UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

NRC INFORMATION NOTICE 2010-XX: Leaking Buried Piping Issues

ADDRESSEES

All holders of operating licenses for nuclear power and research and test reactors including those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor and those authorized by Title 10 of the Code of Federal Regulations (10 CFR) Part 72 licenses to store spent fuel in water-filled structures.

All current holders of and applicants for an early site permit, combined operating license, or standard design certification for a nuclear power plant under the provisions of Title 10 of the Code of Federal Regulations (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of continuing occurrences of radioactive contamination of ground water at multiple facilities due to undetected leakage from facility structures, systems, or components that contain or transport radioactive fluids. Instances of buried piping leakage have occurred in both safety-related and non-safety-related piping systems at nuclear power plants. Some of these underground piping leaks have involved radioactive material, diesel fuel oil or other chemicals.

Undetected leakage has the potential to adversely impact the environment and also can affect public confidence. Discovery of buried piping leakage at some stations has resulted in Congressional concerns especially when these leaks involve radioactive material releases with the potential to impact groundwater (i.e., tritium groundwater contamination issues for example). Industry initiatives and actions to detect and minimize occurrences of buried piping leakage and to improve the integrity of buried/underground piping are discussed in this Information Notice. NRC staff will evaluate the need to revise NRC inspection procedures to aid in the assessment of licensee implementation of industry buried piping integrity initiatives and actions.

The NRC expects that recipients will review this information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

Instances of buried piping leaks have occurred in safety-related and non-safety-related piping at nuclear power plants over the years **(~ 60 of the 65 reactor plant sites have had some**

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leakage reported *per Richard Conaster* - we need to create a TABLE and say see Table 1 Title XXXX in ADAMS ML##### ~~-*similar to* see "Table 1: Radiological Consequences of Several Recent Buried Piping Degradation Events" in ADAMS ML093160004~~ for examples of these occurrences). This has resulted in groundwater contamination at several plant sites. The piping degradation leading to these leaks has generally not affected the operability of safety systems, and the type and amount of radioactive material or chemicals released to the environment has been a small fraction of the regulatory limits. The actual safety significance of these events to the public or environment thus far has been very low.

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These buried piping leaks, however, may lead to unmonitored, undetected, unevaluated releases of radioactivity or other chemicals to the environment (and eventually to unrestricted areas) and therefore are of concern to the NRC. The continued integrity of buried piping systems is an important factor among many considered by the NRC in assuring that nuclear facilities in the United States are being operated in a safe and environmentally responsible manner. Public confidence in the safety and long term viability of nuclear power stations is affected by the actions taken to evaluate and address issues such as these leaks.

BACKGROUND

As far back as 1979 staff issued NRC IE Circular 79-21 "Prevention of Unplanned Releases of Radioactivity (ADAMS ML031220588) that discussed issues with underground/ buried piping.and unplanned releases.

More recently, in 2004 staff issued NRC Information Notice 2004-05, "Spent Fuel Pool Leakage to Onsite Ground Water," (ADAMS ML040580454).

In 2006 staff issued NRC Information Notice 2006-13 "Ground-Water Contamination Due to Undetected Leakage of Radioactive Water," (ADAMS ML060540038).

In a memorandum dated September 3, 2009, (ADAMS ML092460648), the NRC Chairman requested a staff evaluation of the adequacy of: (1) NRC requirements for design, inspection and maintenance of safety-related buried piping; (2) American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements for design, inspection, and maintenance of safety-related piping; and (3) voluntary initiatives for the design, inspection, and maintenance of safety-related and non-safety-related buried piping.

The NRC Chairman also requested a discussion of staff plans for recommending any revisions to regulations, requirements, practices or oversight related to buried piping. The staff provided a response to this request via SECY-09-0174 (ADAMS ML093160004) dated December 2, 2009 that was supplemented December 31, 2009).

DISCUSSION

An NRC NUREG/CR-6876, "Risk-Informed Assessment of Degraded Buried Piping Systems in Nuclear Power Plants," (ADAMS ML051650146) was published in June 2005 that evaluated corrosion damage on buried pipe and concluded that structural integrity can be maintained even

with relatively high levels of general wall thinning. Because corrosion of buried piping typically initiates at local areas of coating damage, the resulting degradation is localized. From a structural integrity perspective, localized corrosion is much less challenging than general wall thinning. Localized degradation of buried piping typically causes small leaks that do not challenge structural integrity. Reports of operating experience are consistent with this observation; there have been no significant challenges to structural integrity due to degradation of buried, safety-related piping at nuclear power plants.

In May 2006, the U.S. commercial nuclear power plants adopted the Nuclear Energy Institute (NEI) Groundwater Protection Initiative (GPI) in response to leaks containing radioactive material at several plants. The initiative is described in Attachment 1 to "NEI-07-07 Industry Ground Water Protection Initiative - Final Guidance Document," dated August 2007 (ADAMS Accession No. ML062260198).

All current nuclear plants committed to follow this GPI. It identifies actions to improve licensee response to inadvertent releases that may result in low but detectible levels of plant-related radioactive materials in subsurface soils and water. The GPI provides the actions licensees are expected to take including the development of written groundwater protection programs, improved stakeholder communications, and program oversight. One objective of the GPI is to detect leaks well before they can challenge regulatory limits for unintended release of radioactive material and to take actions to remediate such leaks. This initiative is not focused on preventing leaks.

NRC is verifying implementation of the GPI using Temporary Instruction 2515/173 REVIEW OF THE IMPLEMENTATION OF THE INDUSTRY GROUND WATER PROTECTION VOLUNTARY INITIATIVE, (ADAMS ML082770349). The NRC staff will continue verifying the long term implementation of the initiative through various NRC routine Reactor Oversight Process (ROP) baseline inspections and through effluent and environmental inspections.

In a November 20, 2009 letter to the NRC (ADAMS ML093350032), the Nuclear Energy Institute (NEI) indicated that the recent industry's Buried Piping Integrity Initiative ..."is a formal commitment by the companies that operate nuclear energy facilities to follow a specific policy or plan of action. The Buried Piping Integrity Initiative calls for a proactive approach for managing potential buried piping degradation with a goal to "provide reasonable assurance of structural and leakage integrity of all buried piping with special emphasis on piping that contains radioactive materials."" Objectives include proactive assessment and management of the condition of buried piping systems and technology development to improve upon available techniques for inspecting and analyzing underground piping.

In order to meet planned goals, every utility shall implement a Buried Piping Integrity Program that incorporates the elements and associated key attributes. In December 2008, Electric Power Research Institute (EPRI) published "Recommendations for an Effective Program to Control the Degradation of Buried Pipe," to provide nuclear power plant licensees with guidance on implementing preventive maintenance programs to detect and mitigate degradation in piping systems before leakage occurs. The industry has recently begun to implement this guidance: "Recommendations for an Effective Program to Control the Degradation of Buried Pipe," December 2008 – Report # 1016456" (this document that has been placed in public domain for

no charge, at ERPI.com). This EPRI document provides the nuclear industry additional details on the initiative elements and attributes. "An Overview of the EPRI/BPIG Recommended Program for Buried Piping," presented at a NRC public meeting presentation is available in ADAMS ML093010474 .

All current nuclear power reactor licensees have committed to have a buried piping asset management plan in place by December 31, 2013, in accordance with the NEI "Buried Piping Integrity Initiative."

A summary of the February 24, 2010, Category 2 Public Meeting between the US NRC and Industry Representatives to discuss the Industry's Buried Piping Integrity Initiative is available, along with slide presentations that were presented at the meeting at ADAMS ML100810295.

NRC staff will continue to discuss and meet with the industry as necessary to further understand this "Buried Piping Integrity Initiative", and will evaluate the need to revise NRC inspection procedures to assess licensee implementation of the initiative.

Licensees should under the initiative, consider actions such as: (1) proper maintenance of cathodic protection systems (2) proper installation of piping (3) proper protective coatings on piping (4) proper leak detection methods (5) location and amount of buried pipe at each site and (6) which buried piping is most susceptible to leakage.

Licensees should also consider other underground/ buried assets besides piping (such as tanks, vaults, etc.) Appropriate focus should be considered for these assets, as well. Preparation before leaks occur (i.e., for sampling and analysis protocols, communication protocols, understanding site hydrology, etc.) is crucial for ensuring an effective and prompt response to buried pipe leaks.

The NRC License Renewal Process specifically considers buried piping and tank issues as part of its review process.

The NRC Office of New Reactors (NRO) staff has also reviewed the concerns with buried piping integrity and determined that new reactors will be required to meet the current requirements. In addition, new reactor license applicants will be required to comply with 10 CFR 20.1406 (Minimization of Contamination). This regulation requires license applications submitted after August 1997 to demonstrate how the facility's design and procedures for operation will reduce contamination of the facility and environment and the generation of radioactive waste. Proper implementation of this regulation for new facilities is intended to substantially reduce or eliminate the occurrence of residual contamination for the next generation of nuclear facilities, and could include adoption of predictive maintenance practices to ensure leakage and contamination is maintained as low as reasonably achievable..

The combined operating license applications currently under review do not describe any safety-related systems that require the use of buried piping. All of the safety- related piping is proposed to be either above ground or installed in vaults or chases that provide accessibility and the ability to capture any leakage. If an applicant submitted a new design certification for consideration that featured buried safety-related piping, NRC staff reviews would include

consideration of the applicant's description of its plans to satisfy the requirements of 10 CFR 20.1406.

The integrity of buried piping systems is an important factor among many considered by the NRC in assuring that nuclear facilities in the United States are being operated in a safe and environmentally responsible manner. Licensee efforts to ensure the integrity of buried piping will continue to be assessed and reviewed by NRC staff.

Conclusion / Generic Implications

As stated in the memo STAFF PROGRESS IN EVALUATION OF BURIED PIPING DEGRADATION AT NUCLEAR REACTOR FACILITIES, (ADAMS ML093160004), the staff concluded:

> "Based on the staff's review of operating experience related to buried piping degradation, current regulations and ASME Code requirements have been effective in ensuring that the structural integrity and functionality of buried, safety-related piping are maintained.
>
> Current regulations have also been effective in ensuring unintended releases of hazardous material to the environment from leaks in both safety-related and nonsafety-related buried piping remain below regulatory limits. Therefore, the staff has no current plans to recommend regulatory changes to address degradation of buried piping.
>
> The staff will continue to actively participate in ASME Code and NACE standards activities [NACE International, formerly National Association of Corrosion Engineers]. The revised [Generic Aging Lessons Learned report,(NUREG-1801)] GALL report, including revisions to the [Aging Management Programs] AMPs related to buried piping, is scheduled to be published in December 2010.
>
> The industry has recently developed the Buried Piping Integrity Initiative. The staff plans to meet with the industry to further understand this initiative and monitor industry implementation. The staff will also evaluate the need to revise NRC inspection procedures to assess licensee implementation of this new initiative.
>
> The staff will continue to monitor operating experience and assess the need for any further regulatory actions or communications."

The NRC plans to increase inspector emphasis on buried piping issues under the License Renewal process and under the ROP inspection process because of these recent issues. Abnormal radioactive releases and repeated occurrences of abnormal releases will draw additional and increased regulatory scrutiny.

The NRC expects that recipients will review this information notice for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. This will help prevent more significant leaks from occurring that could impact public health and safety or negatively impact the environment and these actions will also help maintain public confidence.

CONTACTS

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

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Note: NRC generic communications may be found on the NRC public Web site, http://www.nrc.gov, under Electronic Reading Room/Document Collections.

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