Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
Cr-51	0.791%	6.16E-02
Mn-54	0.754%	5.87E-02
Fe-55	16.614%	1.29E+00
Co-57	0.012%	9.39E-04
Co-58	14.711%	1.15E+00
Co-60	12.332%	9.60E-01
Ni-63	17.677%	1.38E+00
Zr-95	9.781%	7.62E-01
Nb-95	22.895%	1.78E+00
Ag-110m	0.188%	1.46E-02
Sb-124	0.340%	2.65E-02
Sb-125	1.203%	9.37E-02
Cs-134	0.645%	5.02E-02
Cs-137	2.059%	1.60E-01

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2005 to 12/31/2005

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class A

Nuclide Name	Percent Abundance	Curies
Cr-51	8.438%	1.14E-01
Mn-54	0.467%	6.33E-03
Fe-55	6.004%	8.14E-02
Co-57	0.144%	1.95E-03
Co-58	55.983%	7.59E-01
Co-60	4.354%	5.90E-02
Ni-63	7.113%	9.64E-02
Zr-95	2.316%	3.14E-02
Nb-95	5.522%	7.49E-02
Ag-110m	0.045%	6.11E-04
Sb-124	3.905%	5.29E-02
Sb-125	4.049%	5.49E-02
Cs-134	0.702%	9.52E-03
Cs-137	0.957%	1.30E-02

Sum of All 4 Categories
Waste Class B

Nuclide Name	Percent Abundance	Curies
Mn-54	0.782%	5.68E-02
Fe-55	17.631%	1.28E+00
Co-58	10.822%	7.86E-01
Co-60	13.096%	9.51E-01
Ni-63	18.696%	1.36E+00
Zr-95	10.485%	7.62E-01
Nb-95	24.526%	1.78E+00
Ag-110m	0.202%	1.46E-02
Sb-125	0.954%	6.93E-02
Cs-134	0.642%	4.66E-02
Cs-137	2.166%	1.57E-01

Sum of All 4 Categories
Waste Class All

Nuclide Name	Percent Abundance	Curies
Cr-51	1.327%	1.14E-01
Mn-54	0.732%	6.31E-02
Fe-55	15.802%	1.36E+00
Co-57	0.023%	1.95E-03
Co-58	17.923%	1.55E+00
Co-60	11.721%	1.01E+00
Ni-63	16.875%	1.45E+00
Zr-95	9.200%	7.93E-01
Nb-95	21.538%	1.86E+00
Ag-110m	0.177%	1.53E-02
Sb-124	0.614%	5.29E-02
Sb-125	1.441%	1.24E-01
Cs-134	0.651%	5.62E-02
Cs-137	1.976%	1.70E-01

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

E. RADIOLOGICAL IMPACT ON MAN

Jan 1, 2005 - Dec 31, 2005

RADIOLOGICAL IMPACT ON MAN

Routine Effluent Dose Calculations:
The radiological impact on man is determined by conservatively calculating doses to a hypothetical maximally exposed individual offsite based on plant effluents. These calculations are divided into 3 categories: Noble Gases, Particulates and Iodine, and Liquid Releases (fish and invertebrate consumption).

A computer code is used to perform liquid and gaseous dose calculations according to the models and parameters presented in the Indian Point Offsite Dose Calculation Manuals (ODCMs). Annual average dispersion and deposition factors are used in airborne effluent calculations. Liquid calculations involve fish and invertebrate consumption pathways. Details of these calculations are presented in the ODCM, along with the applicable assumptions in Regulatory Guide 1.109 and NUREG 0133.

Indian Point Energy Center is a multi-unit site owned and operated by Entergy Nuclear Operations, Incorporated.

Carbon-14:
Concentrations and offsite dose from Carbon-14 have been estimated using data generated at IP3 from August 1980 to June 1982 after a study conducted by the NY State Department of Health. These estimates are consistent with NUREG 0017, Rev. 1. The maximum expected annual dose from Carbon 14 releases at IP2 and IP3 have been calculated using the maximum dependable gross electrical capacity, which is approximately 1000 MW(e) maintained for the entire year. The resultant worst case doses are based upon site specific assumptions of source term released for an entire year at 1000 MW(e) output, as outlined in the ODCM.

> The annual dose to the maximally exposed individual (child) from gaseous releases of Carbon-14 is 0.254 mRem to the critical organ (bone) and 0.0508 mRem to the total body. The annual dose to the maximally exposed individual (child) from liquid releases of Carbon-14 is 0.00583 mRem to the critical organ (bone) and 0.00117 mRem to the total body.
>
> These curies and doses are reported in this section to include all known effluent isotopes in the annual effluent report (which has become the standard in recent years). The data is listed separately from other isotopes (in the familiar table format) to preserve consistency with the format of Reg Guide 1.21 and the listed isotopes of concern, which do NOT include C-14.

Groundwater:
Curies and dose contribution from activity discovered in onsite ground water and storm drain pathways in 2005 are discussed in detail in Section H. The conservative (bounding) dose calculations from storm drains and monitoring wells are also included in the summary table at the end of this section, for comparison.

Members of the Public:

Doses to members of the public from airborne and liquid releases are minimal due to the relatively insignificant total duration of these individuals on site. Their doses can be calculated from standard ODCM methodology, with typical occupancy factors employed. These factors are determined by comparing the expected hours on site to 8760 hours (the number of hours in a year, used in calculations in the ODCM).

example 1: Several students visit the site for an 8-hour guided tour. Their occupancy factor is: 8 / 8760 or **.0009.**

example 2: A man drives his wife to work and drops her off at the security gate each morning, with a total stay-time on site for 2 minutes per day. His occupancy factor is calculated as follows: 2 min/60 min per hour =.0333 hr ; 0.0333 / 8760 = **3.8E-6**

These factors, when multiplied by doses calculated per the ODCM, demonstrate that dose to MEMBERS OF THE PUBLIC within the site boundary is negligible, despite a potential reduction in the atmospheric dispersion.

Total Dose:

In compliance with 40CFR190, the following table indicates the Total Dose, including any measured direct shine component from the site property for 2005:

		Whole Body (mrem)	Max Organ (mrem)
40 CFR 190 limit ===→	**IPEC**	**25**	**75**
Routine Airborne Effluents	Units 1 and 2	1.26E-03	1.26E-03
Routine Liquid Effluents	Units 1 and 2	8.11E-04	1.31E-03
Routine Airborne Effluents	Unit 3	3.61E-03	3.61E-03
Routine Liquid Effluents	Unit 3	4.45E-04	5.38E-04
Carbon-14 Liquid & Airborne Totals	IPEC	5.20E-02	2.60E-01
Ground Water & Storm Drain Totals	IPEC[1]	2.12E-03	9.72E-03
Radwaste Storage, Direct Shine	IPEC[2]	< 4	< 4
Indian Point Energy Center Total Dose	**IPEC**	**< 4.06**	**< 4.28**

Note 1: Groundwater curie and dose calculations are provided in Section H.

Note 2: The direct shine component is indistinguishable from background. Four mrem is conservatively used from a one mrem siting criteria established for each area.

INDIAN POINT UNITS 1 and 2 NUCLEAR POWER PLANTS
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2005

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	3.95E-04	4.68E-04	2.67E-04	1.96E-04	1.31E-03
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	7.90E-03	9.36E-03	5.34E-03	3.92E-03	1.31E-02
Age Group		Teen	Child	Child	Adult	Child
Critical Organ		Liver	Bone	Bone	Bone	Bone

Adult Total Body	(mrem)	2.93E-04	2.88E-04	1.40E-04	9.01E-05	8.11E-04
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3
Percent of Limit	(%)	1.95E-02	1.92E-02	9.33E-03	6.01E-03	2.70E-02

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	8.84E-06	1.46E-05	8.17E-05	7.04E-05	1.76E-04
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	1.77E-04	2.92E-04	1.63E-03	1.41E-03	1.76E-03

Beta Air	(mrad)	1.31E-04	2.73E-04	4.52E-04	3.74E-04	1.23E-03
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	1.31E-03	2.73E-03	4.52E-03	3.74E-03	6.15E-03

C. AIRBORNE IODINE and PARTICULATE DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	3.99E-04	4.09E-04	3.43E-04	1.09E-04	1.26E-03
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	5.32E-03	5.45E-03	4.57E-03	1.45E-03	8.40E-03

Age Group		Child	Child	Child	Child	Child
Critical Organ		Liver	Liver	Liver	Liver	Liver

INDIAN POINT 3 NUCLEAR POWER PLANT
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2005

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	3.85E-04	1.25E-04	9.37E-06	1.07E-04	5.38E-04
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	7.70E-03	2.50E-03	1.87E-04	2.14E-03	5.38E-03
Age Group		Adult	Adult	Child	Adult	Adult
Critical Organ		Liver	GILLI	Bone	Liver	GILLI

Adult Total Body	(mrem)	3.29E-04	2.16E-05	6.47E-06	8.77E-05	4.45E-04
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3
Percent of Limit	(%)	2.19E-02	1.44E-03	4.31E-04	5.85E-03	1.48E-02

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	1.01E-03	2.73E-05	5.16E-06	9.15E-06	1.05E-03
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	2.02E-02	5.46E-04	1.03E-04	1.83E-04	1.05E-02

Beta Air	(mrad)	5.90E-03	1.00E-04	9.37E-06	2.00E-05	6.03E-03
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	5.90E-02	1.00E-03	9.37E-05	2.00E-04	3.01E-02

C. AIRBORNE IODINE and PARTICULATE DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	1.98E-03	5.99E-04	6.54E-04	3.74E-04	3.61E-03
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	2.64E-02	7.99E-03	8.72E-03	4.99E-03	2.40E-02

Age Group		Child	Child	Child	Child	Child
Critical Organ		Thyroid	Thyroid	Liver	Liver	Thyroid

Indian Point Energy Center
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RADIOLOGICAL EFFLUENT REPORT

F. METEOROLOGICAL DATA

Jan 1, 2005 - Dec 31, 2005

This data is stored onsite and is available in printed or electronic form.

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

G. OFFSITE DOSE CALCULATION MANUAL,
PROCESS CONTROL PROGRAM, OR LAND USE CENSUS LOCATION CHANGES

2005

There were no changes in the REMP locations for dose calculations and/or environmental monitoring in year 2005.

There were no changes to the Land Use Census in year 2005.

The PCPs were not upgraded in this period.
They remain Rev 7 for unit 3 and Rev 9 for units 1 and 2.

Unit 1 and 2's ODCM was upgraded in September, 2005 to Revision 9.
Unit 3's ODCM was upgraded in September, 2005 to Revision 17.

(See the following pages)

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 1*

OBJECTIVE:

Allow unit 2 to use the same approved methodology as unit 3, for ensuring adequate control for liquid effluents with respect to 10CFR20 limits, despite the fact that unit 2's Technical Specifications still identify the use of the old 10CFR20 for unit 2.

DESCRIPTION OF CHANGES:

This update to unit 2's ODCM adds the specific definition of MPCW to the RECS. This definition allows for the standard general function and use for control of diluted concentrations in the discharge canal, but for unit 2, these limits are merely defined as the old 10CFR20 "MPCWs".

IMPACT:

1) The SOP for liquid effluent permits from the control room must be updated to include the use of ADC in place of the conservative "factor" applied by the old "go/no-go" method of Iodine in the sample.

2) Chemistry procedures for reporting to Operations will also need to be adjusted. The generation of the actual values is automatic from gamma spectroscopy libraries already standardized at IPEC.

3) The computer code for generating liquid effluent permits will only require a small upgrade.

4) Although these efforts will be nearly invisible to the end user, training or familiarization should be conducted for Operators and Chemtechs concurrent with making these changes effective.

JUSTIFICATION:

The methodology of "Allowed Diluted Concentration" is shared between units in this revision because both units refer to a "Maximum Permissible Concentration in Water" (MPCW) defined in each unit's respective RECS. This definition allows for the standard general function and use for control of diluted concentrations in the discharge canal, but for unit 2, these limits are merely defined as the old 10CFR20 "MPCWs". On the other hand, for unit 3, the RECS definition for MPCW is defined as "10 times the ECs" of the NEW 10CFR20. Referring to this formal definition of MPCW allows for identical methods of control to be employed at IPEC, effectively improving the previous method at unit 2, which did NOT employ a calculation with every release. This calculation is industry standard and in keeping with the regulations governing this objective: NUREG 0133, Reg Guide 1.109, NUREG 0472, and NUREG 1301. The use of this new definition allows IPEC to apply this standard while awaiting the Tech Spec update to authorize use of the NEW 10CFR20 (officially) at unit 2.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 2*

OBJECTIVE:

In DLCO 3.1.1a, replace the specific words describing "MPCW" with a reference to officially defined "MPCW" in the definition section.

DESCRIPTION OF CHANGES:

Removed "10 CFR Part 20, Appendix B..." and replaced with "MPCW... as defined in D1.1"

IMPACT:

None

JUSTIFICATION:

Simplify current and future revisions for potential upgrade to new 10CFR20. See item 1.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 3*

OBJECTIVE:

Correct a typographical error under Condition B of DLCO 3.2.2.

DESCRIPTION OF CHANGES:

Replaced the word "liquid" with "airborne".

IMPACT:

None

JUSTIFICATION:

Cut and paste error from original transfer during ITS. This section applies to Airborne releases.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 4*

OBJECTIVE:

Users identified a need to include Radiation Monitors by specific number, not just description, in the Instrumentation section of the RECS

DESCRIPTION OF CHANGES:

Tables 3.3.1-1 and 3.3.2-1 were updated to include the specific Radiation Monitor number as applicable.

IMPACT:

None

JUSTIFICATION:

This improvement does not change any requirements, but identifies plant equipment by number for improved clarity.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 5*

OBJECTIVE:

Ensure the ODCM includes instruction to take Plant Vent grab samples for noble gas periodically when the Plant Vent Radiation monitor is OOS, per NUREG 0472 and 1301.

DESCRIPTION OF CHANGES:

Added a condition referenced from required action B.1 for DCLO 3.3.2 on Table 3.3.2-1, block 3a, to included condition C, as well as the previously identified condition G.

IMPACT:

None

JUSTIFICATION:

This omission was an oversight during the original conversion to ITS. The requirement to obtain a second compensatory sample for batch releases was identified, but the requirement to obtain periodic (once per 12 hours) Plant Vent samples when the PV monitor is OOS was not included in this table. Station procedures maintained this requirements and no samples were missed, but this table required an update to ensure BOTH instances of required compensatory samples were noted in the ODCM. These requirements are based directly from ODCM source documents: NUREG 0472 and NUREG 1301.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 6*

OBJECTIVE:

Clarify the applicability of 10CFR20 limits to the entire site in the bases sections of the RECS.

DESCRIPTION OF CHANGES:

BD 3.1.1 and BD 3.2.1 incorrectly identified applicability to units 1 and 2 only in the paragraph's final sentence. This sentences was corrected to clarify the fact that 10CFR20 specifications apply to all units on site.

IMPACT:

None.

JUSTIFICATION:

The wording of this section was not properly updated during ITS conversion. It was updated to correctly identify 10CFR20's applicability to the entire site, not just the units to which the old Tech Spec/ODCM had historically referred. This clarification is in keeping with ODCM source documents NUREG 0472 and NUREG 1301.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 7*

OBJECTIVE:

Replace the drinking water pathway caveat on Table 3.5.1-2 (footnote b).

DESCRIPTION OF CHANGES:

Replace the footnote lost during ITS, for the drinking water pathway caveat, which increases the reporting level of I-131 from 2 to 20 pCi/L when there is no drinking water pathway.

IMPACT:

None.

JUSTIFICATION:

There is no drinking water pathway at IPEC. Unit 3 ODCMs have included this footnote directly transcribed from NUREG 0133 and 1301. During the preparation of the Indian Point 2 ODCM for the ITS project, the footnote "(b)" was identified on the effected Table, but the actual sentence at the bottom of the page was omitted in error. This footnote and caveat for I-131 reporting levels are directly transcribed from NUREGs 0133 and 1301.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 8*

OBJECTIVE:

In ODCM, Part II, for liquid effluents, remove the old methodology of a fixed minimum dilution flow, and establish a calculation to ensure each liquid effluent release has documented assurance of compliance with 10CFR20.

DESCRIPTION OF CHANGES:

Modified Section 2.1 to include the use of "Allowed Diluted Concentration", referencing Section 4.1 and Appendix E, which identify specific application of this new term. Maintained the administrative conservative guideline to have a minimum of 100,000 gpm dilution flow for each release. The generation and application of monitor conversion factors is discussed and referenced to Appendix F.

IMPACT:

This item is tied to item #1 and will require the identified updates to procedures, along with training.

JUSTIFICATION:

These improvements and their justification are identified in item #1. The use of ADC allows for an industry standard calculation to be performed with each release, rather than using default required dilution flows for effluent with or without Iodine. This improvement is in keeping with NUREGs 0133, 0472, and 1301, and will eliminate the error-likely situation of making special calculations only when Iodine is identified in the liquid effluent. Instead, a simple, automatic calculation is performed within the Chemistry organization with every release (within the gamma spectroscopy analyses) and communicated to Operations to include in the release criteria.

The renaming of "monitor calibration factor" to the more appropriate "monitor conversion factor" is in keeping with industry standards and vendor technical manuals. It also serves to clarify potential confusion between the drawer and detector calibrations performed by I&C on a refueling basis, and the conversion of cpm to uCi/ml, which is a function of the isotopic mixture through the liquid effluent radiation monitor.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 9*

OBJECTIVE:

Update the MET data reference in Section 2.1 with the 10-year averaged results accumulated from Entech Engineering Inc from PO # 4500531825.

DESCRIPTION OF CHANGES:

The source of the annual average MET data was previously identified in this section, referencing data from 1982 to 1992. New data was accumulated from 1992 to 2002 and summarized for inclusion in the ODCM, per expectations of NUREG 0133 and other ODCM guidance. This updated data is referenced by report name. Actual data is presented in Appendix A, and the bases for the calculations is referenced in unit 3 ODCM, Section 3.5 and 3.6.

IMPACT:

No impact to programs or methodologies, but any calculation using the old MET data constants will need to be updated. For example, this will include the back-calculated uCi/sec limits associated with the maximum "Tech Spec" release rates in SMM-CY-001 and the Eplan. The annual and quarterly release rate limits of Appendix I will also be slightly modified.

JUSTIFICATION:

NUREG 0133 suggests updating the average MET data. Industry standard periodicity for this update is 5-10 years. The author of the first effort performed the work as an employee of Indian Point 3. The same individual performed the update for IPEC as a contractor under a purchase order.

Keeping annual average MET data current is an expectation of the NUREG. Averaging data over ten years provides for a greater sample size and better statistics with regard to averaged MET constants to be used for random releases.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 10*

OBJECTIVE:

Clarify verbiage with reference to LLD applications in Section 2.1.

DESCRIPTION OF CHANGES:

Reworded confusing last two sentences of 3rd paragraph for clarity.

IMPACT:

None.

JUSTIFICATION:

The slight wording change is a clarification of existing practice of assigning a zero value to the isotopic concentration of isotopes in the ODCM tables that were NOT identified in radiochemical analyses.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 11*

OBJECTIVE:

Include airborne authorized release rates in uCi/sec, as well as the permissions required for application, in the unit 2 ODCM.

DESCRIPTION OF CHANGES:

Section 2.1 was updated at the bottom of page 13 to include the required permissions for application of the different rates (as found in SMM-CY-001, the lower tier implementing document). This section refers to Appendix I for derivation of these rates.

IMPACT:

Operations SOP for airborne effluent permits will require and update to establish a given setpoint per appropriate level of permission, followed by adjustments commensurate with required individual acknowledgement for increasing the setpoint. This update is in line with the removal of rad monitor setpoint control from the old "Operator Aid", and instead, to a CRS-controlled matrix kept with the Waste Permits in the control room, similar to the unit 3 method.

JUSTIFICATION:

This verbiage was added to the ODCM to ensure the upper tier document included the actions underway as a result of lower tier documents already making this improvement. The method identified in this section and again in Appendix I shows the step by step compliance with 10CFR20.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 12*

OBJECTIVE:

Clarify the passage referring to iodine and particulate dose impact, 3rd paragraph, page 14.

DESCRIPTION OF CHANGES:

The previous revision verbiage attempted to justify the lack of immediate knowledge of dose impact from iodine and particulate by stating that the radiochemical data was not available for months after the moment of last sample collection. With this revision, a more complete justification was appended to this paragraph, describing the application of noble gas and radiation monitor setpoints for immediate control of proximity to 10CFR20 limits, and that the evaluated iodine to noble gas ratios were applied to make this assessment, both accident and routine.

IMPACT:

None.

JUSTIFICATION:

Compliance with 10CFR20 has always been performed with noble gas rad monitor setpoints and this condition has not changed. The wording in the old paragraph did not fully identify this method.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 13*

OBJECTIVE:

Identify the use of instantaneous, quarterly, and annual release rates as the sequential methods of setpoint basis to control proximity to 10CFR20 airborne effluent release rates near the end of Section 2.1.

DESCRIPTION OF CHANGES:

Modified the statements in the 6th paragraph of page 14 to include the use of the 3-tiered approach for setpoint control, from routine (annual), to quarterly, then instantaneous limits, with appropriate controls and permissions, per Section 4.2.1 and Appendix I.

IMPACT:

This method has already been identified in SMM-CY-001, Radioactive Effluents Control Program. However, SOP-5.2.4 may need clarification, and training of control room operators should be considered, as these methods will be used hand in hand with the new RMS setpoint control program.

JUSTIFICATION:

Prior to this revision, 10CFR20 –based limits (back-calculated to uCi/cc for Operations) were derived in identical fashion. However, application of progressively more conservative setpoints was left to the shift manager or CRS discretion. This revision of the ODCM (as well as the implementing procedure, SMM-CY-001) provides the data and the bases for determining the more routine setpoints (annual or quarterly), applied well before the use of the instantaneous setpoints are requested. This method ensures a more defined and structured process for obtaining permissions (and verifying controls are in place) as more operational flexibility is required for non-routine releases (such as the VC Purge at shutdown), while still providing the traceability and assurance of compliance with 10CFR20.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 14*

OBJECTIVE:

Clarify the application of K_{eff} near the end of Section 2.3.

DESCRIPTION OF CHANGES:

The previous version suggested that a calculated K_{eff} "can" be used for each releases. The wording was changed to identify that this is the normal condition.

IMPACT:

None.

JUSTIFICATION:

The ODCM implementing documents and software have always performed the actual dose calculations with noble gas dose factors derived from actual mixtures. There is no change to that process. This improvement of the verbiage only clarifies the difference between individual actual release calculations, and the application of K_{eff} for back-calculating a release rate limit in Appendix I with an assumed mixture.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 15*

OBJECTIVE:

Clarify the methodology for identifying the compliance methodology with 10CFR20 for Iodine and Particulate.

DESCRIPTION OF CHANGES:

This revision clarifies the fact that ***all*** age group and organ dose rates are inspected for most critical contribution with regard to 10CFR20 compliance (by computer code). The previous verbiage *incorrectly* stated that the child thyroid will always be the most critical.

IMPACT:

None.

JUSTIFICATION:

While any type of Iodine release will indeed make the child thyroid dose the limiting age group and organ, recent operational history does NOT include routine releases of iodine. Therefore, this ultra-conservative statement was not only incorrect, but not in keeping with the calculations that followed, in Section 2.4, which clearly show each age group and organ being calculated separately. The calculations were upgraded in previous revisions of the ODCM, but the overly-conservative statement was not improved to identify that, in fact, each age group and organ has its own calculation for proximity to 10CFR20. The calculational method shown below this paragraph was indeed how this proximity has been inspected since the late 1980's.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 16*

OBJECTIVE:

Remove the universally applied short term correction factor throughout Section 2.

DESCRIPTION OF CHANGES:

Removed the "short term" correction factor and references to this inappropriately used term. Identified the built-in conservativism of the chosen mixtures in Table 2-8, as well as the 3-tiered effect of annual, quarterly, and instantaneous setpoints as the appropriate means of setpoint conservativism.

IMPACT:

None.

JUSTIFICATION:

This repeated application of a conservative factor had been confused with the actual definition of 'short term" in NUREG 0133. Short term correction factors should be applied only when the release is identified as "short term". The objective to apply a conservative factor is achieved inherently by the choice of nuclide mix in Table 2-8. However, if a conservative factor is still desired, it is applied ONCE, at the end of the calculation, within lower tier documents and should not be built into the ODCM calculations, to preclude confusion with the bases calculations in NUREG 0133.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 17*

OBJECTIVE:

Clarify the application of M_{eff} and N_{eff} in equations G-9 and G-11 near the end of Sections 2.5 and 2.6.

DESCRIPTION OF CHANGES:

Clearly stated that monthly effluent calculations include the actual gamma and beta air dose factors for the applicable mixtures.

IMPACT:

None.

JUSTIFICATION:

Previous verbiage was confusing with regard to which isotopes were used to calculate the applicable factors (M and N). Current wording ensures that the use of actual release isotopes is clear. The method used in the computer codes have not changed and are in keeping with guidance from NUREG-0133.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 18*

OBJECTIVE:

Note the difference between actual nearest resident and the worst MET sector in Section 2.7

DESCRIPTION OF CHANGES:

Clarified the potentially confusing statements in the opening paragraph of Section 2.7. Although the nearest resident is identified at ESE, the worst MET sector and dose calculations are applied in the SSW, per Table 2-9, Appendix I, and vendor supplied MET data.

IMPACT:

None.

JUSTIFICATION:

No changes to the program or lower tier documents, this change clarifies the passage in the ODCM. Dose calculations are still performed per NUREG 0133 at the most limiting sector.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 19*

OBJECTIVE:

Clarify Section 2.8 to include bases for the Technical Specification, RECS, and FSAR requirements for Gas Decay Tank curie limits.

DESCRIPTION OF CHANGES:

The NUREG 0133 basis equation is referenced with chosen dose factors and MET data from the FSAR to more clearly show the Xe-133 equivalent and accident mixture bases for curie limitations.

After identifying these limitations, a phrase was added under 2.8.2 to explain the basis for the add tional conservativism established in FSAR 14.2.3 (which further limits the activity in a Gas Decay Tank to 6000 curies each, due to the fact that the entire series of tanks may be interconnected).

IMPACT:

None

JUSTIFICATION:

The fact that the tanks can be interconnected was established in the FSAR as cause for further limiting the source term. The established, more-conservative limit of 6000 Curies is included in Section 2.8.2 for consistency, as an appended paragraph after the NUREG 0133 method is shown.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 20*

OBJECTIVE:

Update Tables 2-4, 2-6, 2-8, and 2-9. This includes 1) updating for the most recent averaged MET data, 2) updating/merging the assumed radionuclide mix for determining noble gas dose factors to be used in the combined efforts to control proximity to release rate (10CFR20), 3) updating/merging the quoted distances to the site boundary and nearest residents between the various governing documents which include this information.

DESCRIPTION OF CHANGES:

Updated the Finite Cloud Correction Factors (and subsequent dose factors) for total body and air gamma dose per the new 10-year averaged data (collected 1992 to 2002). Updated Tables 2-8 and 2-9 with new more recently determined data.

IMPACT:

None, except for the setpoint calculations, re-evaluated with the new data. These values will be incorporated in the implementing procedure SMM-CY-001.

JUSTIFICATION:

NUREG 0133 suggests updating the annual average data periodically, and industry standard has been 10 years or less. There is an approximate 10% variance from previous data, collected 1982-1992. The methodology remains the same, directly from NUREG 0133 and Reg Guide 1.109. The Finite Cloud correction factor methodology was not updated and it's use has been accepted as a basis for the ODCM. The meteorological data collection and reduction to generate dispersion and deposition coefficients is identified as Reference 9, and includes the recent update.

Table 2-8 was updated with more recent mixtures of radionuclides from which weighted average and instantaneous dose factors could be generated. These values are conservative, but much more accurate than those employed in the previous version, as they referred to mixtures consistent with fuel in the 1970s. The new mixtures were derived from actual and recent worst-case conditions of reactor coolant, which is inherently conservative to the mixture of gas expected to be released. An IPEC memo was included in the References (#21) to provide a basis for this information.

Table 2-9 identifies newly determined distances to the site boundary, measured from the applicable unit's Plant Vent release point. The distance to the nearest resident was measured ONCE, with Global Positioning Software, using the unit 1 superheater stack as the point of origin. The values did not change appreciably, but the effort to identify these values from an IPEC perspective will assist in the final combining of unit 2 and 3 ODCMs into one (planned for the next revision). Additionally, one source document (a memo identified as Reference #22) will serve as a formal basis for future considerations.

OBJECTIVE:

Modify the title of Section 3 to properly include all subcategories.

DESCRIPTION OF CHANGES:

Section 3 had previously been entitled "40CFR190 Dose Evaluations", but this was only one of the sub-categories under this section. Changed section title to "Total Dose Evaluations" and assigned sub-sections as follows:

3.1 40CFR190 Dose Evaluation
3.2 Doses From Liquid Releases
3.3 Doses From Airborne Releases

Also removed unnecessary statement regarding "calculation of doses only when desired". This verbiage was in reference to an antiquated software code which poorly estimated releases and is now retired. Currently, a more modern 10CFR50 tracking database product provides this function at any time.

IMPACT:

None

JUSTIFICATION:

Restructuring paragraphs and clarity improvement only.

OBJECTIVE:

Modify Section 4.0 to use Allowed Diluted Concentration (ADC) to determine liquid effluent monitor setpoints, and authorized release rate limits for airborne effluents.

DESCRIPTION OF CHANGES:

Replaced the old method of determining a general worst case requirement (Section 4.1), with a more modern application of determining the dilution requirements of EVERY release with the effected isotopic mixture and concentrations for each release. In the place of the terse and complicated one-time approach, this section now includes the simple calculation for ADC with every release, and includes the compensated effect of best-estimated beta emitters, which had NOT been employed in the past.

Added direction in Section 4.2 to apply the defined authorized release rate limits as a means of providing a tiered management tool for airborne effluents.

Monitor conversion factor discussions were removed to Appendix F and bases documents, not required to be in the ODCM.

IMPACT: (see item #1)

JUSTIFICATION:

In addition to the justification found in item #1, these changes simplify the process for both liquid and airborne monitor alarm and warn setpoint generation. They provide a basis for generation of specific data that is planned for storage in a more accessible application in the unit 2 CCR, such that setpoints subject to change can be controlled with an improved process, retiring the ineffective "operator aid" which had been in place.

Historical information regarding the bases for particulate monitors, etc, was captured for historical reference, but removed from the ODCM because effluent particulate monitors are no longer in use.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 23*

OBJECTIVE:

Remove the superfluous data under Section 5.0 to a basis document and simplify the equation for LLD to an industry standard presentation.

DESCRIPTION OF CHANGES:

Applied the generic industry standard LLD equation, with sufficient bases information for applicability to all effluent or environmental monitoring.

Other bases information was removed from the ODCM to historical documents for reference value only.

IMPACT:

None.

JUSTIFICATION:

No changes to the application of LLD. The elongated integrating and non-integrating monitor equations and their elaborate breakdown is not the intent of this section of the ODCM, and is better served as a reference document. Furthermore, the 3-page effort to define LLD for the VC particulate monitor is NOT part of the effluent program and did not belong in the ODCM. The standard representation from Currie, L.A, 1968, and NUREGs 0133, 0472, and 1301 were used to define LLD.

This discussion and example equation are more in line with industry standard and will assist in the planned merging of the two unit ODCMs in the near future.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 24*

OBJECTIVE:

Update Appendix A with new annual average MET data from 1992 to 2002.

DESCRIPTION OF CHANGES:

Contracted original vendor (Entech Engineering) and established updated MET constants, in the same format as the previous work (Reference #9) with newer raw data. Dispersion and deposition factors were slightly modified as a result of using the new 10-year averaged data and included on this Appendix.

IMPACT:

The new factors were employed in back-calculating new reduced uCi/sec administrative limits. These new limits will need to be inserted in the implementing procedures (SMM-CY-001, SOPs, and Eplan).

JUSTIFICATION:

NUREG 0133 suggests updating the average MET data. Industry standard periodicity for this update is 5-10 years. The author of the first effort performed the work as an employee of Indian Point 3. The same individual performed this most recent update for IPEC as a contractor under a purchase order.

Keeping annual average MET data current is an expectation of the NUREG. Averaging data over ten years provides for a greater sample size and better statistics with regard to averaged MET constants to be used for random releases.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 25*

OBJECTIVE:

Relocate information from old Appendix B to Table 2-9, and split old Appendix C (2 pages) into Appendix B and Appendix C (one page each)

DESCRIPTION OF CHANGES:

Moved sector identification, and information regarding distances from the site to Table 2-9 (item # 19).

Moved the liquid effluent flow diagram to Appendix B, leaving Appendix C as only the gas diagram.

IMPACT:

None

JUSTIFICATION:

This move was performed to maintain the table headings sequential, and for clarity. There is no need to provide the sector and distance data again in the Appendices, they are already in Table 2-9.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 26*

OBJECTIVE:

Change title of Appendix D to be more clear.

DESCRIPTION OF CHANGES:

Identified Appendix D as "Steam Partition Factor Calculation (f)"

IMPACT:

None.

JUSTIFICATION:

This calculation was not well understood because it's applicability was not defined. This lack of definition or purpose stemmed from the previous title, which simply identified the Appendix as the "Factor f Calculation". Applying an appropriate title will ensure this Appendix is referenced for bases information regarding the split of airborne and liquid effluent from flash tanks, based on enthalpy of the steam.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 27*

OBJECTIVE:

Update Appendix E and F to include application and basis information for Allowed Diluted Concentration (ADC).

Remove previous superfluous information to a historical basis file.

DESCRIPTION OF CHANGES:

Appendix E shows the mathematical basis and derivation for ADC, and why it is superior to a one-time default application which lacked any control for Tritium or other Beta emitter.

Appendix F had been a detailed example of calculating and applying isotope specific energy–based conversion factors for use in determining a monitor "calibration factor". The term was corrected to "conversion factor". The final paragraph of this Appendix in previous revisions, accurately defined what was actually happening with these monitors. It was incorporated at the beginning of the updated Appendix F, and a brief description of monitor conversion factors was included. The rest of the detailed Appendix was captured in a separate document (IPEC-CHM-05-022, Reference 23).

IMPACT:

See item #1 for ADC impact on Appendix E.
No impact for update of Appendix F.

JUSTIFICATION:

These updates coincide with those identified in item #1, for application of Appendix E changes.

The method for determining monitor conversion factors does not change from the method employed, and is accepted as industry standard. The isotope-specific method of independent energy contribution will be maintained as an independent reference document, but not included in the ODCM.

Unit 2 ODCM Revision 9 Update *Sep, 2005* *item 28*

OBJECTIVE:

Update Appendix I with the new MET data.

DESCRIPTION OF CHANGES:

Updated the table on page 1. Recalculated the instantaneous release rates with the new shared mixture and MET data. Recalculated new averaged release rates for administrative control of routine setpoints.

IMPACT:

No impact to programs or methodologies, but any calculation using the old MET data constants will need to be updated. For example, this will include the back-calculated uCi/sec limits associated with the maximum "Tech Spec" release rates in SMM-CY-001 and the Eplan.

JUSTIFICATION:

NUREG 0133 suggests updating the average MET data. Industry standard periodicity for this update is 5-10 years. The author of the first effort performed the work as an employee of Indian Point 3. The same individual performed the update for IPEC as a contractor under a purchase order.

Updating the back-calculated uCi/sec from expected worst-case releases with this MET data results in slight modifications of established limits. These limits, however, are tied to the more defendable shared isotopic mixtures, better fuel than that of the 1970's, and the updated 10-year MET data. These kinds of upgrades are in keeping with requirements of Reg Guide 1.109, NUREGs 0133, NUREG 0472, and NUREG 1301. It is also industry standard practice to update these site-specific parameters periodically.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 1*

OBJECTIVE:

Relocate the definition of Primary to Secondary Leak to the more appropriate location of RECS definitions.

DESCRIPTION OF CHANGES:

Add Step 1.6 for the definition, relocated from Part II, Sec 1, Table 1-1, note 4.

IMPACT:

Chemistry procedure RE-CS-110 needs to reference the correct new location.

JUSTIFICATION:

This change in location does not alter the intent of the declaration of a primary to secondary leak. The definition is better located in the RECS definition section.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 2*

OBJECTIVE:

Remove the confusing Section 4 (requirements for recorders) of RECS Tables 2.1-1 and 3.1-1 which do not apply at IPEC unit 3.

DESCRIPTION OF CHANGES:

Simplify/Clarify these tables with specific requirements for IPEC only, removing the section for recorders, which is not required.

IMPACT:

None

JUSTIFICATION:

NUREG 1301 includes this section only for those recorders with alarm or trip setpoints driven from the recorder, as stipulated in NUREG 1301, page 19. Since IPEC's alarm/trip setpoints are driven from the detector's RM-80 module, this section has never been required.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 3*

OBJECTIVE:

Update RECS Tables 2.1-1 and 3.1-1 to include specific requirements for the Condensate Polisher Facility (CPF) and to apply a 24 month periodicity universally for refueling tests.

DESCRIPTION OF CHANGES:

Applied specific requirements for R-61 and the CPF effluents instrumentation (rather than use an implied reference to identical requirements for R-18 and the routine liquid waste effluent line). Modified the channel calibration for R-23, liquid waste flow rate meter, and tank level indicators to 24 months.

IMPACT:

None. (Existing calibration periodicity can be relaxed from 18 months to 24 months as time permits).

JUSTIFICATION:

The calibration periodicities left at 18 months when the unit went to 24 month cycles were left at the old values to preclude having to change tests. However, there is no failure rate or other justification for NOT moving these periodicities to the standard refueling period of 24 months. Tests may or may not be physically altered to this more relaxed periodicity, but NUREG 1301 and other bases information prescribes these calibrations as "R", signifying a refueling basis. Specific information regarding the CPF instrumentation is directly applied from NUREG 1301, as this pathway's requirements are identical to the liquid waste pathway, when a primary to secondary leak exists. Providing specific information on the applicable row for the CPF instrumentation precludes potential confusion as to when the requirements apply.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 4*

OBJECTIVE:

Restructure RECS Table 2.2-1 Section 3 for greater clarity and remove the Reg Guide 1.97 requirement for R-27.

DESCRIPTION OF CHANGES:

Noble Gas rad monitors and pathways were broken up in RECS Section 3.a. to show all three pathways and specific notation applicable to each one. Removed Action 12 (R-27's Reg Guide 1.97 requirement) from the table, as well as the list of Actions.

IMPACT:

None

JUSTIFICATION:

R-27's Reg Guide 1.97 requirement for the 7-day/14-day PAM report were conservatively added to the ODCM in 2000 during initial implementation of Generic Letter 89-01. At this time, the PAM requirements were also covered in the TRM and FSAR. Experience has revealed that inclusion in the ODCM as well only caused confusion, so any reference to post accident monitoring requirements from Reg Guide 1.97 were removed from this table, simplifying it to establish the effluent criteria for both R-14 and R-27 only. Coverage of the Reg Guide 1.97 requirements for R-27 remain in the TRM and the FSAR.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 5*

OBJECTIVE:

Modify RECS Table 3.2-1 Sec 3 for clarity with regard to each noble gas pathway and the flow rate meter requirements.

DESCRIPTION OF CHANGES:

Split continuous effluent release points for noble gas similar to Table 2.2-1. Identified 24 months as the channel calibration periodicity requirement for the process flow meter and updated footnote "c" to clarify that this instrument is generally associated with the noble gas process rad monitor.

IMPACT:

None

JUSTIFICATION:

The splitting of noble gas release points is a cosmetic improvement for clarity. NUREG 1301 lists the flow rate instrument channel calibration requirements as "R" for refueling. There are no data to support more periodic calibrations than necessary, so the old value of 18 months was changed to 24 months, per NUREG 0472 and NUREG 1301. Actual calibration procedures may be performed more frequently.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 6*

OBJECTIVE:

Modify footnotes under RECS Table 3.4.1-1 to clarify collection of 24-hour charcoals on continuous airborne vent pathways.

DESCRIPTION OF CHANGES:

Reworded footnote "c" to list conditions first, consequences last, matching unit 2 format.
Reworded footnote "g" to clarify that 24-hour charcoals are also required (in addition to footnote c), on a routine basis, should Iodine-131 be identified on any of the routine weekly airborne vent charcoals.

IMPACT:

None.

JUSTIFICATION:

These typographical improvements improve clarity and describe the actual activities applied to ensure compliance with NUREG 1301 for quantification of short lived Iodines. The improved wording on footnote "g" clarifies previous confusion with regard to measurement of I-132 through I-135 on a routine basis.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 7*

OBJECTIVE:

Update ODCM Part II, Section 1.2.1 from the new MET data and subsequent update of Appendix A.

DESCRIPTION OF CHANGES:

Used the new information from Entech Engineering (Reference 17) to update Appendix A, and the summary thereof in Section 1.2.1 of Part II of the ODCM. The new MET data application resulted in slightly modified uCi/sec administrative limits for this section, and for lower tier procedures.

IMPACT:

IP-SMM-CY-001 will require an update with these new conservative administrative limits.

JUSTIFICATION:

The methodology has not changed for back-calculating these release rate limits. The precise averaged atmospheric dispersion factor upgrades from the latest MET averaging resulted in a slightly increased release rate criteria.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 8*

OBJECTIVE:

Add detail to the dose equation in ODCM Part II, Section 2.4.2 to include a variable defining the number of isotopes. Additionally, expand the definition of Fk to better document the initial and corrected means of determining the dilution and subsequent dose calculations for liquid effluent from IPEC.

DESCRIPTION OF CHANGES:

The equation previously used variable "n" as the upper limit of summation for both isotopes and releases. Used variable "m" to identify the isotope upper limit. Clarified terms to preclude confusion with regard to the two methods of calculating dose: 1) using total time of all releases, or 2) using a period total duration. Identified that doses are immediately calculated with concurrent dilution flow, then recalculated with quarterly dilution for the annual effluent report. The final paragraph in this section was clarified to more clearly present the fact that doses are recalculated with quarterly dilution for long term assessment.

IMPACT:

None

JUSTIFICATION:

The improvement in equation variables is for clarity only, with no changes to the calculation. The bases documents, NUREG 0133, Reg Guide 1.109, and Reg Guide 1.21 allow averaging liquid effluent diluted concentration and subsequent 10CFR50 dose calculations over a quarter. This clarification in the wording does not change any policy or operation of the effluents program, but more clearly defines how we comply with these regulations, and how the annual effluent report (Reg Guide 1.21) is submitted.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 9*

OBJECTIVE:

Modify ODCM Part II, Sec 2.4.3.1 to identify IPEC (not IP3 or IP2) and include all applicable references to site specific dose factors.

DESCRIPTION OF CHANGES:

Changed IP3 to IPEC and included references to all applicable site-specific dose factors: (References 2,12,13,and 25)

IMPACT:

None

JUSTIFICATION:

Liquid dose factors have been common for IPEC since 2003, per guidance in NUREG 1301 and the quoted bases for the site-specific data. This update in wording is for clarity only.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 10*

OBJECTIVE:

Modify ODCM Part II, Sec 3.1.5 to identify the Chemistry Superintendent and clarify VC Purge reclassification to building ventilation.

DESCRIPTION OF CHANGES:

This section of the ODCM describes airborne releases which may last over one day. It was modified to clarify the correct titles and to account for the specific reclassification of the VC Purge, substituting "reclassification" for the word "terminated" as the closing criteria for the permit.

IMPACT:

None

JUSTIFICATION:

No change in operation or permitting, this modification is for clarity only. The distinction between building ventilation and batch releases, signifying the termination of the permit for the VC Purge, remains unchanged, and is in keeping with guidance from NUREG 1301 and 0133.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 11*

OBJECTIVE:

Modify ODCM Part II, Sec 3.1.8 to use proper titles for individuals whose permission is required for using various release rates.

DESCRIPTION OF CHANGES:

Changed titles to Site Operations Manager, General Manager-Plant Ops, and the Chemistry Superintendent, per the latest nomenclature.

IMPACT:

None

JUSTIFICATION:

No change in the level of permission required, only the wording of the titles.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 12*

OBJECTIVE:

Modify ODCM Part II, Sec 3.1.17 and 3.3.3.2 to refer to the Monitor Tank special dispersion constant in another paragraph (specifically Section 3.5.3).

DESCRIPTION OF CHANGES:

Inclusion of the actual value in sec/m^3 in these locations was superfluous and produced an error-likely situation for any potential updates. Instead, the appropriate value is listed where these factors are identified (Section 3.5.3 in the meteorological section), and simply referenced in earlier sections.

IMPACT:

None

JUSTIFICATION:

No changes in operation or calculation of the ODCM, typographical improvement only.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 13*

OBJECTIVE:

Modify ODCM Part II, Sec 3.1.20 to identify that the listed release points are ground level, while others, unless noted, are identified as "mixed mode".,

DESCRIPTION OF CHANGES:

This modification in the wording more accurately reflects the correct methods being used at both plants. Release points that are directly off a building (not atop the Plant Vent) are identified as ground level. While the Plant Vent cannot be called "elevated" Ref 17 defends the method of identifying and using the term "mixed mode" to warrant special meteorological conditions.

IMPACT:

None

JUSTIFICATION:

The careful distinction of "ground level releases" is taken directly from NUREG 0133. The application of "mixed mode" is unchanged. This modification clarifies which release points are which.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 14*

OBJECTIVE:

Modify ODCM Part II, Sec 3.5.1 to clarify the site boundary and nearest resident measurements from IPEC.

DESCRIPTION OF CHANGES:

Slight modifications were made to update the exact distances to the site boundary and nearest resident at IPEC. (Reference 31). This section references Table 3-9 with the updated distances. Each site boundary distance was measured with a scaled topographical map from the applicable unit's Plant Vent release point. The distance to the nearest resident was established as a common value for IPEC, measured by Global Positioning from the unit 1 superheater stack. While these values did not change appreciably, the work identified in Reference 31 provides a more succinct and inspectable bases for the values chosen.

IMPACT:

None

JUSTIFICATION:

The definitions and methods for measuring these criteria comply with NUREG 0133, with the more modern and accurate GPS equipment providing detailed locations for the nearest resident.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 15*

OBJECTIVE:

Modify ODCM Part II, Sec 3.5.2, 3.5.3, and Reference 17 to include the update 10-yr averaged MET data provided by Entech Engineering in December, 2004.

DESCRIPTION OF CHANGES:

The MET data was updated with averaged data from 1992 to 2002, by the same individual who performed the first averaging, so this reference was appended as an update to Reference 17. This data includes the worst sector dispersion and deposition factors from the modeling used, as well as the subsequent noble gas dose factors generated from this data (identified later in this package).

IMPACT:

No impact from updating Section 3.5.2 and 3.5.3. Other impact from the MET data update is discussed later in this package.

JUSTIFICATION:

There was no change in the methods or calculations used to determine dispersion or deposition factors, however, the originating source data was updated from that of the 1980s, to a ten year period from 1992 to 2002. This periodic updating of averaged MET data is in keeping with the methodology identified in NUREG 0133, pages 7-36.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 16*

OBJECTIVE:

Modify ODCM Part II, Sec 3.5.4 definitions of Wn to defer actual numerical values to Attachment A.

DESCRIPTION OF CHANGES:

Removed the previously calculated values from this section and inserted a reference to Attachment A to preclude an error-likely situation with future MET updates. The MET data summary is captured in the Attachment.

IMPACT:

None

JUSTIFICATION:

Typographical clarity. Data was referenced to a new location in the ODCM.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 17*

OBJECTIVE:

Add new short term MET data for both units in ODCM Part II, Sec 3.5.6.

DESCRIPTION OF CHANGES:

Determined the site boundary and nearest resident dispersion and deposition factors for short-term releases for BOTH units from the new MET data provided in Reference 17. In addition to the old format from this section, unit 2 values were added in preparation of merging the two ODCMs. The specific values for the slope ("m") were slightly altered with the new averaged MET data and summarized in this section with a more clear format for potential use in any release deemed to be short-term.

IMPACT:

None. Unit 2 ODCM already refers to this section of the unit 3 ODCM when needed.

JUSTIFICATION:

The calculation of the 15th percentile short term correction factor did not change from that originally discussed in Reference 17. However, with the new MET data, the values changed slightly. The new format of this section presents the actual values more clearly, for both units. These calculations and correction factors are in keeping with NUREG 0133, page 7-8 and the specific definition of short term releases.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 18*

OBJECTIVE:

Modify Tables 3-4 and 3-6 with the new noble gas dose factors from the updated MET data.

DESCRIPTION OF CHANGES:

Dose factors Ki and Mi (total body and air dose from gamma radiation) were modified due to the updated finite cloud correction factor, from the updated MET data.

IMPACT:

Hand calculations and computer models for calculations of dose must update these factors for correct dose assessment after implementation of this revision. This data is a known variable in established computer modeling and is an expected step in the successful operation of IPEC's program.

JUSTIFICATION:

This factor was calculated per prescribed criteria in Sections 3.5 and 3.6 per NUREG 0133. The methods of determining these values did not change. The actual correction factors for each nuclide were modified slightly due to the new averaged MET data, per Reference 17.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 19*

OBJECTIVE:

Update and solidify the instantaneous and time average mixture for determining conservative dose factors for noble gas releases, in uCi/sec, on Table 3-8 of ODCM Part II, Sec 3.

DESCRIPTION OF CHANGES:

From operational history, and Reference 30, typical mixtures were established for instantaneous and time averaged releases, for purposes of establishing conservative back-calculated release rates in uCi/sec, per Attachment A. Table 3-8 establishes the new chosen mixtures and the resulting dose factors.

IMPACT:

The dose factors calculated from this table are used in Attachment A to update the conservative uCi/sec limits for instantaneous and time-average releases. These limits are provided in the lower tier document: IP-SMM-CY-001. This procedure will require an update to reflect these new limits.

JUSTIFICATION:

There is no change in the format or method of this calculation, however, the values changed slightly due to the updated assumptions for the two mixtures. These assumptions are historically based, rather than unnaturally conservative, and are presented in Reference 30. The purpose of this table remains the same: to provide default dose factors for back-calculating release rate limits in terms of uCi/sec, to assist Operations in setting Radiation Monitor setpoints and Eplan criteria.

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 20*

OBJECTIVE:

Modify Table 3-9 with the new distances to the Site Boundary and nearest residents, from Reference 31.

DESCRIPTION OF CHANGES:

These distances were slightly modified (per item #13) to enhance station consolidation and to verify distances with modern maps and GPS equipment. Measurements were simplified such that each unit's distance to the site boundary was measured from the unit's Plant Vent, and the distance to the nearest resident was measured from the unit 1 superheater stack, to provide a common IPEC measurement.

IMPACT:

Data from the slightly modified locations was input to the work performed in Reference 17 for calculation of dispersion and deposition factors at the worst sector. The locations of the worst sector did not change, but there were minor modifications to the MET factors, incorporated in this ODCM revision.

JUSTIFICATION:

Determination of distances to the Site Boundary and Nearest Resident was conducted in accordance with NUREG 0133. The distance to Site Boundary does not apply over water and this information is noted in the table. There is no change in the format or intent of this table, but the values changed slightly in order to perform a modern evaluation with appropriate basis information (Reference 31).

Unit 3 ODCM Revision 17 Update *Sep, 2005* *item 21*

OBJECTIVE:

Update old Appendix 3-A, renaming it to simply Appendix A, and using the new 10-yr averaged MET data from Reference 17.

DESCRIPTION OF CHANGES:

The work provided in Reference 17 was primarily requisitioned to update this Attachment with new MET data. This Attachment demonstrates the back-calculations performed to create administrative release rate limits in uCi/sec. Dispersion and deposition factors from Reference 17 are used, as well as assumptions from Reference 30 with regard to nuclide mixtures. The identical equations were re-evaluated to determine the new limits with these slightly modified input parameters.

IMPACT:

Lower tier documents IP-SMM-CY-001, and Operations procedures (SOP-WDS-13 and 14 for unit 3, SOP 5.1.5 and 5.2.4 for unit 2) will need to be updated to reference the newly calculated uCi/sec release limits from this upgrade.

Additionally, the SITE maximum release rate limit in use for Eplan will need to be updated to the new value, in order for correct assessment of proximity to "Technical Specification" limits, identified in Block 6 of the Eplan EP form 1.

JUSTIFICATION:

The calculations for these determined release rates did not change. The input parameters were slightly modified from the updated MET data and newly established noble gas mixtures for the site. The back-calculated uCi/sec release rates were determined in keeping with NUREG 0133 and other IPEC ODCM parameters. Renaming the appendix as simply "A" eliminates some confusion and assists in the eventual merging of the station's ODCMs.

Indian Point Energy Center
(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

H. GROUNDWATER and STORM WATER ACTIVITY ON SITE

Jan 1, 2005 - Dec 31, 2005

IPEC Groundwater and Storm Water Activity and Dose Calculation, 2005

The following water mass balance methodology was used as a conservative interim measure for curie and dose impact for the 2005 annual effluent report. When sufficient data becomes available from the existing and planned monitoring wells, this assessment may be refined.

The basic methodology for this dose assessment was based on an overall mass balance driven by precipitation. The hydrology portion of this assessment was performed by representatives from IPEC's consultant company, GZA GeoEnvironmental, Inc. IPEC concurs with this methodology. This "watershed analysis" partitions the precipitation falling on the watershed catchment area (i.e., that portion of the Facility area where the surface topography is sloped towards the river) into water that infiltrates the ground to become groundwater (GW), water that flows off the surface as storm water (SW) and that water which directly moves back into the atmosphere via evapotranspiration and other processes. This "top down" method of analysis is based on well established hydrologic principles. Our selection of parameters is heavily biased towards larger flows and higher concentrations of H^3 and Sr^{90}. As such, this analysis results in estimates of activity moving to the river (both directly and via the Discharge Canal) that will most likely prove to be substantially conservative after additional data becomes available.

Over the entire watershed catchment area of 3.2 million ft^2, the GW and SW has been segmented relative to the areas of the facility through which it flows (primarily established based on H^3 concentrations in the various facility areas). The bulk of the GW activity however, is identified near the transformer yard of Unit 2.

Overall, the partitioning was established as follows for infiltration areas contributing to GW flow (does not include paved or building areas):

GROUNDWATER AREAS:

- **AREA 1.** The northwestern most area where GW appears to move directly to the river, but passes to the north of the Unit 2 Turbine Building Road (area of 0.25 million ft^2). This GW is unlikely to contain appreciable H^3 concentrations based on the data available to date and the lack of likely H^3 sources;
- **AREA 2.** The area where the GW appears to move through Unit 2 facilities (area of 0.57 million ft^2);
- **AREA 3.** The area where the GW appears to move through Unit 1/3 facilities (area of 1.7 million ft^2);
- **AREA 4.** The southwestern most area where GW appears to move directly to the river, but passes to the south of the Unit 3 Turbine Building Road (area of 0.67 million ft^2). This GW is unlikely to contain appreciable H^3 concentrations based on the data available to date and the lack of likely H^3 sources.

SW flow from paved areas and building roof areas has also been partitioned into various zones within the above Facility GW areas as follows:

STORM WATER AREAS:

- **ZONE A.** The eastern most parking lots which likely drain along flow paths where the SW is unlikely to contain H^3, and storm drain exfiltration into the GW flow zone is also unlikely to pick up H^3 (area of 0.35 million ft^2);
- **ZONE B.** Within the Unit 2 Facility, the eastern and western zones where SW appears to discharge to the river, but does not pass through the Unit 2 Transformer Yard (area of 0.21 million ft^2);

- **ZONE C.** Within the Unit 2 Facility, the middle zone where SW flows to the Discharge Canal, and does pass through the Unit 2 Transformer Yard (area of 0.15 million ft^2);
- **ZONE D.** Within the Unit 1 Facility where SW flows to the Discharge Canal (area of 0.13 million ft^2); and
- **ZONE E.** Within the Unit 3 Facility where SW flows to the Discharge Canal (area of 0.75 million ft^2).

A portion of the SW has been assumed to leak out of storm drains and thus increases the GW flow to the river as follows:

- **ZONE A.** Storm drain exfiltration =0% - set to 0% because exfiltration from pipes in this zone are unlikely to contribute flow to GW which contains H^3 and the SW itself is unlikely to contain H^3;
- **ZONE B.** Storm drain exfiltration =0% - set to 0% because exfiltration from pipes in this zone are unlikely to contribute flow to GW which contains H^3 and the SW itself is unlikely to contain H^3;
- **ZONE C.** Storm drain exfiltration =25% - set to a relatively high value to result in higher than anticipated GW flow through the Unit 2 Transformer Yard which contains the highest H^3 GW values, so as to be conservative;
- **ZONE D.** Storm drain exfiltration =50%; set very high given current knowledge of these drains; and
- **ZONE E.** Storm drain exfiltration =10%; set to a nominal value given current lack of specific data and limited impact on overall H^3 flux due to low H^3 concentrations.

H^3 concentrations have been established for all Areas and Zones using 2005 data. Very conservative Nickel-63 and Strontium-90 have been included for groundwater flow from an early sample result in Area 2.

- **GW flow AREA 1.** [H^3] = 0 pCi/L given lack of likely H^3 source areas and flow path which appears not to flow through areas exhibiting H^3 concentrations in the GW ;
- **GW flow AREA 2.** [H^3] = 200,000 pCi/L which represents an upper bound average of the concentrations found in the Unit 2 Transformer Yard . It is expected that the pending Phase I and II data will prove this assumed value for H^3 in the GW moving to the river through the Unit 2 area to be significantly higher than actual values. Very conservative Ni^{63} and Sr^{90} source terms were added (100 and 50 pCi/L, respectively) from a single early sample from a Monitoring Well in March, 2006.
- **GW flow AREA 3.** [H^3] = 620 pCi/L which represents an upper average of the concentrations found in the Unit 1 and 3 Facility areas;
- **GW flow AREA 4.** [H^3] = 0 pCi/L given lack of likely H^3 source areas and flow path which appears not to flow through areas exhibiting H^3 concentrations in the GW;

- **SW flow ZONE A.** [H^3] = 0 pCi/L given that exfiltration from pipes in this zone are unlikely to contribute flow to GW which contains H^3 and the SW itself is unlikely to contain H^3;
- **SW flow ZONE B.** [H^3] = 651 pCi/L given measured storm drain concentrations;
- **SW flow ZONE C.** [H^3] = 2,900 pCi/L given measured storm drain concentrations;
- **SW flow ZONE D.** [H^3] = 1,560 pCi/L given measured storm drain concentrations; and
- **SW flow ZONE E.** [H^3] = 1,560 pCi/L given measured storm drain concentrations.

The infiltration rate in non-paved/building areas was established at 0.46 feet/year based on the USGS report: Water Use, Groundwater Recharge and Availability, and Quality in the Greenwich Area, Fairfield County, CT and Westchester County, NY, 2000 - 2002. The precipitation rate for the area was set at 3.74 feet/year based on onsite meteorological data.

Based on the above analysis, it is estimated that approximately 1.36 Ci/year of H^3 migrates directly to the river via the GW flow path. It is also estimated that less than 0.02 Ci/year flows directly to the river via SW. It is further estimated that approximately 0.16 Ci/year flows to the river with SW via the Discharge Canal.

It is noted that the H^3 concentrations adopted herein are expected to represent values which are significantly greater than those which actually exist given the conservatism exercised during parameter selection. An example of the conservatism employed in these assessments includes:

- H^3 concentrations selected for the various GW and SW flows are likely to be higher values than actually exist. It is believed that these values will be proven to be significantly too high with the acquisition of additional Phase I and II data. This is particularly true for the 200,000 pCi/L adopted for the Unit 2 Transformer Area;
- The areas contributing GW flow through various IPEC Facilities was biased toward placing more flow through the Unit 2 Transformer Yard where the highest H^3 concentrations were used;
- All GW flow has been assumed to discharge directly to the river. Some of this GW flow must infiltrate the Discharge Canal thus reducing the apportionment to the river;
- All storm drain pipe leakage has been assumed to be exfiltration which will increase GW flow values. However, current data in the Unit 2 Transformer Yard indicates that significant GW infiltrates the storm drain during rainfall events, thus flowing to the Discharge Canal via SW rather than directly to the river as GW. In addition, it is noted that SW H^3 concentrations were typically obtained during non-storm events and thus represent the high end of H^3 values associated with low flow conditions. However, these high H^3 concentrations, were then applied to the much higher storm flows where much lower H^3 values should exist;
- All precipitation falling on paved/building areas was assumed to result in SW flow. Some of this water actually evaporates directly to atmosphere from pavement and buildings; and
- The very large value of GW flow extracted from the GW system via the Unit 1 curtain and footing drains has not been subtracted from the GW flows adopted in the analysis.
- The application of Ni^{63} and Sr^{90} at values determined from one early sample at a Monitoring Well between the Discharge Canal and the Hudson River in early March, 2006.

Results:

The results of the assessment are shown on the following table. These dose values were added to the table in the Dose to Man section of this report (Section E).

The annual dose from the groundwater and storm water (with the very conservative inclusion of Sr and Ni) remains well below the applicable limits (approximately 0.1%). These results are considered to be quite conservative due to assuming Sr^{90} and Ni^{63} concentrations from a single location as being representative of the bulk fluid in Area 2 for the entire year. These source terms will be re-evaluated after additional Monitoring Well data is assessed.

Total IPEC Summary for Ground Water releases in 2005 (H-3, Ni-63, Sr-90)

Sum of two monitoring well calculations, IP2 and IP3, Areas 2 and 3

Doses, in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.52E-05	1.52E-05	*1.36E+06*
Ni-63	1.32E-03	9.17E-05	4.44E-05	0.00E+00	0.00E+00	0.00E+00	1.91E-05	*6.70E+02*
Sr-90	8.40E-03	0.00E+00	2.06E-03	0.00E+00	0.00E+00	0.00E+00	2.42E-04	*3.35E+02*
totals	9.72E-03	1.07E-04	2.12E-03	1.50E-05	1.50E-05	1.50E-05	2.76E-04	***1.36E+06***

Storm Drain Water from Zone B, East/West Unit 2, near MH-2, going to river directly

Doses, in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	1.63E-07	*1.46E+04*

Storm Drain Water from Zones C and D/E (Central U2 & U1/U3) to Discharge Canal

Doses, in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	2.82E-08	2.82E-08	2.82E-08	2.82E-08	2.82E-08	2.82E-08	*1.58E+05*

Totals: Doses, in mrem

H-3 only	0.00E+00	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.54E-05	1.54E-05	*1.53E+06*
	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi H-3*
H-3, Ni-63, Sr-90	9.72E-03	1.07E-04	2.12E-03	1.54E-05	1.54E-05	1.54E-05	2.76E-04	
% Annual Limit	*0.097*	*0.001*	*0.071*	*0.000*	*0.000*	*0.000*	*0.003*	