

December 3, 2015

MEMORANDUM TO: Marissa G. Bailey, Director  
Division of Engineering  
Office of Nuclear Reactor Regulation

FROM: Robert O. Hardies, Senior Level Advisor */RA/*  
Division of Engineering  
Office of Nuclear Reactor Regulation

SUBJECT: BURIED PIPING ACTION PLAN UPDATE

In SECY-09-0174 (Agencywide Documents Access and Management System (ADAMS) Accession Number ML093160004) dated December 2, 2009, the staff reviewed codes, standards, regulations and industry practices related to degradation of buried piping and identified a number of ongoing activities. The Buried Piping Action Plan (initial plan ADAMS Accession Number ML101380697, Revision 1 ADAMS Accession Number ML102590171, Revision 2 Adams Accession Number ML11332A122, and Revision 3 Adams Accession Number ML13107A984) described and tracked the ongoing activities related to buried piping. The enclosure to this memorandum provides an updated plan that reflects completion of all activities and closure of the action plan.

Enclosure:  
NRR Action Plan

CONTACT: Robert O. Hardies, NRR/DE  
(301)-415-5802

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**ADAMS ACCESSION NO.: ML15316A847**

<b>OFFICE</b>	NRR/DE	NRR/DE
<b>NAME</b>	RHardies	MRoss-Lee
<b>DATE</b>	11/16/2015	12/03/2015

**OFFICIAL RECORD COPY**

## **NRR ACTION PLAN**

Complete  
November, 2015

### **BURIED PIPING**

TAC NO. ME3939

Last Update: April, 2013

Lead Division: DE

Supporting Division(s): DLR, DIRS, DPR, DRA

Supporting Office: NRO, RES, Regions, OCA, OPA

#### **Description:**

Some sections of buried piping at some nuclear power plants degraded to the point that through wall leakage occurred. In most cases leakage has been observed in non-safety related, non-nuclear applications. In a few cases leaks have occurred through safety related piping or piping that contained radioactive material. In a few cases this led to releases of tritium into groundwater, which generated significant stakeholder interest. Leaks from degraded buried piping are responsible for less than approximately 10% of reported abnormal releases of tritium from nuclear power plants. The U.S. Nuclear Regulatory Commission (NRC) staff, in SECY 09-0174 (ML093160004), reviewed codes, standards, regulations and industry practices related to degradation of buried piping and identified a number of ongoing activities. This action plan tracked those activities.

#### **Background:**

Leaks from buried piping, particularly of tritiated water, have attracted significant stakeholder attention. For example, during 2009 buried piping leaks introduced water that contained low levels of tritium into the groundwater at Dresden, Oyster Creek and Peach Bottom nuclear plants. The levels of tritium did not exceed any NRC limits (that would be applicable on-site) and, after additional dilution and decay that would occur as a natural consequence of migration toward the site boundary, would not exceed any NRC limit offsite. Although these leaks did not exceed any NRC limits, either on-site or offsite, the level of tritium triggered the licensees to initiate voluntary communications with local and state officials. In response to these leakage events the staff performed a collective significance review of buried piping degradation. In September 2009, the Chairman issued a tasking memorandum that required the staff to review the adequacy of regulations, codes, standards and industry activities related to degradation of buried piping. In response, the staff prepared SECY 09-0174 (ML093160004), which concluded that no immediate regulatory changes were necessary to address degradation of buried piping because a) leakage from buried piping was of low safety significance with respect to structural integrity of the piping, and b) the amount of radioactive material that has been released has been a small fraction of regulatory limits.

The SECY paper described a number of ongoing staff, codes and standards, and industry activities. The staff identified plans to review operating experience to continue to validate conclusions in the SECY paper. The staff indicated it would continue its participation in codes and standards organizations efforts to incorporate changes in the state-of-the-art with respect to maintenance and evaluation of buried piping. Independent of the staff's actions, the nuclear

ENCLOSURE

industry developed, and in November 2009, issued their “Buried Piping Integrity Initiative,” an executive level inter-utility agreement to address degradation of buried piping. The staff identified actions necessary to understand the breadth of implementation and effectiveness of this initiative. The staff also identified actions related to license renewal, new reactors, and the need to communicate about buried piping issues with licensees and other stakeholders.

The NRC defines buried piping as piping that is underground and in contact with soil or concrete. In September 2010, the industry developed the Underground Piping and Tanks Integrity Initiative, which extended the objectives and actions in the Buried Piping Integrity Initiative to tanks that are partly or entirely below the surface of the ground and piping that is below the surface of the ground, but that does not contact soil because the piping is in chases, vaults or tunnels. Actions in this plan that previously applied only to the Buried Piping Integrity Initiative applied to the full scope of both industry initiatives.

During 2010-2011, the Government Accountability Office (GAO) performed a review of NRC activities related to buried and underground piping. The GAO issued a report, “Oversight of Underground Piping Systems Commensurate with Risk, but Proactive Measures Could Help Address Future Leaks,” GAO-11-563, June 3, 2011, that contained a recommendation for the staff to keep abreast of emerging inspection technology. A milestone was added to the plan to specifically address the GAO recommendation.

In August, 2011, the Commission issued a staff requirements memorandum (SRM) addressing SECY 2011-0019 that approved the staff’s continued efforts to work with industry initiatives and consensus standards organizations. This SRM also stated “if, based on its participation in consensus standard activities the staff determines that revisions to the agency’s regulations are necessary to incorporate changes to the ASME codes related to groundwater protection, the staff should seek Commission approval via a notation vote paper.” An action item was added to address this requirement.

In February, 2013, the industry issued revisions to the Buried Piping Integrity Initiative and Underground Piping and Tanks Integrity Initiatives. The revisions changed dates for actions in the initiatives; the changes did not affect due dates for activities in this action plan.

In July, 2014 the NRC completed activities associated with Temporary Instruction TI-182 and verified all plants were following the industry’s Buried Piping Integrity Initiative and Underground Piping and Tanks Integrity Initiatives.

In November, 2015 the NRC had completed all action items and closed the action plan. Certain activities will continue, such as maintaining the website, participating in codes and standards activities, and periodically meeting with industry, but the activities no longer need to be tracked by an action plan.

### **Regulatory Outcome:**

In SECY 09-0174 the staff concluded that current regulations, codes, standards and industry activities had been adequate to ensure: a) leakage from buried piping has been of low safety significance with respect to structural integrity of the piping, and b) the amount of radioactive

material that has been released has been a small fraction of regulatory limits. Continued validation of these conclusions is one of the outcomes of this action plan. In addition, this plan tracked interaction with industry to understand whether, by 2015, their Buried Piping and Underground Piping and Tanks Integrity Initiatives ultimately reduce the incidence of degradation and leaks.

Over the course of the six years while the action plan was in place leakage associated with buried piping and underground tanks, when it has occurred, a) has been of low safety significance with respect to structural integrity, and b) the amount of radioactive material that has been released has been a small fraction of regulatory limits. Furthermore, over that time period rates of significant leakage events as tracked by the Institute of Nuclear Power Operations initially increased, and has since exhibited a decreasing trend consistent with improved maintenance and inspection practices. Reported significant leaks, those in safety related piping or in piping containing environmentally hazardous material, increased from 8 to 15 from 2009 to 2010, but have since decreased to 8 in 2011, 5 in 2012, 4 in 2013, and 3 in 2014 (ML15023A499).

**Project success criteria include:**

Licensees adequately implement the Buried Piping Integrity and Underground Piping and Tanks Integrity Initiatives, and the initiative activities are effective in addressing degradation of buried piping.

Stakeholders are informed of and educated about the safety and environmental significance of degradation of buried piping, and are adequately and appropriately informed about the potential increase in reported degradation expected over the next 3-4 years.

Current regulations, codes, standards and industry activities continue to be adequate to ensure: a) leakage from buried piping has been of low safety significance with respect to structural integrity of the piping, and b) the amount of radioactive material that has been released has been a small fraction of regulatory limits. If operational or other information becomes available that requires a change in these conclusions, appropriate regulatory action is to be initiated via generic communication, revision to the NRC inspection activities, or rulemaking, as appropriate.

The milestones in the action plan, and documents or products that result from completed milestones should be publicly available. Planning information, personnel assignments and draft documents will not, in general, be made public.

**Assessment:**

Over the course of the six years while the action plan was in place leakage associated with buried piping and underground tanks, when it has occurred, a) has been of low safety significance with respect to structural integrity, and b) the amount of radioactive material that has been released has been a small fraction of regulatory limits. Furthermore, over that time period rates of significant leakage events as tracked by the Institute of Nuclear Power Operations initially increased, and has since exhibited a decreasing trend consistent with improved maintenance and inspection practices. Reported significant leaks, those in safety

related piping or in piping containing environmentally hazardous material, increased from 8 to 15 from 2009 to 2010, but have since decreased to 8 in 2011, 5 in 2012, 4 in 2013, and 3 in 2014 (ML15023A499).

**Milestones, Update Frequency, and Scheduled Dates for Completion:**

The action plan will no longer be updated.

Number	Milestone	Date (T=Target) (C=Complete)
1-1	Develop list of historical buried piping degradation incidents (target 1990-present)	8/2010 C
1-2	Update list of buried piping degradation incidents (Ongoing through 12/2015. Milestone is semi-annual, update may occur more frequently)	5/2015 C
1-3	Acquire from the industry, review and assess a listing of buried piping systems at nuclear power plants. Specifically determine whether there is any buried ASME Class 1 piping. (request list from Buried Piping Initiative Executive)	5/2011 C
1-4	Develop an historical listing of abnormal liquid releases of tritium that have affected groundwater at nuclear power plants (ML101270439) (target 1990-present)	12/2012 C
1-5	Update listing of abnormal tritium releases at nuclear power plants (Ongoing through 12/2015. Milestone is semi-annual, update may occur more frequently) (ML101270439)	12/2010 C 6/2011 C 12/2011 C 6/2012 C 12/2012 C 11/2015 C
1-6	Compile and evaluate available buried piping degradation and leakage event causal information	6/2011 C
1-7	Using output from the Temporary Instruction, verify that buried high pressure piping (over 275 psi) is identified and given appropriate inspection priority, and that ASME Section XI IWA-5244 Buried Component pressure tests have been	3/2015 C

	and are being periodically performed	
1-8	Evaluate the need to issue generic communication to collect information necessary to complete items 1-6 and 1-7	5/2011 C
1-9	Using historical buried piping degradation event information developed in step 1-1, establish a pre-2010 rate of occurrence of buried piping degradation events	4/2013 C
1-10	Review the Groundwater Contamination task force final report for consistency with the buried piping action plan. Consider additional actions/milestones based on recommendations from the GW task force pertaining to buried piping.	7/2010 C
2-1	Assess the Buried Piping Integrity Initiative through a series of public meetings with industry (Summaries on website)	2/2010 C 9/2010 C 3/2011 C 10/2011 C 4/2012 C 12/2012 C 2/2015C
2-2	Identify staff training needs with respect to the EPRI buried piping program, guided wave ultrasonic examination technology, NACE standards, cathodic protection system assessment, risk ranking and other relevant training	10/2010 C
2-3	Evaluate need to develop Temporary Instruction for inspection of Buried Piping Integrity initiative activities and if necessary, develop draft TI	9/2010 C
2-4	If required as outcome of 2-3, issue Temporary Instruction for inspection of Buried Piping Integrity initiative activities	12/2011 C
2-5	If required as outcome of 2-3, implement Temporary Instruction	12/2011 C
2-6	Using information from 1-9 and 1-2, determine whether the incidence of degradation of buried piping decreases after implementation of the Buried Piping Integrity Initiative	9/2015 C
2-7	Determine whether the Buried Piping	9/2010 C

	Integrity Initiative addresses pipe systems in vaults that, while not soil covered, may be subject to degradation similar to buried pipe components and/or where the extent of inspection or observation is limited	
2-8	Evaluate the qualification and application of guided wave ultrasonic inspection techniques for evaluation of piping condition (annual status reports)	5/2011 C 5/2012 C 5/2015 C
2-9	Assess Buried Piping Integrity Initiative risk ranking processes	12/2012 C
2-10	Stay abreast of ongoing industry research to develop technologies for structural integrity tests, and when they become feasible, analyze costs to licensees of implementing these tests compared with the likely benefits to public health and safety.	5/2015 C
3-1	Participate in NACE standards activities to develop nuclear industry-specific corrosion prevention and inspection standards (Ongoing through 12/2015. Milestone is semi-annual, update may occur more frequently)	12/2010 C 6/2011 C 12/2011 C 6/2012 C 12/2012 C 11/2015 C
3-2	Participate in ASME standards activities to incorporate into the code state-of-the art design, evaluation and inspection technologies (Ongoing through 12/2015. Milestone is semi-annual, update may occur more frequently)	12/2010 C 6/2011 C 12/2011 C 6/2012 C 12/2012 C 11/2015 C
3-3	Meet with ASME management at the August 2010 Code meeting in Washington to discuss ASME plans with respect to buried piping.	9/2010 C
4-1	Issue draft revision of aging management programs for buried piping and buried tanks in GALL for public comment	5/2010 C
4-2	Issue GALL revision	1/2011 C
4-3	Develop RAIs for all current LRA applicants to address augmented requirements in Buried Pipe Programs based on industry OE	11/2010 C



4-4	Provide OE data on buried and underground pipe leakage or degradation to the PI&R Inspection Teams to inform that inspection process	10/2010 C
4-5	Evaluate the need to issue generic communication soliciting licensee commitments to the Buried Piping Integrity Initiative (Ongoing through 12/2015. Milestone is semi-annual, update may occur more frequently)	11/2010 C 5/2011 C 12/2011 C 6/2012 C 12/2012 C 5/2015 C
4-6	Evaluate the staff's treatment of licensee commitments with respect to Regulatory Guide 1.143	12/2011 C
4-7	Update buried piping website bi-monthly	11/2015 C
4-8	Evaluate the need to make changes to the Reactor Oversight Process based on results of the TI inspections	7/2013 C
4-9	Develop and post on website a description of the expected increase in leak discovery due to an increase in inspection	9/2010 C
4-10	Evaluate the need to recommend rulemaking to require enhanced maintenance, corrective action, and aging management programs for these systems, structures and components that contain radioactive materials. Consider the interim results of item 2-10.	11/2015 C
4-11	In accordance with Staff Requirements Memorandum for SECY 2011-0019, revise LIC-300 to capture the requirement, for certain rulemakings related to the ASME Code updates that affect groundwater protection, for the responsible technical organization to prepare a notation vote paper (separate from the rule package) for Commission consideration.	9/2012 C

**Current Status: Complete**

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**References:**

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STAFF PROGRESS IN EVALUATION OF BURIED PIPING AT NUCLEAR REACTOR FACILITIES, SECY 09-0174, December 2, 2009 (ML093160004)

Industry Initiative on Buried Piping Integrity, November 20, 2009 (ML093350032)

Industry Initiative on Groundwater Protection, July 31, 2006 (ML062260198)

SUMMARY OF CATEGORY 2 PUBLIC MEETING BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND INDUSTRY REPRESENTATIVES TO DISCUSS BURIED PIPING ISSUES, November 2, 2009 (ML093070150)

SUMMARY OF CATEGORY 2 PUBLIC MEETING BETWEEN THE U.S. NUCLEAR REGULATORY COMMISSION AND INDUSTRY REPRESENTATIVES TO DISCUSS THE INDUSTRY'S BURIED PIPING INTEGRITY INITIATIVE, March 24, 2010 (ML100820453)

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NRR Yellow Ticket Number: YT20100098, Buried Piping Action Plan

Staff Requirements Memorandum, SECY 2011-0019

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NEI 09-14, Rev 2, "GUIDELINE FOR THE MANAGEMENT OF UNDERGROUND PIPING AND TANK INTEGRITY" (ML13086A086 and ML13086A089)

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