POLICY ISSUE
(Notation Vote)

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FOR: The Commissioners

FROM: R. W. Borchardt
Executive Director for Operations

SUBJECT: OPTIONS FOR REVISING THE REGULATORY APPROACH TO GROUND WATER PROTECTION

PURPOSE:

The purpose of this paper is to provide the Commission with options for revising the regulatory approach to ground water protection, as directed in the Staff Requirements Memorandum (SRM) SRM-SECY-11-0019, "Senior Management Review of Overall Regulatory Approach to Groundwater Protection," dated August 15, 2011. In addition, the paper describes the high-level communications initiatives that the staff is using to enhance public awareness of the U.S. Nuclear Regulatory Commission's (NRC's) regulatory framework for ground water protection.

SUMMARY:

In SRM-SECY-11-0019, the Commission approved the staff's current approach to ground water protection, and also directed the staff to provide for Commission review and approval options for revising the agency's approach to ground water protection. The staff has developed two proposed options for revising the regulatory framework: (1) continue the current regulatory approach, strengthened by new regulatory requirements recently issued by the decommissioning planning rulemaking and additional rulemakings currently under consideration by the NRC, or (2) consider the development of a technical basis for potential additional rulemaking to increase engineering controls that are provided in Enclosure 1.

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Enclosure 2 provides the basic elements of the high-level communications initiatives. The staff will periodically update its initiatives and communication methods and tools based on feedback from stakeholders and in response to any new issues.

BACKGROUND:

Numerous leaks and spills from buried piping and systems at nuclear power plants have resulted in substantial onsite, subsurface residual radioactivity, primarily tritium. Concentrations of tritium from leaks and spills have been detected in a few locations in offsite surface waters. In one location, inspectors detected tritium in an offsite drinking water well at concentrations less than the NRC reporting requirements and less than 10 percent of the Environmental Protection Agency (EPA) safe drinking water standard for tritium. There has not been any offsite tritium from routine or abnormal discharges in any drinking water supply that has exceeded EPA maximum contaminant levels established under the Safe Drinking Water Act.

The NRC's existing regulatory framework for ground water protection is established in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection Against Radiation," in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," and in plant technical specifications. The regulations primarily relate to limitations on effluent releases to offsite unrestricted areas, limitations on dose to members of the public, and "as low as is reasonably achievable" (ALARA) requirements.

The effluent control systems at most existing plants have been designed to a criterion similar to General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment," of Appendix A, "General Design Criteria for Nuclear Power Plants," in 10 CFR Part 50. The plant designs provide a "means to control suitably the release of radioactive materials" to the environment. For discharges of radioactive material in effluent releases to offsite unrestricted areas, NRC regulations in 10 CFR 50.36(a), "Technical Specifications on Effluents from Nuclear Power Reactors," require licensees to keep levels of radioactive material in effluents ALARA, and meet the numerical guides of Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation To Meet the Criterion 'As Low As Is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," of 10 CFR Part 50.

Through the Reactor Oversight Process, the NRC inspects and enforces licensee compliance with the regulatory requirements. Inspections of licensee effluent and environmental monitoring programs are performed using Inspection Procedures 71124.06, "Radioactive Gaseous and Liquid Effluent Treatment," and 71124.07, "Radiological Environmental Monitoring Program." The inspection procedures also require verification that the licensee is continuing to implement the voluntary Nuclear Energy Institute (NEI) 07-07, "Industry Ground Water Protection Initiative" (NEI-GPI), issued August 2007 (Agencywide Documents and Management System (ADAMS) Accession No. ML072600290). Inspection procedures include, but are not limited to, a review of abnormal releases, ground water monitoring results, and licensee evaluations of the type and amount of radioactive material released. NRC inspectors ensure the adequacy of dose assessments, use of corrective action programs, and review any remediation actions that have been taken. They also verify that the licensee has completed notifications to NRC, State, and local officials. The inspection reports document the NRC's inspection of abnormal or unplanned radioactive discharges (e.g., leaks and spills).

For facilities licensed after August 1997, under 10 CFR Part 52, "Licenses, Certifications, and Approvals For Nuclear Power Plants," the requirements of 10 CFR 20.1406, "Minimization of Contamination," address the design and program elements for the minimization of contamination of plant facilities and the environment. Specifically, 10 CFR 20.1406(a) applies to licenses and renewals other than early site permits and manufacturing; and 10 CFR 20.1406(b) applies to standard design certifications, design approvals, and manufacturing.

Under 10 CFR 20.1501, "General" (radiological surveys), all licensees are required to conduct radiological surveys to characterize the presence of radioactive materials in subsurface soils and ground water in planning decommissioning. In all instances, the main objective of these regulations is to avoid unmonitored and uncontrolled releases of radioactive materials on both the site and in unrestricted areas and to provide information that can be used to assess potential radiological hazards.

NRC guidance on acceptable methods of demonstrating compliance with these regulations is presented in the following:

- Regulatory Guide (RG) 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants"

- RG 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life-Cycle Planning"

- NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition"

- associated interim staff guidance

In a safety evaluation report (ADAMS Accession No. ML092720253) issued on October 19, 2009, the NRC staff approved the use of technical report NEI 08-08A, "Generic FSAR Template Guidance for Life-Cycle Minimization of Contamination." This guidance describes operational policies and programs that are acceptable to meet the programmatic requirements of 10 CFR Part 20.1406(a) and (b) for life-cycle minimization of contamination, in part by addressing the applicable regulatory position elements of RG 4.21.

CURRENT NRC RULEMAKINGS:

Although not initiated for the specific purpose of ground water protection, other recently finalized or under consideration rulemakings potentially affect the NRC's regulatory approach to ground water protection. These rulemakings consist of the following:

1. Decommissioning

The NRC published a final rule on decommissioning planning in the *Federal Register*, which made changes to 10 CFR Part 20 (76 FR 35512; June 17, 2011). Specifically, the rule requires in 10 CFR 20.1406 that all licensees, to the extent practical, conduct operations to minimize the

introduction of residual radioactivity into the site. The rule also modified 10 CFR 20.1501 to require licensees to perform subsurface (i.e., soil and ground water) surveys to identify residual radioactivity. The implementation date for the rule is December 17, 2012. Licensees will have to implement procedures and practices that minimize the occurrence of leaks and spills and identify them throughout the facility soon after they occur.

2. Remediation

The Commission directed the staff to further improve the decommissioning planning process by engaging stakeholders and developing a technical basis for remediation of residual radioactivity during operations ("Staff Requirements–SRM-SECY-07-0177–Proposed Rule: Decommissioning Planning (10 CFR Parts 20, 30, 40, 50, 70, and 72; RIN: 3150-AH45))." The staff is currently developing a technical basis, as directed by the Commission.

3. Environmental Reviews for License Renewal

The staff has proposed amending the agency's regulations in 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," on the renewal of a nuclear power plant's operating license (74 FR 38117; July 31, 2009). Although not directly related to the regulatory framework for ground water protection, the proposed rule addresses environmental impact by redefining the number and scope of environmental impact issues included in the review of applications for license renewal, adding to the list the impact of radioactive leaks and spills into ground water. The staff expects to submit the final rule to the Commission for approval in May 2012.

POTENTIAL EPA RULEMAKING:

The EPA currently is considering revising 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations." EPA recognizes that in the development of the existing 40 CFR Part 190 rule, the EPA staff did not anticipate the need for protection of the water resource. EPA is also considering a number of other issues, including the use of current scientific methodologies and terminology. Note: The current 10 CFR 20 regulations in 20.1301, "Radiation Dose Limits for Individual Members of the Public," in paragraph (e) requires NRC licensees subject to the provisions of EPA's generally applicable environmental radiation standards in 40 CFR 190 to comply with those standards. Thus, revisions to 40 CFR Part 190 made by EPA would become requirements for applicable NRC licensees, including any specific regulations related to ground water.

INDUSTRY INITIATIVES:

In 2007, the nuclear power industry began implementing its "Industry Ground Water Protection Initiative." Since 2008, the NRC staff has been monitoring its implementation. As of August 30, 2010, approximately 40 percent of the licensees had not fully implemented 100 percent of the 42 program elements. In total, approximately 8 percent of the program elements were incomplete. The NRC staff is currently re-inspecting those licensees with incomplete program elements to determine whether they have completed full implementation. The NRC will complete this re-inspection by the end of 2012, followed by routine Reactor Oversight Process inspections to verify the continued implementation of the initiatives. As directed, the staff will inform the Commission if licensees are not implementing the voluntary

initiatives in a technically acceptable manner which achieves the NRC's performance expectations.

The nuclear power industry instituted another voluntary initiative, "Industry Initiative on Underground Pipes and Tanks Integrity" (ADAMS Accession Number ML103410507). The NRC staff has been monitoring the industry's implementation of this initiative by inspections that began in January 2012 and will continue through June 2014.

RESULTS OF PREVIOUS GROUND WATER ASSESSMENTS:

In SECY-11-0019, the staff concluded that the NRC is accomplishing its stated mission of protecting public health and safety and the environment through its response to ground water leaks and spills, consistent with its regulatory framework. Similarly, the Advisory Committee on Reactor Safeguards (ACRS) concluded in its letter to the Commission on March 23, 2011, that the NRC is accomplishing its mission to protect public health and safety and the environment (ADAMS Accession Number ML110730443). The General Accountability Office (GAO) concluded in its report, "Oversight of Underground Piping Systems Commensurate with Risk, but Proactive Measures Could Help Address Future Leaks," issued June 2011, that while leaks to date have not posed discernable health impacts to the public, there is no guarantee that the impact of future leaks will be the same (ADAMS Accession Number ML11179A102). The GAO recommended, in summary, that the NRC periodically evaluate the extent to which the industry's voluntary ground water protection initiative will detect leaks and stay abreast of the industry's research to develop technologies for structural integrity tests. GAO recommended, based on these analyses, NRC should determine whether it should expand its regulatory requirements.

Options for the Regulatory Approach to Ground Water Protection

The staff has identified two basic options:

Option No. 1: *Continue the current regulatory approach.*

Under this option, the staff would continue inspecting and enforcing existing regulations using the system of dose limits and ALARA principles, and it would implement the new regulatory requirements in 10 CFR 20.1406 for minimizing the introduction of residual radioactivity into the site and in 10 CFR 20.1501 for performing subsurface (i.e., soil and ground water) monitoring.

The staff would continue to develop a technical basis for remediation rulemaking, as directed by the Commission. In addition, staff would monitor the potential EPA rulemaking related to ground water protection, including review and comment, as appropriate, particularly if an advance notice of proposed rulemaking is published in the *Federal Register*. NRC inspections would continue to be used to monitor the effectiveness of the industry initiatives, and the staff would notify the Commission if licensees are not implementing the industry initiatives in a technically acceptable manner which achieves the NRC's performance expectations.

The staff would continue to participate in the development of American Society of Mechanical Engineers (ASME) standards related to inspection of nonsafety-related piping, which may be incorporated into ASME Code cases, and with NACE International (formerly the National Association of Corrosion Engineers) to evaluate the need for corrosion protection standards.

The staff would continue to evaluate the long-term effectiveness of the industry initiatives through onsite inspections, review of licensees' root cause analyses, tracking the frequency of leakage, and evaluating industry performance metrics, as identified in the Office of Nuclear Reactor Regulation (NRR) action plan: "Buried Piping" (ADAMS Accession Number ML11332A122).

Option No. 2: *Propose new rulemaking.*

Under this option, the staff could consider developing a technical basis necessary to propose new rules to increase ground water protection by establishing more stringent engineering controls (e.g., required inspections and maintenance of piping and tanks). A list of potential regulatory changes is included in Enclosure 1.

In accordance with 10 CFR 50.109, "Backfitting," any new regulations (except for information collection and reporting requirements) would require a backfit analysis and need to conclude that there is a substantial increase in the overall protection of the public health and safety and that the costs of implementation are justified in view of this increased protection. Comparable or more stringent requirements are set forth in various "issue finality" provisions in 10 CFR Part 52. NRC staff inspection results, senior management reports, ACRS, and GAO previously have concluded that there has been minimal impact on public health and safety from radioactive material in leaks and spills. Therefore, the staff believes that, under NRC's current regulatory framework, it is unlikely that a backfit analysis would be able to conclude that there is a substantial increase in the overall protection of the public health and safety

A new rulemaking could also be established which complies with the backfit rule if the Commission would find and declare, in accordance with 10 CFR 50.109(a)(4)(ii) and/or (iii) with the appropriate documented evaluation, that the regulatory action involves the level of protection considered adequate for public health and safety. For example, a new rulemaking could be established if the Commission was to find and declare that in order to provide adequate protection of public health and safety, that a separate standard for the ground water radiation exposure pathway is necessary.

The staff notes that establishing a separate radiation protection standard for the ground water exposure pathway would not be consistent with the NRC regulatory approach taken in 10 CFR Part 20. The NRC radiation protection standards use a dose limitation system based on an integrated, all-exposure pathway approach (e.g., exposure to radioactive materials in air, surface water, and ground water), instead of specific pathway standards, such as exposure to radioactive materials in ground water.

STAFF RECOMMENDATION:

The staff recommends Option 1. The staff believes that the existing regulatory framework, including the recent decommissioning planning rule, combined with the development of a technical basis for remediation, is the best approach to providing adequate protection of public health and safety and the environment. Additionally, Option 1 balances existing staff resources consistent with the relatively minor risk significance of the leaks and spills experienced to date.

RESOURCES AND TIMELINES:

The staff estimates resource needs as identified in the table below. The resources identified for Option 1 are estimated resources for standard baseline work related to ground water protection.

	FY 2012	FY 2013
Option 1	1 FTE	1 FTE
Option 2	$100,000 and 3 FTE	$100,000 and 3 FTE

The NRC's fiscal year (FY) 2012 budget and FY 2013 President's Budget includes resources for Option 1 but does not include resources for Option 2. If the Commission approves Option 2, NRR will notify OCFO of the resources that will be reallocated to fund Option 2 along with the impacts. Resources required beyond FY 2013 will be address during the Planning, Budgeting, and Performance Management process.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has concurred.

/RA/

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Enclosures:
1. Potential Rulemaking Changes
2. High-Level Communications Initiatives

POTENTIAL RULEMAKING CHANGES (IF OPTION 2 IS CHOSEN)

The U.S. Nuclear Regulatory Commission (NRC) could consider the following potential regulatory changes, depending on the results of an analysis and an identified need for additional regulatory requirements. Changes to the regulatory framework would require that the criteria for backfit in 10 CFR 50.109 and issue finality provisions in 10 CFR Part 52 be met, except for information collection and reporting requirements (fourth bullet below).

Potential Rulemaking Changes:

- Adopt regulations incorporating elements of the Nuclear Energy Institute's "Industry Ground Water Protection Initiative," issued August 2007 (Agencywide Documents and Management System (ADAMS) Accession Number ML072600290), thereby removing the voluntary nature of the initiative.

- Adopt regulations incorporating elements of the Nuclear Energy Institute's "Industry Initiative on Underground Pipes and Tanks Integrity" (ADAMS Accession Number ML103410507), thereby removing the voluntary nature of the initiative.

- Establish additional regulations to protect ground water by requiring that piping and tanks containing licensed material with a potential to leak into groundwater:

    - be constructed from, or replaced with, corrosion resistant material (e.g., super austenitic stainless, or titanium)

    - be located above ground

    - be placed in vaults

    - be provided with cathodic protection

    - be modified so they are capable of inspection with suitable frequency requirements

    - be maintained to prevent leaks

    The specific requirements associated with these regulatory changes would be identified and resolved in a rulemaking in conjunction with stakeholders.

- Adopt regulations that increase reporting requirements to require licensees to promptly report ground water monitoring data for leaks and spills, which the NRC could make publicly available on its Web site. Provision for additional reporting requirements would not be subject to the 10 CFR 50.109 backfit rule.

Note: The NRC staff currently publishes on its Web site a list of individual plants that have leaks and spills, including each plant's maximum historical tritium concentration and the current tritium concentration (i.e., for those plants with ground water concentrations exceeding the EPA drinking water standard). In addition, the NRC Web site contains each site's annual effluent and environmental monitoring reports including data on ground water monitoring results, and radioactive effluent summary reports for the nuclear power industry.

HIGH-LEVEL COMMUNICATIONS INITIATIVES

Goal

The goal of these initiatives is to provide stakeholders with information that addresses how the U.S. Nuclear Regulatory Commission's (NRC's) regulatory framework provides ground water protection. The staff will use the following communication methods and forums to enhance NRC's communications to stakeholders.

- Explain how NRC's regulatory framework addresses ground water protection in plain language during public meetings. (NRC staff)

- Explain licensees' previous radiological performance related to the release of radiological effluents in plain language during public meetings. (NRC staff)

- Engage the media and the public by issuing press releases on public meetings and answering media inquiries. (NRC Office of Public Affairs)

- Engage Federal authorities in discussions of ground water protection in meetings of the Interagency Steering Committee on Radiation Standards and U.S. Environmental Protection Agency rulemaking meetings. (NRC staff)

- Engage State, appropriate Tribal and local authorities in routine outreach programs. (Regional State Liaison Officers, Office of Federal and State Materials and Environmental Management)

- Engage congressional representatives and staff members when issues arise by proactively contacting them and providing information and briefings and by answering questions. (NRC Office of Congressional Affairs)

Communication Tools

- The NRC Standard Protocol for State and Tribal Outreach on Unintended Releases of Radioactive Material

- Licensee event notifications and NRC press releases related to recent leaks and spills

- Web pages explaining the NRC's regulatory processes and ground water contaminants

- Web pages providing public information on existing leaks and spills at nuclear power plants and monitoring data

- Web page "For The Record" clarifying facts related to ground water contamination events

- Questions and answers for staff to use in explaining radioactive leaks and spills into ground water

- Fact sheets and brochures on ground water contamination and tritium releases