

August 24, 2006

Sandra Gavutis, Executive Director  
C-10 Foundation  
44 Merrimac St.  
Newburyport, MA 01950

SUBJECT: RESPONSE TO YOUR LETTER REGARDING THE TRITIUM LEAK  
IDENTIFIED AT SEABROOK STATION

Dear Ms. Gavutis:

I am responding to your letter dated July 13, 2006, in which you expressed concerns centered on the tritium leak first identified at Seabrook Station in 1999. We understand how such leaks can be of interest and concern to members of the public. The NRC has inspected and reviewed the licensee's performance relative to this matter on several occasions since 1999. As we discussed with you on July 6, 2006, the specific event did not have any adverse effect on public health and safety, nor impact the off-site environment. The NRC determined that, upon identification of the leak, the licensee initiated appropriate actions to monitor and repair the condition, and complied with applicable NRC regulatory requirements.

Attached is additional information which we believe is responsive to your inquiry. If you have any further questions in this matter, please contact John White or Paul Krohn at (610) 337-5114 or (610) 337-5120, respectively.

Sincerely,

**/RA/ David Lew Signed for**

Brian E. Holian  
Director, Division of Reactor Projects

Enclosure: Response to C-10 Questions of July 13, 2006

S. Gavutis

Sandra Gavutis, Executive Director  
C-10 Foundation  
44 Merrimac St.  
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Dear Ms. Gavutis:

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Attached is additional information which we believe is responsive to your inquiry. We believe our actions in this matter have been prudent and focused on safety. If you have any further questions in this matter, please contact John White or Paul Krohn at (610) 337-5114 or (610) 337-5120, respectively.

Sincerely,

Brian E. Holian  
Director, Division of Reactor Projects

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## Response to C-10 Questions of July 13, 2006

The NRC has established extensive regulatory oversight for radioactive materials pursuant to its authority under the Atomic Energy Act of 1954 and the Energy Reorganization Act of 1974. Gaseous, liquid, and particulate effluents from the station are monitored and controlled so that the maximum dose rates at the site boundary at any time are limited to the equivalent annual dose limits of 10 CFR Part 20 to unrestricted areas, and are as low as reasonably achievable (ALARA) in accordance with 10 CFR Part 50, Appendix I. 10 CFR Part 50, Appendix I includes an annual dose commitment due to liquid effluents not to exceed 3 millirem, total body, and 10 millirem, organ.

These dose limits are specified in the licensee's Off-site Dose Calculation Manual (ODCM), which details the implementation and specifications for the licensee's Radioactive Effluent Controls and Environmental Monitoring Program, as required by the licensee's Technical Specifications, Section 6.7. In addition to NRC regulatory requirements, the licensee is also required to comply with the Environmental Protection Agency's regulation, 40 CFR 190, relative to conducting operations sufficient to assure, in part, that annual dose equivalents do not exceed 25 millirem, whole body or organ, except thyroid which is 75 millirem.

While NRC regulatory requirements do not currently address the monitoring of on-site groundwater that is not a source of drinking water, 10 CFR 20.1501 requires licensees to conduct evaluations of identified spills or leaks to assess radiological consequences to members of the public or occupational workers. In addition, 10 CFR 50.75(g) requires licensees to maintain information important to the safe and effective decommissioning of the facility, such as records of spills or other unusual occurrences involving the spread of contamination. Accordingly, information associated with the tritium leak is maintained by the licensee to ensure compliance with 10 CFR 50.75(g).

The NRC reviews the licensee's radiological effluent release programs through the conduct of the reactor oversight process (ROP) baseline inspection<sup>1</sup>. Each of these inspections is conducted biennially by regional specialists. In addition, the NRC resident inspectors maintain an awareness of plant conditions and issues as part of their daily inspection activities.

NRC inspections in this area are documented and available for public review.<sup>2</sup> Additionally, the licensee is required to provide an annual report of radioactive effluent releases. Reports from 1999 to 2005, indicate that there were no unplanned, unanticipated, or abnormal releases of radioactive materials of gaseous, particulate, or liquid effluents from the site to unrestricted

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<sup>1</sup>Procedures 7112201, "Radioactive Gaseous and Liquid Effluent Treatment and Monitoring Systems," and 7112203, "Radiological Environmental Monitoring Program (REMP) and Radioactive Material Control."

<sup>2</sup> Inspection Reports 2000-05 (ML003739043), 2001-10 (ML013460007), 2002-02 (ML021120115), 2003-04 (ML033110323), 2004-04 (ML043090311) and 2005-11 (ML060270428).

areas.<sup>3</sup> NRC review of the tritium leak is discussed specifically in four inspection reports.<sup>4</sup> These inspection reports, in conjunction with the ROP baseline radiological effluent release inspections, provide the basis for the NRC determination that the tritium leak did not have any adverse effect on public health and safety or the offsite environment; and that licensee performance relative to this condition was in compliance with NRC regulatory requirements.

This condition was first identified following a June 1999 planned discharge of groundwater that normally collects in the containment annulus sump (i.e., the area between the containment building and the outer concrete enclosure). As we described in our telephone discussion with Ms. Grinnell of your organization on July 6, 2006, a containment annulus sump sample was analyzed and found to contain about 700,000 pCi/l, tritium. Information on tritium may be found on our public web page (<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/tritium-radiation-fs.html>).

The licensee assigned a project team to investigate the source of the tritium, the mechanism by which it was getting to the annulus sump area, and to assess the methods to resolve the condition. The licensee determined that leakage from the fuel transfer canal and cask loading area in the Fuel Storage Building was the source of the tritium contamination found in the annulus sump. In December 1999, non-destructive examinations were performed at specific locations in the transfer canal and cask handling area with no definitive results. Also, leak-off lines (sometimes referred to as tell-tale drains) from the area behind the spent fuel pool and cask handling area liner were examined, cleaned and flushed in October 2000. While the licensee engaged in activities directed to resolve this condition, resolution was complicated by the fact that the tritium leak (estimated by the licensee to be about 10 to 30 gallons per day into the spent fuel pool tell-tail drain sump) was small and not readily distinguishable from the water volume routinely lost through evaporation from the spent fuel pool and cask handling area. Accordingly, it was difficult to determine the specific point of leakage.

In February 2003, the licensee attempted to repair the cask handling pool and transfer canal; but the repair proved unsuccessful. However, in April 2003, when water level in the cask handling pool and transfer canal areas was lowered, the licensee determined that the action effectively stopped the leak. The licensee continued troubleshooting by raising and lowering water levels in the cask handling pool and transfer canal areas to determine the specific elevation of the suspected leak. A flaw in the liner was subsequently identified in the cask handling pool. This pool was drained and repaired in October 2004, by the application of a non-metallic liner to the entire cask handling pool, transfer canal wall, and floor surfaces. These areas have since been reflooded and all indications are that the leak has been stopped.

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<sup>3</sup>Effluent Reports 2005, Appendix E (ML061250364); 2004, Appendix G (ML051240296); 2003, Appendix G (ML041270473); 2002, Appendix G (ML031270008); 2001 Appendix (ML021280117); 2000, Appendix G (ML011240282); and 1999, Appendix G (ML003710969).

<sup>4</sup>Inspection Reports 1999-07, Section R8.1 (ML993400293); 2003-04, Section 4OA2 (ML033110323); 2004-04, Section 4OA2.3 (ML043090311); and 2005-11, Section 2PS3 (ML060270428).

To remediate the condition, the licensee initiated action as early as 2000 to pump groundwater out of the affected areas, thereby reducing the potential for any offsite migration. Eventually, four dewatering locations were established in the affected area that provide a combined dewatering rate of about 8000 gallons per day. To date, there is no evidence to indicate that any contaminated groundwater migrated beyond the site boundary. From the time of the discovery of the leak to present, tritium concentration in the four wells used for dewatering and fifteen wells used for site groundwater monitoring and characterization have indicated no more than about 2500 pCi/l, tritium. While these wells are not sources of drinking water, for perspective, EPA's drinking water standard for tritium is 20,000 pCi/l.

Other aspects of this matter that are germane to your concerns, include:

- The licensee has performed a piping integrity test on the waste liquid discharge line (the pipe used for the transfer and discharge of effluents) that is connected to the station's circulating water cooling system. No piping integrity deficiencies were found.
- This condition did not require formal notification of the NRC. However, following the onset of the leak investigation in 1999, the licensee notified several agencies (including the NRC, the New Hampshire Department of Environmental Services, the US Environmental Protection Agency, and the Massachusetts Emergency Management Agency) of the condition and actions initiated to resolve the matter. Additionally, the licensee informed various local news organizations and the Seacoast Anti-Pollution League.
- NRC requires a licensee to annually report the results of their radiological effluents and environmental monitoring programs, including any abnormal radiological releases to the off-site environment. As reported by Seabrook, this condition did not result in any abnormal off-site release. The licensee monitors effluent releases from several pathways including batch sources (i.e., waste test tanks, turbine building sumps, steam generator blowdown flash tank, and the water treatment system) and continuous sources (i.e., the plant vent, condenser air removal exhaust, and gland steam packing exhaust).
- Since the tritium leak was first identified in 1999 the licensee has initiated a spent fuel pool and cask handling pool monitoring program to confirm the ongoing integrity of associated systems, implemented an on-site groundwater sampling and analysis program for tritium (in 2000), and enhanced monitoring and maintenance of the spent fuel/cask handling/transfer canal leakage detection system.
- Several monitoring wells have been developed to provide early detection of any contaminated groundwater that might potentially migrate beyond the site boundary. Fifteen wells (shallow and deep) are currently in service and are sampled on a quarterly basis. The well locations were selected based on site hydrology (i.e., most wells were placed down gradient from the source of the leak to detect potential plume movement). Samples are drawn and tested on a quarterly basis; the analyses use a Lower Limit of Detection (LLD) of approximately 600 pCi/liter for tritium. The samples have confirmed that there is no detectable migration of tritium containing water off-site. In addition, operations personnel perform routine observations of dewatering locations inside

buildings and check plant systems for leaks during periodic rounds. Operations, Engineering, Radiation Protection, and Chemistry personnel are also trained to look for and report leaks at the power plant.

- Seabrook town drinking water and a nearby off-site well are also sampled periodically to assure the integrity of off-site groundwater sources. There is no drinking water source on-site. There has been no indication of radioactivity above natural background levels in any off-site sampling location, including municipal drinking water. Moreover, the hydrology of the site indicates that groundwater flows away from these drinking water sources. To date, there have been no instances where radioactivity has been measured in groundwater on-site that exceeded the maximum contaminant level (MCL) for tritium established by the US Environmental Protection Agency for drinking water, i.e., 20,000 pCi/l, which is equivalent to a total body dose of 4 millirems in a year, assuming continuous consumption of 2 liters of water per day having this concentration.
- To date, assessment of the groundwater condition at the Seabrook Station indicates that the licensee's corrective actions and groundwater dewatering campaign have minimized the effect of this small tritium leak such that no migration of tritium has been detected outside the plant site boundary.

NRC has established a special task force to address inadvertent, unmonitored liquid releases of radioactivity from U.S. commercial nuclear power plants based on recent events at Indian Point and Braidwood. This task force is in the process of reviewing previous events (including the Seabrook issue), identifying lessons learned from these events, and determining what, if any, changes are needed in the Agency's regulatory program. The task force's findings are expected to be published in the near future. NRC has established a public information web page at <http://www.nrc.gov/reactors/operating/ops-experience/grndwtr-contam-tritium.html> to convey general information about groundwater contamination and NRC's plans and response to this generic issue. This web page contains several information links which you may find particularly useful.

Additionally, the licensee is a voluntary participant in a nuclear industry-wide groundwater monitoring and control initiative. This industry initiative includes commitments to monitor and control on-site groundwater, and provide notification to various State, local, and Federal officials, including NRC, of spills or leaks that have the potential to affect the integrity of groundwater.

In summary, since 1999 the NRC has periodically reviewed the tritium leak at Seabrook, and inspected the licensee's performance relative to the control and monitoring of radiological effluents and implementation of its radiological environmental monitoring program. Our inspections determined that the licensee: (1) identified the full extent of the issue; (2) performed appropriate evaluations; (3) instituted effective corrective actions, including repairing the leak, expanding its groundwater monitoring program, and conducting dewatering/remediation activities; and (4) continues to closely monitor the condition to ensure that the health and safety of the public and occupational workers, and the environment was not adversely affected. No plant-related radionuclides other than tritium have been identified, and no detectable tritium has migrated outside the site boundary.