

UNITED STATES OF AMERICA
 NUCLEAR REGULATORY COMMISSION
 OFFICE OF NUCLEAR REACTOR REGULATION

Eric J. Leeds, Director

In the Matter of)	Docket No. 50-271
)	
ENERGY NUCLEAR VERMONT YANKEE, LLC)	License No. DPR-28
and)	
ENERGY NUCLEAR OPERATIONS, INC.)	
)	
Vermont Yankee Nuclear Power Station)	

DIRECTOR'S DECISION UNDER 10 CFR 2.206

I. INTRODUCTION

By letter dated April 19, 2010, Congressman Paul W. Hodes, U.S. House of Representatives, filed a Petition pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 2.206, "Requests for action under this subpart," with the Nuclear Regulatory Commission (NRC or the Commission). The Petition requested that the NRC not allow the Vermont Yankee Nuclear Power Station (Vermont Yankee), operated by Entergy Nuclear Operations, Inc. (Entergy or the licensee), to restart in May 2010 after its scheduled refueling outage until the completion of all environmental remediation work and relevant reports on leaking tritium at the plant. Specifically, the Petition asked the NRC to prevent Vermont Yankee from resuming power production until the following efforts have been completed to the Commission's satisfaction: (1) the tritiated groundwater remediation process; (2) the soil remediation process scheduled to take place during the refueling outage, to remove soil containing tritium and radioactive isotopes of cesium, manganese, zinc, and cobalt; (3) Entergy's root cause analysis; and (4) the Commission's review of the documents presented by

Entergy as a result of the Commission's Demand for Information (DFI) imposed on the licensee on March 1, 2010.

This Petition was assigned to the NRC's Office of Nuclear Reactor Regulation (NRR) for review. NRR's Petition Review Board (PRB) met on May 3, 2010, and made an initial recommendation to accept this Petition for review. The NRC communicated this decision to the Petitioner's staff, who told the PRB that the Petitioner did not desire to address the PRB. The PRB's final recommendation was to accept the Petition for review. By letter dated May 20, 2010, Agencywide Documents Access and Management System (ADAMS) Accession No. ML101310049, the NRC informed the Petitioner of the PRB's recommendation and also stated that the NRC did not find cause to prohibit the restart of Vermont Yankee.

By letters dated May 14 and June 16, 2010, the Petitioner provided the NRC with supplements to his Petition. After full consideration of the Petition and supplements, NRR has concluded that the actions requested in the Petition have been taken, with the exception of preventing the restart of Vermont Yankee. Therefore, NRR concludes that the Petition has been granted in part and denied in part, as explained below.

Copies of the Petition are available for inspection at the Commission's Public Document Room (PDR) at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, Maryland, and from the NRC's ADAMS Public Electronic Reading Room on the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> under ADAMS Accession No. ML101120663. The supplemental letters are under ADAMS Accession Nos. ML101370031 and ML101720485. NRC Management Directive 8.11, "Review Process for 10 CFR 2.206 Petitions," ADAMS Accession No. ML041770328, describes the petition review process. Persons who do not have access to ADAMS or who have problems accessing the documents in ADAMS should contact the NRC PDR reference staff by telephone at 1-800-397-4209 or 301-415-4737, or by e-mail to pdr@nrc.gov.

The NRC sent a copy of the proposed Director's Decision to the Petitioner for comment on November 18, 2010, and to the licensee for comment on November 29, 2010. The Petitioner did not provide any comments. By e-mail dated December 21, 2010, ADAMS Accession No. ML110050341, the licensee provided minor comments. The licensee's comments and the NRC staff responses are discussed in the Attachment to this Director's Decision.

II. DISCUSSION

On January 7, 2010, Entergy reported to the NRC that water samples taken from groundwater monitoring well GZ-3 on site at Vermont Yankee showed tritium levels above background. GZ-3 is about 70 feet from the Connecticut River. Tritium is another name for the radioactive nuclide hydrogen-3. Tritium occurs naturally in the environment because of cosmic ray interactions. It is also produced by nuclear reactor operations, and can be legally discharged as a radioactive effluent under NRC regulations. Tritium is chemically identical to normal hydrogen (hydrogen-1), and, like normal hydrogen, tends to combine with oxygen to form water, which is referred to as tritiated water. The detection of tritiated water in the monitoring well indicated abnormal leakage from the nuclear plant. The Environmental Protection Agency's (EPA's) regulatory standard for tritium in drinking water is 20,000 picocuries per liter (pCi/L). Tritium was initially measured at levels up to about 17,000 pCi/L in monitoring well GZ-3. Water from monitoring well GZ-3 is not used for drinking water. Samples at other monitoring wells have also shown some tritium. The highest reading from any monitoring well has been about 2.5 million pCi/L, from monitoring well GZ-10. Entergy immediately started an investigation to identify the source of the tritium, and later installed additional monitoring wells to help locate the source.

Upon notification, the NRC staff initiated actions to review and assess the condition, including review of all available sampling data, hydrologic information and analyses, on-site inspection and assessment of Entergy's plans and process for investigating the condition, and

independent determination of public health and safety consequences based on available information. NRC inspectors provided close regulatory oversight of Entergy's investigation in order to independently assure conformance with applicable NRC regulatory requirements, assess licensee performance, and evaluate the condition with respect to NRC's radiological release limits.

On February 27, 2010, following excavation and leak testing of the Advanced Off-Gas (AOG) system pipe tunnel, Entergy reported that it had identified leakage into the surrounding soil, and therefore to the groundwater, from an unsealed joint in the concrete tunnel wall. The AOG pipe tunnel is located about 15 feet underground. Also, piping inside the tunnel had previously been found to be leaking, and the drain inside the tunnel had been found to be clogged. Soil samples in the vicinity showed traces of radioactive isotopes. Entergy reported that the leakage to the environment had been stopped by isolating the piping and containing the water leaking from the AOG pipe tunnel. However, on May 28, 2010, Entergy reported a second leak from AOG piping into the soil. Entergy quickly isolated this leak and has sealed off that piping to prevent further leaks in that area. On June 8, 2010, Entergy reported a leak in the reactor building, which was not associated with the AOG system. The leak reported on June 8th was from a relief valve on a heat exchanger that started leaking to the building drain system. This leakage was collected and processed through the radioactive waste treatment system, and had no effect on the environment. The relief valve was replaced.

As part of its oversight effort, NRC staff conducted an evaluation in accordance with NRC Manual Chapter 0309, "Reactive Inspection Decision Basis for Reactors," to determine if the occurrence with the AOG piping constituted a significant operational event (i.e., a radiological, safeguards, or other safety-related operational condition) that posed an actual or potential hazard to public health and safety, property, or the environment. The evaluation reviewed the condition against the specified deterministic criteria, which are based on regulatory

safety limits, and determined that none of the criteria were met. Notwithstanding that determination, NRC staff continued on-going review, oversight, and assessment of the condition, including independent evaluation of any potential public health and safety consequence. These activities included:

1. Several on-site inspections and reviews to assess radiological and hydrological data to establish reasonable assurance that members of the public were not, nor expected to be, exposed to radiation in excess of the dose limits for individual members of the public specified in 10 CFR 20.1301, 100 millirem in a year; and determine if the licensee's performance was in conformance with applicable regulatory requirements.
2. Engagement of hydrological scientists from NRC's Office of Nuclear Reactor Regulation, Office of Regulatory Research, and the U.S. Geological Survey to independently assess the licensee's hydrological and geological data and conclusions on groundwater flow characteristics of the area.
3. Inspection in accordance with NRC Temporary Instruction TI-2515/173, "Review of the Implementation of the Industry Ground Water Protection Voluntary Initiative," to determine the licensee's implementation of the specifications in the industry's groundwater initiative document Nuclear Energy Institute (NEI)-07-07, "Industry Groundwater Protection Initiative – Final Guidance Document," ADAMS Accession No. ML072610036.
4. Independent confirmation of the basis, calculation methodology, and results obtained by the licensee to estimate a contaminated groundwater effluent release and off-site dose consequence to members of the public.
5. Independent analysis of selected groundwater and environmental samples to aid in determining the adequacy of the licensee's analytical methods.

6. Establishment of an approved deviation from NRC's normal Reactor Oversight Process in order to expend additional NRC inspection resources to fully evaluate and provide continuing regulatory oversight of the licensee's investigation and remediation activities.
7. Documentation of inspection scope and conclusions in publicly available NRC Inspection Reports.

As a result of these activities, the NRC established reasonable assurance, in a timely manner, that this groundwater condition would not result in any dose consequence that would jeopardize public health and safety. To date, information and data continue to support the finding that the dose consequence attributable to the groundwater condition at Vermont Yankee remains well below the "as low as reasonably achievable" (ALARA) dose objectives specified in 10 CFR Part 50, Appendix I; and that the NRC regulatory criteria of 10 CFR 20.1301, "Dose limits for individual members of the public," were never approached.

In addition, the State of Vermont has provided support from the Vermont Department of Health, Office of Public Health Preparedness. The State of Vermont's Radiological Health Chief participated in the oversight of the tritium investigation, with direct onsite participation in inspections and data analysis. In addition, the State of Vermont has performed independent split sampling analyses of the groundwater monitoring samples.

A. The Tritiated Groundwater Remediation Process

On March 24, 2010, Entergy began removing tritiated water from extraction well GZ-EW1. On April 7, 2010, Entergy placed into service a second extraction well, GZ-EW1A, with a higher flow capacity. As the highest plume concentration progressed toward the Connecticut River, the extraction wells were sited accordingly, with GZ-15 being used for groundwater extraction at various times starting on July 28, 2010, followed by installation of extraction well EW-2, which began operation along with GZ-14 on September 13, 2010. As of December 21, 2010, Entergy had pumped approximately 307,000 gallons of groundwater out of these wells to reduce the

amount of tritiated water in the groundwater. About 298,000 gallons of the extracted water has been shipped offsite for disposal at a licensed waste disposal facility, and the remainder was processed in the station's radioactive waste system. Entergy recently announced it intends to make additional groundwater withdrawals going forward. A plume of tritiated groundwater extends from the source of the leak to the Connecticut River, which is the direction of flow for the groundwater in this location. Although no detectable tritium has been found in the Connecticut River, the hydrology model indicates that there has been some flow into the river, and some flow will continue as rainwater recharges the groundwater. The NRC's inspections indicate that no federal regulatory limits have been or are expected to be exceeded, and there are no health or safety concerns for members of the public or plant workers.

B. The Soil Remediation Process

The soil in the vicinity of the leak was contaminated with small amounts of other radioactive nuclides associated with nuclear plant operations, including manganese-54, cobalt-60, zinc-65, strontium-90, and cesium-137. Sampling indicated very little migration in the immediate area, which is typical for these radionuclides. Entergy has removed about 150 cubic feet of contaminated soil, and packaged it for disposal at a licensed disposal facility. Although some minor amounts of soil contaminated with these other radionuclides may remain, NRC inspections indicate that this soil poses no threat to public health and safety. Areas of minor contamination are evaluated and remediated as needed during plant decommissioning in accordance with 10 CFR 50.82. The NRC's experience with decommissioning nuclear plants such as Maine Yankee, Haddam Neck, and Yankee Rowe indicates that these areas can be successfully remediated at that time. The NRC's inspections indicate that no federal regulatory limits have been exceeded, and there are no health or safety concerns for members of the public or plant workers. The initial NRC inspection covered the period of January 25 through April 14, 2010. Inspection results were initially discussed in an NRC letter with preliminary

results, dated April 16, 2010, ADAMS Accession No. ML101060419. The NRC issued its completed report on May 20, 2010, ADAMS Accession No. ML101400040, and continues to inspect the licensee's actions in these areas.

C. Entergy's Root Cause Analysis

As part of its corrective action program, Entergy performed a root cause analysis (RCA) of the leakage event. The NRC assessed the comprehensiveness of this analysis and documented this review in NRC Inspection Report 05000271/2010009 dated October 13, 2010, ADAMS Accession No. ML102860037. The NRC concluded that Entergy's root and apparent cause evaluations for the tritium groundwater leakage events were appropriate, although the agency noted some performance deficiencies. No violation of NRC requirements was identified.

D. The NRC's Demand For Information

On February 24, 2010, Entergy informed the NRC that it had removed some employees at Vermont Yankee from their site positions and placed them on administrative leave. Entergy took these actions as a result of its independent internal investigation into alleged contradictory or misleading information provided to the State of Vermont that was not corrected. In light of Entergy's investigation and resulting actions, the NRC issued a DFI dated March 1, 2010, ADAMS Accession No. ML100570237, requiring Entergy to confirm whether communications over the past 5 years to the NRC by these individuals, that were material to NRC-regulated activities, were complete and accurate. Entergy responded to the NRC on March 31, 2010, ADAMS Accession No. ML100910420. The NRC's review of Entergy's DFI response and Entergy's communications did not identify any cases of incomplete or inaccurate statements to the NRC. The NRC closed the review of the DFI response in a letter to Entergy dated June 17, 2010, ADAMS Accession No. ML101670271. Based on this review, the NRC concludes that Entergy's communications with the NRC have been accurate and have met

regulatory requirements. The NRC also concluded that the site employees continue to demonstrate an appropriate safety culture.

E. NRC Actions Pertaining to Groundwater Contamination

In March of 2010, NRC's Executive Director of Operations (EDO) established a Groundwater Task Force (GTF) to review the NRC's approach to overseeing buried pipes given the recent incidents of leaking buried pipes at commercial nuclear power plants. The charter of the Task Force was to reevaluate the recommendations made in the Liquid Radioactive Release Lessons Learned Task Force Final Report dated September 1, 2006, ADAMS Accession No. ML062650312; review the actions taken in the Commission paper SECY-09-0174 (Staff Progress in Evaluation of Buried Piping at Nuclear Reactor Facilities, dated December 2, 2009, ADAMS Accession No. ML093160004); and review the actions taken in response to recent releases of tritium into groundwater by nuclear facilities.

The GTF completed its work in June 2010 and provided its report to the EDO. The report characterized a variety of issues ranging from policy issues to communications improvement opportunities. The complete report may be found under ADAMS Accession No. ML101680435. 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. Within the current regulatory structure, the NRC is correctly applying requirements and properly characterizing the relevant issues. However, the GTF reported that there are further observations, conclusions, and recommendations that the NRC should consider in its oversight of licensed material outside of its design confinement.

The EDO appointed a group of NRC senior executives to review the report and consider its findings. Over the past several months, the group has been reviewing the GTF final report, including the conclusions, recommendations, and their bases. They identified conclusions and recommendations that do not involve policy issues, and tasked the NRC staff to address them.

They have also identified policy issues, are developing options to address them, and will send a policy paper to the Commission discussing those options.

The NRC held a public workshop on October 4, 2010, with external stakeholders to discuss the findings of the GTF report and to receive input on the potential policy issues. In addition, a request for public comment was published in the *Federal Register* (75 FR 57987, September 23, 2010). These efforts help to ensure the NRC is considering the right issues on which to focus its attention as it moves forward. The transcript from this meeting is available on the NRC's Web site at:

<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/buried-pipes-tritium.html>

III. CONCLUSION

Based on the information summarized above, the NRC staff concludes that the activities requested by the Petitioner have been completed, with the exception of preventing the restart of Vermont Yankee. Therefore, NRR concludes that the Petition has been granted in part and denied in part. Related documentation includes an NRC letter to Entergy on increased oversight dated April 8, 2010, ADAMS Accession No. ML100990458.

As provided in 10 CFR 2.206(c), a copy of this Director's Decision will be filed with the Secretary of the Commission for the Commission to review. As provided for by this regulation, the Decision will constitute the final action of the Commission 25 days after the date of the Decision unless the Commission, on its own motion, institutes a review of the Decision within that time.

Dated at Rockville, Maryland, this 27 day of January 2011.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

ATTACHMENT TO THE FINAL DIRECTOR'S DECISION
DISCUSSION OF COMMENTS ON THE PROPOSED DIRECTOR'S DECISION
FROM THE LICENSEE, AND THE NRC STAFF RESPONSES

By e-mail dated December 21, 2010, ADAMS Accession No. ML110050341, the licensee provided comments on the proposed Director's Decision on the Petition filed by Congressman Paul Hodes pursuant to 10 CFR 2.206, "Requests for action under this subpart." The licensee's comments and corresponding response from the NRC staff are provided below:

Comment 1:

Section II, "Discussion:

- a) GZ-3 is actually located approximately 70 ft from the Connecticut River. Actual distance depends on river stage.
- b) The highest reading from any monitoring well has been 2.52 million pci/L (measured on 2/8/2010) from monitoring well GZ-10.
- c) On June 8th, Entergy reported a leak in the reactor building (June 8th was the date that RHR relief valve leakage was discovered. This required a 4-hour notification to the NRC).

The NRC Staff Response:

Revised the Director's Decision to reflect the comments.

Comment 2:

A. The Tritiated Groundwater Remediation Process:

- a) Monitoring well GZ-15 was utilized for groundwater extraction from July 28, 2010, until September 2, 2010, and again from October 28, 2010, until November 8, 2010.
- b) As of December 21, 2010, Entergy has pumped 307,000 gallons of groundwater.
- c) About 298,000 gallons of water was shipped offsite for disposal and 9,000 gallons was returned to the station's liquid radioactive waste system for in-plant use.
- d) Evaluation of continued extraction is on-going.
- e) On March 23, 2010, Entergy installed an extraction well (GZ-EW1). (The well was installed on 3/23 and placed in service on 3/24).

The NRC Staff Response:

Revised the Director's Decision to reflect the comments.