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J. E. Pollock  
Site Vice President  
Administration

January 11, 2008

Re: Indian Point Units 1, 2 and 3  
Dockets 50-003, 50-247 and 50-286  
NL-08-009

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

Subject: **Results of Ground Water Contamination Investigation**

Reference: Entergy Letter NL-06-033, "Current Status / Future Plans Regarding Onsite Groundwater Contamination at IPEC," dated April 10, 2006.

Dear Sir or Madam;

Entergy Nuclear Operations, Inc. (Entergy) has completed a comprehensive ground water investigation at the Indian Point Energy Center (IPEC). This investigation was conducted in accordance with the referenced letter from October 2005 through October 2007 as a result of an apparent spent fuel pool (SFP) leak at Unit 2 which was discovered during construction activities within the Unit 2 Fuel Storage Building (FSB) as previously reported. During the ensuing investigation it also became apparent that the previously known Unit 1 leak was migrating beyond collection points thought to contain it.

The scope of this investigation included all three (3) reactor units and all areas of the site where credible potential sources of leakage could exist. The investigation has identified the sources of leaking radioactivity responsible for the radioactive contaminants that have been found in ground water at the IPEC site. The affected ground water regime has been characterized and modeled to determine the nature of leaked contaminants in the environment, identified the sources of the leakage and determined the radiological impacts that result from this leakage. As a result, Entergy has begun implementation of a long term ground water monitoring program and initiated a remediation program. Detailed results of the investigation are provided in the enclosed ground water investigation report, and summarized below.

The sources of ground water contamination have been traced back to leakage that originates from two separate structures, the Unit 2 fuel building and the Unit 1 fuel building. This conclusion is based on the radionuclide and chemical characteristics of the sources, ground water flow patterns, and the concentration gradients within the

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plumes. No other sources of leakage to ground water were identified as contributing to these ground water plumes.

The resulting contaminated ground water at IPEC can be characterized as two commingled ground water contaminant plumes that flow west towards and into the plants' discharge canal and the Hudson River. The plume originating from Unit 2 was found to be comprised of predominantly one radionuclide, Tritium (H-3); while the plume originating from Unit 1 is comprised principally of Strontium (Sr-90), with other radionuclides being observed in smaller sub-sets of the plume (e.g., Cobalt (Co-60), Nickel (Ni-63), and Cesium (Cs-137)).

Two interrelated leak mechanisms were identified as having contributed leakage to the Unit 2 Tritium plume. Entergy has determined that there was a legacy leak discovered and repaired in the early 1990's and that there was likely a small leak from the spent fuel pool transfer canal liner (terminated when the canal was drained for inspection in July 2007 and repaired in December 2007), both of which are responsible for the observed ground water contamination.

The legacy leak that occurred in the 1990s was a result of Unit 2 SFP's stainless steel liner being accidentally punctured. That puncture occurred in 1990 as a result of fuel rack modification activities. That leak was discovered and repaired in 1992. As a result of that liner damage, SFP water filled the interstitial space behind the liner and concrete structure, and upon reaching a construction joint at the 85' elevation, flowed out through the wall joint on the east side of the Spent Fuel Building (SFB). It is believed that SFP water leaked out of the construction joint at a rate of about 50 gallons per day for about 2 years, leaking into the underlying ground water. An additional consequence of this leak resulted in the interstitial space between the liner and concrete pool structure being left filled with pool water after the damaged liner was repaired.

A pin hole sized flaw is now known to have been present in the Unit 2 transfer canal liner. This flaw, a pin hole in a liner weld, was discovered in September of 2007 as a result of two years of varied pool and transfer canal liner inspection activities. This flaw appears to be present from the time of original construction. Metallurgical assessments have found there is no ongoing degradation of the liner associated with the cause of the flaw, nor is there an ongoing concern. Inspections of the transfer canal and accessible portions of the SFP liner have been completed and only that single flaw in the transfer canal has been identified. The transfer canal defect has been repaired.

During excavation activities performed in 2005 next to the south wall of the SFP structure, water seepage was observed on shrinkage cracks. Initially the flow rate was on the order of 1500 ml per day. However that flow rate rapidly decreased over the next few weeks. After that, water flow was intermittent with flow rates of about 20 ml per day becoming the norm. Based upon two years of flow and radiological and chemical sample data, we believe that the higher initial flow rates were due to the shrinkage crack opening up, due to soil pressure on the exterior wall of the fuel pool being relieved by the excavation activities. This allowed the water that had been trapped behind the liner since 1992 to flow out of the opened crack.

Hydro-geological characterization data indicates that there is a perched body of ground water in the vicinity of the Unit 2 SFP where clearance rates are very low when compared to the rest of the site. This data supports the hypotheses that some of the pool water released from the 1990's leak has been held up in the ground water in that area. This hypothesis is further supported by dye tracer testing and the fact that the Unit 2 ground water plume also does not contain any short half-lived radionuclides that are abundant in Unit 2's SFP water. Thus, it is Entergy's conclusion that the Unit 2 "Tritium" plume that has been observed is primarily the result of an old legacy leak, which was being recharged in small amounts by the pinhole leak from the Unit 2 transfer canal.

Entergy has determined that Unit 1 west fuel pool water leaks to ground water under the fuel building and is responsible for the Unit 1 "Strontium" ground water plume that was discovered in 2006. Prior to that time, Entergy's predecessor, Consolidated Edison had identified leakage from the west fuel pool in the 1990's and was managing the leakage by collecting it from a re-configured footing drain that surrounded the fuel building. However, based on Entergy's ground water investigation, it has been determined that the pool leakage management program was not successful in collecting all of the leakage. As a result, uncollected contaminants released from the Unit 1 SFP, past and present, have been observed by Entergy's ground water investigation at various locations near the site of Unit 1.

Ground water contamination is limited to Indian Point's property and is not migrating towards off-site properties to the north, south or east. The ground water contamination migrates with the site ground water from areas of higher hydraulic heads to areas of lower heads along paths of least resistance, and ultimately discharges to the Hudson River to the west.

The radiological dose impact of these leaks due to the resulting ground water contamination has been evaluated. The only significant pathway for ground water is through consumption of fish and invertebrates in the Hudson River, the calculated doses of which are well below 1/100 of the federal limits.

Based upon the results of the ground water investigation, Entergy has been, and will continue to take the following corrective and remedial actions:

1. Continue source term reduction in Unit 1 pool via the installed demineralization system which has been reducing the quantity of radioactivity in the Unit 1 leakage; and remove the remaining Unit 1 fuel and drain the pool to stop leakage from Unit 1 by the end of 2008.

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2. Implement long-term monitoring of the site's ground water which includes monitoring the natural attenuation of the ground water plumes and providing ongoing detection and identification of potential new leaks, in support of ongoing annual assessment of the dose impact. This will be done consistent with the commitments made in the referenced letter. Entergy will also implement site specific enhancements to the dose assessment method for the 2007 Radioactive Effluent Release Report.

Entergy is making no new commitments in this letter. Should you have any questions regarding this matter, please contact Mr. Donald Mayer, Unit 1 Director, Indian Point Energy Center at (914) 827-7716.

Sincerely yours,



J.E. Pollock  
Site Vice President  
Indian Point Energy Center

Enclosure: Results of Ground Water Contamination Investigation

cc: Mr. Samuel Collins, Regional Administrator, NRC Region 1  
Mr. John White, NRC Region 1  
NRC Resident Inspector's Office, IPEC  
Mr. John Boska, Senior Project Manager, NRC NRR DORL  
Mr. Paul D. Tonko, President, NYSERDA  
Mr. Paul Eddy, New York State Dept. of Public Service

w/o enclosure:  
Mr. Timothy Rice, New York State DEC