

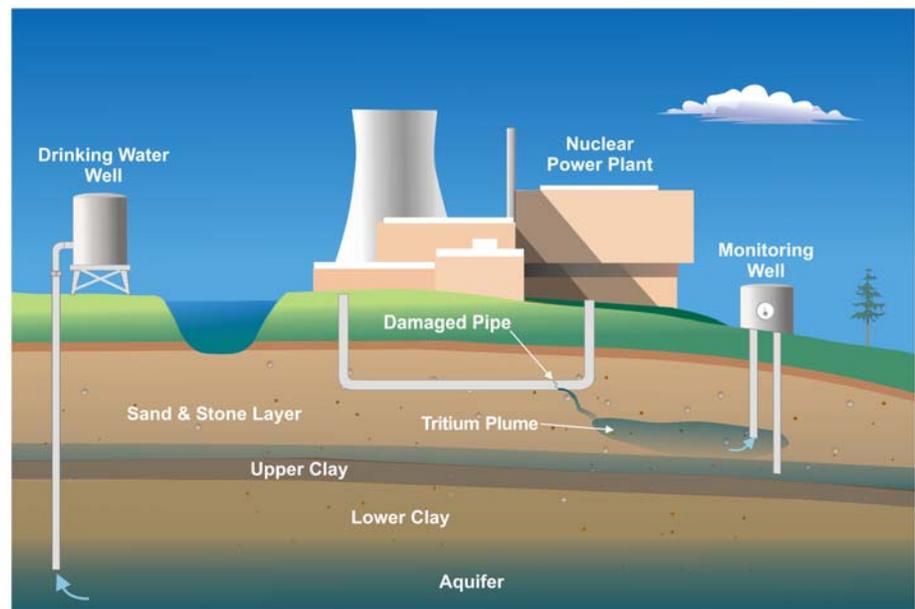
Buried Pipes at Nuclear Reactors

Background

Over the past several years, minor corrosion incidents have caused leaks in buried pipes and related systems at several U.S. nuclear power plants, contaminating groundwater with minor levels of radioactive material. The plants' safety systems continue to function properly despite these leaks. The types and amounts of radioactive material involved in the leaks have represented a small fraction of limits the NRC sets to maintain public health and safety, so the leaks do not present a risk to the public.

The most recent buried pipe leaks have primarily involved water with above-normal levels of tritium, a mildly radioactive isotope of hydrogen normally measured in picocuries (trillionths of a curie) per liter.

The NRC reviews affected plants' groundwater monitoring programs to confirm the leaks do not affect public health and safety and the environment. The NRC's oversight of the overarching buried pipe issue focuses on ensuring nuclear power plant operators properly monitor and when necessary repair the pipes, maintaining their ability to safely run the plants.



NRC Response

The NRC's regulations focus on systems necessary to safely operate the plant or safely shut it down in case of an emergency. These safety systems' buried piping is subject to inspection and testing requirements laid out in agency regulations and standards from the American Society of Mechanical Engineers. These standards call for regular flow testing and other surveillance for buried safety-related pipes, and NRC reviews have confirmed nuclear plants perform these tests several times every year. If leaks are detected, agency regulations call for repairs, although they can be postponed up to 24 months if circumstances permit. NRC regulations also require plants to ensure procedures and resources are in place to prevent potential leaks from exceeding strict and reportable limits on radioactive material releases and

any associated public radiation doses. The agency's resident inspectors, who work full-time at operating U.S. nuclear power plants, regularly monitor all these activities and any deficiencies can trigger more intensive NRC oversight of buried piping issues.

Industry Response

Following increased NRC inspections, the Institute for Nuclear Power Operations (INPO), an industry review group, has been examining buried piping degradation and maintenance for several years, including individual plant efforts in this area. A non-nuclear industry group, NACE International (formerly the National Association of Corrosion Engineers), has formed a "Nuclear Buried Piping" group to examine how its standards can be optimized for use at nuclear power plants. The Electric Power Research Institute (EPRI) has produced recommendations for controlling buried pipe corrosion and other degradation, based on existing NACE standards. The nuclear power industry recently began working with EPRI on developing additional guidance for buried piping maintenance. The industry is responding to a recent NRC request by pursuing an overall Buried Piping Integrity Initiative to implement all these additional measures. The NRC continues to monitor the initiative to determine if any additional inspections or other oversight are called for.

License Renewal

When a nuclear plant licensee attempts to meet NRC requirements for renewing a plant's operating license, the licensee must show it can account for the effects of aging on a plant's systems, including passive, long-lived safety-related structures. Some categories of buried piping fall under these requirements. The NRC judges a plant's Aging Management Programs against examples in the agency's Generic Aging Lessons Learned (GALL) report, which includes information on the aging of both interior and exterior surfaces of buried pipes. Several recent license renewal applications have included provisions for additional buried pipe inspections and replacement programs to account for recent operating plant experience. The NRC is also revising the GALL report and will incorporate additional information on managing buried piping.

New Reactors

Applications for new nuclear power plants must show the proposed reactor meets the same buried piping requirements current plants follow, including relevant ASME standards and codes. The nuclear power industry and NRC staff are working with ASME to develop design requirements that use alternative materials to ensure more robust, long-lived buried piping. Applicants for design certifications and new reactor licenses must also describe how their designs and operational procedures will facilitate eventual decommissioning by minimizing any contamination of the facility and environment, as well as the generation of radioactive waste. The NRC staff will incorporate current operating reactor experience as they review and evaluate measures implemented by new reactor applicants to confirm they are appropriate and sufficient for minimizing contamination. New reactor application information to date indicates many standardized plant designs use, to the extent practical, less buried piping systems for fluids contaminated with radioactive material. This is consistent with efforts to minimize contamination.

More information regarding the NRC's activities on buried is available on the agency Web site: <http://www.nrc.gov/reactors/operating/ops-experience/buried-piping-activities.html> .

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