

Senior Management Review of the Groundwater Task Force Report

Led by Martin J. Virgilio

**Deputy Executive Director for
Reactor and Preparedness Programs**

February 24, 2011

Groundwater Task Force

Charles Casto

**Deputy Regional Administrator
for Construction**

Region II

Agenda

- **Overview of Task Force activities**
- **Findings of the Groundwater Task Force**
- **Conclusions and key recommendations**

Groundwater Task Force Activities

- **Completed review of charter items**
- **Determined facts and observations**
- **Developed conclusions and recommendations**
- **Identified four themes**
- **Identified 16 specific conclusions**
- **Identified four key recommendations**

Overall Finding

- **After a thorough review, the GTF determined that the NRC is accomplishing its stated mission of protecting public health, safety, and protection of the environment through its response to groundwater leaks/spills.**

Overall Finding

- **Within the current regulatory structure, NRC is correctly applying requirements and properly characterizing the relevant issues.**

Themes

- **Theme 1 – Reassess NRC’s regulatory framework for groundwater protection**
- **Theme 2 – Maintain barriers as designed to confine licensed material**

Themes

- **Theme 3 – More reliable NRC response**
- **Theme 4 – Strengthen trust**

Key Recommendations

- **Identify the policy issues associated with an assessment of the NRC's groundwater protection regulatory framework**

Key Recommendations

- **Once the policy issues are addressed, implement conforming changes to incorporate appropriate enhancements in the Reactor Oversight Program**

Key Recommendations

- **Consider development of specific actions to address the key themes and conclusions in this report**

Key Recommendations

- **Conduct a focused dialogue with EPA, States, and international regulators to develop a collaborative approach for enhanced groundwater protection strategy**

**Legal Authorities
Over Radionuclides
In Groundwater**

**Steven Crockett
Special Counsel
Office of the General Counsel**

NRC Authority

- **Under Atomic Energy Act:**
 - **General Design Criteria 60 and 64**
 - **100 mrem standard (10 CFR 20.1301(a)(1))**
 - **ALARA 3 mrem guide (10 CFR Part 50 App. I, § II)**

EPA Authorities

- **Atomic Energy Act (by way of Reorg. Plan 3)**
 - **25 mrem whole body (40 CFR 190.10)**
 - **Enforced by NRC (10 CFR 20.1301(e))**
- **Safe Drinking Water Act**
 - **20k pCi/L of tritium (40 CFR 141.66)**
 - **Applied by EPA to public water systems, at the tap**

State Authorities

- **Possible sources of authority**
- **Uncertainties**
- **NRC interaction with states**
 - **To ensure that state action protects plant safety**

Reassessing NRC's Regulatory Framework and Maintaining Barriers to Confine Licensed Material

**Eric Leeds, Director
Office of Nuclear Reactor
Regulation**

Groundwater Task Force Report

- **First two themes:**
 - **Reassess the NRC's Regulatory Framework for Groundwater Protection**
 - **Maintain Barriers as Designed to Confine Licensed Material**

Incorporating Voluntary Initiative into Regulatory Framework

- **Inspect implementation of Licensee's programs**
- **Evaluate long-term effectiveness**
- **Continue to track releases**
- **Re-evaluate the need for additional actions based on industry performance**

Participating in Consensus Standard Development

- **Working with ASME to address inspection of nonsafety-related piping**
- **Working with NACE International regarding nuclear-specific corrosion protection standards**

Participating in Consensus Standard Development

- **Monitoring industry efforts to develop more effective piping diagnostic evaluation methods**

Revising the Radiological Effluent Performance Indicator

- **Evaluate effluent performance indicator usefulness**
- **Provide the Commission with a recommendation in the annual ROP self-assessment paper**

Immediate Remediation of Spills

- **SRM for Decommissioning Planning (2007) directed staff to address remediation of residual radioactivity during operational phase in proposed rule**
- **Developing technical basis to address**

Immediate Remediation of Spills

- **Scheduled to provide
recommendation regarding
rulemaking in FY2011**

Initiatives for Improved Communication of Groundwater Incidents

**Charles Miller, Director
Office of Federal and State
Materials and Environmental
Management Programs**

Creating More Reliable Response and Strengthening Trust

- **NRC's communication of groundwater incidents can be improved**
- **Staff has undertaken a number of initiatives to improve communication, create more reliable response, and strengthen trust**

Creating More Reliable Response and Strengthening Trust

- **Near-Term Initiatives (1)**
 - **Establish a community of practice**
 - **Establish a Stakeholder Confidence working group**
 - **Improve factsheets**

Creating More Reliable Response and Strengthening Trust

- **Near-Term Initiatives (2)**
 - **Develop standard protocol for split samples**
 - **Improve effluent reports**

Creating More Reliable Response and Strengthening Trust

- **Initiatives for the Long-Term**
 - **Improve communication strategies**
 - **Enhance communication with States**
 - **Enhance international outreach**

ACRONYMS

- **ASME – American Society of Mechanical Engineers**
- **EPA – Environmental Protection Agency**
- **GTF – Groundwater Task Force**

ACRONYMS

- **NACE – formerly National Association of Corrosion Engineers**
- **ROP – Reactor Oversight Process**
- **SRM – Staff Requirements Memorandum**

Groundwater Protection

James Meister
VP, Operations Support
Exelon Nuclear

Background

- Robust NRC monitoring programs include effluent monitoring, dose assessment for all releases, and environmental samples
 - Limits less than public safety limits
 - Annual reporting of monitoring results available to the public
- Industry developed voluntary initiative
 - Based on events and Operating Experience
 - Builds upon existing NRC required programs

Initiative Program Elements

- Prevent unintended releases from getting offsite
 - Analyzes site hydrology and geology
 - Conducts site risk assessment
 - Implements on-site ground water monitoring
 - Delineates remediation process
- Enhance openness and transparency
 - Stakeholder briefings
 - Voluntary prompt initial and follow-up reporting
 - Data and information contained in annual reports
- Assure on-going effectiveness
 - Periodic self and independent peer assessments conducted
 - Lessons learned and best practices shared with industry

Groundwater Protection Initiative Chronology

- Adopted by CNOs – May 2006
- Program guidance – May 2006
- Initial implementation – July 2006
- Lessons learned workshop – Feb 2007
- Updated program guidance – August 2007
- EPRI Technical Guidelines – January 2008
- Updated implementation – December 2008
- Independent peer reviews – 2009-2010

Going Forward

- Suggestions to NRC on Task Force report – Oct. 2010
- EPRI Remediation guideline – Dec. 2010
- EPRI Airborne Tritium Transport guideline – Dec. 2010
- Peer assessment report to NRC – Jan. 2011
- NRC Commission briefing – Feb. 2011
- Annual industry groundwater workshop – June 2011
- 2nd round of peer reviews initiated – Jul. 2011
- Annual update to industry guidance - Dec. 2011

Peer Assessment - Summary Results

- Nuclear power plant sites have:
 - Assessed site hydro-geology & SSC leakage vulnerabilities
 - Implemented early detection methods for inadvertent leaks or spills
 - Enhanced communications with state and local stakeholders
- Areas for continued improvement include:
 - Evaluation of work practices
 - Protocols for remediation decision-making
 - SSC inspection, testing and leak prevention
 - Modeling airborne Tritium transport and deposition

Summary

- The current NRC regulatory framework assures protection of public health and safety
- The industry initiative goes above and beyond NRC requirements to address environmental stewardship, openness and transparency
- There is substantial opportunity for improving communications

Oyster Creek Activities

- Repeat leaks in underground piping identified in 2009
- The Groundwater Protection program provided for early detection
- Sources were identified, isolated, and repaired
- Dose assessment completed (worker and public)
 - No health impacts
- Oyster Creek engaged stakeholders early and often through: site visits, community information nights, public meetings, web based information, newspaper articles, print advertising, and direct mailings

Oyster Creek Activities

- Various mitigation strategies were evaluated
- Considered piping condition, site characteristics, and internal/external stakeholder inputs to develop a unique Oyster Creek approach
- Mitigated buried liquid piping containing licensed material by replacement above ground, placement in engineered trenches, or double-walled pipe
 - Completed in 2010

Exelon Underground Piping and Tank Program

- Exelon is implementing the Industry Initiative for all stations
- Condition assessment and asset management of components containing licensed material will be in accordance with the Industry Initiative

Underground Piping and Tanks Integrity Initiative

**Maria Korsnick,
Chief Nuclear Officer, SVP - Chief Operations Officer
Constellation Energy Nuclear Group
February 24, 2011**

Background

- **Buried piping leaks are occurring**
- **Leakage of radiological fluid is a public confidence concern**
- **The industry has lowered its threshold for leak reporting to ensure we are maximizing our opportunities to learn from each other**
- **No significant safety or radiological concerns to date**

Industry Actions

- **Buried Piping Integrity Initiative approved in November 2009**
- **Goal**
 - **Reasonable assurance of structural and leakage integrity of buried piping**
 - **Special emphasis on piping that contains radioactive materials**
- **Builds on the Ground Water Protection Initiative**
 - **Proactive assessment and management**
 - **Share operating experience**
 - **Drive inspection and analysis technology**

Considerations for Initiative Revision

- **Buried Piping Integrity Initiative applies to all buried piping that is in direct contact with the soil**
- **Operating experience**
 - **Degradation of piping in vaults and tunnels can occur**
 - **Initiative does not address tanks**
- **Importance of maintaining public confidence**

Expansion of Initiative Scope

- **Added underground piping and tanks outside of buildings whether or not they are in direct contact with the soil if they**
 - **Contain licensed radioactive material**
or
 - **Are safety related**
- **Identified the new Initiative and the original Initiative as the “Underground Piping and Tanks Integrity Initiative”**

Initiative Framework

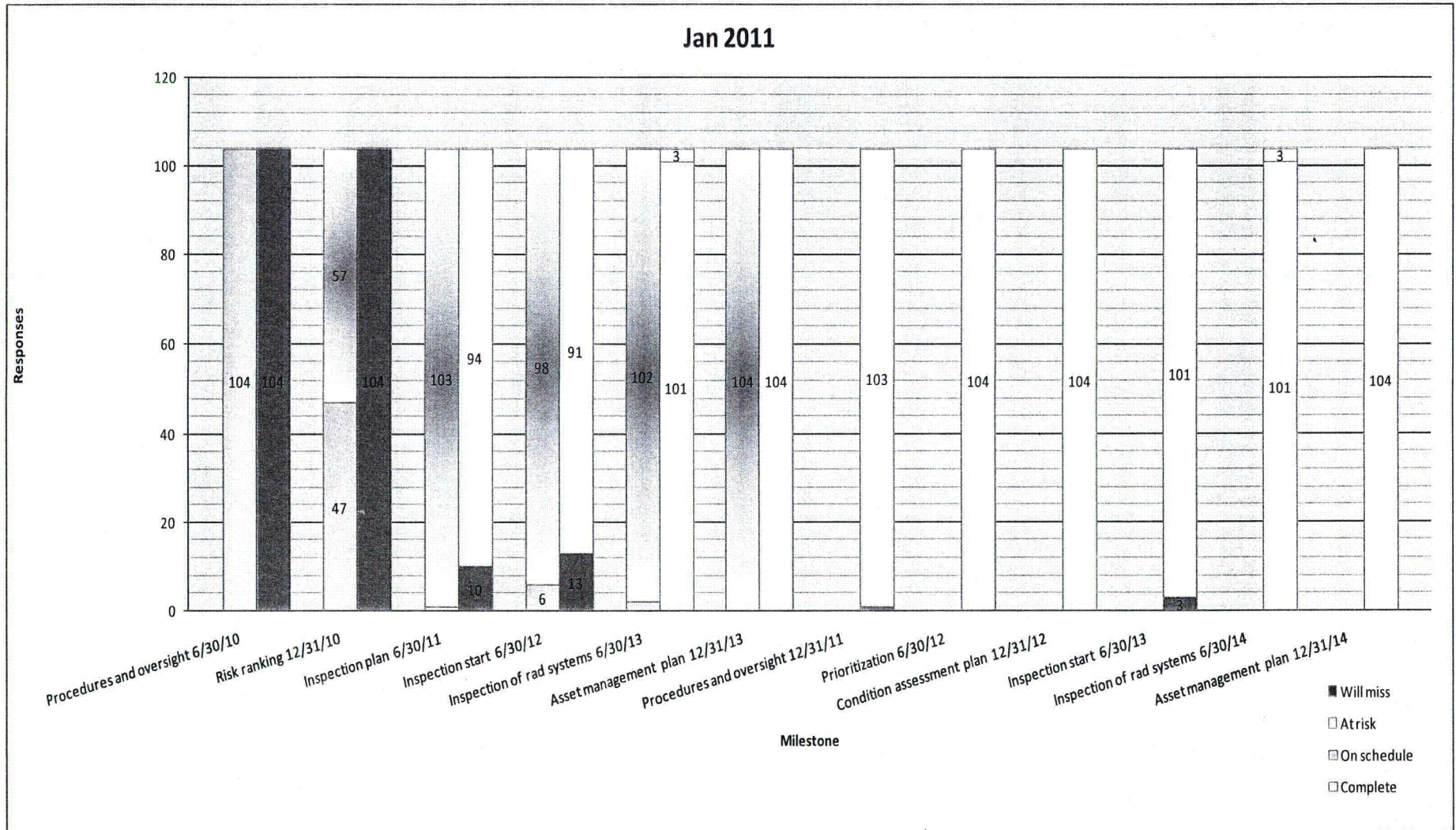
- **Milestones**

- 1. Procedures and oversight**
- 2. Risk ranking / Prioritization**
- 3. Condition assessment plan**
- 4. Plan implementation**
- 5. Condition assessment of components containing licensed material**
- 6. Asset management plan**

- **Purposeful approach**

- **Establish a foundation**
- **Allow time for inspection planning and technology development**
- **Develop strategic plans**

Initiative Implementation Status



Summary

- **Essential to ensure that resources are directed in a manner consistent with safety significance**
- **Existing regulatory framework is adequate**
- **Underground Piping and Tanks Integrity Initiative actions go beyond what is necessary for public health and safety**

NRC Commission Meeting Groundwater Task Force

Patrick Mulligan, Manager
Conference of Radiation Control Program Directors
and
NJ DEP Bureau of Nuclear Engineering

Theme 1: Regulatory Framework

“The SMRG concurred with the GTF’s conclusion that the NRC is accomplishing its stated mission of protecting public health, safety, and protection of the environment through its response to groundwater leaks/spills, consistent with its regulatory framework.”

Issues

- NRC release standards are dose based and directly related to public health and safety.
- GWTF document states that regulation based on environmental protection is not within the NRC's statutory authority.
- EPA water quality standards are based on "environmental protection"
- NRC should not pre-empt any actions taken by states that are based on environmental regulation (state or federal) regarding groundwater or drinking water

Theme 2: Maintain Barriers

- NRC needs to take a more pro-active role in the inspection of systems to ensure integrity is maintained and licensed material is controlled in accordance with the design.
- Employ more stringent requirements for all underground piping carrying licensed materials.
- Verify modification records and proper application of coatings through inspection process.
- Explore feasibility for moving pipes above ground or into vaults to prevent possibility of future occurrences

Additional Measures

- Consider making the Voluntary Industry Initiative on Groundwater Protection more than just voluntary.
 - Regulatory
 - Memorandum of Agreement
 - Environmental Surveillance Program

Theme 3: Improve NRC Response

- Improve the Reactor Oversight Process to make Performance Indicators more meaningful.
- Evaluate reporting requirements for loss of control of licensed material so that events are identified timely, investigated thoroughly and actions taken to mitigate future occurrences.

Theme 3: Improve NRC Response

- Consider making hydrogeologic study part of environmental impact statement.
 - Fully understand the flow of groundwater at the site prior to releases to groundwater.
 - Quickly assess the potential impact to local drinking water supplies
- Natural attenuation constitutes an uncontrolled, unmonitored release of licensed material to the environment
 - Consider immediate remediation rather than at decommissioning

THEME 4: Strengthen Trust

- All leaks of licensed materials from unplanned, unmonitored pathways should be reported to the NRC and the state upon recognition without regard to magnitude.
- An investigation should start immediately in order to bound the extent and magnitude of the release.
- Make prompt public notification of facts including supporting data.

THEME 4: Strengthen Trust

- Make the entire process transparent to all stakeholders.
- Make public information available timely (quickly).
- Develop public Outreach programs that can be brought to the local communities in the event of a leak and encourage state and industry participation

CRCPD's Committee on Emergency Response Planning (HS/ER-5)

Conference of Radiation Control Program Directors, Inc.

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October 28, 2010

Ms. Cindy Bladey, Chief
Rules, Announcements and Directives Branch
Division of Administrative Services, Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Docket ID NRC-2010-0302-0002

Dear Ms. Bladey,

The Conference of Radiation Control Program Director's (CRCPD) has reviewed the NRC's Groundwater Task Force Final Report dated June 2010. The CRCPD appreciates the opportunity to provide feedback and comments on the subject document. Without question, the events of the past several years related to the unintentional release of tritium to groundwater at commercial nuclear facilities has raised public interest and concern. In addition, many state public health and environmental agencies have been actively involved in the investigation, root cause analysis and follow up actions at sites where uncontrolled releases of licensed material have occurred. In several of these instances, NRC and State government have disagreed about the best approach to address tritium in groundwater. Based on the experiences that state agencies have had with this process, it is clear that there is a gap in the oversight process that would prevent these releases and deficiencies in the process for investigating, reporting and mitigation of releases that do occur.

The following pages provide the comments and suggestions the CRCPD would like the NRC to consider before finalizing any policy changes or guidance document development. We have attempted to frame our responses in the context of the questions that were posed in the document. We would be happy to discuss our comments and suggestions further with NRC if requested. Should you have any questions or concerns regarding the comments provided please feel free to contact Mr. Patrick Mulligan at (609) 984-7701.

Sincerely,



Patrick Mulligan, Chair
CRCPD HS/ER-5 Committee

Theme 1: Reassess NRC's Regulatory Framework for Groundwater Protection

NRC regulation evaluates the impact of radiological releases, either intentional from normal operations or unintentional via unexpected releases using 10 CFR Part 20 values and a dose based assessment for the public. For groundwater contamination, it is unlikely that the concentrations of tritium necessary to exceed those limits would be reached. However, EPA drinking water standards have been set at 20,000 pCi/l for tritium. This value is well below the threshold value that would be necessary to reach the 10 CFR 20 limits for public dose. NRC should recognize that many states have adopted the EPA drinking water standards and apply them under state regulation to groundwater and surface water as well as drinking water. Other states have set target goals well below the EPA limits. In this respect, there is a conflict in regulatory limits set by some states and the NRC. The NRC states that they have statutory authority for drinking water under the Atomic Energy Act. However, some state environmental protection programs in adopting EPA standards might very well challenge that authority based on state law.

Certainly the most controversial issue will be groundwater affected in areas directly under plant property. The degree that state laws apply to those areas may vary from state to state depending on the language of the law and the rules and standards developed for enforcement. However, where the standards are exceeded in groundwater off of the NRC licensed facility property, it appears more likely that State or EPA regulations would be found to be applicable

It is apparent that this issue will not be resolved through this task force but it does raise interesting legal questions. It is clearly stated by NRC in this document that their standards for public protection are dose based and directly related to public health and safety. The NRC further states that regulation based on environmental protection is not within the NRC's statutory authority. State environmental programs are stewards of natural resources, including groundwater, and take appropriate actions to regulate those resources from an environmental protection perspective.

1. The apparent ambiguity in federal and state regulatory authority for groundwater and the protection of the environment needs to be discussed in detail and changes made where appropriate.
2. The NRC states that the current regulatory framework impacts their ability to respond to leaks as the public would like. If the NRC is unable to regulate groundwater effectively from an environmental protection perspective then the authority should be with those agencies that do have the authority, namely EPA or the state.

Theme 2 – Maintain Barriers as Designed to Confine Licensed Material

This is the area where the NRC can make real changes that can be most beneficial. There is no doubt that the best way to protect groundwater and other natural resources from unintentional contamination is prevention. At least part of the issue that undermines a robust

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prevention program is that underground piping that carries licensed material is not safety related. Therefore, issues related to underground piping inspection and maintenance never rise to anything greater than a green finding because it carries low safety significance from a risk perspective. The reactor oversight program as it relates to these non-safety related pipes does not adequately identify performance problems. Deficiencies in this area can lead to serious environmental impacts like the contamination of groundwater, potentially denying its use as a drinking water source, but will not result in increased NRC oversight because of the low public health impact. Further, the Public Radiation Safety Cornerstone is clearly not a good indicator of performance because there have been no findings in this area despite the growing number of unintentional releases of tritium to the environment. It is the unreasonably high threshold values established under the dose based evaluation on 10 CFR 20 limits that prevents these significant environmental events from being reported. The reporting limits severely impact the possibility of a thorough follow up investigation, root cause analysis and corrective action program to prevent future events. It is recognized that many licensees are voluntarily reporting impacts to State and local governments below the NRC reporting limits. However, voluntary reporting is not an acceptable substitute for a comprehensive regulatory program. For reporting, NRC should be aware that radiological material is considered a hazardous material in certain states such as New Jersey and reporting events to the State is mandatory regardless of concentration.

Licensees are obligated to maintain plant design throughout the course of operations to ensure that licensed materials are contained. As plants age, more effort needs to be done in the area of inspection, maintenance and repair of components that are involved with the containment of licensed material. Based on historical evidence from several sites, UT and guided wave are not sufficiently reliable to assure the integrity of the containment systems. Further, record keeping and plant modifications have not been properly documented leading to false assumptions about material and pipe coating. NRC needs to take a more pro-active role in the inspection of these systems to ensure the integrity is maintained and licensed material controlled in accordance with the design.

1. The NRC needs to improve the Reactor Oversight Process to make Performance Indicators more meaningful.
2. The NRC needs to evaluate the reporting requirements for loss of control of licensed material so that events are identified in a timely manner, investigated thoroughly and actions are taken to mitigate future occurrences.
3. The Groundwater Protection Initiative should be made a requirement. While prevention is the preferred method to ensure protection of the environment, detection is essential to identify unknown leaks before the contamination migrates offsite. An onsite monitoring well program designed by an experienced hydrologist, that places wells strategically near high risk areas for leaks are necessary for early detection and should be mandatory.
4. Each site should be required to perform a detailed hydrogeologic study in order to fully understand the flow of groundwater at the site. The studies should include vertical as

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well as horizontal flow so that consequences and impacts can be more readily evaluated in the event of an unintentional release and can be used to inform the placement of on-site monitoring wells.

Theme 3 – More Reliable NRC Response

Based on the historical evidence, the NRC response to the uncontrolled release of licensed materials at commercial nuclear reactors is inadequate. The NRC should develop a standard response to all events that involve the loss of control of licensed material. That should start with reporting. There is clearly no reliable method to detect a tritium leak other than a well placed monitoring well. That is not to say that a robust program of routine monitoring of site stormdrains, building sumps and perimeter drains should not be part of the program. However, until more monitoring wells are placed in the vicinity of a suspected leak, it is impossible to make a determination of the extent, magnitude and origin of the leak. Regardless of initial sampling results or screening tests, all leaks should be reported to the NRC and the state upon recognition. A prompt investigation should start immediately in order to bound the extent and magnitude of the release.

Based on state experiences, without a thorough investigation, it is nearly impossible to determine how long the release has been occurring or how much material has been released. Further, until the extent of the plume is fully characterized and the source of the leak determined, it is impossible to know the maximum concentration of the tritium in the environment or the extent of the resulting groundwater plume. Until that is determined, any calculations of offsite dose consequences can only be guesswork. The NRC performs what they term “bounding calculations” that represent worst case scenarios. However, that calculation is based on assumptions that have not been determined with any degree of certainty. Basing decisions regarding public health and safety on these calculations is part of what leads to public distrust. The NRC makes public statements in most cases based on the bounding calculations prior to the completion of an investigation.

The NRC should be transparent in sharing with the public facts about the investigation including verified data, sources of the leak, root cause analysis reports and corrective actions. The information should be shared timely, as it is verified and available. Transparency helps to build trust and trust leads to confidence. The NRC should include the EPA in their investigation to advise and provide expertise in matters of groundwater quality and drinking water standards. Further, the NRC should engage experts from the US Geological Survey to provide expertise in hydrogeology, fate and transport evaluation and groundwater flow. By engaging other federal agencies in the process, both the state and local government agencies, interested stakeholders and the public will be better informed through a more thorough NRC investigation.

The preceding paragraph is meant to advise the NRC regarding the expected level of investigation and use of experts in their own analysis of the root cause and environmental impact from an identified leak. NRC should recognize that each state will conduct an independent investigation, analysis and assessment of the environmental impacts to natural resources under

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the protection of the state. Any investigation should be coordinated with state involvement and licensee support. All data, information and findings must be openly shared between state and federal organizations.

The NRC should ensure that the site fully investigates the root cause of the issue and identifies weaknesses in similar plant structures and equipment. Lessons learned should be shared with the industry and measures should be taken to establish a best practices policy in to prevent similar occurrences at other sites. Corrective actions and mitigation measures should be implemented so that future releases are prevented and routine monitoring is increased for "at risk" equipment. Follow up site inspections should be performed by NRC to ensure that licensees are in compliance with corrective action commitments. The investigation, findings and outcomes should be published in a report that is publically available.

Theme 4 – Strengthen Trust

Dr. John Till summarized four essential points in his discussion of this theme at the public meeting held on October 4, 2010. We agree with the discussion Mr. Till made and would offer the NRC a summary of those points to consider moving forward.

1. Trust and Credibility have to be earned. There is no scientific title, no particular regulatory agency, no set amount of experience, no education that guarantees you will have credibility with the public. Not even the name "Nuclear Regulatory Commission" will guarantee trust. You have to earn it.
2. You have to earn trust and credibility based on science and fact. It has to be based on real monitoring results, modeling of fate and transport, exposure pathway analysis, with specifics based on actual stakeholder inputs. You have to explain things in a way that each stakeholder can see themselves in your data/ analysis.
3. You have to present things in a transparent manner, and timeliness is part of transparency. You can't hold results back. If any radioactivity goes beyond the plant boundary, it should be public information. And it should be as close to real time as you can get.
4. You must go beyond what is expected of you if you want to earn that credibility and trust. You can't just be "adequate". You must be "excellent" or at least better than "average". You have to demonstrate it in every interaction, every day.

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***Riverkeeper Perspective
on Groundwater
Protection at Operating
Reactor Sites***

February 24, 2011

***Phillip Musegaas
Hudson River Program
Director
Riverkeeper, Inc.***

Riverkeeper

- ***Riverkeeper is a nonprofit membership organization, founded in 1966, whose mission is to protect and restore the Hudson River and safeguard the New York City drinking water supply.***
- ***Involved with Indian Point and national nuclear regulatory issues since 1970.***

Response to SECY-11-0019

- ***Voluntary industry initiatives are insufficient to address increasing instances of groundwater contamination at reactor sites (Finding #1)***
- ***Riverkeeper supports revising the performance indicator for radiological effluent to focus on trending degrading performance (Finding #2)***

Response to SECY-11-0019

- ***Power reactor licensees should be required to provide specific financial assurance for remediation of subsurface contamination pursuant to 10 CFR 50.75 (f)(3). (Finding #3)***

Response to SECY-11-0019

- ***Non-safety related underground piping that carries radioactive fluids should be subject to corrosion protection standards and improved inspection requirements (Finding #4)***

Riverkeeper Recommendations

- ***Require onsite groundwater monitoring and reporting at all currently operating reactors***
- ***Require licensees to submit all records pursuant to 10 CFR 50.75(g) (specifically (g)(1), (2)(3)) to the NRC for public disclosure. (See SECY-11-0019, pg. 4)***

Recommendations (cont.)

- ***Require licensees with documented leakage incidents to affirmatively prove cessation of leaks and fully evaluate status/condition of all systems, structures and components that carry radioactive fluids to reduce likelihood of future leaks***

Thank you

- ***phillip@riverkeeper.org***
- ***www.riverkeeper.org***