ENCLOSURE 1 TO NL-09-045

2008 Annual Radioactive Effluent Release Report

ENTERGY NUCLEAR OPERATIONS, INC
INDIAN POINT NUCLEAR GENERATING UNIT NOS. 1, 2, and 3
DOCKETS 50-3, 50-247 and 50-286

Radioactive Effluent Release Report: 2008

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 Guide, pages 10 to 12. This report includes effluent information from Indian Point units 1, 2, and 3. Units 1 and 2 share effluent processing equipment and Technical Specifications. In this site report, releases from Unit 1 are included with Unit 2, while Unit 3 releases are calculated and shown separately.

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 (ODCM), Parts I and II, as defined in the Technical Specifications. ODCM Part I, also known as the Radiological Effluent Controls (or RECS) contains the specific requirements and controls, while ODCM Part II (calculational methodologies) contains the details necessary to perform offsite dose calculations from the sampling and monitoring outlined in the RECS.

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. ADC is defined in the station ODCM as a means of assuring compliance with the release rate limits of 10CFR20, as defined by the application of ten times the Effluent Concentrations of the new 10CFR20.

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, a maximum gamma concentration of 5E-5 uCi/ml (without gas or tritium) for routine effluents, and procedural guidance for optimizing decay and treatment of liquid waste.

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	$\bar{E}_\beta$ =	1.49E-01 Mev/dis	$\bar{E}_\gamma$ =	6.56E-02 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	2.00E-01 Mev/dis	$\bar{E}_\gamma$ =	2.41E-01 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	2.50E-01 Mev/dis	$\bar{E}_\gamma$ =	3.13E-03 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	3.53E-01 Mev/dis	$\bar{E}_\gamma$ =	7.92E-01 Mev/dis

Unit 3:

1st Quarter	$\bar{E}_\beta$ =	4.64E-01 Mev/dis	$\bar{E}_\gamma$ =	1.28E+00 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	4.63E-01 Mev/dis	$\bar{E}_\gamma$ =	1.28E+00 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	4.35E-01 Mev/dis	$\bar{E}_\gamma$ =	1.17E+00 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	4.41E-01 Mev/dis	$\bar{E}_\gamma$ =	1.20E+00 Mev/dis

4. Measurements and Approximations of Total Radioactivity

a) Fission and Activation Gases

Analyses of effluent gases are 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 and compared to a process monitor's reading. Pressure reliefs are quantified by scaling subsequent releases with the monitor's reading, applying the mixture from the grab sample. In this fashion, the base grab sample defines the mixture and the activity released. The monitor scales the release up or down and provides continuous indication of potential leaks.

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, "-" is entered in Table 1A. A typical Minimum Detectable Activity (MDA) for weekly I-131 analyses is 1.0E-13 uCi/cc, which is 100 times lower than ODCM requirements.

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. An absence of any positive Gross Alpha value for the quarter is identified on Table 1A as "-". A typical MDA for gross alpha is 8.0E-14 uCi/cc, which is over 100 times lower than ODCM requirements.

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 there has been no positive Gross Alpha identified in a quarter, "-" is entered in Table 2A. A typical MDA value for Gross Alpha in liquids is 5E-8 uCi/ml, which is two times lower than ODCM requirements.

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).

The unprocessed water may still contain trace levels of contamination (generally only tritium) and as such, is identified as liquid waste and included in total curie and dose summaries in the following tables, along with all other liquid effluent, continuous or batch, processed or not.

However, to prevent confusion with regard to measures undertaken to convert liquid to solid waste (resin cleanup), the volumes of processed and unprocessed waste are reported separately on Table 2A.

5. Batch Releases

Airborne:

Unit 1 and 2 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2008
Number of Batch Releases		49	64	40	48	201
Total Time Period	(min)	4.35E+3	8.60E+3	2.54E+3	3.14E+3	1.86E+4
Maximum Time Period	(min)	3.02E+2	4.35E+2	1.82E+2	1.51E+2	4.35E+2
Average Time Period	(min)	8.87E+1	1.34E+2	6.35E+1	6.53E+1	9.27E+1
Minimum Time Period	(min)	5.00E+0	2.00E+0	4.00E+0	2.00E+0	2.00E+0

Unit 3 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2008
Number of Batch Releases		16	19	20	21	76
Total Time Period	(min)	1.95E+3	2.31E+3	2.28E+3	2.35E+3	8.90E+3
Maximum Time Period	(min)	1.70E+2	1.69E+2	1.72E+2	1.90E+2	1.90E+2
Average Time Period	(min)	1.22E+2	1.22E+2	1.14E+2	1.12E+2	1.17E+2
Minimum Time Period	(min)	6.00E+0	7.00E+0	5.00E+0	2.00E+0	2.00E+0

Liquid:

Unit 1 and 2 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2008
Number of Batch Releases		19	16	10	9	54
Total Time Period	(min)	1.58E+3	1.54E+3	1.55E+4	1.51E+3	2.01E+4
Maximum Time Period	(min)	9.90E+1	1.91E+2	5.90E+3	7.32E+2	5.90E+3
Average Time Period	(min)	8.32E+1	9.62E+1	1.55E+3	1.67E+2	3.72E+2
Minimum Time Period	(min)	2.00E+1	5.00E+1	8.40E+1	7.70E+1	2.00E+1

Unit 3 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2008
Number of Batch Releases		4	6	12	18	40
Total Time Period	(min)	4.73E+2	6.71E+2	1.32E+3	2.02E+3	4.49E+3
Maximum Time Period	(min)	1.25E+2	1.18E+2	1.16E+2	1.23E+2	1.25E+2
Average Time Period	(min)	1.18E+2	1.12E+2	1.10E+2	1.12E+2	1.12E+2
Minimum Time Period	(min)	1.08E+2	1.06E+2	1.03E+2	9.70E+1	9.70E+1

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 becomes available.

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

Year	Quarter	Flow (cfs)
2006	Fourth	93,200
2007	First	92,100
2007	Second	95,280
2007	Third	16,600

6. Abnormal Releases

a) Liquid

Groundwater

IPEC's groundwater monitoring program and the process (model) for quantification of effluent remained unchanged in 2008, from that of 2007. The resulting offsite dose as a result of the station's continuing natural attenuation was very small, similar to 2007's totals. Groundwater doses are included in the total dose table of Section E, the Dose-To-Man section of this report. Details of the IPEC Radiological Groundwater Monitoring Program are provided in Section H of this report, and include the following:

1) an update on the current condition of IPEC's GW natural attenuation,

2) a discussion of the removal of fuel (source term) from Unit 1, and

3) per the ODCM and NEI 07-07, a summary table of all groundwater radio-analyses results in 2008.

Unit 1 Foundation Drain (80-10)

In September, 2008, samples of a roof and footing drain system were initiated, per improvements in the site's IE Bulletin 80-10 program. Trace Cs-137 on the order of approximately 2E-7 uCi/ml was identified in the water.

Since the precise discharge rate was not known, an investigation ensued to not only determine the source of the Cs-137 contamination, but to better quantify the release to the discharge canal. (The Radiological Environmental Monitoring Program includes a composite sampler at the discharge point).

The most likely source of the Cs-137 is contamination related to legacy Unit 1 Pool leakage. Impact quantification and assessment was performed in accordance with the NRC's IE Bulletin 80-10.

A very conservative assessment performed on this pathway yields an extremely low dose of less than one one-thousandth of the limit. The annual summary in Sections C and E include this conservative assessment.

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.

ODCM Instrumentation:

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

Instrument	Out of Service Period	Details
R-14, Unit 3 backup plant vent noble gas monitor	Sept 6, 2007 to Jun 10, 2008 (278 days) (161 days in 2008)	Troubleshooting and engineering was initiated to investigate excessive background in the channel. No cause was determined. The noise subsided in early 2008, and the monitor appeared functional. Since the primary monitor (the WRGM) has a good performance record, and the background problem has not returned, it was decided to accept the current condition and return this monitor to service. No compensatory samples were required for this OOS condition (the primary monitor was operable).
R-43/44, Unit 2 plant vent particulate and noble gas monitor	Jan 2, 2008 to Feb 11, 2008 (40 days)	The monitor assembly was taken OOS due to frequent loss-of-power problems. Many internal parts were changed, but most of the spare parts installed were later found to be defective. Parts had to be re-ordered. After multiple unsat tests, and parts replacements, (each with long lead time from the vendor), monitor database was reloaded and passed retest. Compensatory samples were obtained as required during this interval.
R-46, Unit 3 admin building noble gas monitor	Mar 7, 2008 to May 9, 2008 (63 days)	At the conclusion of a quarterly test, a Control Room annunciator was found inoperable. A decision was then rendered to identify the monitor as OOS. Scheduling and prioritization challenges from a refueling outage delayed troubleshooting. The monitor was returned to service upon repair of the annunciator. Compensatory sampling was performed during the OOS interval.

Instrument	Out of Service Period	Details
R-61, Unit 3 condensate polisher TDS tank effluent	Mar 29, 2008 to Jun 20, 2008 (83 days)	The monitor was rendered officially inoperable due to a broken reset switch. There was an excessive delay in obtaining the replacement contact block. The switch was replaced and monitor declared operable. Compensatory samples were obtained during the OOS interval. (The ODCM requires this monitor only during a Primary to Secondary leak, which was NOT in effect.)
R-59, Unit 3 radiation machine shop vent noble gas monitor and process flow rate instrument	Aug 13, 2008 to Oct 14, 2008 (62 days)	The monitor was declared out of service due to a communication failure with the control room console, leaving only a local readout, which was not considered acceptable. The failure was due to a severe electrical disturbance. Multiple parts were found inoperative, with resulting delays for procurement and further troubleshooting. Compensatory samples were collected during the OOS interval.
R-49/46/53, Unit 2 SGBD and FCU SW monitors	Sep 18, 2008 to Nov 10, 2008 (53 days)	Monitors were OOS due to isolation of Service Water, required for weld repair on the Service Water Mixing Tee at the FCU SW outlet. Complications were discovered after the system was apart, involving Ultrasonic testing of piping. In-house welding was selected to lower the OOS duration (the other option involved a 6-month lead time with the vendor supplying a new part). These monitors were tested and successfully returned to service at completion of the maintenance. Compensatory samples were collected for the OOS interval.
R-61, Unit 3 condensate polisher TDS tank effluent	Oct 6, 2008 to Jan 12, 2009 (98 days) (87 days in 2008)	Discovered non-functional during quarterly test. Found faulty tank selector switch, which negated a successful actuation of potential ALARM functions (tank isolation). While the monitor was functional, the inability to perform an auto-action forced a declaration of OOS. Long lead time of parts and planning were responsible for the extended outage. Compensatory samples were completed during this interval. No radioactivity was identified in this normally clean system.

7. ODCM Reporting Requirements (continued)

Other Reporting Criteria:

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

The two independent Process Control Programs for Indian Point Units 2 and 3 were merged and applied as a Entergy Fleet document during this reporting period.

The IPEC ODCM was updated in June 2008 to include some administrative REMP and Groundwater program improvements. Detailed ODCM update information is discussed in Section G. A full copy of the ODCM and its justification package is included as an addendum to this report.

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT RELEASE REPORT

B. GASEOUS EFFLUENTS

2008

TABLE 1A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008	Est. Total % Error
1. Total Release	Ci	1.13E+00	4.69E-01	4.50E+01	7.18E-01	4.73E+01	± 25
2. Average release rate	uCi/sec	1.44E-01	5.97E-02	5.66E+00	9.03E-02	1.50E+00	

B. Iodines

1. Total Iodine-131	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	

C. Particulates

1. Total Release, with half-life > 8 days	Ci	-	-	1.28E-04	-	1.28E-04	± 25
2. Average release rate	uCi/sec	-	-	1.61E-05	-	4.04E-06	
3. Gross Alpha	Ci	-	-	2.14E-06	-	2.14E-06	± 25

D. Tritium

1. Total release	Ci	1.83E+00	2.42E+00	3.79E+00	1.82E+00	9.86E+00	+ 25
2. Average release rate	uCi/sec	2.33E-01	3.08E-01	4.77E-01	2.29E-01	3.12E-01	

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 **CONTINUOUS** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008
Kr-85	Ci	-	-	4.49E+01	6.12E-01	4.55E+01
Total for Period	Ci	0.00E+00	0.00E+00	4.49E+01	6.12E-01	4.55E+01

2) Iodines						
I-131	Ci	-		-	-	0.00E+00
I-133	Ci	-	-	-	-	0.00E+00
I-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3) Particulates						
Cs-137	Ci	-	-	1.28E-04	-	1.28E-04
Total for Period	Ci	0.00E+00	0.00E+00	1.28E-04	0.00E+00	1.28E-04

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 - **BATCH** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

Nuclides Released

1) Fission Gases	Units	**Qtr 1**	**Qtr 2**	**Qtr 3**	**Qtr 4**	**Year 2008**
Ar-41	Ci	1.53E-02	6.20E-02	3.01E-02	5.73E-02	1.65E-01
Kr-85	Ci	4.42E-02	8.68E-03	-	-	5.29E-02
Kr-85m	Ci	7.87E-05	1.76E-03	3.57E-04	9.42E-04	3.13E-03
Kr-87	Ci	1.83E-05	1.09E-03	2.56E-04	7.55E-04	2.12E-03
Kr-88	Ci	4.66E-05	2.68E-03	6.73E-04	1.71E-03	5.10E-03
Xe-131m	Ci	3.13E-03	1.74E-03	-	-	4.88E-03
Xe-133	Ci	1.03E+00	3.48E-01	2.48E-02	2.77E-02	1.43E+00
Xe-133m	Ci	1.16E-02	4.33E-03	1.82E-04	5.35E-04	1.66E-02
Xe-135	Ci	2.40E-02	3.51E-02	5.64E-03	1.51E-02	7.98E-02
Xe-135m	Ci	5.95E-05	2.92E-03	4.32E-04	1.74E-03	5.15E-03
Xe-138	Ci	1.50E-05	7.39E-04	-	3.36E-04	1.09E-03
Total for Period	Ci	1.13E+00	4.69E-01	6.24E-02	1.06E-01	1.77E+00

2) Iodines

Not Applicable for Batch Releases

3) Particulates

Not Applicable for Batch Releases

- Indicates < MDA

TABLE 1A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008	Est. Total % Error
1. Total Release	Ci	1.54E-02	1.67E-02	1.96E-02	1.96E-02	7.12E-02	± 25
2. Average release rate	uCi/sec	1.96E-03	2.12E-03	2.46E-03	2.46E-03	2.25E-03	

B. Iodines

1. Total Iodine-131	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	

C. Particulates

1. Total Release, with half-life > 8 days	Ci	-	-	-	-	0.00E+00	± 25
2. Average release rate	uCi/sec	-	-	-	-	0.00E+00	
3. Gross Alpha	Ci	-	-	-	-	0.00E+00	± 25

D. Tritium

1. Total release	Ci	3.04E+00	3.00E+00	3.43E+00	2.57E+00	1.20E+01	+ 25
2. Average release rate	uCi/sec	3.86E-01	3.82E-01	4.31E-01	3.24E-01	3.81E-01	

- Indicates < MDA

TABLE 1C
INDIAN POINT 3 - CONTINUOUS GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008
Xe-133	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	-	-	-	-	0.00E+00

2) Iodines						
I-131	Ci	-	-	-	-	0.00E+00
I-133	Ci	-	-	-	-	0.00E+00
I-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	-	-	-	-	0.00E+00

3) Particulates						
Total for Period	Ci	-	-	-	-	0.00E+00

- indicates < MDA

TABLE 1C
INDIAN POINT 3 - BATCH GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008
Ar-41	Ci	1.54E-02	1.66E-02	1.79E-02	1.82E-02	6.81E-02
Kr-85	Ci	-	-	-	-	0.00E+00
Kr-85m	Ci	-	-	-	-	0.00E+00
Kr-87	Ci	-	-	-	-	0.00E+00
Kr-88	Ci	-	-	-	-	0.00E+00
Xe-131m	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	-	6.96E-05	1.72E-03	1.38E-03	3.17E-03
Xe-133m	Ci	-	-	-	-	0.00E+00
Xe-135	Ci	-	-	-	-	0.00E+00
Xe-135m	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	1.54E-02	1.67E-02	1.96E-02	1.96E-02	7.13E-02

2) Iodines

Not Applicable for Batch Releases

3) Particulates

Not Applicable for Batch Releases

- Indicates < MDA

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

C. LIQUID EFFLUENTS

2008

TABLE 2A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	1.57E-02	2.01E-02	1.24E-02	6.37E-03	5.46E-02	+ 25
2. Average Diluted Conc	uCi/ml	2.71E-11	2.95E-11	1.44E-11	8.85E-12	1.92E-11	

B. Tritium

1. Total Release	Ci	6.42E+01	5.52E+01	6.16E+01	2.92E+01	2.10E+02	± 25
2. Average Diluted Conc	uCi/ml	1.11E-07	8.10E-08	7.14E-08	4.05E-08	7.39E-08	

C. Dissolved & Entrained Gases

1. Total Release	Ci	1.63E-03	1.13E-05	3.58E-02	-	3.75E-02	± 25
2. AverageDiluted Conc	uCi/ml	2.81E-12	1.65E-14	4.15E-11	-	1.32E-11	

D. Gross Alpha

1. Total Release	Ci	-	-	-	-	-	± 25

E. Volume of Waste Released

1. Processed Waste (LW & NCD)	liters	3.90E+06	2.10E+06	3.94E+06	2.16E+06	1.21E+07	+ 10
2. Unprocessed (SGBD, SFDS, U1FD)	liters	4.13E+07	5.62E+07	4.61E+07	4.79E+07	1.91E+08	± 10

F. Volume of Dilution Water	liters	5.79E+11	6.81E+11	8.63E+11	7.19E+11	2.84E+12	+ 10

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

CONTINUOUS RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008
Cs-137	Ci	9.82E-04	2.53E-03	1.77E-03	1.58E-03	6.86E-03
Ni-63	Ci	-	4.22E-04	-	-	4.22E-04
Sr-89	Ci	-	-	-	-	0.00E+00
Sr-90	Ci	1.20E-04	1.91E-04	5.59E-04	7.84E-04	1.65E-03
Total for Period	Ci	1.10E-03	3.14E-03	2.33E-03	2.36E-03	8.94E-03

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

BATCH RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008
Ag-110m	Ci	2.02E-04	5.09E-05	1.17E-04	-	3.70E-04
Co-58	Ci	2.81E-05	2.01E-03	1.51E-03	1.32E-04	3.68E-03
Co-60	Ci	3.95E-04	6.87E-04	9.24E-04	3.70E-05	2.04E-03
Cr-51	Ci	1.85E-04	-	-	-	1.85E-04
Cs-134	Ci	5.80E-05	1.52E-04	2.93E-04	1.33E-05	5.16E-04
Cs-137	Ci	8.50E-04	9.07E-04	4.64E-03	2.43E-04	6.64E-03
Mn-54	Ci	2.55E-06	1.90E-05	7.64E-06	-	2.92E-05
Ni-63	Ci	3.89E-03	3.35E-03	6.52E-04	5.74E-04	8.46E-03
Sb-124	Ci	1.10E-05	4.33E-04	-	-	4.44E-04
Sb-125	Ci	8.99E-03	7.12E-03	1.95E-03	3.01E-03	2.11E-02
Sr-90	Ci	-	-	1.61E-05	-	1.61E-05
Te-123m	Ci	-	2.13E-05	-	-	2.13E-05
Te-125m	Ci	-	2.19E-03	-	-	2.19E-03
Total for Period	Ci	1.46E-02	1.69E-02	1.01E-02	4.01E-03	4.57E-02

Dissolved & Entrained Gas

Kr-85	Ci	-	-	3.58E-02	-	3.58E-02
Xe-133	Ci	1.63E-03	1.13E-05	-	-	1.64E-03
Total for Period	Ci	1.63E-03	1.13E-05	3.58E-02	-	3.75E-02

- Indicates < MDA

TABLE 2A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2008	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	2.44E-04	2.00E-03	5.49E-03	6.54E-03	1.43E-02	+ 25
2. Average Diluted Conc	uCi/ml	4.22E-13	2.93E-12	6.37E-12	9.09E-12	5.02E-12	

B. Tritium

1. Total Release	Ci	1.88E+01	7.49E+01	8.13E+01	4.92E+02	6.67E+02	± 25
2. Average Diluted Conc	uCi/ml	3.24E-08	1.10E-07	9.42E-08	6.84E-07	2.35E-07	

C. Dissolved & Entrained Gases

1. Total Release	Ci	-	-	-	4.96E-05	4.96E-05	± 25
2. AverageDiluted Conc	uCi/ml	-	-	-	6.90E-14	1.75E-14	

D. Gross Alpha

1. Total Release	Ci	-	-	-	-	0.00E+00	± 25

E. Volume of Waste Released

1. Processed Fluids (Mon Tanks)	liters	1.04E+05	1.56E+05	3.08E+05	4.66E+05	1.04E+06	+ 10
2. Unprocessed Fluids (SGs)	liters	1.62E+06	1.62E+06	1.64E+06	1.64E+06	6.52E+06	+ 10

F. Volume of Dilution Water	liters	5.79E+11	6.81E+11	8.63E+11	7.19E+11	2.84E+12	± 10

'- indicates < MDA

TABLE 2B
INDIAN POINT 3 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2008)
BATCH and CONTINUOUS RADIOACTIVE LIQUID EFFLUENT

Batch Fission/Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	2008
Ag-110m	Ci	-	8.00E-05	2.60E-05	-	1.06E-04
Co-58	Ci	6.90E-06	1.31E-05	2.18E-05	2.33E-05	6.51E-05
Co-60	Ci	2.69E-05	9.35E-04	1.69E-03	1.56E-03	4.22E-03
Cs-134	Ci	-		1.02E-04	9.61E-05	1.98E-04
Cs-137	Ci	-	-	2.50E-04	2.90E-04	5.40E-04
Fe-55	Ci	-	-	1.14E-03	7.28E-04	1.87E-03
Mn-54	Ci	-	1.63E-05	3.07E-05	1.07E-05	5.77E-05
Ni-63	Ci	1.52E-04	8.36E-04	1.97E-03	2.26E-03	5.22E-03
Sb-125	Ci	5.87E-05	1.19E-04	2.60E-04	1.57E-03	2.00E-03
Total for Period	Ci	2.44E-04	2.00E-03	5.49E-03	6.54E-03	1.43E-02

Dissolved and Entrained Gas (Batch)

Kr-85	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	-	-	-	4.96E-05	4.96E-05
Xe-133m	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	4.96E-05	4.96E-05

Continuous Releases (SG Blowdown)

H-3 (only)	Ci	4.02E-03	4.35E-03	5.43E-03	4.00E-03	1.78E-02

'- indicates < mda

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

D. SOLID WASTE

2008

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2008 to 12/31/2008

Percent Cutoff: 0 (all identified isotopes are included)

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

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	1.08E+02	3.06E+00	1.01E-01	+/- 25%
B	3.71E+02	1.05E+01	7.27E+01	+/- 25%
C	8.50E+01	2.41E+00	2.36E+02	+/- 25%
All	5.64E+02	1.60E+01	3.09E+02	+/- 25%

Waste Stream : Dry Active Waste DAW / Equip
DAW /Dirt;B-25 Box DAW 20' Sea Land IF200 Cask

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.45E+04	6.93E+02	7.78E+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	2.45E+04	6.93E+02	7.78E+00	+/-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 River Silt - Intermodal

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	3.28E+03	9.29E+01	9.20E-04	+/-25%
B	3.00E+01	8.48E-01	2.17E+01	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	3.31E+03	9.37E+01	2.17E+01	+/-25%

Waste Stream : Sum of All 4 Categories Combined Packages:
DAW /Dirt; B-25 Box DAW 20' Sea Land LWS Resin IF 200 Cask
River Silt - Intermodal DAW-/ Equip Plant Resin 8-120

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.79E+04	7.89E+02	7.88E+00	+/-25%
B	4.01E+02	1.14E+01	9.44E+01	+/-25%
C	8.50E+01	2.41E+00	2.36E+02	+/-25%
All	2.84E+04	8.03E+02	3.38E+02	+/-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 01/01/2008 to 12/31/2008

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
18	Hittman Transport	Energy Solutions - Bear Creek
2	Hittman Transport	Energy Solutions - GRF
10	Horwith Trucks	Studsvik Processing - Memphis
2	Studsvik Logistics	Studsvik Processing - Memphis
5	Hittman Transport	Studsvik Processing Facility

Resins, Filters, and Evap Bottoms

Waste Class A

Nuclide Name	Percent Abundance	Curies
Fe-55	0.01%	1.05E-05
Co-60	0.30%	3.09E-04
Ni-63	1.84%	1.86E-03
Sr-90	0.02%	1.98E-05
Cs-137	97.70%	9.90E-02
Ce-144	0.13%	1.30E-04
Pu-238	0.00%	7.01E-08
Pu-239	0.00%	1.03E-07
Am-241	0.00%	1.75E-07
Cm-243	0.00%	4.48E-09

Resins, Filters, and Evap Bottoms
Waste Class B

Nuclide Name	Percent Abundance	Curies
C-14	0.15%	1.07E-01
Mn-54	0.18%	1.34E-01
Fe-55	28.16%	2.05E+01
Co-57	0.08%	5.80E-02
Co-58	0.32%	2.31E-01
Co-60	3.78%	2.75E+00
Ni-63	28.99%	2.11E+01
Sr-90	0.13%	9.82E-02
Ag-110m	0.17%	1.21E-01
Sb-124	0.00%	3.76E-04
Sb-125	0.05%	3.29E-02
Cs-134	7.10%	5.17E+00
Cs-137	30.36%	2.21E+01
Ce-144	0.52%	3.80E-01
Pu-238	0.00%	2.91E-04
Pu-239	0.00%	1.31E-04
Pu-241	0.01%	6.51E-03
Am-241	0.00%	1.48E-04
Cm-242	0.00%	1.23E-05
Cm-243	0.00%	1.53E-04

Resins, Filters, and Evap Bottoms
Waste Class C

Nuclide Name	Percent Abundance	Curies
Mn-54	0.28%	6.55E-01
Fe-55	3.78%	8.92E+00
Co-57	0.05%	1.22E-01
Co-58	0.09%	2.19E-01
Co-60	6.10%	1.44E+01
Ni-63	37.51%	8.85E+01
Sr-90	0.09%	2.16E-01
Cs-134	16.91%	3.99E+01
Cs-137	34.84%	8.22E+01
Ce-144	0.30%	7.14E-01
Pu-238	0.00%	2.30E-03
Pu-239	0.00%	6.71E-04
Pu-241	0.02%	5.84E-02
Am-241	0.00%	4.70E-04
Cm-242	0.00%	6.78E-05
Cm-243	0.00%	1.36E-03

Resins, Filters, and Evap Bottoms
Waste Class All

Nuclide Name	Percent Abundance	Curies
C-14	0.03%	1.07E-01
Mn-54	0.26%	7.89E-01
Fe-55	9.52%	2.94E+01
Co-57	0.06%	1.80E-01
Co-58	0.15%	4.50E-01
Co-60	5.54%	1.71E+01
Ni-63	35.63%	1.10E+02
Sr-90	0.10%	3.14E-01
Ag-110m	0.04%	1.21E-01
Sb-124	0.00%	3.76E-04
Sb-125	0.01%	3.29E-02
Cs-134	14.61%	4.51E+01
Cs-137	33.68%	1.04E+02
Ce-144	0.35%	1.09E+00
Pu-238	0.00%	2.59E-03
Pu-239	0.00%	8.02E-04
Pu-241	0.02%	6.49E-02
Am-241	0.00%	6.18E-04
Cm-242	0.00%	8.02E-05
Cm-243	0.00%	1.52E-03

Dry Active Waste

Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	5.71%	4.44E-01
C-14	0.87%	6.75E-02
Mn-54	0.75%	5.86E-02
Fe-55	0.00%	1.30E-04
Co-57	0.13%	9.81E-03
Co-58	4.98%	3.87E-01
Co-60	22.25%	1.73E+00

Ni-63	1.21%	9.40E-02
Sr-89	0.00%	1.46E-06
Sr-90	0.10%	7.91E-03
Nb-95	0.00%	1.58E-05
Ag-110m	0.37%	2.88E-02
Sb-125	0.63%	4.89E-02
Cs-134	8.73%	6.79E-01
Cs-137	54.27%	4.22E+00
Ce-144	0.00%	6.94E-05
Pu-238	0.00%	1.23E-05
Pu-239	0.00%	6.30E-06
Pu-241	0.00%	1.61E-04
Am-241	0.00%	3.89E-05
Cm-242	0.00%	1.48E-07
Cm-243	0.00%	6.94E-06

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	5.71%	4.44E-01
C-14	0.87%	6.75E-02
Mn-54	0.75%	5.86E-02
Fe-55	0.00%	1.30E-04
Co-57	0.13%	9.81E-03
Co-58	4.98%	3.87E-01
Co-60	22.25%	1.73E+00
Ni-63	1.21%	9.40E-02
Sr-89	0.00%	1.46E-06
Sr-90	0.10%	7.91E-03
Nb-95	0.00%	1.58E-05
Ag-110m	0.37%	2.88E-02
Sb-125	0.63%	4.89E-02
Cs-134	8.73%	6.79E-01
Cs-137	54.27%	4.22E+00
Ce-144	0.00%	6.94E-05
Pu-238	0.00%	1.23E-05
Pu-239	0.00%	6.30E-06
Pu-241	0.00%	1.61E-04
Am-241	0.00%	3.89E-05
Cm-242	0.00%	1.48E-07
Cm-243	0.00%	6.94E-06

Other Waste

Waste Class A

Nuclide Name	Percent Abundance	Curies
Fe-55	12.06%	1.11E-04
Co-58	1.33%	1.22E-05
Co-60	36.60%	3.37E-04
Ni-63	30.52%	2.81E-04
Sr-90	0.27%	2.46E-06
Cs-137	19.23%	1.77E-04

Other Waste
Waste Class B

Nuclide Name	Percent Abundance	Curies
Mn-54	0.33%	7.22E-02
Fe-55	3.93%	8.53E-01
Co-57	0.06%	1.39E-02
Co-58	0.25%	5.37E-02
Co-60	6.13%	1.33E+00
Ni-63	36.67%	7.96E+00
Sr-90	0.09%	1.95E-02
Cs-134	17.92%	3.89E+00
Cs-137	34.23%	7.43E+00
Ce-144	0.37%	8.05E-02
Pu-238	0.00%	2.07E-04
Pu-239	0.00%	6.03E-05
Pu-241	0.02%	5.31E-03
Am-241	0.00%	4.23E-05
Cm-242	0.00%	9.16E-06
Cm-243	0.00%	1.23E-04

Other Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
Mn-54	0.33%	7.22E-02
Fe-55	3.93%	8.53E-01
Co-57	0.06%	1.39E-02
Co-58	0.25%	5.37E-02
Co-60	6.13%	1.33E+00
Ni-63	36.67%	7.96E+00
Sr-90	0.09%	1.95E-02
Cs-134	17.92%	3.89E+00
Cs-137	34.23%	7.43E+00
Ce-144	0.37%	8.05E-02
Pu-238	0.00%	2.07E-04
Pu-239	0.00%	6.03E-05
Pu-241	0.02%	5.31E-03
Am-241	0.00%	4.23E-05
Cm-242	0.00%	9.16E-06
Cm-243	0.00%	1.23E-04

Sum of All 4 Categories

Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	5.64%	4.44E-01
C-14	0.86%	6.75E-02
Mn-54	0.74%	5.86E-02
Fe-55	0.00%	2.52E-04
Co-57	0.12%	9.81E-03
Co-58	4.91%	3.87E-01
Co-60	21.96%	1.73E+00
Ni-63	1.22%	9.62E-02
Sr-89	0.00%	1.46E-06
Sr-90	0.10%	7.93E-03
Nb-95	0.00%	1.58E-05

Ag-110m	0.37%	2.88E-02
Sb-125	0.62%	4.89E-02
Cs-134	8.62%	6.79E-01
Cs-137	54.83%	4.32E+00
Ce-144	0.00%	1.99E-04
Pu-238	0.00%	1.23E-05
Pu-239	0.00%	6.40E-06
Pu-241	0.00%	1.61E-04
Am-241	0.00%	3.90E-05
Cm-242	0.00%	1.48E-07
Cm-243	0.00%	6.95E-06

Sum of All 4 Categories
Waste Class B

Nuclide Name	Percent Abundance	Curies
C-14	0.11%	1.07E-01
Mn-54	0.22%	2.07E-01
Fe-55	22.57%	2.13E+01
Co-57	0.08%	7.19E-02
Co-58	0.30%	2.85E-01
Co-60	4.33%	4.09E+00
Ni-63	30.73%	2.90E+01
Sr-90	0.13%	1.18E-01
Ag-110m	0.13%	1.21E-01
Sb-124	0.00%	3.76E-04
Sb-125	0.03%	3.29E-02
Cs-134	9.61%	9.07E+00
Cs-137	31.26%	2.95E+01
Ce-144	0.49%	4.61E-01
Pu-238	0.00%	4.98E-04
Pu-239	0.00%	1.91E-04
Pu-241	0.01%	1.18E-02
Am-241	0.00%	1.90E-04
Cm-242	0.00%	2.15E-05
Cm-243	0.00%	2.77E-04

Sum of All 4 Categories
Waste Class C

Nuclide Name	Percent Abundance	Curies
Mn-54	0.28%	6.55E-01
Fe-55	3.78%	8.92E+00
Co-57	0.05%	1.22E-01
Co-58	0.09%	2.19E-01
Co-60	6.10%	1.44E+01
Ni-63	37.51%	8.85E+01
Sr-90	0.09%	2.16E-01
Cs-134	16.91%	3.99E+01
Cs-137	34.84%	8.22E+01
Ce-144	0.30%	7.14E-01
Pu-238	0.00%	2.30E-03
Pu-239	0.00%	6.71E-04
Pu-241	0.02%	5.84E-02
Am-241	0.00%	4.70E-04
Cm-242	0.00%	6.78E-05
Cm-243	0.00%	1.36E-03

Sum of All 4 Categories
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.13%	4.44E-01
C-14	0.05%	1.74E-01
Mn-54	0.27%	9.20E-01
Fe-55	8.92%	3.02E+01
Co-57	0.06%	2.04E-01
Co-58	0.26%	8.91E-01
Co-60	5.97%	2.02E+01
Ni-63	34.86%	1.18E+02
Sr-89	0.00%	1.46E-06
Sr-90	0.10%	3.42E-01
Nb-95	0.00%	1.58E-05
Ag-110m	0.04%	1.49E-01
Sb-124	0.00%	3.76E-04
Sb-125	0.02%	8.17E-02
Cs-134	14.65%	4.96E+01
Cs-137	34.27%	1.16E+02
Ce-144	0.35%	1.18E+00
Pu-238	0.00%	2.81E-03
Pu-239	0.00%	8.69E-04
Pu-241	0.02%	7.04E-02
Am-241	0.00%	7.00E-04
Cm-242	0.00%	8.95E-05
Cm-243	0.00%	1.65E-03

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2008 to 12/31/2008

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms
LWS Resin 14-170

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	0.00E+00	0.00E+00	0.00E+00	+/- 25%
B	1.30E+02	3.68E+00	8.47E+01	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
All	1.30E+02	3.68E+00	8.47E+01	+/- 25%

Waste Stream : Dry Active Waste
Unit 3 DAW-20' Sealand DAW 40' Sea Land

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	6.50E+02	1.84E+01	4.54E-05	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	6.50E+02	1.84E+01	4.54E-05	+/-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	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 : Sum of All 4 Categories
Unit 3 DAW-20' Sealand LWS Resin 14-170
Combined Packages DAW 40' Sea Land

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	6.50E+02	1.84E+01	4.54E-05	+/-25%
B	1.30E+02	3.68E+00	8.47E+01	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	7.80E+02	2.21E+01	8.47E+01	+/-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 01/01/2008 to 12/31/2008

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
2	S-J Transportation	Perma-Fix of Florida
1	Hittman Transport	Studsvik Processing Facility

Resins, Filters, and Evap Bottoms
Waste Class B

Nuclide Name	Percent Abundance	Curies
H-3	0.02%	1.32E-02
Mn-54	2.23%	1.89E+00
Fe-55	22.55%	1.91E+01
Co-57	0.05%	4.32E-02
Co-58	0.07%	6.17E-02
Co-60	11.09%	9.39E+00
Ni-63	27.86%	2.36E+01
Sr-90	0.03%	2.43E-02
Sb-125	0.93%	7.86E-01
Cs-134	11.07%	9.38E+00
Cs-137	23.85%	2.02E+01
Ce-144	0.24%	2.07E-01
Pu-238	0.00%	4.99E-05
Pu-239	0.00%	1.48E-05
Am-241	0.00%	4.89E-05
Cm-242	0.00%	4.02E-05
Cm-243	0.00%	1.99E-04

Resins, Filters, and Evap Bottoms
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.02%	1.32E-02
Mn-54	2.23%	1.89E+00
Fe-55	22.55%	1.91E+01
Co-57	0.05%	4.32E-02
Co-58	0.07%	6.17E-02
Co-60	11.09%	9.39E+00
Ni-63	27.86%	2.36E+01
Sr-90	0.03%	2.43E-02
Sb-125	0.93%	7.86E-01
Cs-134	11.07%	9.38E+00
Cs-137	23.85%	2.02E+01
Ce-144	0.24%	2.07E-01
Pu-238	0.00%	4.99E-05
Pu-239	0.00%	1.48E-05
Am-241	0.00%	4.89E-05
Cm-242	0.00%	4.02E-05
Cm-243	0.00%	1.99E-04

Dry Active Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
Co-60	18.19%	8.25E-06
Cs-137	81.81%	3.71E-05

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
Co-60	18.19%	8.25E-06
Cs-137	81.81%	3.71E-05

Sum of All 4 Categories
Waste Class A

Nuclide Name	Percent Abundance	Curies
Co-60	18.19%	8.25E-06
Cs-137	81.81%	3.71E-05

Sum of All 4 Categories
Waste Class B

Nuclide Name	Percent Abundance	Curies
H-3	0.02%	1.32E-02
Mn-54	2.23%	1.89E+00
Fe-55	22.55%	1.91E+01
Co-57	0.05%	4.32E-02
Co-58	0.07%	6.17E-02
Co-60	11.09%	9.39E+00
Ni-63	27.86%	2.36E+01
Sr-90	0.03%	2.43E-02
Sb-125	0.93%	7.86E-01
Cs-134	11.07%	9.38E+00
Cs-137	23.85%	2.02E+01
Ce-144	0.24%	2.07E-01
Pu-238	0.00%	4.99E-05
Pu-239	0.00%	1.48E-05
Am-241	0.00%	4.89E-05
Cm-242	0.00%	4.02E-05
Cm-243	0.00%	1.99E-04

Sum of All 4 Categories
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.02%	1.32E-02
Mn-54	2.23%	1.89E+00
Fe-55	22.55%	1.91E+01
Co-57	0.05%	4.32E-02
Co-58	0.07%	6.17E-02
Co-60	11.09%	9.39E+00
Ni-63	27.86%	2.36E+01
Sr-90	0.03%	2.43E-02
Sb-125	0.93%	7.86E-01
Cs-134	11.07%	9.38E+00
Cs-137	23.85%	2.02E+01
Ce-144	0.24%	2.07E-01
Pu-238	0.00%	4.99E-05
Pu-239	0.00%	1.48E-05
Am-241	0.00%	4.89E-05
Cm-242	0.00%	4.02E-05
Cm-243	0.00%	1.99E-04

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

RADIOACTIVE EFFLUENT REPORT

E. RADIOLOGICAL IMPACT ON MAN

Jan 1, 2008 - Dec 31, 2008

RADIOLOGICAL IMPACT ON MAN

Routine Effluent Dose Calculations:

The Radiological Impact on Man due to radioactive effluent from the site is determined from NRC approved modeling, per Reg Guide 1.109 and NUREG 0133. Calculations are divided into 3 categories: Noble Gases, Particulates and Iodine, and Liquid Releases (fish and invertebrate consumption). This modeling involves conservative dose calculations to Adult, Teen, Child, and Infant age groups. Furthermore, dose modeling is performed for six separate organs as well as the total body dose. This well-established industry model provides doses (as a result of plant effluent) to a hypothetical maximally exposed individual offsite. While ALL age groups and organs are considered, it is this ***maximum value*** that is provided in the tables that follow.

An approved 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 Manual (ODCM). This information is stored in a database on site to enhance dose tracking information and management.

Site airborne effluent dose calculations include annual average dispersion and deposition factors, averaged from data collected over approximate ten year periods. When new data is averaged (approximately every ten years) the modeling is updated and used in subsequent airborne effluent calculations.

Liquid offsite dose calculations involve fish and invertebrate consumption pathways only, as determined in the ODCM. While the ODCM identified some site-specific dose factors, the bulk of this information is obtained directly from Regulatory Guide 1.109 and NUREG 0133. Details of the calculations, site-specific data, and their bases are presented in the ODCM.

Carbon-14 (C-14):

Concentrations and offsite dose from C-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 C-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 bounding 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 resulting annual dose to the maximally exposed individual (child) from gaseous releases of C-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 C-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 (and not in the earlier tables), specifically to avoid confusion. 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 during the year are discussed in detail in Section H. The offsite dose calculation involves multiple source term measurements, as well as determinations for release and dilution flow. A summary of the quantification methodology, and the resulting calculated doses, is provided at the end of Section H. The Total Dose table below provides a means to compare ground water doses with those of other components making up the site's total dose.

Members of the Public:

Members of the public visiting the site receive minimal dose as a result of airborne and liquid releases because of the relatively insignificant total amount of time they are on site, as well as the immeasurably low levels of dose at the critical receptors. Their doses can be calculated from standard ODCM methodology, with typical occupancy factors employed. These factors are determined by comparing a conservative assumption for their 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 2008:

		Whole Body (mrem)	Max Organ (mrem)
40 CFR 190 limit ===→	**IPEC**	**25**	**75**
Routine Airborne Effluents	Units 1 and 2	2.07E-3	2.67E-3
Routine Liquid Effluents	Units 1 and 2	6.11E-4	1.47E-3
Routine Airborne Effluents	Unit 3	1.99E-3	1.99E-3
Routine Liquid Effluents	Unit 3	1.56E-4	2.83E-4
Carbon-14 Liquid & Airborne Totals	IPEC	5.20E-02	2.60E-01
Ground Water & Storm Drain Totals	IPEC[1]	2.86E-04	9.35E-04
Direct Shine from ISFSI, Radwaste Storage, SG Mausoleum, etc.	IPEC[2]	6	6
Indian Point Energy Center Total Dose, per 40 CFR 190	**IPEC**	**6.057E+00**	**6.267E+00**

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

Note 2: The direct shine component from sources other than ISFSI are indistinguishable from background. ISFSI doses were determined from net integrated quarterly TLD readings at the identified critical site boundary locations, and comparing these values with ISFSI boundary and REMP TLDs. No occupancy factors were applied for this conservative assessment. Details of this evaluation are available on site.

INDIAN POINT UNITS 1 and 2 NUCLEAR POWER PLANTS
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2008

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	3.47E-04	3.93E-04	4.04E-04	3.81E-04	1.47E-03
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	6.94E-03	7.86E-03	8.08E-03	7.62E-03	1.47E-02
Age Group		Child	Child	Child	Adult	Child
Critical Organ		Bone	Bone	Bone	Bone	Bone

Adult Total Body	(mrem)	1.03E-04	1.49E-04	2.25E-04	1.34E-04	6.11E-04
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3
Percent of Limit	(%)	6.87E-03	9.93E-03	1.50E-02	8.93E-03	2.04E-02

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	3.16E-05	3.79E-05	4.95E-05	2.66E-05	1.46E-04
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	6.32E-04	7.58E-04	9.90E-04	5.32E-04	1.46E-03

Beta Air	(mrad)	9.17E-05	4.99E-05	6.17E-03	1.97E-05	6.33E-03
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	9.17E-04	4.99E-04	6.17E-02	1.97E-04	3.17E-02

C. AIRBORNE IODINE and PARTICULATE DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	3.07E-04	4.05E-04	1.65E-03	3.05E-04	2.67E-03
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	4.09E-03	5.40E-03	2.20E-02	4.07E-03	1.78E-02

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 2008

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	7.84E-06	3.99E-05	1.07E-04	1.32E-04	2.83E-04
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	1.57E-04	7.98E-04	2.14E-03	2.63E-03	2.83E-03
Age Group		Child	Adult	Child	Child	Child
Critical Organ		Bone	GILLI	Bone	Bone	Bone

Adult Total Body	(mrem)	4.26E-06	1.64E-05	2.96E-05	1.06E-04	1.56E-04
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3
Percent of Limit	(%)	2.84E-04	1.10E-03	1.97E-03	7.07E-03	5.21E-03

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	4.29E-06	5.01E-06	5.07E-06	5.00E-06	1.94E-05
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	8.58E-05	1.00E-04	1.01E-04	1.00E-04	1.94E-04

Beta Air	(mrad)	7.08E-06	8.26E-06	8.53E-06	8.38E-06	3.23E-05
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	7.08E-05	8.26E-05	8.53E-05	8.38E-05	1.61E-04

C. AIRBORNE IODINE and PARTICULATE DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	5.02E-04	4.96E-04	5.67E-04	4.25E-04	1.99E-03
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	6.69E-03	6.61E-03	7.56E-03	5.67E-03	1.33E-02

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

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

RADIOLOGICAL EFFLUENT REPORT

F. METEOROLOGICAL DATA

Jan 1, 2008 - Dec 31, 2008

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, REMP SAMPLING LOCATIONS, PROCESS CONTROL PROGRAM, OR LAND USE CENSUS LOCATION CHANGES

2008

There were no changes to REMP sampling locations in year 2008.

There were no changes to the Land Use Census in year 2008.

IPEC was added to the Entergy Fleet Process Control Program (PCP) in 2008.

In July, 2008, IPEC was added to the Entergy Fleet Process Control Program, EN-RW-105, Revision 1, per a combined fleet 10CFR50.59 review process. The Entergy Fleet PCP is attached to this report as an addendum.

There was one ODCM update in 2008.

In June, 2008 the station ODCM was upgraded to revision 1. This revision made some minor changes to the Table of Contents and REMP Table D3.5.1-1. Additionally, Ni-63 data was added to Tables 3.5.1-2 and 3.5.1.3, and Section D5.6 was expanded to more completely describe the Radiological Groundwater Monitoring Program.

Updates to Part 2 included a modification to section 2.1.16 to reference a new Attachment for detailed Groundwater monitoring, Existing REMP sample nomenclature (1a1-1a4) was added to Appendix G, and references to a discontinued air sampling station at the dismantled Lovett Power Station were removed. Also included in this ODCM revision is the identification of a historical sampling location (Cold Spring Hudson River) as a "control location" in Appendix G, and an updated Appendix J, for Groundwater, with a more detailed description of groundwater flow and dose determinations.

The revised ODCM and the justification package for the updates are provided in an Addendum to this report. All historical revisions to the station's ODCM remain available on site.

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

RADIOACTIVE EFFLUENT REPORT

H. GROUNDWATER and STORM WATER REPORT

ACTIVITY ON SITE and OFFSITE DOSE CALCULATION

FOR THE PERIOD:

Jan 1, 2008 - Dec 31, 2008

Summary of IPEC Groundwater and Storm Water Activity, 2008

The Unit 1 Spent Fuel, which has been considered the source of most of the groundwater contamination, was removed in 2008, to integrated spent fuel storage. This process demanded pool levels to be increased in April, 2008, for the defueling operation. During this evolution, the pool water was continuously demineralized and carefully monitored. After defueling, the pools were further processed with additional cleanup. For dewatering, two sets of composite samplers were installed, and the slow, permitted release was carefully integrated. Resin-specific cleanup systems were added during the pump down to the routine liquid effluent release line. The empty pools were then cleaned, closed, and covered.

As a result of aggressive processing before, during, and after the defueling operation, the effluent release from draining the pools (Sep, 2008) resulted in curies and mrem consistent with or slightly lower than routine monthly effluent. Stontium-90 releases, in particular, were essentially non-existent, because the pool water had been cleaned up for months prior draining.

The period to offload the fuel, necessitated some time of known and expected increased leakage into groundwater, as the pool water height was increased for offload operations. Wells near the Unit 1 pool did in fact start to show somewhat elevated activity, as expected, by the end of 2008. This activity is expected to peak and subside, per natural attenuation plans, in the coming months, as all of the old fuel assemblies have now been removed from Unit 1, and the pools are empty.

The precipitation mass balance model applied in 2007 was applied for offsite dose calculations in 2008. Hydraulic conductivity readings continued to validate the model throughout the year, and the USGS, as well as IPEC local MET data verified annual precipitation averaging 2.92 feet per year. No changes to the model were required. The ODCM was updated in 2008 to include more details of the Ground Water Monitoring Program. These updates are discussed in Section G of this report, and in the addendum for the ODCM update, and reflect both the requirements of the GW Monitoring Program, and specifics on calculating offsite dose.

Results of 2008 Groundwater and Storm water offsite dose evaluation

The results of the assessment are shown on the following table. These dose values are again a small portion of the annual limits (<0.01%), and were added to the Total Dose table in the opening summary of the Dose to Man section of this report (Section E).

Based on the above analysis, it is estimated that approximately 0.2 Curies of Tritium migrated directly to the river via the GW flow path in 2008, resulting in an approximate total body dose of less than 0.1 mrem (2.2E-7 mrem). It is evident that tritium alone, whether from ground water or routine effluents, does not significantly add to offsite dose.

Strontium-90, Cesium-137, and Co-60 collectively contributed approximately 0.00016 curies to site effluent from the groundwater pathway. Combined groundwater releases from IPEC in 2008 (all radionuclides) resulted in a calculated annual dose of less than 0.1 mrem to the whole body and critical organ:

0.000286 mrem to the total body,	(<0.01% limit)
0.000935 mrem to the critical organ, adult bone	(<0.01% limit)

The annual dose from combined groundwater and storm water pathways remains well below applicable limits. When combined with routine liquid effluents, the total dose remains significantly below ALARA limits of 3 mrem total body, and 10 mrem to the critical organ. This comparison is provided in the opening discussion of Section E, Radiological Impact on Man.

IPEC Summary for Storm & Ground Water releases (H-3, Co-60, Ni-63, Sr-90, and Cs-137)

2008
year

Northern Clean Zone

Adult Doses,in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	4.64E-09	4.64E-09	4.64E-09	4.64E-09	4.64E-09	4.64E-09	4.15E+02
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	4.64E-09	4.64E-09	4.64E-09	4.64E-09	4.64E-09	4.64E-09	**4.15E+02**

Unit 2 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	1.44E-08	1.44E-08	1.44E-08	1.44E-08	1.44E-08	1.44E-08	2.78E+04
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	1.44E-08	1.44E-08	1.44E-08	1.44E-08	1.44E-08	1.44E-08	**2.78E+04**

Unit 1/2

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	8.99E-08	8.99E-08	8.99E-08	8.99E-08	8.99E-08	8.99E-08	1.15E+04
Co-60	0.00E+00	1.35E-06	2.97E-06	0.00E+00	0.00E+00	0.00E+00	2.53E-05	2.30E+01
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	6.45E-04	0.00E+00	1.58E-04	0.00E+00	0.00E+00	0.00E+00	1.86E-05	4.10E+01
Cs-137	3.29E-05	4.50E-05	2.95E-05	0.00E+00	1.53E-05	5.07E-06	8.68E-07	3.41E+01
totals	6.78E-04	4.64E-05	1.91E-04	8.99E-08	1.53E-05	5.16E-06	4.49E-05	**1.15E+04**

Unit 3 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	3.26E-08	3.26E-08	3.26E-08	3.26E-08	3.26E-08	3.26E-08	3.83E+03
Co-60	0.00E+00	5.53E-07	1.22E-06	0.00E+00	0.00E+00	0.00E+00	1.04E-05	9.42E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	6.15E-05	0.00E+00	1.51E-05	0.00E+00	0.00E+00	0.00E+00	1.77E-06	2.45E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	6.15E-05	5.86E-07	1.63E-05	3.26E-08	3.26E-08	3.26E-08	1.22E-05	**3.84E+03**

Unit 3 South

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	3.99E-08	3.99E-08	3.99E-08	3.99E-08	3.99E-08	3.99E-08	1.65E+05
Co-60	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	1.52E-04	0.00E+00	3.73E-05	0.00E+00	0.00E+00	0.00E+00	4.38E-06	9.47E+00
Cs-137	4.31E-05	5.89E-05	3.86E-05	0.00E+00	2.00E-05	6.64E-06	1.14E-06	2.05E+01
totals	1.95E-04	5.89E-05	7.59E-05	3.99E-08	2.00E-05	6.68E-06	5.56E-06	**1.65E+05**

Southern Clean Zone

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	uCi
H-3	0.00E+00	3.78E-08	3.78E-08	3.78E-08	3.78E-08	3.78E-08	3.78E-08	3.38E+03
Co-60	0.00E+00	1.31E-06	2.88E-06	0.00E+00	0.00E+00	0.00E+00	2.45E-05	2.22E+01
Ni-63	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Sr-90	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
totals	0.00E+00	1.34E-06	2.92E-06	3.78E-08	3.78E-08	3.78E-08	2.46E-05	**3.40E+03**

Totals:

Adult Doses, in mrem

	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI
H-3 only	0.00E+00	2.19E-07	2.19E-07	2.19E-07	2.19E-07	2.19E-07	2.19E-07
all isotopes	**9.35E-04**	1.07E-04	**2.86E-04**	2.19E-07	3.55E-05	1.19E-05	8.72E-05
Adult Doses							
% Annual Limit	*0.00935*	*0.001*	*0.00953*	*0.000*	*0.000*	*0.000*	*0.001*

Total uCis	
2.12E+05	H3
5.46E+01	Co
0.00E+00	Ni
5.30E+01	Sr
5.45E+01	Cs

INDIAN POINT
RADIOLOGICAL GROUNDWATER
MONITORING PROGRAM

2008

Summary of Results

The following pages represent a summary of isotopic radio-analytical data for all onsite groundwater testing performed at Indian Point in 2008, as required per the ODCM and NEI 07-07.

Tritium (H-3) Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Average Positive Activity	Minimum Positive Activity	Maximum Positive Activity
B-1	2	2	6.99E+02	2.27E+02	1.17E+03
B-6	2	1	4.72E+02	4.72E+02	4.72E+02
MH-5	1	1	9.28E+02	9.28E+02	9.28E+02
MW-107	2	1	1.91E+02	1.91E+02	1.91E+02
MW-111	3	3	6.27E+04	4.77E+04	7.39E+04
MW-30-69	6	6	1.32E+05	7.36E+04	1.99E+05
MW-30-84	6	6	4.29E+03	3.78E+03	5.25E+03
MW-31-49	5	5	3.20E+03	3.97E+02	1.36E+04
MW-31-63	6	6	1.85E+04	1.02E+04	2.55E+04
MW-31-85	6	6	4.37E+03	1.31E+03	8.34E+03
MW-32-131	2	2	7.67E+02	5.04E+02	1.03E+03
MW-32-149	4	4	7.67E+02	5.03E+02	1.15E+03
MW-32-173	5	5	1.63E+03	9.72E+02	3.40E+03
MW-32-190	5	5	5.50E+03	3.35E+03	8.89E+03
MW-32-59	6	6	5.02E+03	4.13E+02	1.87E+04
MW-32-85	6	6	9.05E+03	7.48E+03	1.11E+04
MW-33	2	2	6.33E+04	5.85E+04	6.80E+04
MW-35	1	1	1.04E+03	1.04E+03	1.04E+03
MW-36-24	3	3	1.13E+03	2.01E+02	2.16E+03
MW-36-52	3	3	1.16E+04	1.10E+04	1.26E+04
MW-37-22	3	3	4.51E+03	2.68E+03	6.52E+03
MW-37-32	3	3	4.94E+03	2.89E+03	6.76E+03
MW-37-40	3	3	5.82E+03	5.24E+03	6.73E+03
MW-37-57	3	3	5.41E+03	4.27E+03	6.63E+03
MW-39-102	3	1	5.03E+02	5.03E+02	5.03E+02
MW-39-124	3	3	2.04E+02	1.67E+02	2.31E+02
MW-39-195	3	1	2.74E+02	2.74E+02	2.74E+02
MW-39-67	3	3	3.63E+02	3.18E+02	4.15E+02
MW-39-84	3	1	2.34E+02	2.34E+02	2.34E+02
MW-40-100	4	1	1.93E+02	1.93E+02	1.93E+02
MW-40-127	4	1	1.68E+02	1.68E+02	1.68E+02
MW-40-162	3	1	2.30E+02	2.30E+02	2.30E+02
MW-40-27	3	1	2.22E+02	2.22E+02	2.22E+02
MW-40-46	3	1	1.68E+02	1.68E+02	1.68E+02
MW-40-81	3	1	2.42E+02	2.42E+02	2.42E+02
MW-41-40	2	2	1.21E+03	2.15E+02	2.21E+03
MW-41-63	2	2	4.97E+02	3.03E+02	6.91E+02
MW-42-49	6	6	4.11E+03	1.12E+03	1.32E+04
MW-42-78	3	3	5.09E+02	3.46E+02	6.18E+02
MW-43-28	2	2	2.86E+02	2.65E+02	3.06E+02
MW-43-62	2	1	2.25E+02	2.25E+02	2.25E+02

Tritium (H-3) Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Avg Pos Act	Min Pos Act	Max Pos Act
MW-44-102	4	4	3.65E+02	2.56E+02	4.75E+02
MW-44-66	4	3	4.28E+02	3.18E+02	5.50E+02
MW-45-42	4	4	2.01E+03	1.13E+03	3.14E+03
MW-45-61	4	4	1.99E+03	1.27E+03	2.66E+03
MW-46	4	4	8.05E+02	5.21E+02	1.38E+03
MW-49-26	4	4	4.16E+03	3.47E+03	5.00E+03
MW-49-42	4	4	2.77E+03	2.52E+03	3.20E+03
MW-49-65	4	4	1.65E+03	1.26E+03	1.93E+03
MW-50-42	4	3	6.45E+02	3.73E+02	9.48E+02
MW-50-66	7	7	2.83E+03	2.08E+03	3.74E+03
MW-51-104	3	1	2.82E+02	2.82E+02	2.82E+02
MW-51-135	3	1	2.09E+02	2.09E+02	2.09E+02
MW-51-40	4	1	3.29E+02	3.29E+02	3.29E+02
MW-52-11	1	1	1.13E+03	1.13E+03	1.13E+03
MW-52-162	1	1	1.45E+02	1.45E+02	1.45E+02
MW-52-18	1	1	2.79E+02	2.79E+02	2.79E+02
MW-52-181	1	1	1.56E+02	1.56E+02	1.56E+02
MW-52-48	1	1	2.30E+02	2.30E+02	2.30E+02
MW-53-120	6	6	5.93E+03	5.04E+03	7.48E+03
MW-53-82	3	3	9.82E+02	7.94E+02	1.21E+03
MW-54-123	4	4	6.06E+02	5.33E+02	6.98E+02
MW-54-144	4	4	1.21E+03	1.13E+03	1.40E+03
MW-54-173	4	4	1.92E+03	1.66E+03	2.11E+03
MW-54-190	4	4	1.69E+03	1.25E+03	2.24E+03
MW-54-37	4	4	1.04E+03	8.70E+02	1.25E+03
MW-54-58	4	4	6.64E+02	5.78E+02	7.33E+02
MW-55-24	4	4	1.09E+03	7.82E+02	1.40E+03
MW-55-35	3	3	1.89E+03	1.60E+03	2.33E+03
MW-55-54	4	4	6.88E+03	5.96E+03	7.76E+03
MW-56-53	2	2	3.31E+02	2.63E+02	3.99E+02
MW-56-83	2	2	2.46E+03	1.94E+03	2.98E+03
MW-57-11	2	2	2.73E+03	2.17E+03	3.28E+03
MW-57-20	2	2	1.12E+03	7.27E+02	1.51E+03
MW-57-45	2	2	8.48E+02	5.65E+02	1.13E+03
MW-58-26	2	2	2.67E+02	2.38E+02	2.95E+02
MW-58-65	2	2	2.97E+02	2.81E+02	3.13E+02
MW-60-135	4	4	4.70E+02	3.79E+02	5.85E+02
MW-60-154	4	4	5.54E+02	4.53E+02	6.87E+02
MW-60-176	4	4	7.93E+02	6.68E+02	8.95E+02
MW-60-35	4	1	1.95E+02	1.95E+02	1.95E+02
MW-60-72	4	1	1.94E+02	1.94E+02	1.94E+02

Tritium (H-3) Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Avg Pos Act	Min Pos Act	Max Pos Act
MW-62-138	3	3	6.84E+02	5.33E+02	7.69E+02
MW-62-18	3	3	3.42E+02	2.69E+02	4.08E+02
MW-62-182	3	3	4.56E+02	3.99E+02	4.98E+02
MW-62-37	3	3	4.42E+02	3.94E+02	5.35E+02
MW-62-53	3	3	3.69E+02	3.48E+02	4.08E+02
MW-62-71	3	3	4.43E+02	3.53E+02	5.12E+02
MW-62-92	3	3	4.57E+02	3.94E+02	4.95E+02
MW-63-112	4	4	3.31E+02	2.07E+02	4.69E+02
MW-63-121	4	4	4.58E+02	3.44E+02	5.40E+02
MW-63-163	4	4	5.36E+02	4.44E+02	6.85E+02
MW-63-174	4	4	5.10E+02	4.49E+02	6.23E+02
MW-63-18	4	2	2.89E+02	2.57E+02	3.20E+02
MW-63-34	4	4	4.18E+02	3.26E+02	4.90E+02
MW-63-50	4	4	3.20E+02	2.70E+02	3.56E+02
MW-63-93	4	4	2.86E+02	2.15E+02	3.90E+02
MW-66-21	4	4	7.72E+02	5.34E+02	9.53E+02
MW-66-36	4	4	5.95E+03	5.01E+03	7.26E+03
MW-67-105	4	4	2.48E+03	2.16E+03	2.93E+03
MW-67-173	4	4	8.88E+02	6.95E+02	9.93E+02
MW-67-219	4	4	1.26E+03	1.17E+03	1.37E+03
MW-67-276	4	4	1.11E+03	1.03E+03	1.18E+03
MW-67-323	4	4	4.42E+02	3.38E+02	6.84E+02
MW-67-340	4	4	5.38E+02	4.78E+02	6.69E+02
MW-67-39	5	5	3.73E+03	3.07E+03	4.35E+03
U1-CSS	6	6	1.54E+03	4.95E+02	2.66E+03
U3-4D	4	4	4.32E+02	3.19E+02	5.68E+02
U3-T1	4	4	6.48E+02	5.56E+02	7.29E+02
U3-T2	4	4	1.07E+03	9.28E+02	1.33E+03

Note 1: All results are in pCi/L

Note 2: A total of 406 samples were analyzed for H-3 in 2008 with 344 positive results. This total includes samples from REMP wells MW-40 and MW-51. See the AREOR for additional data.

Note 3: A sample is positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. The target MDC is 200 pCi/L.

Cobalt-60 Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Ave Pos Act	Min Pos Act	Max Pos Act
MW-40-162	3	1	3.15E+00	3.15E+00	3.15E+00
MW-42-49	6	2	1.12E+01	5.47E+00	1.69E+01
MW-54-123	4	1	4.12E+00	4.12E+00	4.12E+00
MW-62-92	3	1	5.16E+00	5.16E+00	5.16E+00
MW-67-39	5	1	1.59E+01	1.59E+01	1.59E+01

Note 1: All results are in pCi/L

Note 2: A total of 406 samples were analyzed for Co-60 in 2008 with 6 positive results. This total includes samples from REMP wells MW-40 and MW-51. See the AREOR for additional data.

Note 3: A sample is positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. The target MDC is 15 pCi/L.

Nickel-63 Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Ave Pos Act	Min Pos Act	Max Pos Act
MW-42-49	6	6	4.21E+02	2.44E+02	7.34E+02
MW-53-120	6	4	2.23E+01	1.94E+01	2.65E+01

Note 1: All results are in pCi/L

Note 2: A total of 167 samples were analyzed for Ni-63 in 2008 with 10 positive results. This total includes samples from REMP wells MW-40 and MW-51. See the AREOR for additional data.

Note 3: A sample is positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. The target MDC is 30 pCi/L.

Strontium-90 Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Ave Pos Act	Min Pos Act	Max Pos Act
LAF-002	2	1	4.73E-01	4.73E-01	4.73E-01
MW-111	3	2	1.79E+00	1.02E+00	2.56E+00
MW-32-173	5	1	6.80E-01	6.80E-01	6.80E-01
MW-36-52	3	3	6.26E+00	4.85E+00	8.27E+00
MW-37-22	3	3	1.30E+01	8.73E+00	1.80E+01
MW-37-32	3	3	1.81E+01	1.52E+01	2.06E+01
MW-37-40	3	3	1.13E+00	9.48E-01	1.31E+00
MW-37-57	3	3	2.47E+01	2.12E+01	2.89E+01
MW-39-102	3	3	1.03E+00	8.83E-01	1.23E+00
MW-39-124	3	3	1.40E+00	9.42E-01	1.79E+00
MW-39-183	3	2	9.75E-01	8.29E-01	1.12E+00
MW-39-195	3	3	9.96E-01	8.81E-01	1.21E+00
MW-39-67	3	3	3.01E+00	2.21E+00	3.52E+00
MW-39-84	3	3	1.68E+00	1.04E+00	2.23E+00
MW-41-40	2	2	4.48E+00	3.05E+00	5.91E+00
MW-41-63	2	2	4.73E+00	3.76E+00	5.69E+00
MW-42-49	6	6	9.78E+01	2.36E+01	2.96E+02
MW-42-78	3	1	3.91E-01	3.91E-01	3.91E-01
MW-43-62	2	1	1.00E+00	1.00E+00	1.00E+00
MW-46	4	1	9.33E-01	9.33E-01	9.33E-01
MW-49-26	4	4	1.81E+01	1.53E+01	2.29E+01
MW-49-42	4	4	2.40E+01	2.16E+01	2.94E+01
MW-49-65	4	4	2.03E+01	1.72E+01	2.73E+01
MW-50-42	4	4	4.29E+00	2.40E+00	9.28E+00
MW-50-66	7	7	3.61E+01	3.20E+01	4.99E+01
MW-52-162	1	1	1.03E+00	1.03E+00	1.03E+00
MW-53-120	6	6	3.19E+01	2.53E+01	4.25E+01
MW-53-82	3	1	6.95E-01	6.95E-01	6.95E-01
MW-54-123	4	4	8.78E+00	6.45E+00	1.26E+01
MW-54-144	4	4	1.71E+01	1.53E+01	2.02E+01
MW-54-173	4	4	1.38E+01	1.22E+01	1.61E+01
MW-54-190	4	4	2.35E+01	1.93E+01	3.38E+01
MW-54-37	4	4	6.10E+00	5.08E+00	7.33E+00
MW-54-58	4	4	3.69E+00	1.69E+00	9.02E+00
MW-55-24	4	4	2.03E+01	1.08E+01	2.55E+01
MW-55-35	3	3	2.87E+01	2.54E+01	3.44E+01
MW-55-54	4	4	2.30E+01	1.94E+01	2.67E+01
MW-56-83	2	2	2.85E+00	2.13E+00	3.56E+00

Strontium-90 Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Ave Pos Act	Min Pos Act	Max Pos Act
MW-57-11	2	2	3.22E+01	2.27E+01	4.16E+01
MW-57-20	2	2	2.15E+00	1.23E+00	3.06E+00
MW-57-45	2	2	1.73E+00	1.20E+00	2.26E+00
MW-62-138	3	3	1.06E+00	7.34E-01	1.24E+00
MW-62-18	3	1	5.31E-01	5.31E-01	5.31E-01
MW-62-37	3	1	1.36E+00	1.36E+00	1.36E+00
MW-63-121	4	1	6.63E-01	6.63E-01	6.63E-01
MW-66-21	4	4	1.01E+00	9.07E-01	1.09E+00
MW-66-36	4	4	1.35E+01	1.20E+01	1.51E+01
MW-67-105	4	3	1.07E+00	9.63E-01	1.13E+00
MW-67-39	5	5	1.83E+01	1.37E+01	2.59E+01
U1-CSS	6	6	7.42E+00	4.83E+00	9.38E+00
U3-T1	4	1	7.01E-01	7.01E-01	7.01E-01
U3-T2	4	1	6.52E-01	6.52E-01	6.52E-01

Note 1: All results are in pCi/L.

Note 2: A total of 406 samples were analyzed for Sr-90 in 2008 with 153 positive results. This total includes samples from REMP wells MW-40 and MW-51. See the AREOR for additional data.

Note 3: A sample is positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. The target MDC is 1 pCi/L.

Cesium-137 Summary

Well Name	# Samples in 2008	# Positive Samples in 2008	Ave Pos Act	Min Pos Act	Max Pos Act
B-1	2	1	2.00E+01	2.00E+01	2.00E+01
MW-41-40	2	1	2.67E+00	2.67E+00	2.67E+00
MW-42-49	6	6	1.90E+04	1.06E+04	3.38E+04
MW-42-78	3	1	1.08E+02	1.08E+02	1.08E+02
MW-44-102	4	1	1.73E+01	1.73E+01	1.73E+01
MW-44-66	4	1	1.18E+01	1.18E+01	1.18E+01
MW-50-42	4	1	1.63E+01	1.63E+01	1.63E+01
MW-50-66	7	1	1.56E+01	1.56E+01	1.56E+01
MW-55-24	4	1	3.33E+00	3.33E+00	3.33E+00
MW-67-105	4	1	9.32E+00	9.32E+00	9.32E+00
MW-67-173	4	1	5.82E+00	5.82E+00	5.82E+00
MW-67-219	4	1	4.25E+00	4.25E+00	4.25E+00
MW-67-276	4	1	4.55E+00	4.55E+00	4.55E+00
MW-67-340	4	1	5.82E+00	5.82E+00	5.82E+00

Note 1: All results are in pCi/L

Note 2: A total of 406 samples were analyzed for Cs-137 in 2008 with only 19 positive results. This total includes samples from REMP wells MW-40 and MW-51. See the AREOR for additional data.

Note 3: A sample is positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. The target MDC is 18 pCi/L.