July 27, 2009

The Honorable John H. Adler
United States House of Representatives
Washington, D.C. 20515

Dear Congressman Adler:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter of May 27, 2009, in which you expressed concern about a leak in buried piping at the Oyster Creek Generating Station (Oyster Creek).

The NRC has reviewed the Oyster Creek issue noted in your letter and has closely monitored the licensee's corrective action. Although not desirable, the leakage identified at Oyster Creek did not impact the health and safety of the public. Nonetheless, the NRC believes that leakage in an underground pipe that has the potential to impact the environment due to groundwater contamination is an issue that should be addressed seriously. The NRC will continue to examine the specific details associated with the Oyster Creek condensate system leak. In addition, the staff will review the regulatory requirements, industry codes and standards for inspection of buried piping to ensure that the test requirements meet the expectations for maintenance of safety systems. In the enclosure to this letter, I have provided detailed responses to your questions which were prepared by the NRC staff.

The NRC reviews and assesses nuclear plant design, licensing requirements, and performance to ensure that reactors are operating safely and in accordance with applicable regulations. The NRC regulations require periodic testing of safety-related buried piping, and require that licensees take corrective action for degraded conditions. In the case of significant degraded conditions, NRC regulations also require that the licensee take corrective action to preclude the reoccurrence of the condition. NRC inspectors routinely inspect the licensees' programs including licensees' inservice inspection programs as part of the baseline inspections in the Reactor Oversight Process and verify that licensees have taken appropriate corrective actions. Issues identified by NRC inspectors are assessed for safety significance and documented in publicly available inspection reports. The NRC continues to closely monitor any degradation in safety-related systems at nuclear power reactors, and will take appropriate regulatory or enforcement action if conditions warrant.

The NRC continuously reviews new operating experience with buried piping for potential generic implications to the industry. Based on further or new information that becomes available through the agency's continued inspection and oversight of the issue, the NRC will consider generic aspects of the issue to determine if generic communications on the subject are warranted. The agency will also continue to review our inspection requirements and oversight processes to ensure our inspection approach appropriately considers the buried piping issues commensurate with their safety significance.

The NRC staff is available to provide a briefing for your staff if you desire. If you have additional questions on this matter, please contact me.

Sincerely,

/RA/

Gregory B. Jaczko

Enclosure:
As stated

NRC Response to May 27, 2009, Information Request

Question 1:

Does the Commission require licensees to conduct inspections of their buried pipes? If not, why not? If so, how often are licensees required to inspect their buried pipes?

Answer 1:

The Nuclear Regulatory Commission (NRC) requires licensees to conduct inspections and tests that verify the integrity of buried piping. The requirements for these inspections vary depending upon the safety significance of the piping.

In the case of safety-related piping, licensees are required to comply with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, "Codes and Standards," which requires that licensees implement an inservice inspection program that complies with the standards of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code). The ASME Code provides requirements for the examination and testing associated with safety-related buried piping. Licensees, such as Exelon, which operates the Oyster Creek Nuclear Generating Station (Oyster Creek), are required to implement applicable ASME Code requirements through site-specific processes and procedures that comprise their inservice inspection and inservice testing programs.

Licensees are also required to comply with 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," which requires monitoring the performance or condition of structures, systems, and components, against licensee-established goals, in a manner sufficient to provide reasonable assurance that these structures, systems, and components are capable of fulfilling their intended functions. The scope of the monitoring program required by 10 CFR 50.65 includes safety-related and non-safety-related components that are relied upon to mitigate adverse conditions and accidents or whose failure could prevent safety-related components from fulfilling their safety-related function.

Applicants for license renewal must also meet the safety requirements of 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." For license renewal, aging management of buried piping relies on opportunistic (e.g., when the piping is excavated for another reason) or focused inspections of buried piping systems. Prior to entering the period of extended operation, the applicant is required to verify that there has been at least one opportunistic or focused inspection performed within the past 10 years. Upon entering the period of extended operation, the applicant is required to perform another focused inspection within 10 years, unless an opportunistic inspection has otherwise occurred within this 10-year period. These inspections should be performed in areas with the highest likelihood of corrosion problems.

Exelon has an underground piping aging management program that directs inspection activities at Oyster Creek for safety and non-safety-related buried piping. Through this program, the licensee determines the frequency of piping inspections based upon the susceptibility of the

piping to degradation and the consequence of its failure. The licensee's corrective action program identifies, evaluates, and implements corrective actions for adverse conditions commensurate with the safety significance of the condition. The NRC staff has verified that Exelon initiated several corrective action items to address the tritium leakage onsite and the subsequent buried piping problems noted in April 2009, following excavation of the piping.

For Oyster Creek, the Condensate System, which preliminarily has been determined to be the source of the tritium leak, is a non-safety-related system. According to Exelon's buried piping aging management program, this system is subjected to flow surveillance testing on a quarterly basis, testing which can reveal significant piping leaks. Exterior inspections of the piping are conducted on an opportunistic basis when the buried sections of pipe are exposed. The NRC will continue to observe, assess, and document Exelon's actions taken to address this issue and precluding future problems. Exelon has additional programs in place that monitor groundwater conditions onsite and test potential effluents before release. These environmental programs provide an additional barrier for detection of leakage from buried pipes.

Question 2:

> **How much of each pipe is the licensee required to inspect – a segment or the entire pipe?**

Answer 2:

The licensee is not required to inspect the entire length of all buried pipes. The inspection of safety-related piping is governed by 10 CFR 50.55a and the ASME Code. Exelon's buried piping aging management program also does not require that a specific length of piping be inspected. Piping integrity is verified by a number of different methods, such as hydrostatic (e.g., pressure-drop) or flow testing, which check system integrity as a whole. Inspections of opportunity conducted on exterior portions of excavated piping verify the condition of segments of a pipe and provide an indication of the condition of the remainder of the pipe.

Exelon's buried piping inspection program, corrective action program, and 10 CFR 50.65 program focus Exelon's inspection, testing, and maintenance efforts on areas of piping that are of higher safety significance and are more susceptible to degradation. In focusing its efforts, the licensee is able to use operating experience from both Oyster Creek and other industrial plants with similar conditions. The NRC regulations and Exelon's procedures require any degradation to be promptly identified and corrected.

Question 3:

> **Is the inspection conducted on all of the licensee's buried pipes or just a sampling? If it is a sampling, how is this sampling determined and by whom is this sampling determined?**

Answer 3:

The licensee is not required to inspect the entire length of all buried pipes. The inspection of safety-related piping is governed by 10 CFR 50.55a and the ASME Code. The licensee's buried

piping aging management program governs the inspection of non-safety-related piping and augments the inspection of safety-related piping. The sampling size and frequency of inspections performed are determined by the licensee considering both the susceptibility of the piping to degradation and the consequence of its failure.

Question 4:

Does the Commission require an independent party to conduct buried pipe inspections in addition to the licensee? If not, why not?

Answer 4:

The NRC performs inspections that independently verify licensee compliance with ASME Code requirements and, where applicable, adherence to its buried piping aging management program. The NRC conducts oversight of the licensee's inspections to verify their adequacy. Licensees are not required to have a third-party perform buried piping inspections.

Question 5:

Regarding Oyster Creek specifically, when was the licensee most recently required to inspect their buried pipe system?

Answer 5:

There are multiple systems that contain buried piping running between unconnected buildings. As described in the response to Question 1, different systems are inspected at different frequencies. Buried pipe inspection activities are conducted at frequencies that are commensurate with the susceptibility to degradation and the consequence relative to radiological or operational safety.

The most recent planned inspection of buried piping was conducted by Exelon in 2008 in accordance with license renewal commitments. As noted in the publicly available NRC Inspection Report, two carbon steel buried pipes, one aluminum buried pipe, and one cast iron buried pipe were excavated and visually inspected with no identified deficiencies.

In addition to the aforementioned buried piping inspections and replacements in April 2009, Exelon accomplished the following at Oyster Creek:

- During the period between 2004 and 2008, 100% of safety-related underground Emergency Service Water (ESW) piping was replaced. In the same period, Exelon replaced 20% of underground Service Water (SW) piping. The licensee plans to rehabilitate recondition, or replace the remaining 80 percent in the future.

- In 2006, approximately 1000 linear feet of fuel oil transfer piping was replaced with double-walled pipe. Leak detection monitors were also installed.

- In 2008, Exelon replaced all underground chlorination lines to the ESW and SW systems.

In addition to programmatic inspection activities, underground piping inspections are performed when opportunities arise. For example, the excavation to examine potential leaking pipes in April 2009, provided an opportunity to inspect all of the buried piping contained in that area.

Inspection is also accomplished by the licensee's Inservice Testing program using flow surveillances of various systems that contain underground piping to demonstrate system integrity. Such testing can reveal flow anomalies caused by buried pipe leakage. In 2008, the applicable testing procedures were revised to consider the potential for leakage in six systems containing underground piping.

Question 6:

What did the licensee find as a result of this inspection?

Answer 6:

The 2008 buried piping inspection, as discussed in the response to Question 5, identified no degradation of the inspected segments of piping.

The most recent inspection, performed after identifying elevated levels of tritium in the Emergency Service Water System cable vault, identified two areas of leakage from piping in the Condensate System. The leaking sections of pipe, which preliminarily have been determined to be the cause of the tritium found in the Emergency Service Water System vault, were promptly replaced by Exelon. The leakage noted was small and thus not identified by flow testing or by a drop in Condensate Storage Tank level. As discussed in the response to Question 1, an additional barrier for the detection of leakage in buried pipes is Exelon's program to monitor groundwater conditions onsite. It was the groundwater monitoring program that identified the tritium leakage. Exelon is performing a root cause evaluation of this issue.

The NRC is currently inspecting and reviewing this issue to assess Exelon's implementation of its underground piping inspection program. The results of this inspection will be documented in a publicly available NRC Inspection Report.

Question 7:

Why did the licensee not find evidence of faulty piping?

Answer 7:

The licensee identified the leaking piping through its environmental monitoring programs. The identification of elevated tritium levels in onsite groundwater monitoring wells prompted Exelon to conduct additional inspections, including excavating areas of buried pipe suspected of leaking. As discussed in the response to Question 6, the leakage noted was small and thus not identified by flow testing or a drop in Condensate Storage Tank level.

The NRC is currently inspecting this issue, including a review of the Exelon's conduct of its underground piping inspection program. The results of this inspection will be documented in a publicly available NRC Inspection Report.

Question 8:

Do you believe that the tritium leaks are caused by corrosion from inside the pipes, outside the pipes, or both?

Answer 8:

Although leakage can be caused by many different mechanisms, a common cause of leakage is external corrosion of the pipe that occurs when the protective coating on the exterior fails and adverse soil conditions come in contact with the piping. Corrosion of the inside of pipes is more common in those pipes that carry natural water sources with uncontrolled chemistry (e.g., salt water).

Exelon's root cause and extent of condition review, including laboratory analysis of the affected piping, is still in progress. The NRC is currently inspecting this area and will review and assess the cause of the corrosion in the publicly available NRC Inspection Report.

Question 9:

Has the Commission ever considered requiring licensees to develop technologies and methods to inspect difficult-to-access buried pipe? If so, have these requirements been implemented? If not, why not?

Answer 9:

The NRC continues to review the operating experience at nuclear power plants and has considered many different technologies and methods for inspection of components. To date, the experience with buried piping systems has indicated only minor problems that do not justify expansion of the current NRC regulations. New corrosion-resistant materials continue to be evaluated, and as an example, the NRC has recently approved the use of high density polyethylene pipe in certain buried systems.

The NRC requires licensees to implement an inservice inspection program that complies with the ASME Code requirements for safety-related piping. Where applicable, the licensee's buried pipe aging management program also prescribes techniques for examining the buried pipes. Licensees are also exploring new technologies on their own initiative to detect leakage and corrosion before piping failures occur.

Degradation that is detected in buried piping is evaluated and addressed by the licensee's corrective action programs. The NRC has a program to evaluate operating experience and disseminate the information to licensees. If an issue is significant, the agency can evaluate it under our Generic Issues program for further regulatory action. The NRC will continue to evaluate operating experience with buried piping and will take further regulatory or enforcement actions as warranted.