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NL-12-020

April 30, 2012

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

SUBJECT: 2011 Annual Radioactive Effluent Release Report
Indian Point Unit Nos. 1, 2 and 3
Docket Nos. 50-03, 50-247, 50-286
License Nos. DPR-5. DPR-26, DPR-64

Dear Sir or Madam:

Enclosures 1, 2 and 3 to this letter provide Entergy Nuclear Operations, Inc.'s (ENO's) Annual Effluent and Waste Disposal Report for 2011. This report is submitted in accordance with Technical Specification 5.6.3 and Regulatory Guide 1.21.

There are no new commitments contained in this letter. If you have any questions or require additional information, please contact me at 914-254-6710.

Sincerely,

RW/mb/ss

cc: next page

FSME20
IE48
NRR
FSME

Enclosures:
1. Radioactive Effluent Release Report: 2011
2. Offsite Dose Calculation Manual Rev.3
3. IPEC Combined ODCM Rev 3 Justification Package
4. EN-RW-105 Rev. 2, 'Process Control Program'
5. IPEC OSRC Meeting Minutes, IPEC 11-014

cc: Mr. William Dean, Regional Administrator, NRC Region 1
Mr. Douglas Pickett, Senior Project Manager, NRC NRR DORL
IPEC NRC Resident Inspector's Office
Mr. Stephen Giebel, IPEC NRC Unit 1 Project Manager
Mr. Francis J. Murray, President and CEO, NYSERDA (w/o enclosure)
Ms. Bridget Frymire, New York State Department of Public Service (w/o enclosure)
Mr. Timothy Rice, Bureau of Hazardous Waste & Radiation Mgmt, NYSDEC
Mr. Robert Snyder, NYS Department of Health
Mr. Chuck Nieder, NYS Department of Environmental Conservation
Mr. Jason Martinez, American Nuclear Insurers
Chief, Compliance Section, New York State DEC,
Division of Water Regional Water Engineer, New York State DEC

ENCLOSURE 1 TO NL-12-020

Radioactive Effluent Release Report: 2011

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: 2011

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) 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	$\bar{E}_\beta$ =	4.28E-01 Mev/dis	$\bar{E}_\gamma$ =	1.15E+00 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	3.91E-01 Mev/dis	$\bar{E}_\gamma$ =	9.85E-01 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	2.92E-01 Mev/dis	$\bar{E}_\gamma$ =	6.31E-01 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	2.46E-01 Mev/dis	$\bar{E}_\gamma$ =	4.59E-01 Mev/dis

Unit 3:

1st Quarter	$\bar{E}_\beta$ =	1.86E-01 Mev/dis	$\bar{E}_\gamma$ =	1.95E-01 Mev/dis
2nd Quarter	$\bar{E}_\beta$ =	3.46E-01 Mev/dis	$\bar{E}_\gamma$ =	8.39E-01 Mev/dis
3rd Quarter	$\bar{E}_\beta$ =	4.40E-01 Mev/dis	$\bar{E}_\gamma$ =	1.19E+00 Mev/dis
4th Quarter	$\bar{E}_\beta$ =	4.40E-01 Mev/dis	$\bar{E}_\gamma$ =	1.19E+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, which 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 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 (I-133, I-135) 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, Sr-89, and Sr-90 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) Carbon-14

C-14 release quantification details are discussed in Section E.

e) Liquid Effluents

A sample of each batch discharge is taken and an isotopic analysis is performed in compliance with requirements specified in the ODCM. Proportional composite samples of continuous discharges are taken and analyzed per the ODCM, 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 non-gamma emitters is used per the station ODCM (Gross Alpha, Sr-89, Sr-90, Fe-55 and Ni-63). 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. Curie and dose data from unprocessed fluid is included in the following tables, along with all other liquid effluent, continuous or batch, processed or not. Processed and unprocessed water is differentiated only to prevent confusion with regard to measures undertaken to convert liquid to solid waste (resin cleanup). Therefore, volumes of processed and unprocessed liquid 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	2011
Number of Batch Releases		45	47	55	70	217
Total Time Period	(min)	2920	4680	3320	3750	14,700
Maximum Time Period	(min)	214	1440	215	106	1440
Average Time Period	(min)	65	100	60	54	68
Minimum Time Period	(min)	2	2	10	2	2

Unit 3 Airborne Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2011
Number of Batch Releases		49	21	18	17	105
Total Time Period	(min)	5560	2140	1520	1840	11,100
Maximum Time Period	(min)	190	168	157	201	201
Average Time Period	(min)	114	102	84	108	105
Minimum Time Period	(min)	9	1	1	3	1

Liquid:

Unit 1 and 2 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2011
Number of Batch Releases		14	12	15	16	57
Total Time Period	(min)	1510	1280	1580	1580	5950
Maximum Time Period	(min)	128	128	126	111	128
Average Time Period	(min)	108	106	105	99	104
Minimum Time Period	(min)	95	101	90	79	79

Unit 3 Liquid Releases		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2011
Number of Batch Releases		83	23	18	84	132
Total Time Period	(min)	9880	2620	1980	886	15,400
Maximum Time Period	(min)	240	145	121	117	240
Average Time Period	(min)	119	114	110	111	116
Minimum Time Period	(min)	98	102	104	105	98

Average Stream Flow :

Regulatory Guide 1.21 includes a section to report average stream flows. This data, for some plants, is used to determine dilution volume. However, at IPEC, the Hudson River stream flow is not applied to dilution calculations, in favor of the more conservative method of using only the dilution in the discharge canal, running north to south, parallel to the river, and servicing the plant.

This conservative dilution volume is determined quarterly, applied for liquid offsite dose calculations (and all other determinations of diluted effluent), and reported on Tables 2A, in Section B of this report.

Hudson River flow information remains available, however, from the Department of the Interior, United States Geological Survey (USGS), or from web sites such as:

http://ny.water.usgs.gov/projects/dialer_plots/Hudson_R_at_Poughkeepsie_Freshwater_Discharge.htm

6. Abnormal Releases

a) Liquid

General Groundwater

IPEC's overall approach to, and formulation of, the Precipitation Mass Balance Model based process used to quantify groundwater releases based on monitoring data remained unchanged in 2011. Groundwater elevation data, collected from the initiation of the Long Term Monitoring Program in 2007 through 2009, was used to recalibrate the model in Quarter two of 2009, as summarized in the second quarter 2009 Long Term Monitoring Report, GZA, September 22, 2010. Subsequent groundwater elevation data, through 2011, has been used to further verify the accuracy of this calibration. The resulting offsite dose associated with the groundwater pathway remains small (<0.02% of the NRC's annual limit).

Increased precipitation observed in 2011 resulted in increased transport to the river when compared to 2010 data. The effects of the increased precipitation were consistent with expectations and understanding of the groundwater flow modeling, and further described in Section H of this report.

A breakdown of the total dose from the groundwater and storm water pathways is provided in Section E of this report (Radiological Impact on Man).

Storm Drain Contamination Events, 2011

A storm drain (A-2) outside Unit 3 Fuel Storage Building (FSB) was identified with increased tritium from 2010 into 2011. After a long investigation, the increase was attributed to a temporary loss of ventilation in the nearby FSB. This building's exhaust fan had been removed to replace a more critical, failed fan in Unit 2, leaving no operable exhaust fan for Unit 3. During the repair interval for the Unit 3 fan, a ground-level airborne effluent term was understood to be unavoidable from small openings such as the ventilation inlet plenum on the roof. Airborne effluent was monitored, calculated, and reported, based on measurements of FSB atmosphere (for tritium and other contaminants), pool level, temperature and barometric pressure, etc. These parameters were used to complete a mass balance for the lost tritium.

While the airborne effluent was being fully monitored and reported, it became evident that there was a subsequent effect from the airborne effluent, the released vapor was condensing (particularly on the FSB roof) and traveling (via a direct pipe roof drain) into a storm drain located a few feet from the south-east corner of the spent fuel building (identified as storm drain A-2). The direct contribution from the FSB roof was verified by collecting a sample directly from the outlet of the roof drain pipe where it enters the basin of drain A-2. This manhole continued to indicate elevated H-3 until July 2011, when the fan was repaired and ventilation in the Unit 3 FSB restored. Even though the curies and dose were already fully quantified and accounted for within the preceding, root cause gaseous release, no attempt was made to subtract the associated curies from the liquid effluent reporting.

The curies and dose from this liquid pathway (from storm drain A-2, and a similar measurement in drain B-1) were verified to be insignificant with regard to total site effluent. Totals were also shown to be well below the threshold established for increased or renewed 80-10 evaluation. Notwithstanding these conclusions, for completeness, the curies and dose associated with A-2 and B-1 were added to the monthly reports for Unit 3.

In quarter 3, 2011, an increase in the tritium levels was also noted in Manhole 5, located in the Unit 2 Auxiliary Feed Building. The tritium increase has been isolated to the pipe leading to the Vapor Containment Building Foundation Drain (MH-5 VCFD). This pipe also carries drainage from roof drains and floor drains from the Auxiliary Feed Building. Tritium levels exhibited substantial variability during Q3 and Q4, but did subsequently decrease to baseline levels by Q1 of 2012. The root cause of this transient tritium increase is still being investigated.

A spill of liquid waste inside the Unit 1 processing facility also caused detectable tritium in nearby storm drains and Monitoring Wells in April, 2011. Potential effluent impact was evaluated and determined to have negligible impact on total dose reported. However, this discovery offered an opportunity for better understanding of trace contaminants migrating through concrete. Because the spill was inside a building, potential migration of the tritium through the building foundation system and into local wells or drains was not immediately understood. A multi-departmental focused assessment in July 2011 included corrective actions to account for the likelihood that tritium, even from a spill inside a protected building, could potentially migrate into the environment. This experience was shared with fleet GW specialists and will be discussed at the annual EPRI GW conference in June, 2012.

Both the liquid and airborne tritium effluent contribution from the above events proved insignificant with respect to monthly totals. However, station procedures and policies with regard to indoor spills were improved and possible other sources for the trace tritium contamination continue to be investigated.

b) Gaseous

During the interval where the FSB exhaust fan was OOS (discussed above), tritium and other radionuclide monitoring was performed at multiple elevations above floor level in the FSB to provide a more accurate representation of potential vapor effluent migration out through the access door. All airborne effluent was quantified at ground level. While the total tritium leaving the building was determined to be approximately the same as during routine operation (prior to and after vent fan OOS), the effluent airborne dose calculations indicated increased mrem. This dose increase is due to releases at ground level having a higher dispersion constant than that of the normal release point atop the containment building. Despite exceeding department goals, the effluent airborne dose from this tritium release remained a very small portion of the ODCM limit.

Regardless of significance to total activity, all effluent, even that of limited significance, was quantified and included in the monthly effluent reports as well as the annual summary.

7. ODCM Reporting Requirements

ODCM Part I requires reporting of effluent monitoring equipment out of service for periods exceeding 30 consecutive days, notification of any changes in the land use census, the Radiological Environmental Monitoring Program (REMP), exceeding total curie content limitations in outdoor tanks, or any other changes in the ODCM or Process Control Program (PCP).

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

Instrument	Effected Interval	Details
Unit 2 Plant Vent Process Flow Rate Indicator, SV2-DPT	01-01-11 00:00 to 03-28-11 11:00 (87 days)	This instrument failed its routine calibration in 2009. Further testing was performed to compare this ODCM-required instrument with a redundant instrument that appeared to be working. Investigation ensued as to why the values were outside desirable tolerances with each other. Parts (not readily available) for the ODCM instrument were deemed necessary and ordered from vendor. After parts arrived, calibration was scheduled after a refueling outage. Test procedures were updated to improve the calibration process. Safety conditions related to frozen surfaces delayed completion of the calibration. While OOS, compensatory measurements (estimates of process flow) were conducted per the ODCM. In addition, a redundant, non-ODCM instrument was evaluated as a backup. This instrument's reading compared favorably with manual measurements of vent flow rate to increase confidence. While compensatory action continued, the backup instrument readings provided additional continuous indication.
Unit 1 Stack Vent Noble Gas Monitor, R-60	01-01-11 00:00 to 07-19-11 12:00 (188 days)	The monitor's memory failed during calibration. After repair, an independent failure occurred with a non-required sub-channel that rendered the noble gas channel inoperable. Prioritization, high work load, limited resources, flooding in the work area, and an on-going modification to retire the superfluous and faulty channels combined to delay repairs. During the OOS interval, compensatory actions (periodic grab samples) were completed.
Unit 3 Steam Gen Blowdown Monitor, R-19	01-01-11 00:00 to 04-05-11 13:12 (94 days)	A containment isolation valve for one Steam Generator sample line to this monitor was declared inoperable. Therefore, the other valve was shut, securing flow from one SG. Difficulty in accessing and repairing the valve drove a decision to leave this line isolated until the upcoming refueling outage, while simultaneously investigating options for routing flow to the monitor from other lines. Compensatory sampling was performed from an unaffected line to SG Blowdown Recovery. This monitor was not required during the refueling outage, and returned to service with plant startup.
Unit 2 Steam Gen Blowdown Monitor, R-49	01-19-11 00:00 to 02-24-11 11:00 (36 days)	This instrument was removed from service for it normal 2 yr calibration on 1-19-11. There were no issues with the calibration. However, before it was completed, a leak on a sample cooler required that the monitor be taken out of service, as 23 SG was not being delivered to the monitor. While R-49 was OOS, compensatory grab samples were taken till the monitor was returned to service in Feb, 2011.
Unit 3 Radioactive Machine Shop Vent Process Flow meter	01-01-11 00:00 to 11-22-11 14:00 (327 days) (427 days total)	The flow rate meter was declared OOS in Sep, 2010. The vendor was needed to calibrate the instrument, and was not available till Jan 2011. After the vendor's test, it was believed to be in service. It was later determined that the vendor was not on the approved vendor list, so the instrument's official condition was changed back to OOS. It remained OOS awaiting approved-vendor paperwork to be completed. The subsequent retest/recalibration was successfully performed in Nov 2011. During this interval, default values of flow rate are being used (from rated fan flow), and recorded every 4 hours, per the ODCM requirements.

Other Reporting Criteria:

Tank Curie Limits

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

Land Use Census

During this reporting period, there were no changes to the Land Use Census, as defined in the ODCM.

PCP changes:

An editorial change to the fleet Process Control Program was performed in 2011.

EN-RW-105 was updated to Revision 2 in November, 2011, modifying the site applicability column for NRC letters, to ensure requirements were properly connected to each site in the Entergy fleet.

These changes were editorial, as defined on page 1 of the updated PCP (EN-RW-105). A complete copy of the PCP, along with meeting notes from the approval of the Onsite Safety Review Committee (OSRC) on Nov 30, 2011, is attached to this report as an addendum.

ODCM changes:

The ODCM was updated to Revision 3 in 2011.

Changes included clarifying lower limits of detection, radiation monitor ranges, calculations for C-14 effluent, determination of quarterly dilution volumes for liquid effluent, and some administrative/typographical improvements for clarity. This revision was approved by OSRC on Jan 13, 2011.

A complete copy of the ODCM Rev 3, along with its justification package is attached to this report as an addendum. Changes are marked with month and date in the right-hand margin.

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT RELEASE REPORT

B. GASEOUS EFFLUENTS

2011

TABLE 1A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011	Est. Total % Error
1. Total Release	Ci	2.15E-02	1.08E-01	5.28E-02	9.99E-02	2.82E-01	± 25
2. Average release rate	uCi/sec	2.76E-03	1.37E-02	6.65E-03	1.26E-02	8.94E-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	1.40E-05	-	-	-	1.40E-05	± 25
2. Average release rate	uCi/sec	1.80E-06	-	-	-	4.43E-07	
3. Gross Alpha	Ci	-	-	-	-	0.00E+00	± 25

D. Tritium							
1. Total release	Ci	2.50E+00	4.76E+00	3.71E+00	3.99E+00	1.50E+01	± 25
2. Average release rate	uCi/sec	3.21E-01	6.05E-01	4.67E-01	5.02E-01	4.74E-01	

E. Carbon-14						
1. Total release	Ci	2.75E+00	2.75E+00	2.75E+00	2.75E+00	1.10E+01
2. Average release rate	uCi/sec	3.54E-01	3.50E-01	3.46E-01	3.46E-01	3.49E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2011

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 **CONTINUOUS** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011
Xe-133	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	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	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3) Particulates

Cs-134	Ci	2.50E-06	-	-	-	2.50E-06
Cs-137	Ci	1.15E-05	-	-	-	1.15E-05
Total for Period	Ci	1.40E-05	0.00E+00	0.00E+00	0.00E+00	1.40E-05

- Indicates < MDA

TABLE 1C
INDIAN POINT 1 and 2 - **BATCH** GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011
Ar-41	Ci	1.91E-02	7.97E-02	2.48E-02	3.33E-02	1.57E-01
Kr-85	Ci	-	-	-	-	0.00E+00
Kr-85m	Ci	4.62E-07	3.06E-04	1.53E-06	2.55E-06	3.11E-04
Kr-87	Ci	1.00E-07	2.38E-04	9.46E-07	2.07E-06	2.41E-04
Kr-88	Ci	5.78E-07	5.42E-04	2.71E-06	4.50E-08	5.45E-04
Xe-131m	Ci	-	-	-	4.72E-05	4.72E-05
Xe-133	Ci	2.33E-03	2.12E-02	2.72E-02	6.59E-02	1.17E-01
Xe-133m	Ci	6.20E-07	1.63E-04	1.10E-06	1.38E-04	3.02E-04
Xe-135	Ci	1.07E-05	4.71E-03	7.91E-04	5.15E-04	6.03E-03
Xe-135m	Ci	-	7.65E-04	-	4.70E-06	7.70E-04
Xe-138	Ci	-	1.78E-04	-	1.12E-06	1.79E-04
Total for Period	Ci	2.15E-02	1.08E-01	5.28E-02	9.99E-02	2.82E-01

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 2011)

GASEOUS EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011	Est. Total % Error
1. Total Release	Ci	4.24E-01	2.00E-02	1.48E-02	1.41E-02	4.73E-01	± 25
2. Average release rate	uCi/sec	5.45E-02	2.54E-03	1.86E-03	1.77E-03	1.50E-02	

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	2.69E+00	1.20E+00	3.33E+00	4.06E+00	1.13E+01	± 25
2. Average release rate	uCi/sec	3.46E-01	1.52E-01	4.19E-01	5.11E-01	3.58E-01	

E. Carbon-14						
1. Total release	Ci	2.49E+00	2.49E+00	2.49E+00	2.49E+00	9.94E+00
2. Average release rate	uCi/sec	3.20E-01	3.16E-01	3.13E-01	3.13E-01	3.15E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	2011

- Indicates < MDA

TABLE 1C
INDIAN POINT 3 - CONTINUOUS GASEOUS EFFLUENTS
RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011
Ar-41	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	-	-	-	-	0.00E+00
Xe-135	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	0.00E+00	0.00E+00	0.00E+00	0.00E+00	**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 2011)

Nuclides Released

1) Fission Gases	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011
Ar-41	Ci	4.46E-02	1.28E-02	1.37E-02	1.30E-02	8.41E-02
Kr-85	Ci	7.66E-04	-	-	-	7.66E-04
Kr-85m	Ci	5.26E-04	-	-	-	5.26E-04
Kr-87	Ci	-	-	-	-	0.00E+00
Kr-88	Ci	2.75E-04	-	-	-	2.75E-04
Xe-131m	Ci	1.13E-03	-	-	-	1.13E-03
Xe-133	Ci	3.36E-01	7.17E-03	1.09E-03	1.03E-03	3.45E-01
Xe-133m	Ci	4.19E-03	-	-	-	4.19E-03
Xe-135	Ci	3.64E-02	4.26E-06	-	-	3.64E-02
Xe-135m	Ci	2.56E-04	-	-	-	2.56E-04
Total for Period	Ci	4.24E-01	2.00E-02	1.48E-02	1.41E-02	4.73E-01

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

2011

TABLE 2A

INDIAN POINT 1 and 2 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	2.90E-03	6.18E-03	1.32E-02	1.06E-02	3.29E-02	± 25
2. Average Diluted Conc	uCi/ml	5.48E-12	8.77E-12	1.54E-11	1.51E-11	1.18E-11	

B. Tritium

1. Total Release	Ci	2.68E+02	2.37E+02	1.60E+02	2.62E+02	9.27E+02	± 25
2. Average Diluted Conc	uCi/ml	5.06E-07	3.37E-07	1.86E-07	3.72E-07	3.31E-07	

C. Dissolved & Entrained Gases

1. Total Release	Ci	-	5.27E-05	-	-	5.27E-05	± 25
2. AverageDiluted Conc	uCi/ml	-	7.49E-14	-	-	1.88E-14	

D. Gross Alpha

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

E. Volume of Waste Released

1. Processed Waste (LW & NCD)	liters	3.63E+06	2.92E+06	4.80E+06	3.39E+06	1.47E+07	± 10
2. Unprocessed (SGBD, SFDS, U1FD)	liters	4.41E+07	4.39E+07	4.78E+07	4.40E+07	1.80E+08	± 10

F. Volume of Dilution Water	liters	5.31E+11	7.06E+11	8.58E+11	7.03E+11	2.80E+12	± 10

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

CONTINUOUS RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011
Cs-137	Ci	7.96E-04	2.61E-03	3.20E-03	1.61E-03	8.22E-03
Ni-63	Ci	-	-	-	-	0.00E+00
Sr-89	Ci	-	-	-	-	0.00E+00
Sr-90	Ci	2.08E-04	9.45E-05	2.98E-04	7.79E-05	6.79E-04
Total for Period	Ci	1.00E-03	2.70E-03	3.50E-03	1.69E-03	8.90E-03

- Indicates < MDA

TABLE 2B

INDIAN POINT 1 and 2 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

BATCH RADIOACTIVE EFFLUENT

Nuclides Released	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011
Co-57	Ci	-	7.91E-07	-	-	7.91E-07
Co-58	Ci	4.63E-05	1.49E-04	2.07E-05	1.94E-04	4.11E-04
Co-60	Ci	6.18E-05	3.12E-04	1.56E-04	6.00E-04	1.13E-03
Cr-51	Ci	-	-	-	-	0.00E+00
Cs-137	Ci	-	-	-	3.69E-04	3.69E-04
Ni-63	Ci	5.42E-04	1.51E-03	3.70E-03	5.37E-03	1.11E-02
Sb-124	Ci	-	-	1.61E-05	-	1.61E-05
Sb-125	Ci	1.25E-03	1.50E-03	5.86E-03	2.38E-03	1.10E-02
Te-125m	Ci	-	-	-	-	0.00E+00
Total for Period	Ci	1.90E-03	3.47E-03	9.75E-03	8.91E-03	**2.40E-02**

Dissolved & Entrained Gas

Kr-85	Ci	-	-	-	-	0.00E+00
Xe-133	Ci	-	5.27E-05	-	-	5.27E-05
Total for Period	Ci	0.00E+00	5.27E-05	0.00E+00	0.00E+00	**5.27E-05**

- Indicates < MDA

TABLE 2A

INDIAN POINT 3 RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)

LIQUID EFFLUENTS - SUMMATION OF ALL RELEASES

A. Fission & Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Year 2011	Est. Total % Error
1. Total Release (not including Tritium, Gr Alpha, & Gases)	Ci	1.16E-02	9.43E-03	1.15E-03	1.10E-03	2.33E-02	± 25
2. Average Diluted Conc	uCi/ml	2.20E-11	1.34E-11	1.34E-12	1.56E-12	8.34E-12	

B. Tritium

1. Total Release	Ci	8.96E+02	4.53E+01	2.63E+01	1.17E+01	9.80E+02	± 25
2. Average Diluted Conc	uCi/ml	1.69E-06	6.44E-08	3.06E-08	1.67E-08	3.50E-07	

C. Dissolved & Entrained Gases

1. Total Release	Ci	2.46E-02	8.65E-05	1.16E-05	-	2.47E-02	± 25
2. AverageDiluted Conc	uCi/ml	4.64E-11	1.23E-13	1.36E-14	-	8.83E-12	

D. Gross Alpha

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

E. Volume of Waste Released

1. Processed Fluids (Mon Tanks)	liters	2.48E+06	6.01E+05	4.70E+05	2.05E+05	3.75E+06	± 10
2. Unprocessed Fluids (SGs)	liters	2.79E+06	8.26E+06	1.69E+06	3.03E+06	1.58E+07	± 10

F. Volume of Dilution Water	liters	5.31E+11	7.06E+11	8.58E+11	7.03E+11	2.80E+12	± 10

'- indicates < MDA

TABLE 2B
INDIAN POINT 3 LIQUID RADIOACTIVE EFFLUENT REPORT (Jan - Dec 2011)
BATCH and CONTINUOUS RADIOACTIVE LIQUID EFFLUENT

Batch Fission/Activation Products	Units	Qtr 1	Qtr 2	Qtr 3	Qtr 4	2011
Ag-110m	Ci	3.82E-04	1.63E-05	-	2.98E-06	4.01E-04
Co-57	Ci	-	1.79E-06	-	-	1.79E-06
Co-58	Ci	1.53E-03	2.08E-03	4.46E-04	1.31E-04	4.19E-03
Co-60	Ci	6.88E-03	2.59E-04	1.09E-04	8.34E-05	7.33E-03
Cr-51	Ci	1.74E-05	-	-	-	1.74E-05
Cs-137	Ci	4.80E-05	1.92E-06	-	-	5.00E-05
Fe-55	Ci	-	1.42E-04	-	-	1.42E-04
La-140	Ci	1.93E-05	-	-	-	1.93E-05
Mn-54	Ci	1.38E-04	-	-	-	1.38E-04
Nb-95	Ci	5.22E-05	-	-	-	5.22E-05
Ni-63	Ci	1.71E-03	7.68E-04	2.70E-04	4.27E-04	3.18E-03
Sb-124	Ci	-	8.01E-05	1.54E-05	-	9.55E-05
Sb-125	Ci	8.61E-04	1.95E-04	2.99E-04	4.53E-04	1.81E-03
Sn-113	Ci	2.93E-06	-	-	-	2.93E-06
Te-123m	Ci	-	1.72E-04	6.00E-06	-	1.78E-04
Te-125m	Ci	-	5.72E-03	-	-	5.72E-03
Total for Period	Ci	1.16E-02	9.43E-03	1.15E-03	1.10E-03	2.33E-02

Dissolved and Entrained Gas (Batch)

Ar-41	Ci	2.78E-05	-	-	-	2.78E-05
Xe-131m	Ci	-	3.46E-05	-	-	3.46E-05
Xe-133	Ci	2.29E-02	5.19E-05	1.16E-05	-	2.30E-02
Xe-133m	Ci	3.13E-04	-	-	-	3.13E-04
Xe-135	Ci	1.36E-03	-	-	-	1.36E-03
Total for Period	Ci	2.46E-02	8.65E-05	1.16E-05	0.00E+00	2.47E-02

Continuous Releases (SG Blowdown)

H-3 (only)	Ci	1.97E-02	7.20E-03	2.44E-03	1.07E-02	4.00E-02

'- indicates < mda

Indian Point Energy Center

(Units 1, 2, and 3)

RADIOACTIVE EFFLUENT REPORT

D. SOLID WASTE

2011

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms
LWS Resin 2011 Filters WMG

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	3.44E+02	9.74E+00	2.72E+01	+/- 25%
B	0.00E+00	0.00E+00	0.00E+00	+/- 25%
C	6.65E+01	1.88E+00	1.40E+01	+/- 25%
All	4.11E+02	1.16E+01	4.12E+01	+/- 25%

Waste Stream : Dry Active Waste Soil / Bebris Intermodal
DAW 20' Sea Land

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	1.26E+04	3.57E+02	1.02E-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	1.26E+04	3.57E+02	1.02E-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 Waste Oil

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	1.50E+02	4.25E+00	4.18E-03	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	1.50E+02	4.25E+00	4.18E-03	+/-25%

Waste Stream : Sum of All 4 Categories Soil/Debris Intermodal
LWS Resin DAW 20' SeaLand 2011 Filters WMG Waste Oil

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	1.31E+04	3.71E+02	2.73E+01	+/-25%
B	0.00E+00	0.00E+00	0.00E+00	+/-25%
C	6.65E+01	1.88E+00	1.40E+01	+/-25%
All	1.32E+04	3.73E+02	4.13E+01	+/-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 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
2	Hittman Transport	Energy Solutions - Bear Creek
2	Hittman Transport	Energy Solutions - GRF
2	Eastern Technologies, Inc.	Impact Services, Inc
20	Horwith Trucks	Studsvik Processing, Memphis TN
2	Hittman Transport	ToxCo Incorporated

Resins, Filters, and Evap Bottoms
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	0.001%	1.65E-04
Cr-51	86.065%	2.34E+01
Mn-54	0.079%	2.15E-02
Fe-55	0.588%	1.60E-01
Co-57	0.039%	1.06E-02
Co-58	7.650%	2.08E+00
Co-60	0.566%	1.54E-01
Ni-63	1.284%	3.49E-01
Zn-65	0.010%	2.85E-03
Sr-90	0.007%	1.96E-03
Ag-110m	0.000%	7.62E-05
Sb-125	2.107%	5.73E-01
Cs-134	0.105%	2.86E-02
Cs-137	1.497%	4.07E-01

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Resins, Filters, and Evap Bottoms

Waste Class C

Nuclide Name	Percent Abundance	Curies
Be-7	0.491%	6.89E-02
C-14	0.255%	3.58E-02
Cr-51	0.015%	2.17E-03
Mn-54	1.176%	1.65E-01
Fe-55	31.358%	4.40E+00
Fe-59	0.008%	1.17E-03
Co-57	0.091%	1.28E-02
Co-58	5.388%	7.56E-01
Co-60	17.247%	2.42E+00
Ni-63	14.824%	2.08E+00
Zn-65	0.214%	3.00E-02
Sr-89	0.009%	1.32E-03
Sr-90	0.240%	3.37E-02
Zr-95	0.164%	2.30E-02
Nb-95	0.028%	3.88E-03
Ag-110m	0.066%	9.28E-03
Sn-113	0.031%	4.38E-03
Cs-134	2.352%	3.30E-01
Cs-137	25.941%	3.64E+00
Ce-144	0.079%	1.11E-02
Am-241	0.009%	1.26E-03
Cm-242	0.000%	2.56E-05
Cm-243	0.013%	1.89E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Resins, Filters, and Evap Bottoms

Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.000%	1.65E-04
Be-7	0.167%	6.89E-02
C-14	0.087%	3.58E-02
Cr-51	56.766%	2.34E+01
Mn-54	0.454%	1.87E-01
Fe-55	11.062%	4.56E+00
Fe-59	0.003%	1.17E-03
Co-57	0.057%	2.34E-02
Co-58	6.890%	2.84E+00
Co-60	6.235%	2.57E+00
Ni-63	5.895%	2.43E+00
Zn-65	0.080%	3.28E-02
Sr-89	0.003%	1.32E-03
Sr-90	0.087%	3.57E-02
Zr-95	0.056%	2.30E-02
Nb-95	0.009%	3.88E-03
Ag-110m	0.023%	9.35E-03
Sn-113	0.011%	4.38E-03
Sb-125	1.390%	5.73E-01
Cs-134	0.868%	3.58E-01
Cs-137	9.825%	4.05E+00
Ce-144	0.027%	1.11E-02
Am-241	0.003%	1.26E-03
Cm-242	0.000%	2.56E-05
Cm-243	0.005%	1.89E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Dry Active Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	0.281%	2.86E-04
Mn-54	0.191%	1.94E-04
Fe-55	6.504%	6.61E-03
Co-57	0.020%	2.02E-05
Co-58	0.935%	9.50E-04
Co-60	42.313%	4.30E-02
Ni-63	18.303%	1.86E-02
Sr-90	0.038%	3.85E-05
Tc-99	0.020%	2.00E-05
Sb-125	0.562%	5.71E-04
Cs-134	0.342%	3.48E-04
Cs-137	30.308%	3.08E-02
Ce-144	0.070%	7.13E-05
Pu-238	0.003%	2.59E-06
Pu-239	0.001%	8.26E-07
Pu-241	0.102%	1.04E-04
Am-241	0.002%	1.93E-06
Cm-243	0.005%	5.07E-06

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Other Waste

Waste Class A

Nuclide Name	Percent Abundance	Curies
C-14	0.418%	1.75E-05
Mn-54	0.292%	1.22E-05
Fe-55	9.754%	4.08E-04
Co-57	0.030%	1.27E-06
Co-58	1.559%	6.52E-05
Co-60	55.942%	2.34E-03
Ni-63	27.254%	1.14E-03
Sr-90	0.056%	2.36E-06
Tc-99	0.029%	1.22E-06
Sb-125	0.842%	3.52E-05
Cs-134	0.514%	2.15E-05
Cs-137	3.036%	1.27E-04
Ce-144	0.107%	4.49E-06
Pu-238	0.004%	1.58E-07
Pu-239	0.001%	5.05E-08
Pu-241	0.152%	6.35E-06
Am-241	0.003%	1.18E-07
Cm-243	0.007%	3.10E-07

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Sum of All 4 Categories	Waste Class A	
Nuclide Name	Percent Abundance	Curies
H-3	0.001%	1.65E-04
C-14	0.001%	3.03E-04
Cr-51	85.733%	2.34E+01
Mn-54	0.080%	2.17E-02
Fe-55	0.612%	1.67E-01
Co-57	0.039%	1.06E-02
Co-58	7.621%	2.08E+00
Co-60	0.729%	1.99E-01
Ni-63	1.352%	3.69E-01
Zn-65	0.010%	2.85E-03
Sr-90	0.007%	2.00E-03
Tc-99	0.000%	2.12E-05
Ag-110m	0.000%	7.62E-05
Sb-125	2.103%	5.74E-01
Cs-134	0.106%	2.90E-02
Cs-137	1.605%	4.38E-01
Ce-144	0.000%	7.58E-05
Pu-238	0.000%	2.74E-06
Pu-239	0.000%	8.77E-07
Pu-241	0.000%	1.10E-04
Am-241	0.000%	2.04E-06
Cm-243	0.000%	5.38E-06

Sum of All 4 Categories	Waste Class C	
Nuclide Name	Percent Abundance	Curies
Be-7	0.491%	6.89E-02
C-14	0.255%	3.58E-02
Cr-51	0.015%	2.17E-03
Mn-54	1.176%	1.65E-01
Fe-55	31.358%	4.40E+00
Fe-59	0.008%	1.17E-03
Co-57	0.091%	1.28E-02
Co-58	5.388%	7.56E-01
Co-60	17.247%	2.42E+00
Ni-63	14.824%	2.08E+00
Zn-65	0.214%	3.00E-02
Sr-89	0.009%	1.32E-03
Sr-90	0.240%	3.37E-02
Zr-95	0.164%	2.30E-02
Nb-95	0.028%	3.88E-03
Ag-110m	0.066%	9.28E-03
Sn-113	0.031%	4.38E-03
Cs-134	2.352%	3.30E-01
Cs-137	25.941%	3.64E+00
Ce-144	0.079%	1.11E-02
Am-241	0.009%	1.26E-03
Cm-242	0.000%	2.56E-05
Cm-243	0.013%	1.89E-03

Units 1 and 2 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.000%	1.65E-04
Be-7	0.167%	6.89E-02
C-14	0.087%	3.61E-02
Cr-51	56.625%	2.34E+01
Mn-54	0.453%	1.87E-01
Fe-55	11.035%	4.56E+00
Fe-59	0.003%	1.17E-03
Co-57	0.057%	2.34E-02
Co-58	6.872%	2.84E+00
Co-60	6.340%	2.62E+00
Ni-63	5.929%	2.45E+00
Zn-65	0.079%	3.28E-02
Sr-89	0.003%	1.32E-03
Sr-90	0.086%	3.57E-02
Zr-95	0.056%	2.30E-02
Nb-95	0.009%	3.88E-03
Tc-99	0.000%	2.12E-05
Ag-110m	0.023%	9.35E-03
Sn-113	0.011%	4.38E-03
Sb-125	1.389%	5.74E-01
Cs-134	0.869%	3.59E-01
Cs-137	9.873%	4.08E+00
Ce-144	0.027%	1.12E-02
Pu-238	0.000%	2.74E-06
Pu-239	0.000%	8.77E-07
Pu-241	0.000%	1.10E-04
Am-241	0.003%	1.26E-03
Cm-242	0.000%	2.56E-05
Cm-243	0.005%	1.89E-03

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0 (all identified isotopes are included)

Waste Stream : Resins, Filters, and Evap Bottoms

LW S Resin 14-170 Primary Resin 8-120

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	2.27E+02	6.43E+00	2.80E+00	+/- 25%
B	9.00E+01	2.55E+00	5.21E+01	+/- 25%
C	0.00E+00	0.00E+00	0.00E+00	+/- 25%
All	3.17E+02	8.98E+00	5.49E+01	+/- 25%

Waste Stream : Dry Active Waste U3 DAW B-25

Unit 3 DAW-20' Sealand 20' Intermodal Soil DAW 20' Shielded

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	5.54E+04	1.57E+03	5.91E-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	5.54E+04	1.57E+03	5.91E-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	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 B-25 20' Intermodal Soil DAW 20' Shielded SeaLand

Waste Class	Volume ft^3	Volume m^3	Curies Shipped	% Error (Ci)
A	5.56E+04	1.57E+03	3.39E+00	+/-25%
B	9.00E+01	2.55E+00	5.21E+01	+/-25%
C	0.00E+00	0.00E+00	0.00E+00	+/-25%
All	5.57E+04	1.58E+03	5.55E+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 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Number of Shipments	Mode of Transportation	Destination
5	Hittman Transport	Energy Solutions Bear Creek
3	Hittman Transport	Energy Solutions Gallaher Road
4	Eastern Technologies, Inc	IMPACT Services, Inc
5	Hittman Transport	Studsvik Processing, Memphis TN
1	Hittman Transport	Studsvik Processing, Erwin TN
72	R & R Trucking Inc	Studsvik Processing, Memphis TN

Resins, Filters, and Evap Bottoms
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	21.845%	6.13E-01
C-14	0.959%	2.69E-02
Cr-51	0.203%	5.71E-03
Mn-54	0.959%	2.69E-02
Fe-55	11.261%	3.16E-01
Co-57	0.118%	3.32E-03
Co-58	1.910%	5.36E-02
Co-60	12.330%	3.46E-01
Ni-59	0.099%	2.79E-03
Ni-63	32.429%	9.10E-01
Zn-65	0.065%	1.83E-03
Sr-90	0.019%	5.32E-04
Nb-95	0.032%	8.96E-04
Ag-110m	0.306%	8.59E-03
Sb-124	0.015%	4.07E-04
Sb-125	3.777%	1.06E-01
Cs-134	1.661%	4.66E-02
Cs-137	11.368%	3.19E-01
Ce-144	0.549%	1.54E-02
Pu-238	0.003%	8.66E-05
Pu-239	0.001%	1.96E-05
Pu-241	0.086%	2.40E-03
Am-241	0.002%	5.46E-05
Cm-242	0.000%	8.99E-06
Cm-243	0.004%	1.21E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Resins, Filters, and Evap Bottoms,
Waste Class B

Nuclide Name	Percent Abundance	Curies
H-3	0.139%	7.25E-02
C-14	0.280%	1.46E-01
Mn-54	0.170%	8.87E-02
Fe-55	2.593%	1.35E+00
Co-57	0.025%	1.32E-02
Co-58	0.034%	1.78E-02
Co-60	9.199%	4.79E+00
Ni-59	0.309%	1.61E-01
Ni-63	71.635%	3.73E+01
Sr-90	0.051%	2.63E-02
Nb-94	0.009%	4.55E-03
Sb-125	0.903%	4.70E-01
Cs-134	2.439%	1.27E+00
Cs-137	12.195%	6.35E+00
Ce-144	0.014%	7.05E-03
Pu-238	0.000%	1.36E-04
Pu-239	0.000%	2.87E-05
Pu-241	0.004%	2.13E-03
Pu-242	0.000%	8.34E-06
Am-241	0.000%	8.14E-05
Cm-242	0.000%	1.38E-05
Cm-243	0.000%	2.53E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Resins, Filters, and Evap Bottoms,
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	1.249%	6.85E-01
C-14	0.315%	1.73E-01
Cr-51	0.010%	5.71E-03
Mn-54	0.211%	1.16E-01
Fe-55	3.026%	1.66E+00
Co-57	0.030%	1.65E-02
Co-58	0.130%	7.13E-02
Co-60	9.370%	5.14E+00
Ni-59	0.297%	1.63E-01
Ni-63	69.635%	3.82E+01
Zn-65	0.003%	1.83E-03
Sr-90	0.049%	2.68E-02
Nb-94	0.008%	4.55E-03
Nb-95	0.002%	8.96E-04
Ag-110m	0.016%	8.59E-03
Sb-124	0.001%	4.07E-04
Sb-125	1.050%	5.76E-01
Cs-134	2.388%	1.31E+00
Cs-137	12.159%	6.67E+00
Ce-144	0.041%	2.24E-02
Pu-238	0.000%	2.22E-04
Pu-239	0.000%	4.83E-05
Pu-241	0.008%	4.52E-03
Pu-242	0.000%	8.34E-06
Am-241	0.000%	1.36E-04
Cm-242	0.000%	2.28E-05
Cm-243	0.001%	3.74E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Dry Active Waste
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	0.004%	2.10E-05
C-14	0.807%	4.77E-03
Cr-51	0.895%	5.29E-03
Mn-54	0.331%	1.96E-03
Fe-55	0.218%	1.29E-03
Co-57	0.100%	5.92E-04
Co-58	17.420%	1.03E-01
Co-60	17.759%	1.05E-01
Ni-63	41.099%	2.43E-01
Sr-90	0.000%	6.93E-07
Zr-95	4.550%	2.69E-02
Nb-95	7.391%	4.37E-02
Sn-113	0.198%	1.17E-03
Sb-125	0.991%	5.86E-03
I-129	0.001%	4.60E-06
Cs-134	1.015%	6.00E-03
Cs-137	7.222%	4.27E-02

Dry Active Waste
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	0.004%	2.10E-05
C-14	0.807%	4.77E-03
Cr-51	0.895%	5.29E-03
Mn-54	0.331%	1.96E-03
Fe-55	0.218%	1.29E-03
Co-57	0.100%	5.92E-04
Co-58	17.420%	1.03E-01
Co-60	17.759%	1.05E-01
Ni-63	41.099%	2.43E-01
Sr-90	0.000%	6.93E-07
Zr-95	4.550%	2.69E-02
Nb-95	7.391%	4.37E-02
Sn-113	0.198%	1.17E-03
Sb-125	0.991%	5.86E-03
I-129	0.001%	4.60E-06
Cs-134	1.015%	6.00E-03
Cs-137	7.222%	4.27E-02

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class A

Nuclide Name	Percent Abundance	Curies
H-3	18.072%	6.13E-01
C-14	0.932%	3.16E-02
Cr-51	0.324%	1.10E-02
Mn-54	0.852%	2.89E-02
Fe-55	9.346%	3.17E-01
Co-57	0.115%	3.91E-03
Co-58	4.599%	1.56E-01
Co-60	13.267%	4.50E-01
Ni-59	0.082%	2.79E-03
Ni-63	33.904%	1.15E+00
Zn-65	0.054%	1.83E-03
Sr-90	0.016%	5.32E-04
Zr-95	0.793%	2.69E-02
Nb-95	1.315%	4.46E-02
Ag-110m	0.253%	8.59E-03
Sn-113	0.034%	1.17E-03
Sb-124	0.012%	4.07E-04
Sb-125	3.302%	1.12E-01
I-129	0.000%	4.60E-06
Cs-134	1.551%	5.26E-02
Cs-137	10.643%	3.61E-01
Ce-144	0.454%	1.54E-02
Pu-238	0.003%	8.66E-05
Pu-239	0.001%	1.96E-05
Pu-241	0.071%	2.40E-03
Am-241	0.002%	5.46E-05
Cm-242	0.000%	8.99E-06
Cm-243	0.004%	1.21E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class B

Nuclide Name	Percent Abundance	Curies
H-3	0.139%	7.25E-02
C-14	0.280%	1.46E-01
Mn-54	0.170%	8.87E-02
Fe-55	2.593%	1.35E+00
Co-57	0.025%	1.32E-02
Co-58	0.034%	1.78E-02
Co-60	9.199%	4.79E+00
Ni-59	0.309%	1.61E-01
Ni-63	71.635%	3.73E+01
Sr-90	0.051%	2.63E-02
Nb-94	0.009%	4.55E-03
Sb-125	0.903%	4.70E-01
Cs-134	2.439%	1.27E+00
Cs-137	12.195%	6.35E+00
Ce-144	0.014%	7.05E-03
Pu-238	0.000%	1.36E-04
Pu-239	0.000%	2.87E-05
Pu-241	0.004%	2.13E-03
Pu-242	0.000%	8.34E-06
Am-241	0.000%	8.14E-05
Cm-242	0.000%	1.38E-05
Cm-243	0.000%	2.53E-04

Unit 3 Solid Waste Shipped Offsite for Disposal and Estimates of Major Nuclides by Waste Class and Stream 01/01/2011 to 12/31/2011

Percent Cutoff: 0

Sum of All 4 Categories
Waste Class All

Nuclide Name	Percent Abundance	Curies
H-3	1.234%	6.85E-01
C-14	0.321%	1.78E-01
Cr-51	0.020%	1.10E-02
Mn-54	0.213%	1.18E-01
Fe-55	2.991%	1.66E+00
Co-57	0.031%	1.71E-02
Co-58	0.314%	1.74E-01
Co-60	9.441%	5.24E+00
Ni-59	0.294%	1.63E-01
Ni-63	69.369%	3.85E+01
Zn-65	0.003%	1.83E-03
Sr-90	0.048%	2.68E-02
Zr-95	0.048%	2.69E-02
Nb-94	0.008%	4.55E-03
Nb-95	0.080%	4.46E-02
Ag-110m	0.015%	8.59E-03
Sn-113	0.002%	1.17E-03
Sb-124	0.001%	4.07E-04
Sb-125	1.049%	5.82E-01
I-129	0.000%	4.60E-06
Cs-134	2.378%	1.32E+00
Cs-137	12.090%	6.71E+00
Ce-144	0.040%	2.24E-02
Pu-238	0.000%	2.22E-04
Pu-239	0.000%	4.83E-05
Pu-241	0.008%	4.52E-03
Pu-242	0.000%	8.34E-06
Am-241	0.000%	1.36E-04
Cm-242	0.000%	2.28E-05
Cm-243	0.001%	3.74E-04

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

RADIOACTIVE EFFLUENT REPORT

E. RADIOLOGICAL IMPACT ON MAN

Jan 1, 2011 - Dec 31, 2011

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 and information management. Site airborne effluent dose calculations include annual average dispersion and deposition factors, averaged from data collected over approximately 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 appropriate 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 were determined from sampling at Indian Point #3 from August 1980 to June 1982, during a study conducted by the NY State Department of Health (C. Kunz, later published and incorporated into NCRP 81). The annual C-14 curies released, as determined from this study, were consistent with NUREG 0017, Rev. 1. Data was then normalized to a maximum expected annual total, based on rated electrical capacity, (approximately 1000 MW(e) maintained for the entire year). Dose calculations were performed on the fraction of C-14 determined to be in the Carbon Dioxide form (26%), as no dose to man is expected from other forms (methane, etc). Reg Guide 1.109 methodology was applied to determine the offsite maximum dose, per the ODCM.

As of 2010, IPEC and other facilities combined historical data with the application of an EPRI model designed to estimate C-14 releases, given some key site-specific plant parameters (mass of the primary coolant, average thermal neutron cross section, rated MW, etc). The estimates from this model, for IPEC, closely match the measured observations of 1982.

The maximum annual C-14 release information is as follows:

Maximum (Bounding) Annual C-14 releases from IPEC		**Unit 2**	**Unit 3**
Liquid Effluent C^{14} Released	Curies	**0.07**	**0.07**
Total Airborne C^{14} Released	Curies	**11.19**	**11.05**
Airborne C^{14} as CO_2	Curies	**2.91**	**2.87**

Airborne Eff Child TB Dose, C^{14}	mrem	**0.0690**	**0.0675**
Airborne Eff Child Bone Dose, C^{14}	mrem	**0.346**	**0.338**
Liquid Eff Child TB Dose, C^{14}	mrem	**0.00117**	**0.00116**
Liquid Eff Child Bone Dose, C^{14}	mrem	**0.00583**	**0.00577**

Additionally, as of 2010, the bounding values are then normalized with actual effective full power days (EFFD) to yield more accurate year to year annual airborne curies and mrem for each unit. A small liquid effluent component is maintained at IPEC as a result of data accumulated in the 1983 study (Kunz). Tables 1A (shown earlier) include the airborne curie data for the current year. The following section (Radiological Impact on Man) includes the dose information.

> C-14 doses are grouped with "Iodine and Particulate" and reported in Table D in the following Radiological Impact on Man tables, for each unit. Table "C" provides doses from this category *excluding* C-14, to facilitate historical comparisons. However, since C-14 is grouped as a particulate, the total dose for this isotope needs to be added to all other iodines and particulates, for comparison of the singular dose limit for this category.
>
> Therefore, table "D" includes dose from all categories of this group (Iodine, Particulate, Tritium, and Carbon-14), for appropriate comparison of the dose limits.

C-14 doses (alone) for the current year are provided (for information) in the following table:

Calculated Annual C-14 releases from IPEC, **2011**		**Unit 2**	**Unit 3**
Airborne Eff Child TB Dose, C^{14}	mrem	**0.0677**	**0.0607**
Airborne Eff Child Bone Dose, C^{14}	mrem	**0.339**	**0.304**

The airborne effluent dose from C-14 is distributed evenly over the year and applied to a total Iodine and Particulate dose in Table "D" following this section.

Members of the Public:

Members of the public visiting the site receive minimal dose as a result of onsite 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/hr =.0333 hr; 0.0333 / 8760 = **3.8E-6.**

While onsite meteorological factors (dispersion and deposition) may be as high as a factor of ten higher than those used by the ODCM for routine effluents, these occupancy factors, when multiplied by doses calculated per the ODCM, demonstrate that dose to MEMBERS OF THE PUBLIC within the site boundary is negligible.

Groundwater:

Curies and dose contribution from activity discovered in onsite groundwater and storm drain pathways during the year are discussed in more detail in Section H. The offsite dose calculation involves multiple source term measurements, as well as computations 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 total offsite dose.

Total Dose:

Unit and pathway-specific dose data can be found on the Radiological Impact on Man tables following this discussion. For simplicity and to demonstrate compliance with 40CFR190, the following table indicates the maximum hypothetical Total Dose to an individual from operation of the facility, including any measured direct shine component from the site property:

Year: 2011		Whole Body	Max Organ
40 CFR 190 limit ===→	**IPEC**	**25 mrem**	**75 mrem**
Routine Airborne Effluents[1]	**Units 1 and 2**	**0.00267**	**0.00267**
Routine Liquid Effluents	**Units 1 and 2**	**0.000498**	**0.00103**
Liquid Releases of C^{14}	*Units 1 and 2*	*0.00117*	*0.00583*
Airborne Releases of C^{14}	*Units 1 and 2*	*0.0677*	*0.339*
Routine Airborne Effluents[1]	**Unit 3**	**0.00268**	**0.00268**
Routine Liquid Effluents	**Unit 3**	**0.000250**	**0.000521**
Liquid Releases of C^{14}	*Unit 3*	*0.00117*	*0.00583*
Airborne Releases of C^{14}	*Unit 3*	*0.0607*	*0.304*
Ground Water & Storm Drain Totals	**IPEC[2]**	**0.000451**	**0.00183**
Direct Shine from areas such as dry cask storage, radwaste storage, SG Mausoleum, etc.	**IPEC[3]**	**0.082**	**0.082**
Indian Point Energy Center Total Dose, per 40 CFR 190	**IPEC**	**0.219**	**0.745**

Note 1: Routine airborne dose in this table is conservatively represented as a sum of Iodine, Particulate, and Tritium dose (excluding C-14, in mrem) with a mrem term added from noble gas beta air energy (mrad, expressed as mrem). This 'addition' does not represent a real dose and is listed here solely to help demonstrate compliance with 40CFR190. (Doses by type of release and comparison to the specific limits of 10CFR50 Appendix I are summarized on the following pages.)

Note 2: Groundwater curie and dose calculations are provided in Section H.

Note 3: 40CFR190 requires the reporting of total dose, including that of direct shine. Direct shine dose from sources other than dry cask are indistinguishable from background. Direct shine dose is determined from TLDs near the dry cask area and site boundary, compared with REMP TLDs and historical values, and corrected with occupancy factors to determine a bounding, worst case assessment of direct shine dose to a real individual. Details of this evaluation are available on site from Radiation Protection.

INDIAN POINT UNITS 1 and 2 NUCLEAR POWER PLANTS
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2011

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	1.63E-04	2.08E-04	3.21E-04	3.43E-04	**1.03E-03**
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	3.26E-03	4.16E-03	6.42E-03	6.86E-03	1.03E-02
Age Group		Adult	Child	Child	Child	Child
Critical Organ		Bone	Bone	Bone	Bone	Bone

Adult Total Body	(mrem)	1.20E-04	1.30E-04	1.29E-04	1.20E-04	**4.98E-04**
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3.0
Percent of Limit	(%)	7.98E-03	8.64E-03	8.58E-03	8.00E-03	1.66E-02

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	7.43E-06	3.22E-05	1.02E-05	1.43E-05	**6.41E-05**
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	1.49E-04	6.44E-04	2.04E-04	2.86E-04	6.41E-04

Beta Air	(mrad)	4.59E-06	2.12E-05	7.87E-06	1.27E-05	**4.64E-05**
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	4.59E-05	2.12E-04	7.87E-05	1.27E-04	2.32E-04

C. AIRBORNE IODINE, PARTICULATE, & TRITIUM DOSES (excluding C-14, for info only)

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	5.29E-04	7.97E-04	6.22E-04	6.68E-04	**2.62E-03**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	7.05E-03	1.06E-02	8.29E-03	8.91E-03	1.74E-02
Age Group		Child	Child	Child	Child	Child
Critical Organ		Liver	Liver	Liver	Liver	Liver

D. AIRBORNE IODINE, PARTICULATE, TRITIUM, and CARBON-14 DOSES

Child TB Dose	(mrem)	1.74E-02	1.77E-02	1.75E-02	1.76E-02	**7.03E-02**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	2.32E-01	2.36E-01	2.34E-01	2.35E-01	4.68E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Child Bone Dose	(mrem)	8.49E-02	8.48E-02	8.48E-02	8.48E-02	**3.39E-01**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	1.13E+00	1.13E+00	1.13E+00	1.13E+00	2.26E+00

INDIAN POINT 3 NUCLEAR POWER PLANT
RADIOLOGICAL IMPACT ON MAN
JANUARY - DECEMBER 2011

Maximum exposed individual doses in mrem or mrad

A. LIQUID DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Organ Dose	(mrem)	4.35E-04	7.12E-05	9.60E-06	1.84E-05	**5.21E-04**
Applicable Limit	(mrem)	5	5	5	5	10
Percent of Limit	(%)	8.70E-03	1.42E-03	1.92E-04	3.68E-04	5.21E-03
Age Group		Adult	Adult	Child	Child	Child
Critical Organ		GILLI	GILLI	Bone	Bone	Bone

Adult Total Body	(mrem)	2.30E-04	1.26E-05	4.51E-06	2.81E-06	**2.50E-04**
Applicable Limit	(mrem)	1.5	1.5	1.5	1.5	3.0
Percent of Limit	(%)	1.53E-02	8.40E-04	3.01E-04	1.87E-04	8.33E-03

B. AIRBORNE NOBLE GAS DOSES

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Gamma Air	(mrad)	2.72E-05	3.83E-06	3.89E-06	3.71E-06	**3.86E-05**
Applicable Limit	(mrad)	5	5	5	5	10
Percent of Limit	(%)	5.44E-04	7.66E-05	7.78E-05	7.42E-05	3.86E-04

Beta Air	(mrad)	8.49E-05	7.03E-06	6.52E-06	6.22E-06	**1.05E-04**
Applicable Limit	(mrad)	10	10	10	10	20
Percent of Limit	(%)	8.49E-04	7.03E-05	6.52E-05	6.22E-05	5.23E-04

C. AIRBORNE IODINE, PARTICULATE, & TRITIUM DOSES (excluding C-14, for info only)

		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Iodine/Part	(mrem)	6.36E-04	5.92E-04	6.72E-04	6.71E-04	**2.57E-03**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	8.48E-03	7.89E-03	8.96E-03	8.95E-03	1.71E-02
Age Group		Child	Child	Child	Child	Child
Critical Organ		Liver	Liver	Liver	Liver	Liver

D. AIRBORNE IODINE, PARTICULATE, TRITIUM, and CARBON-14 DOSES

Child TB Dose	(mrem)	1.58E-02	1.58E-02	1.58E-02	1.58E-02	**6.33E-02**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	2.11E-01	2.10E-01	2.11E-01	2.11E-01	4.22E-01
		Qtr 1	Qtr 2	Qtr 3	Qtr 4	ANNUAL
Child Bone Dose	(mrem)	7.60E-02	7.60E-02	7.60E-02	7.60E-02	**3.04E-01**
Applicable Limit	(mrem)	7.5	7.5	7.5	7.5	15
Percent of Limit	(%)	1.01E+00	1.01E+00	1.01E+00	1.01E+00	2.03E+00

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

RADIOLOGICAL EFFLUENT REPORT

F. METEOROLOGICAL DATA

Jan 1, 2011 - Dec 31, 2011

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

2011

There were no changes to the REMP Sampling Locations in 2011.

There were no changes in the Land Use Census in 2011.

The Entergy Fleet PCP was updated to EN-RW-105, Rev 2 in 2011.
See the attached summary of changes.

The IPEC ODCM was updated to Revision 3 in 2011.
See the attached summary of changes.

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, 2011 - Dec 31, 2011

Summary of IPEC Groundwater and Storm Water Activity, 2011

The precipitation mass balance model applied in previous years was applied for offsite dose calculations in 2011, with some minor calibration updates performed by the contractor with regard to the distribution of groundwater flow through the site. Groundwater elevation readings continued to validate the model throughout the year.

Precipitation in 2011 was unusually high, averaging over 5 inches of precipitation per month for the year. The previous average over the last 15 years was approximately 3 inches per month. Therefore, it was expected that storm water and groundwater releases would at least double for 2011, consistent with model projection.

Results of 2011 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 (<0.02%), and were added to the Total Dose table in the opening summary of the Dose to Man section of this report (Section E).

The total GW and storm water tritium released from IPEC was approximately 0.357 curies in 2011, resulting in a total body dose of significantly less than 0.1 mrem (5.4E-7 mrem). It is evident that tritium alone, whether from ground water or routine effluents, does not arithmetically contribute to integrated offsite dose.

While trace levels of Co-60, Cs-137, and Ni-63 were identified in a few upstream wells in 2011, sampling near the effluent points identified nominal levels of Tritium and Strontium-90 during the year. These data, as part of the Monitored Natural Attenuation analyses, show a continuation of the decreasing trends established with the termination of the identified Unit 2 SFP leaks (tritium plume) and the defueling and draining of Unit 1 SFPs (strontium plume). Sr-90, a legacy isotope from Unit 1, contributed approximately 0.000132 curies to site effluent from the groundwater pathway. Combined groundwater releases from IPEC in 2011 (all radionuclides) resulted in a calculated annual dose of less than 0.02% of the annual limits for whole body and critical organ:

IPEC Groundwater and Storm Water Effluent Dose, 2011

0.000451 mrem to the total body	(0.0150% limit)
0.00183 mrem to the critical organ, adult bone	(0.0183% 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 also remains significantly below ALARA limits of 3 mrem total body, and 10 mrem to the critical organ.

IPEC Summary for Storm & Ground Water releases (H-3, Co-60, Ni-63, Sr-90, and Cs-137) 2011 *year*

Northern Clean Zone Adult Doses,in mrem

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	6.65E-09	6.65E-09	6.65E-09	6.65E-09	6.65E-09	6.65E-09	*5.94E+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	6.65E-09	6.65E-09	6.65E-09	6.65E-09	6.65E-09	6.65E-09	***5.94E+02***

Unit 2 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	7.26E-08	7.26E-08	7.26E-08	7.26E-08	7.26E-08	7.26E-08	*1.29E+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	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	7.26E-08	7.26E-08	7.26E-08	7.26E-08	7.26E-08	7.26E-08	***1.29E+05***

Unit 1/2

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	2.17E-07	2.17E-07	2.17E-07	2.17E-07	2.17E-07	2.17E-07	*6.60E+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	6.31E-04	0.00E+00	1.55E-04	0.00E+00	0.00E+00	0.00E+00	1.82E-05	*8.45E+01*
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	6.31E-04	2.17E-07	1.55E-04	2.17E-07	2.17E-07	2.17E-07	1.84E-05	***6.61E+04***

Unit 3 North

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	1.69E-07	1.69E-07	1.69E-07	1.69E-07	1.69E-07	1.69E-07	*2.56E+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	8.08E-04	0.00E+00	1.98E-04	0.00E+00	0.00E+00	0.00E+00	2.33E-05	*3.22E+01*
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	8.08E-04	1.69E-07	1.98E-04	1.69E-07	1.69E-07	1.69E-07	2.34E-05	***2.56E+04***

Unit 3 South

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	6.46E-08	6.46E-08	6.46E-08	6.46E-08	6.46E-08	6.46E-08	*6.52E+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	3.95E-04	0.00E+00	9.70E-05	0.00E+00	0.00E+00	0.00E+00	1.14E-05	*1.58E+01*
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	3.95E-04	6.46E-08	9.70E-05	6.46E-08	6.46E-08	6.46E-08	1.15E-05	***6.52E+04***

Southern Clean Zone

ISOTOPE	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*uCi*
H-3	0.00E+00	1.25E-08	1.25E-08	1.25E-08	1.25E-08	1.25E-08	1.25E-08	*7.10E+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	1.25E-08	1.25E-08	1.25E-08	1.25E-08	1.25E-08	1.25E-08	***7.10E+04***

Totals: Adult Doses, in mrem

								Total uCis	
H-3 only	0.00E+00	5.42E-07	5.42E-07	5.42E-07	5.42E-07	5.42E-07	5.42E-07	*3.57E+05*	H3
	BONE	LIVER	TOT BODY	THYROID	KIDNEY	LUNG	GI-LLI	*0.00E+00*	Co
all isotopes	**1.83E-03**	5.42E-07	**4.51E-04**	5.42E-07	5.42E-07	5.42E-07	5.34E-05	*0.00E+00*	Ni
								1.32E+02	Sr
Adult Doses								*0.00E+00*	Cs
% Annual Limit	*0.01835*	*0.000*	*0.01502*	*0.000*	*0.000*	*0.000*	*0.001*		

INDIAN POINT
RADIOLOGICAL GROUNDWATER
MONITORING PROGRAM

2011

Summary of Results

The following pages represent a summary of isotopic radio-analytical data for all onsite groundwater testing performed at Indian Point in 2011, as required per the ODCM and NEI 07-07.

Tritium Summary

Well Name	# Samples in 2011	# Positive Samples in 2011	Average Positive Act in pCi/L	Minimum Positive Act in pCi/L	Maximum Positive Act in pCi/L
B-1	3	3	4.22E+03	7.36E+02	8.10E+03
B-6	5	4	1.18E+03	5.39E+02	2.68E+03
I-2	2	1	2.34E+02	2.34E+02	2.34E+02
MH-5	13	13	1.34E+04	1.86E+03	3.37E+04
MW-108	2	2	1.51E+03	1.24E+03	1.78E+03
MW-109	2	2	2.85E+03	2.43E+03	3.26E+03
MW-111	1	1	1.11E+04	1.11E+04	1.11E+04
MW-30-69	6	6	1.08E+05	9.12E+04	1.19E+05
MW-30-84	6	6	7.94E+03	7.06E+03	9.20E+03
MW-31-49	5	5	5.37E+03	1.06E+03	1.54E+04
MW-31-63	5	5	1.59E+04	7.23E+03	2.46E+04
MW-31-85	5	5	3.80E+03	7.75E+02	5.49E+03
MW-32-149	5	5	8.81E+02	5.91E+02	1.06E+03
MW-32-173	5	5	6.80E+02	5.06E+02	9.02E+02
MW-32-190	5	5	1.43E+03	1.21E+03	1.64E+03
MW-32-59	5	5	1.82E+04	3.31E+03	3.37E+04
MW-32-85	5	5	1.17E+04	8.88E+03	1.34E+04
MW-36-24	4	2	2.10E+03	1.12E+03	3.07E+03
MW-36-41	4	4	6.36E+03	2.63E+03	8.74E+03
MW-36-52	4	4	4.61E+03	3.14E+03	5.84E+03
MW-37-22	4	4	5.78E+03	4.52E+03	6.87E+03
MW-37-32	4	4	4.56E+03	4.11E+03	5.23E+03
MW-37-40	4	4	5.04E+03	3.92E+03	5.97E+03
MW-37-57	4	4	5.36E+03	4.87E+03	5.81E+03
MW-39-102	4	4	1.17E+04	1.12E+03	1.90E+04
MW-39-195	4	4	8.39E+03	4.19E+03	1.72E+04
MW-39-67	4	4	7.27E+03	1.03E+03	1.49E+04
MW-39-84	4	1	4.40E+02	4.40E+02	4.40E+02
MW-41-40	5	5	1.69E+03	5.94E+02	4.51E+03
MW-41-63	5	5	8.01E+02	6.41E+02	1.23E+03
MW-42-49	5	5	1.22E+03	7.39E+02	1.71E+03
MW-42-78	5	3	5.40E+02	3.97E+02	6.26E+02
MW-44-102	5	5	7.15E+02	3.93E+02	1.05E+03
MW-44-66	5	4	8.10E+02	4.57E+02	1.62E+03
MW-45-42	5	5	1.70E+04	1.65E+03	3.94E+04
MW-45-61	5	5	3.49E+03	1.84E+03	5.91E+03
MW-46	5	5	3.28E+03	2.28E+03	5.25E+03
MW-47-56	3	3	3.12E+03	5.42E+02	5.31E+03
MW-47-80	3	3	1.23E+05	9.68E+04	1.37E+05
MW-49-26	4	4	3.84E+03	3.17E+03	4.92E+03
MW-49-42	4	4	3.27E+03	1.90E+03	4.91E+03
MW-49-65	4	4	2.75E+03	1.94E+03	4.24E+03

Tritium Summary

Well Name	# Samples in 2011	# Positive Samples in 2011	Average Positive Act in pCi/L	Minimum Positive Act in pCi/L	Maximum Positive Act in pCi/L
MW-50-42	5	5	1.46E+03	5.61E+02	3.77E+03
MW-50-66	5	5	5.99E+03	3.76E+03	7.83E+03
MW-52-162	2	1	5.16E+02	5.16E+02	5.16E+02
MW-53-120	4	4	5.10E+03	3.84E+03	8.02E+03
MW-53-82	4	3	6.45E+02	5.95E+02	7.16E+02
MW-54-123	5	5	1.52E+03	5.70E+02	3.92E+03
MW-54-144	5	5	3.86E+03	1.35E+03	6.85E+03
MW-54-173	5	5	1.64E+03	1.26E+03	2.32E+03
MW-54-190	5	5	3.68E+03	1.89E+03	8.77E+03
MW-54-37	5	5	1.59E+04	1.33E+03	3.13E+04
MW-54-58	5	5	2.70E+03	9.58E+02	4.83E+03
MW-55-24	3	3	1.77E+03	1.02E+03	2.57E+03
MW-55-35	3	3	2.48E+03	1.70E+03	2.94E+03
MW-55-54	3	3	7.65E+03	5.97E+03	8.53E+03
MW-56-83	4	4	8.45E+04	7.25E+04	1.05E+05
MW-57-11	3	3	7.01E+03	6.40E+03	7.36E+03
MW-57-20	3	3	2.77E+04	2.03E+04	3.81E+04
MW-57-45	3	3	2.11E+04	1.35E+04	2.53E+04
MW-58-26	4	4	2.46E+03	7.22E+02	4.77E+03
MW-58-65	4	3	1.19E+03	7.26E+02	1.75E+03
MW-59-32	2	1	4.74E+02	4.74E+02	4.74E+02
MW-59-45	2	2	8.82E+02	5.24E+02	1.24E+03
MW-60-135	4	3	4.04E+02	3.98E+02	4.14E+02
MW-60-154	4	3	5.87E+02	5.44E+02	6.27E+02
MW-60-176	4	4	1.07E+03	8.99E+02	1.30E+03
MW-60-35	4	1	4.99E+02	4.99E+02	4.99E+02
MW-60-53	4	1	5.16E+02	5.16E+02	5.16E+02
MW-60-72	4	1	2.91E+02	2.91E+02	2.91E+02
MW-62-138	5	5	1.21E+03	4.66E+02	3.01E+03
MW-62-18	5	2	5.27E+02	4.04E+02	6.50E+02
MW-62-182	5	2	6.36E+02	5.84E+02	6.88E+02
MW-62-37	5	1	3.74E+02	3.74E+02	3.74E+02
MW-62-53	5	2	4.47E+02	4.12E+02	4.82E+02
MW-62-71	5	3	5.07E+02	4.68E+02	5.38E+02
MW-62-92	5	5	5.38E+02	5.06E+02	5.61E+02
MW-63-112	5	4	7.90E+02	3.38E+02	1.34E+03
MW-63-121	5	5	1.59E+03	5.03E+02	3.63E+03
MW-63-163	5	5	5.06E+02	4.41E+02	6.05E+02
MW-63-174	5	3	4.92E+02	4.13E+02	6.09E+02
MW-63-18	5	2	3.75E+02	2.59E+02	4.90E+02
MW-63-34	5	3	3.63E+02	2.98E+02	4.30E+02

Tritium Summary

Well Name	# Samples in 2011	# Positive Samples in 2011	Average Positive Act in pCi/L	Minimum Positive Act in pCi/L	Maximum Positive Act in pCi/L
MW-63-50	5	2	3.93E+02	3.50E+02	4.35E+02
MW-63-93	5	1	5.04E+02	5.04E+02	5.04E+02
MW-66-21	4	2	6.31E+02	4.77E+02	7.84E+02
MW-66-36	4	4	3.44E+03	3.01E+03	3.90E+03
MW-67-105	4	4	1.35E+03	9.94E+02	1.89E+03
MW-67-173	4	3	5.91E+02	5.72E+02	6.13E+02
MW-67-219	4	4	1.01E+03	6.41E+02	1.20E+03
MW-67-276	4	4	9.74E+02	8.75E+02	1.06E+03
MW-67-323	4	1	4.26E+02	4.26E+02	4.26E+02
MW-67-340	4	3	5.46E+02	4.19E+02	6.56E+02
MW-67-39	4	4	3.68E+03	3.51E+03	3.85E+03
U1-CSS	3	3	6.29E+03	1.70E+03	1.08E+04
U3-3	2	2	8.52E+02	6.73E+02	1.03E+03
U3-4D	5	3	6.81E+02	6.28E+02	7.41E+02
U3-4S	4	2	6.10E+02	4.67E+02	7.52E+02
U3-T1	4	4	8.02E+02	6.55E+02	1.00E+03
U3-T2	5	5	2.88E+03	2.27E+03	3.83E+03

Note 1: A total of 514 samples were analyzed for H-3 in 2011 with 363 positive results.

Note 2: A sample is conservatively considered positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. This method was adopted at IPEC and is more conservative than using the laboratory's minimum detectable concentration (MDC).

Note 3: The required sensitivity for this analysis is 200 pCi/L.

Cobalt-60 Summary

Well Name	# Samples in 2011	# Positive Samples in 2011	Average Positive Act in pCi/L	Minimum Positive Act in pCi/L	Maximum Positive Act in pCi/L
MW-30-84	6	1	1.39E+01	1.39E+01	1.39E+01
MW-44-102	5	1	8.99E+00	8.99E+00	8.99E+00
MW-50-66	5	1	1.01E+01	1.01E+01	1.01E+01

Note 1: A total of 514 samples were analyzed for Co-60 in 2011 with 3 positive results.

Note 2: A sample is conservatively considered positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. This method was adopted at IPEC and is more conservative than using the laboratory's minimum detectable concentration (MDC).

Note 3: The required sensitivity for this analysis is 15 pCi/L.

Nickel-63 Summary

Well Name	# Samples in 2011	# Positive Samples in 2011	Average Positive Act in pCi/L	Minimum Positive Act in pCi/L	Maximum Positive Act in pCi/L
MW-42-49	5	5	1.99E+02	5.77E+01	3.02E+02
MW-53-120	4	1	1.45E+01	1.45E+01	1.45E+01

Note 1: A total of 185 samples were analyzed for Ni-63 in 2011 with 6 positive results.

Note 2: A sample is conservatively considered positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. This method was adopted at IPEC and is more conservative than using the laboratory's minimum detectable concentration (MDC).

Note 3: The required sensitivity for this analysis is 30 pCi/L.

Cesium-137 Summary

Well Name	# Samples in 2011	# Positive Samples in 2011	Average Positive Act in pCi/L	Minimum Positive Act in pCi/L	Maximum Positive Act in pCi/L
B-1	3	3	1.90E+01	1.51E+01	2.15E+01
MW-39-102	4	1	4.48E+01	4.48E+01	4.48E+01
MW-39-124	4	1	9.13E+00	9.13E+00	9.13E+00
MW-40-100	4	1	2.67E+01	2.67E+01	2.67E+01
MW-40-127	4	1	4.05E+01	4.05E+01	4.05E+01
MW-42-49	5	5	1.70E+04	3.03E+03	3.30E+04
MW-51-189	4	1	3.56E+01	3.56E+01	3.56E+01
MW-52-122	2	1	3.48E+01	3.48E+01	3.48E+01
MW-52-181	2	1	6.46E+01	6.46E+01	6.46E+01

Note 1: A total of 514 samples were analyzed for Cs-137 in 2011 with 15 positive results.

Note 2: A sample is conservatively considered positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. This method was adopted at IPEC and is more conservative than using the laboratory's minimum detectable concentration (MDC).

Note 3: The required sensitivity for this analysis is 18 pCi/L.

Strontium-90 Summary

Well Name	# Samples in 2011	# Positive Samples in 2011	Average Positive Act in pCi/L	Minimum Positive Act in pCi/L	Maximum Positive Act in pCi/L
MW-30-69	6	1	2.40E+00	2.40E+00	2.40E+00
MW-36-41	4	3	3.05E+00	1.74E+00	4.11E+00
MW-36-52	4	3	3.86E+00	2.93E+00	5.23E+00
MW-37-22	4	4	8.68E+00	7.59E+00	1.04E+01
MW-37-32	4	4	1.76E+01	1.26E+01	2.62E+01
MW-37-40	4	4	1.92E+01	1.50E+01	2.30E+01
MW-37-57	4	4	1.91E+01	1.58E+01	2.15E+01
MW-39-102	4	1	2.77E+00	2.77E+00	2.77E+00
MW-39-195	4	1	1.88E+00	1.88E+00	1.88E+00
MW-39-67	4	2	2.06E+00	1.74E+00	2.37E+00
MW-39-84	4	1	3.12E+00	3.12E+00	3.12E+00
MW-41-40	5	3	5.43E+00	2.32E+00	1.15E+01
MW-41-63	5	2	4.98E+00	3.03E+00	6.92E+00
MW-42-49	5	3	1.04E+01	2.60E+00	2.32E+01
MW-47-80	3	2	2.04E+00	1.95E+00	2.13E+00
MW-49-26	4	4	1.27E+01	1.26E+01	1.30E+01
MW-49-42	4	4	1.90E+01	1.57E+01	2.30E+01
MW-49-65	4	4	1.48E+01	1.14E+01	2.02E+01
MW-50-42	5	5	1.15E+01	3.01E+00	3.02E+01
MW-50-66	5	5	2.62E+01	2.57E+01	2.66E+01
MW-53-120	4	4	3.46E+01	2.95E+01	4.05E+01
MW-54-123	5	3	3.25E+00	2.56E+00	3.74E+00
MW-54-144	5	5	1.05E+01	9.05E+00	1.20E+01
MW-54-173	5	5	4.66E+00	3.91E+00	5.81E+00
MW-54-190	5	5	1.81E+01	1.68E+01	1.90E+01
MW-54-37	5	4	4.65E+00	4.34E+00	4.91E+00
MW-54-58	5	2	1.59E+00	1.49E+00	1.68E+00
MW-55-24	3	3	1.57E+01	1.09E+01	2.33E+01
MW-55-35	3	3	1.97E+01	1.63E+01	2.35E+01
MW-55-54	3	3	1.95E+01	1.75E+01	2.20E+01
MW-56-83	4	3	2.81E+00	1.45E+00	3.87E+00
MW-57-11	3	3	3.02E+01	2.08E+01	3.87E+01
MW-57-20	3	3	1.64E+00	1.27E+00	1.90E+00
MW-62-138	5	1	2.15E+00	2.15E+00	2.15E+00
MW-62-18	5	1	1.26E+00	1.26E+00	1.26E+00
MW-66-36	4	4	1.11E+01	8.00E+00	1.55E+01
MW-67-39	4	4	1.16E+01	5.31E+00	1.57E+01
U1-CSS	3	2	1.00E+01	3.90E+00	1.61E+01

Note 1: A total of 514 samples were analyzed for Sr-90 in 2011 with 118 positive results.

Note 2: A sample is conservatively considered positive if the result is greater than or equal to 3 times the 1 sigma uncertainty. This method was adopted at IPEC and is more conservative than using the laboratory's minimum detectable concentration (MDC).

Note 3: The required sensitivity for this analysis is 1 pCi/L.