From: Timothy Kobetz
To: Adrian Muniz ; Carl Lyon; David Jaffe; Deirdre Spaulding; Karl Feintuch; L. Mark Padovan; Mahesh Chawla; Peter Tam; Terry Beltz
Date: 2/14/06 11:30AM
Subject: 2.206 Petition on Leakage

Gentlefolk,

FYI. If you are interested, attached is a 2.206 petition prompted by the Braidwood tritium issue.

Tim

B-32

January 25, 2006

Luis A. Reyes, Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: PETITION PURSUANT TO 10 CFR 2.206 – ENFORCEMENT ACTION – LONGSTANDING LEAKAGE OF CONTAMINATED WATER

Dear Mr. Reyes:

Pursuant to the §2.206 of Title 10 of the Code of Federal Regulations and on behalf of the twenty-two organizations and six individuals listed on the enclosure, I petition the Nuclear Regulatory Commission to take enforcement action in the form of Demands For Information against the licensees specified in the enclosure. We are very concerned by the series of leaks of radioactively contaminated water into the ground around NRC-licensed facilities that remained undetected for long periods of time. We are even more concerned by the NRC's inaction regarding this trend. Our petition seeks to establish whether the list of facilities experiencing longstanding, undetected leaks of contaminated water is an abridged or unabridged list and to hopefully reduce the likelihood that any future additions to the list will be more serious than the known, past problems.

At your discretion, you may elect to correspond with all of the petitioners or to rely on me as the point of contact for the entire coalition.

Sincerely,

David A. Lochbaum

David Lochbaum
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ML060330228 pdf

Public Health Petition:
Longstanding Leakage of Contaminated Water

The 103 nuclear power reactors operating in the United States generate about 20 percent of the nation's electricity. They generate an even larger percentage of the nation's radioactive waste. Inherent byproducts of nuclear generated electricity are vast quantities of radioactively contaminated gases and liquids. Federal regulations seek to protect public health and safety from harm by limiting how much of these radioactive materials can be released from a nuclear facility to the air and water during both routine operation and under accident conditions.

A series of events – occurring at a quickening pace and with increasing magnitude – raise serious questions about whether nuclear facilities across the United States are in compliance with these federal regulations and, more importantly, whether members of the public are at jeopardy. The purpose of this petition is to promptly answer these vital questions.

Within the past 10 years, at least seven events have occurred at U.S. nuclear facilities where water contaminated with radioactivity leaked into the ground. These leaks were initially undetected and remained undetected for as long as 12 years. In at least one case, the leak was not detected until after an underground plume of several million gallons of contaminated water traveled beyond the nuclear facility's site into drinking wells. In most cases, the leak was finally detected more by happenstance than by rigorous monitoring. In all cases, a small leak undetected for an extended period of time permitted large amounts of contaminated water to enter the ground around the facilities. The events are summarized in Appendix A with citations to source documents for additional details.

There is little reason to believe that Appendix A provides an unabridged listing of nuclear facilities experiencing leakages of contaminated water. It seems entirely possible, if not highly likely, that one or more nuclear facilities have an ongoing leak that has yet to be detected as explained in Appendix B. The public health stakes are simply too high to leave this issue unsettled.

The petitioners are extremely disappointed that the Nuclear Regulatory Commission (NRC) has thus far treated these leaks as isolated events and ignored their generic implications. The NRC has not issued correspondence to other licensees requiring them to verify there are no similar leaks ongoing at their facilities. The NRC has not met with licensees to discuss the situation and develop genuine basis for believing the problem is confined to these few facilities. The NRC has not taken steps necessary to ensure that members of the public are not now being exposed to radiation from undetected leaks.

To remedy this inaction, the petitioners formally request under the provisions of §2.206 of Title 10 of the *Code of Federal Regulations* that the NRC take enforcement action against all applicable licensees* by issuing a Demand For Information requiring them to submit on the docket answers to the following questions:

1. What are the systems and components at your licensed facility that contain radioactively contaminated water?

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* 'Applicable licensees' are those licensees as listed in Appendix A, "U.S. Commercial Nuclear Power Reactors," Appendix B, "U.S. Commercial Nuclear Power Reactors Formerly Licensed to Operate," Appendix E, "U.S. Nuclear Research and Test Reactors Regulated by NRC," and Appendix F, "U.S. Nuclear Research and Test Reactors Under Decommissioning" in "NRC Information Digest: 2004-2005 Edition," NUREG-1350, Vol. 16, Rev. 1, published February 2005 by the Nuclear Regulatory Commission.

2. What methods are being used to monitor leakage of radioactively contaminated water from the systems and components identified in response to question 1?

3. What is the largest leak rate that can remain undetected by the monitoring methods identified in response to question 2?

4. What methods are being used to monitor the grounds around the facility for potential leakage of radioactively contaminated water from the systems and components identified in response to question 1?

5. What assurance is there against a leak of radioactively contaminated water into the ground around your licensed facility from remaining undetected long enough to permit migration offsite in quantities exceeding federal regulations?

Members of the public living around US nuclear facilities will only have reasonable assurance of protection against harm from undetected leakage of radioactively contaminated water when all applicable licensees have responded to this Demand For Information and the NRC has reviewed the submittals to verify their completeness and accuracy. The increasing frequency and magnitude of actual leakage events mandates that these questions be asked and answered.

The moral need for the questions to be asked and answered is accompanied by a legal basis; specifically, the following legal basis from Title 10 of the *Code of Federal Regulations* [emphasis added by underlining]:

§ 20.1301 Dose limits for individual members of the public.

(a) Each licensee shall conduct operations so that —

(1) The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 mSv) in a year, exclusive of the dose contributions from background radiation, from any administration the individual has received, from exposure to individuals administered radioactive material and released under § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewerage in accordance with § 20.2003

§ 20.1302 Compliance with dose limits for individual members of the public.

(a) The licensee shall make or cause to be made, as appropriate, surveys of radiation levels in unrestricted and controlled areas and radioactive materials in effluents released to unrestricted and controlled areas to demonstrate compliance with the dose limits for individual members of the public in § 20.1301.

(b) A licensee shall show compliance with the annual dose limit in § 20.1301 by--

(1) Demonstrating by measurement or calculation that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual dose limit; or

(2) Demonstrating that--

(i) The annual average concentrations of radioactive material released in gaseous and liquid effluents at the boundary of the unrestricted area do not exceed the values specified in table 2 of appendix B to part 20; and

(ii) If an individual were continuously present in an unrestricted area, the dose from external sources would not exceed 0.002 rem (0.02 mSv) in an hour and 0.05 rem (0.5 mSv) in a year.

§ 50 Appendix A

Criterion 60--Control of releases of radioactive materials to the environment. The nuclear power unit design shall include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation, including anticipated operational occurrences. Sufficient holdup capacity shall be provided for retention of gaseous and liquid effluents containing radioactive materials, particularly where unfavorable site environmental conditions can be expected to impose unusual operational limitations upon the release of such effluents to the environment.

Criterion 64--Monitoring radioactivity releases. Means shall be provided for monitoring the reactor containment atmosphere, spaces containing components for recirculation of loss-of-coolant accident fluids, effluent discharge paths, and the plant environs for radioactivity that may be released from normal operations, including anticipated operational occurrences, and from postulated accidents.

Federal regulations require that NRC's licensees demonstrate that effluents, including those from 'anticipated operational occurrences,' do not expose members of the public to excessive radiation doses. While leaks of radioactively contaminated water into the ground for extended periods of time may not have been operational occurrences anticipated when the facilities were initially designed and licensed, they can scarcely be "unanticipated" following the series of occurrences summarized in Appendix A. And the licensees are not 'grandfathered' now because such events were not anticipated then. §50.100 in Title 10 of the *Code of Federal Regulations* specifies:

A license or construction permit may be revoked, suspended, or modified, in whole or in part, for any material false statement in the application for license or in the supplemental or other statement of fact required of the applicant; or because of **conditions revealed by the application for license or statement of fact or any report, record, inspection, or other means, which would warrant the Commission to refuse to grant a license on an original application** (other than those relating to §§ 50.51, 50.42(a), and 50.43(b) of this part); or for failure to construct or operate a facility in accordance with the terms of the construction permit or license, provided that failure to make timely completion of the proposed construction or alteration of a facility under a construction permit shall be governed by the provisions of § 50.55(b); or for violation of, or failure to observe, any of the terms and provisions of the act, regulations, license, permit, or order of the Commission.

The NRC would not grant a license to a nuclear facility that had the potential for unmonitored and uncontrolled leakage of several million gallons of radioactively contaminated water to the environment. This petition is needed to verify that no existing U.S. nuclear facility is now violating or will violate federal regulations such as those in §20.1301 and §20.1302 in Title 10 of the *Code of Federal Regulations.*

The Demands For Information sought by this petition are necessary to verify compliance with §20.1301 and §20.1302. An undetected leak of radioactively contaminated water has the potential for migration of radioactive materials off of the nuclear facility site and exposures to members of the public exceeding federal limits. This petition is needed to examine that potential and ensure it does not represent a public health threat.

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Appendix A:
Contaminated Water Leakage Event Summaries

This appendix summarizes seven events within the past decade involving leakage of contaminated water into the ground around a U.S. nuclear facility. The frequency of leakage events is increasing – three (3) of the events were reported last year. In addition, the magnitude of the events is also increasing. It appears that the amount of contaminated water leaked into the ground during the most recently reported event exceeds the total amount of leakage from all six prior events. In addition, this most recent event involved migration of the contaminated water to offsite areas.

Braidwood – Contaminated water leakage from underground piping

On December 6, 2005, the NRC was informed that workers had detected low levels of tritium in a drinking water well at a home near the Braidwood nuclear plant in Illinois. Preliminary sampling results indicated a tritium level of 1,150 picocuries per liter, below the EPA drinking water standard of 20,000 picocuries per liter. The sampling of offsite wells occurred after results from monitoring wells on the Braidwood site indicated tritium levels up to 58,000 picocuries per liter. The highest level from an offsite monitoring well has been 34,000 picocuries per liter. The *"initial evaluation indicated that the tritium in the groundwater was a result of past leakage from a pipe which carries normally non-radioactive circulating water discharge to the Kankakee River, about five miles from the site. Several millions* [sic] *gallons of water leaked from the discharge pipe in 1998 and 2000. The pipe is also used for planned liquid radioactive effluent releases with the effluent mixing with the circulating water being discharged."*[1]

Haddam Neck – Contaminated water leaking from spent fuel pool

On October 31, 2005, the NRC was informed that workers detected evidence that the spent fuel pool at the Haddam Neck nuclear plant in Connecticut was leaking into the ground. The rate of leakage was unknown but estimated to be on the order of a few gallons per day. Monitoring wells down gradient from the leakage site did not indicate the groundwater plume had traveled past the plant site.[2]

Indian Point – Contaminated water leakage from the Unit 2 spent fuel pool

On September 1, 2005, the NRC was informed that workers excavating ground around the Unit 2 Fuel Handling Building at the Indian Point nuclear power plant in New York found water seeping from cracks in the concrete wall of the building. Chemical analysis of the water determined its source to be the Unit 2 spent fuel pool. On October 5, 2005, tritium was detected in a monitoring well on the plant site.[3]

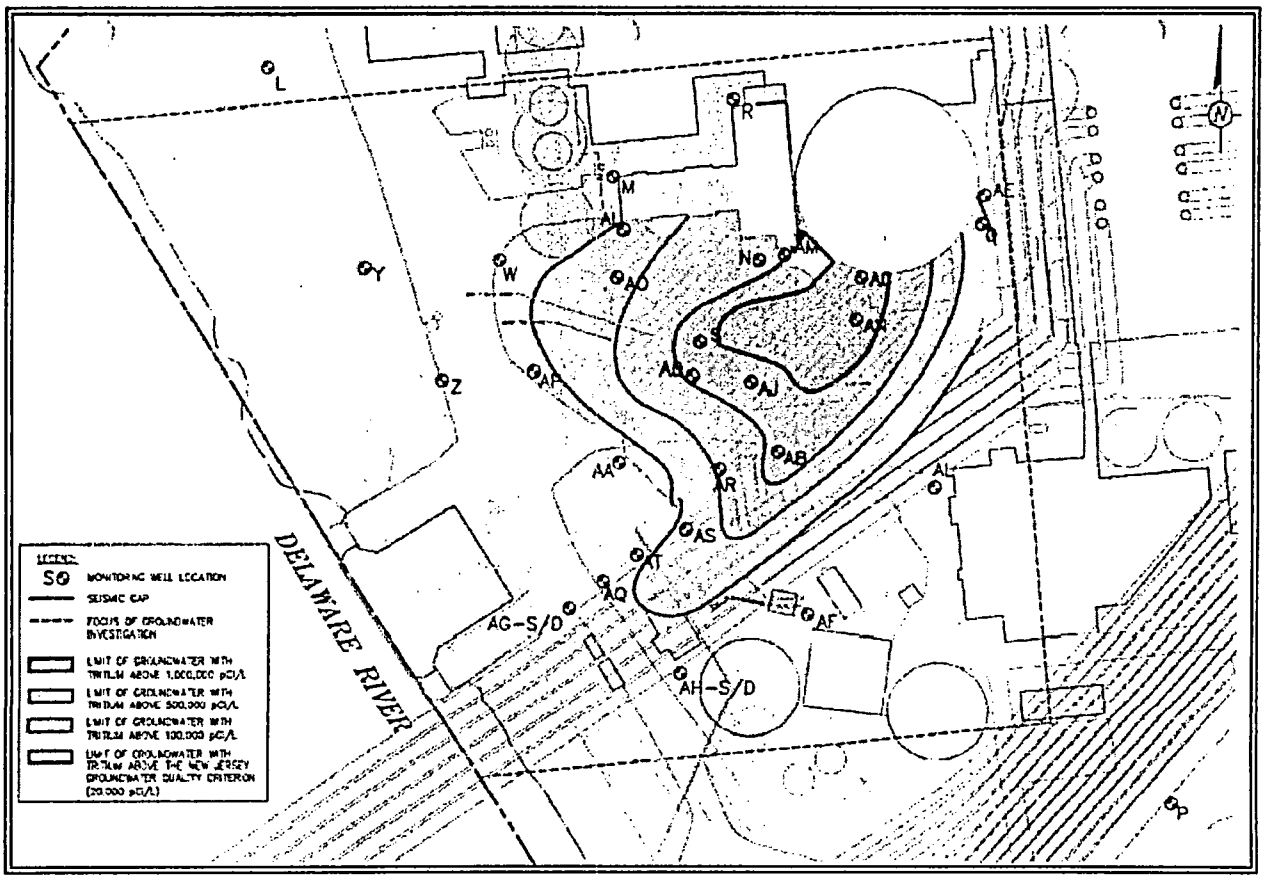
Dresden – Contaminated water leakage from underground piping

On August 30, 2004, the owner of the Dresden nuclear power plant in Illinois determined that tritium levels in monitoring wells indicated that contaminated water might be leaking into the plant's grounds. Further investigation identified the source of the leak as being an underground section of piping that carried *"water with a higher-than-normal level of tritium."* According to utility responses the leakage of 267,000 gallons contaminated the ground with tritium originally described as localized *"roughly in a 30-foot area around the leak"* included multiple storm drains, some of which communicated offsite through the station's discharge canal to the river. According to an Illinois EPA document onsite radiation readings reported tritium levels up to 10,312,000 picocuries per liter. The owner replaced that section of piping by December 2004.[4]

Salem – Contaminated water leakage from the Unit 1 spent fuel pool

On September 18, 2002, workers inside the Auxiliary Building of the Unit 1 reactor at the Salem nuclear power plant in New Jersey had radioactivity detected on their shoes. Investigation into the source of radioactivity picked up on their shoes found water on the flow of a room inside the Auxiliary Building. Chemical analysis of this water pinpointed the spent fuel pool as its likely source. The Unit 1 spent fuel pool has a reinforced concrete floor and walls that are lined with stainless steel. Leakage of groundwater

in through the concrete and leakage of spent fuel pool water out through the liner was routed through drainage piping to a system that collected and processed contaminated liquids. On January 31, 2003, workers conducted a fiber optic examination of the drainage piping and discovered that it was blocked with precipitates, allowing water to accumulate in the space between the concrete and the liner. When the blockage was removed, the measured flow through the drainage piping was 100 gallons per day. During the period that the drainage piping was blocked, spent fuel pool water leaked through the concrete into the grounds surrounding the plant. Workers confirmed this fact with eight monitoring wells installed adjacent to the Unit 1 Fuel Handling Building in January and February 2003. The groundwater contained tritium concentrations "above the New Jersey Groundwater Quality Criterion of 20,000 pCi/L [picocuries per liter]."[5] A consultant retained to investigate the matter concluded: "*The testing results indicate that build-up of SFP* [spent fuel pool] *water behind the liner has been ongoing for at least five years.*"[6] The plant owner undertook an extensive groundwater remediation effort to reduce tritium concentrations below the New Jersey criterion.



BWX Technolgoies, Inc – Contaminated water leakage from cask handling area pool

On September 19, 2000, workers at the BWX Technologies facility in Lynchburg, Virginia determined that the cask handling area pool was leaking approximately 250 gallons per day into the ground. The pool was approximately 528 yards from the James River. The pool contained irradiated reactor hardware and several spent fuel rods. The radionuclide concentrations of the water in this pool were significantly above the concentrations allowed by 10 CFR Part 20 for releases to unrestricted areas. Boroscopic examination identified cracks across the transfer cavity region of the pool. The estimated radiation dose to a member of the public drinking water from the James River was calculated to be less than one millirem per year.[7]

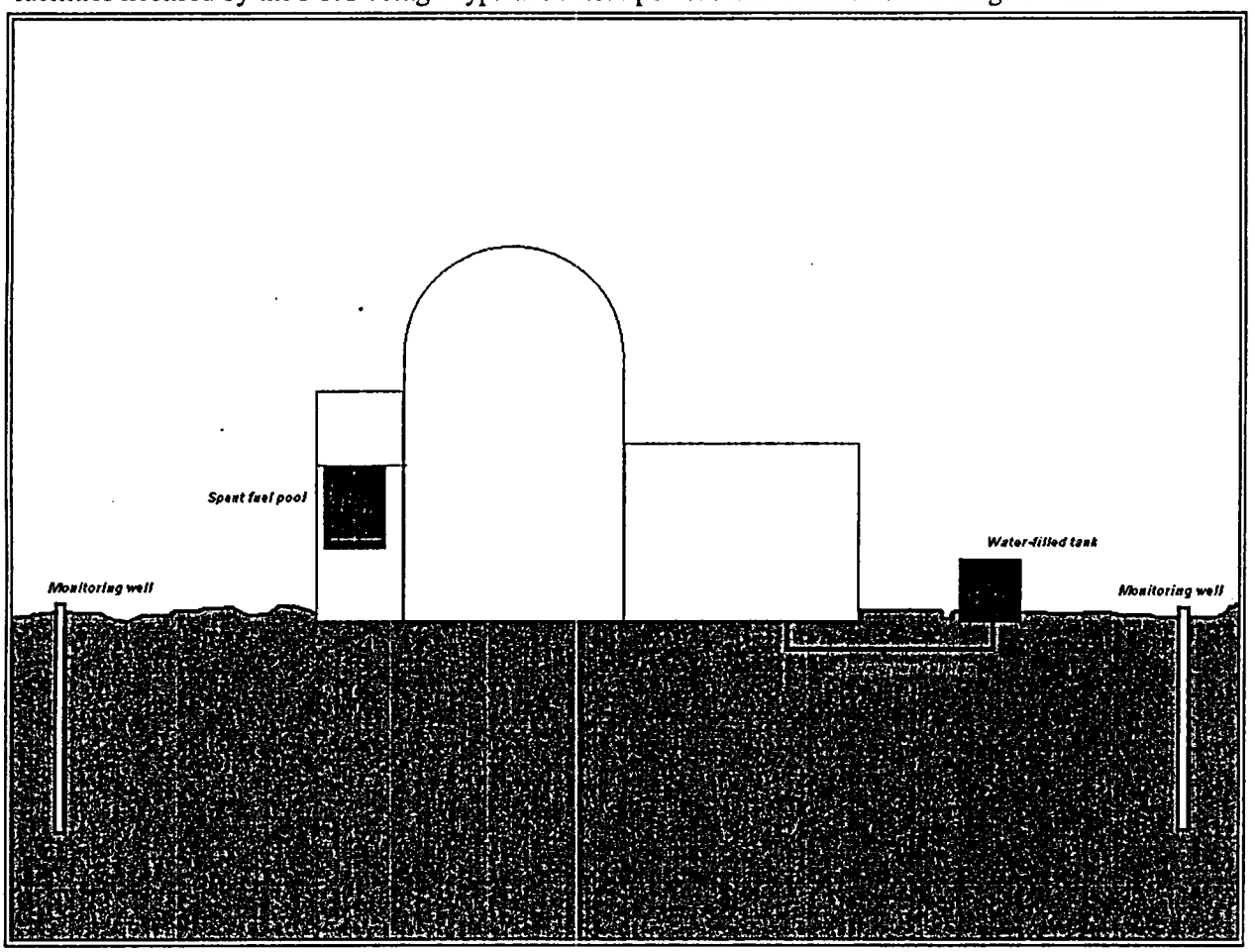
Brookhaven National Laboratory – Contaminated leakage from spent fuel pool[#]

In January 1997, workers detected tritium levels in groundwater samples at twice the EPA drinking water standard. Subsequent investigations found samples reading 32 times higher than the EPA standard and that "*The tritium was found to be leaking from the laboratory's High Flux Beam Reactor's spent-fuel pool into the aquifer that provides drinking water for nearby Suffolk County residents.*" DOE's investigation concluded that the leak, estimated to be 6 to 9 gallons per day, had been occurring for as long as 12 years. On May 16, 1997, the DOE informed the contractor responsible for operating the Brookhaven National Laboratory that its contract was being terminated due to performance problems associated with the longstanding tritium leak.[8]

[#] Unlike all of the other cases, this case does not involve an NRC licensee. The Brookhaven National Laboratory was regulated by the U.S. Department of Energy. This event is included nonetheless because what happened at Brookhaven can happen, and has happened, at NRC-licensed sites and can have similar consequences.

Appendix B:
Contaminated Water Leakage Scenarios

This appendix describes concerns about leakage of radioactively contaminated water from nuclear facilities licensed by the NRC using a typical nuclear power reactor and actual leakage events.



The graphic shows a cross-section of a nuclear power reactor. Components containing radioactively contaminated water are shown in blue. The Haddam Neck, Indian Point, and Salem events involved water leaking from the spent fuel pool into the ground. In the Braidwood and Dresden events, water leaked from buried piping into the ground. Some, if not all, nuclear facility sites have installed monitoring wells that are sampled periodically.

Spent fuel pools are large swimming pool-like components containing tens of thousands of gallons of radioactively contaminated water. A large leak of water from a spent fuel pool can be detected by the level dropping in the pool or by the increased makeup of water to the pool. A smaller leak of water from a spent fuel pool can easily be masked by routine losses from evaporation and leakage past valves to other systems.

Underground piping and external water-filled tanks also contain tens, if not hundreds, of thousands of gallons of radioactively contaminated water. Like with spent fuel pools, a large leak can be detected by the level dropping in a tank or via increased makeup to a tank. But a smaller leak can easily be masked within the accuracy of the level instruments for tanks and the difficulty accounting for routine flows into and out of the tanks each day.

As demonstrated by the events summarized in Appendix A, a small leak from a spent fuel pool, underground pipe, or water-filled tank that deposits contaminated water into the ground around a facility can remain undetected for long periods of time. Even if present, monitoring wells will not flag the problem until the plume intersects the well's location. Given that nuclear facilities were designed with big spills from accidental tank overflows and valve mal-operations in mind rather than small leaks, the monitoring wells may not be optimally located to detect plumes. In several of the events summarized in Appendix A, existing monitoring wells did not 'see' the underground plume of contaminated water and additional monitoring wells had to be drilled to map the extent of the problem.

The frequency of sampling monitoring wells is also a significant factor. For example, consider that the monitoring wells are sampled quarterly. A leak is producing an underground plume of soil contaminated with radioactive water. That plume moves toward a monitoring well that gets sampled the day before the plume reaches the well. The well is not re-sampled for another 90 days. How far past the monitoring well location will this plume reach during those three months?

A small leak of contaminated water remaining undetected over an extended period can conceivably result in a larger release of radioactive liquid into the ground than results from the postulated catastrophic failure of the largest water-retaining component at the facility, which is often analyzed as being the worst-case scenario. Considering that the Braidwood event summarized in Appendix A reportedly involved the undetected leakage of several million gallons of water while the capacity of the largest tank at many sites is approximately 150,000 gallons, such 'worst-case' analysis seem invalidated.

Cited Sources

[1] Preliminary Notification of Event or Unusual Occurrence PNO-RIII-05-016A dated December 7, 2005, by the Nuclear Regulatory Commission, "Potential Off-site Migration of Tritium Contamination (Update)."
[2] Daily Event Report 42099 dated November 1, 2005, by the Nuclear Regulatory Commission.
[3] News Release I-05-049 dated September 20, 2005, Nuclear Regulatory Commission, "NRC Performing Special Inspection at Indian Point 2 Nuclear Plant; Small Amount of Leakage from Spent Fuel Pool Area Under Review," and letter dated October 26, 2005, from Nils J. Diaz, Chairman, Nuclear Regulatory Commission, to Sue Kelly, United States House of Representatives.
[4] Letters dated October 4, 2005, and November 3, 2005, from Craig Nesbit, Director – Nuclear Communications, Exelon Corporation, to Paul Gunter, Director – Reactor Watchdog Project, Nuclear Information and Resource Service.
[5] Letter dated June 30, 2004, from Jeffrey J. Pantazes, Manager – Permitting & Technical Services, PSEG Services Corporation, to Dr. Jill Lipoti, Assistant Director – Radiation Protection and Release Prevention Element, New Jersey Department of Environmental Protection, Division of Environmental Safety and Health, "Remedial Action Workplan, Salem Unit 1, PSEG Nuclear LLC, Salem Generating Station Lower Alloway Creek Township, Salem County, New Jersey."
[6] Final Summary Report dated February 23, 2004, PSEG Nuclear LLC Radiation Protection/Chemistry Support, "Investigations of Salem Unit 1 Fuel Pool Leakage."
[7] Morning Report 2-00-0023 dated October 2, 2000, by the Nuclear Regulatory Commission, "Water Leak in Cask Handling Area Pool at the Lynchburg Technology Center."
[8] Report GAO/RCED-98-26 dated November 1997 by the U.S. General Accounting Office, "Department of Energy: Information on the Tritium Leak and Contractor Dismissal at the Brookhaven National Laboratory."