

UNITED STATES NUCLEAR REGULATORY COMMISSION REGION I 475 ALLENDALE ROAD KING OF PRUSSIA, PA 19406-1415

October 13, 2010

Mr. Michael Colomb Site Vice President Entergy Nuclear Operations, Inc. Vermont Yankee Nuclear Power Station 185 Old Ferry Road P.O. Box 500 Brattleboro, VT 05302-0500

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION – NRC INSPECTION REPORT 05000271/2010009 (ROOT CAUSE EVALUATION REPORT OF BURIED PIPING LEAK)

Dear Mr. Colomb:

On August 30, 2010, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at the Vermont Yankee Nuclear Power Station. The enclosed report documents the inspection results which were discussed on August 30, 2010, with you and other members of your staff. This inspection was conducted during a period from May 25 to August 30, 2010, to assess Entergy's performance relative to the discovery of onsite ground water contamination due to buried pipe leaks. This condition was reported to the NRC on January 7, 2010 (first leak). The inspection focused on Entergy's root cause evaluation for this leak and the apparent cause evaluation for another leak discovered on May 28, 2010 (second leak) associated with the Advanced Off-Gas (AOG) system. This inspection used the guidance of NRC Inspection Procedure (IP) 71152, "Problem Identification and Resolution," and IP 71153, "Follow-Up of Events and Notices of Enforcement Discretion."

The inspection consisted of an examination of activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspection involved field walkdowns, examination of selected procedures and records, and interviews with station personnel. Specifically, the inspectors reviewed the circumstances associated with leakage from buried piping which resulted in tritium contamination of onsite ground water at Vermont Yankee and Entergy's causal evaluations associated with the leakage.

Based on the results of this inspection, the NRC concluded that Entergy's root and apparent cause evaluations for the tritium ground water leakage events were appropriate. The Entergy root cause evaluation team was self-critical in identifying material, programmatic, and organizational factors that directly caused or contributed to the groundwater contamination. Based on your staff's root cause evaluation for the first leak, Entergy identified performance deficiencies. Specifically, the failure to satisfy early construction and housekeeping standards during the 1970s, as well as the lack of corporate emphasis and commitment to the timely implementation of a buried piping inspection and remediation program, are what ultimately resulted in the tritium contamination in 2009/10.

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In addition to the performance deficiencies identified by your organization, the NRC identified a performance deficiency regarding Entergy's failure to identify an additional degraded AOG system pipe (two-inch drain line), which resulted in the second leak in May 2010 during the plant's restart from its Spring refueling outage. Specifically, Entergy failed to perform an adequate extent-of-condition review of the original leak during troubleshooting in February 2010. The second tritium leak was determined to be only several hours in duration during two successive plant start-up attempts while the AOG system was pressurized. This second leak had no significant radiological impact on site personnel or public health and safety.

With respect to the significance of the issues identified by the NRC, and separately by Entergy in the root cause evaluation, the NRC determined the performance deficiencies were of minor significance, in accordance with Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports," based on the lack of radiological significance associated with both leaks (i.e., no contamination of individuals, no impact on public health and safety, and no effluent releases that exceeded NRC requirements). In addition, the NRC noted that the 1970's-era performance issues pre-dated the NRC's current Reactor Oversight Process and determined that they did not reflect current Entergy performance in this area.

Pertinent aspects for each of these deficiencies were appropriately addressed via your corrective action process. Because of their minor significance, these performance deficiencies did not meet the threshold for being characterized in the report as findings. No violations of NRC requirements or findings were identified.

NRC inspectors confirmed in an earlier inspection (Inspection Report No. 05000271/2010006; ML101400040) that, although tritium-contaminated ground water was detected onsite in the vicinity of the leaks, the conditions did not result in any NRC regulatory limits related to effluent releases being exceeded. Ongoing sample results continue to confirm that no offsite environmental monitoring locations contain detectable levels of plant-related radioactivity, including tritium. Recently, on October 8, 2010, your staff notified the NRC of a confirmed positive sample for trace amounts of tritium - approximately 1040 pico-Curies per liter (pCi/L) in the now-inactive Construction Office Building (COB) drinking water well.<sup>1</sup> The NRC staff notes that the indicated tritium levels are below the regulatory required lower limit of detection (2000 pCi/L). Based on information provided by your staff, the results did not appear to represent a new leak onsite and follow-up samples have shown no detectable levels of tritium in other onsite drinking water wells, or in any public drinking water supplies. NRC inspectors continue to evaluate Entergy's assessment of the ground water flow characteristics at the site, including your ongoing hydrological analysis, to verify the acceptability of your site conceptual model for determining changes in the onsite ground water conditions. This ongoing inspection is expected to be completed later this year and will be documented in a separate NRC inspection report.

As you are aware, the NRC continues to address, through its Ground Water Task Force followup activities, agency policies associated with the regulatory oversight of groundwater contamination. This includes reviewing the threshold for industry and regulatory response to

<sup>&</sup>lt;sup>1</sup> The COB well was taken out of service as a site drinking water source soon after the earlier leak was discovered in January 2010, but is still used as a sampling point to aid in determining the site's ground water flow characteristics in the underlying bedrock.

such incidents, as well as appropriate measures to prevent nuclear plant-related ground water contamination from occurring. The agency is also reviewing the industry's initiatives for ground water contamination and buried piping inspections/monitoring in the context of determining the extent to which these initiatives should inform the scope of our regulatory oversight. Independent of the NRC's Ground Water Task Force follow-up activities, your staff's actions at Vermont Yankee require continued focus and due diligence as you implement long-term corrective actions associated with the earlier leaks. We will continue to monitor your performance in this area.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice" a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at <a href="http://www.nrc.gov/reading-rm/adams.html">http://www.nrc.gov/reading-rm/adams.html</a> (the Public Electronic Reading Room).

We appreciate the support provided by your staff during this inspection. Please contact me at (610) 337-5128 if you have any questions regarding this inspection report.

Sincerely,

Darrell J. Roberts, Director Division of Reactor Safety

Docket No. 50-271 License No. DPR-28

Enclosure: NRC Inspection Report No. 05000271/2010009

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# /RA/

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#### SUNSI Review Complete: TFB/RJC (Reviewer's Initials)

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# U. S. NUCLEAR REGULATORY COMMISSION

**REGION I** 

Docket No:	50-271
License No:	DPR-28
Report No:	05000271/2010009
Licensee:	Entergy Nuclear Operations, Inc.
Facility:	Vermont Yankee Nuclear Power Station
Location:	320 Governor Hunt Road Vernon, Vermont 05354-9766
Dates:	May 25 – May 28, 2010 (on site) June 1 – June 4, 2010 (on site) June 29 – July 2, 2010 (on site) August 30, 2010 (on site, Exit Meeting)
Inspectors:	T. Burns, Reactor Inspector D. Spindler, Senior Resident Inspector, Vermont Yankee
Approved By:	Richard J. Conte, Chief Engineering Branch 1 Division of Reactor Safety

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Enclosure

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# SUMMARY OF FINDINGS

IR 05000271/2010009; 05/25/2010 – 08/30/2010; Vermont Nuclear Power Station; Problem Identification and Resolution Inspection of Vermont Yankee Root and Apparent Cause Evaluations (Buried Piping Leaks).

The report covers several weeks of on-site inspection by the senior resident inspector and a region-based inspector between May 25, 2010 and August 30, 2010. Although performance deficiencies were identified by the NRC inspectors for circumstances associated with the second leak, and separately by Entergy staff during their conduct of the root cause evaluation for the first leak, these issues were determined to be of minor significance and therefore were not identified in the report as findings. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

# EXECUTIVE SUMMARY

#### Background:

On January 7, 2010, Entergy informed the NRC that tritium was detected in a perimeter ground water monitoring well onsite (one of three installed prior to 2009 as part of Entergy's implementation of the NEI Ground Water Protection Initiative). Entergy-Vermont Yankee (ENVY) initiated a prompt investigation to determine the extent of condition and potential impact on health and safety and the environment. Entergy initiated a multi-disciplined task force to investigate the cause of the ground water contamination and to mitigate and remediate the condition. Entergy established a network of additional onsite ground water monitoring wells to characterize the ground water behavior (e.g., flow, direction and migration pathways) and to determine the highest source of groundwater contamination in order to pinpoint the leak location and map the extent of the contamination plume.

NRC Region I initiated an inspection on January 25, 2010, to examine the licensee's performance and determine if the ground water affected, or could affect, public health and safety. That inspection also included a review of the licensee's implementation of the industry's ground water protection initiative, which the NRC had previously endorsed as an acceptable approach for licensees to minimize the effects of (or the potential for) ground water contamination associated with nuclear power plants. Based on the results of the inspection (documented in Inspection Report 05000271/2010006, dated May 20, 2010), the NRC determined that ENVY appropriately evaluated the contaminated ground water with respect to offsite effluent release limits and the resulting radiological impact to public health and safety; and that ENVY complied with all applicable regulatory requirements and standards associated with effluent monitoring, dose assessment, and radiological evaluation.

Subsequently on May 28, 2010, during plant startup from its refueling outage, another leak was observed from a two-inch drain line associated with the AOG system. This normally buried pipe was in the excavated AOG area in the vicinity of the pipes associated with the earlier leak. This second leak was determined by the licensee to have existed for only a few hours while the AOG system was pressurized during plant startup. This portion of the AOG system is normally depressurized when the plant is either shutdown or at full power operations. The licensee concluded that the pipe likely also leaked on or around May 26 during an earlier startup from the refueling outage (prior to an unrelated plant trip that necessitated the May 28 startup). NRC inspectors who were onsite to review the licensee's progress with its root cause evaluation associated with the earlier leak, included in the inspection's scope a review of the causal factors associated with this second leak. The inspectors' reviews of those causal analyses are the focus of this inspection report.

# Inspection Results:

No violations of NRC requirements were identified. However, the NRC did identify a performance deficiency associated with the apparent cause evaluation and the circumstances associated with the second leak. Specifically, Entergy failed to conduct an adequate extent-of-condition review after the first leak, which led to its failure to identify the degraded two-inch AOG drain pipe prior to it causing additional tritium contamination in May 2010. Separately, in its own root cause evaluation for the first leak, Entergy identified deficiencies associated with not having

satisfied early construction and housekeeping standards for work associated with the AOG pipe tunnel during the 1970s. Entergy also identified a lack of corporate emphasis on and commitment to the timely implementation of a buried pipe inspection and remediation program in the late-2000s. These performance deficiencies were within Entergy's control and could have either prevented or mitigated the ground water contamination identified in 2010. The 1970s-era workmanship issues pre-dated the NRC's current oversight process and were determined not to represent current licensee performance.

Each of these performance deficiencies were determined to be minor by the NRC in accordance with Inspection Manual Chapter 0612, "Power Reactor Inspection Reports," because they resulted in no significant radiological impact on public health and safety. Because of their minor significance, these performance deficiencies are not documented in this report as findings. The licensee appropriately addressed these deficiencies in its corrective action program, as confirmed by the inspectors' review.

### **Ongoing Inspection Activities:**

NRC inspectors continue to review the licensee's efforts to characterize the Vermont Yankee ground water behavior as a result of this year's earlier leaks. Inspectors have been onsite to review Entergy's field observations, ground water monitoring activities, as well as test data collection and analyses, to verify the acceptability of your site conceptual model for determining changes in the onsite ground water conditions. The NRC's evaluation now includes a split-sample program to provide further independent analyses of the licensee's activities. The results of this hydrological evaluation will be documented in a separate inspection report following the conclusion of these activities, which is expected before the end of 2010.

### REPORT DETAILS

# 4. OTHER ACTIVITIES

# 4OA2 Problem Identification and Resolution (71152)

#### Background

Entergy performed a formal root cause evaluation for the tritium leakage identified in ground water samples drawn in November 2009 from monitoring well GZ-3. Additional samples from GZ-3 were taken on January 7, 2010, which confirmed the presence of tritium at this location. A summary of immediate actions taken or planned by Entergy to identify and stop the leakage was documented in NRC Inspection Report No. 05000271/2010006, issued May 20, 2010. In that report, the NRC indicated its intent to review the formal causal evaluation to verify the adequacy of Entergy's root cause determination and the associated corrective actions.

On May 28, 2010, prior to the completion of the licensee's formal root cause evaluation and during Vermont Yankee's startup operations of the advanced off gas (AOG) system, another tritium leak was self-revealing from a two-inch drain line (CNPE-172A). Entergy conducted an apparent cause evaluation for this second leak. The inspector also reviewed this causal evaluation for adequacy.

# a. Inspection Scope

The purpose of this NRC inspection was to review Entergy's causal evaluations for two leakage events resulting in tritium being found in groundwater samples from monitoring wells onsite, which were in the vicinity of AOG system buried piping. The inspector reviewed these evaluations for adequacy in identifying the root and contributing causes for the leaks and for the appropriateness of associated corrective actions to prevent or mitigate recurrence. The following Entergy causal evaluations were reviewed:

- Root Cause Evaluation Report, CR-VTY-2010-00069, "Analysis Performed on Groundwater Monitoring Well GZ-3 Identified Tritium Concentration that Exceeds Background Levels", dated June 16, 2010, Revision 1
- Apparent Cause Evaluation, CR-VTY-2010-03071, initiated to address a leak that was identified during plant start-up in a two-inch AOG system drain line (CNPE-172A)

The inspector also examined eleven Condition Reports (CRs) associated with various aspects of these leakage events (listed in the Attachment to this report). Corrective Action Program (CAP) implementing procedures, and root cause/apparent cause process implementing procedures. In addition, the inspector interviewed system engineers, root cause evaluation team members, and quality assurance personnel.

# b. Findings

No findings were identified.

### c. Observations

1) Root Cause Evaluation Report, CR-VTY-2010-00069

Entergy's report CR-VTY-2010-00069 identified two root causes and one contributing cause, along with two organizational/programmatic causes for the leakage of water containing tritium into the station's ground water. The contributing cause is also identified as the cause for the erosion-induced leaks of two one-inch recombiner steam trap drain lines within the AOG pipe tunnel. A detailed discussion of the identified root and contributing causes follows:

#### Root Cause No. 1: Latent Standards and Practices That Were Inadequate

The Entergy report stated: "Inadequate housekeeping standards and practices were applied during the construction of the AOG pipe tunnel in 1972. Inadequate design and installation standards and practices were applied during the installation of the two-inch drain line CNPE-172A in 1978. These latent issues combined to compromise the leak tight design of the AOG pipe tunnel and allowed for water containing radionuclides to leak to the environment."

The inspectors concluded that the licensee's first root cause was well-supported. Corrective actions planned were appropriate to the circumstances and included: 1) clearing of obstructions and removal of debris to the extent possible in the AOG pipe tunnel, completed prior to AOG system startup; and, 2) redesign and implement the removal from service (by sealing) of the two-inch drain line CNPE-172A. This action was completed in June 2010. The inspector reviewed Engineering Change (EC) 22659 developed to seal drain line CNPE-172A.

### Root Cause No. 2: Ineffective Monitoring and Inspection

The Entergy report identified "(t)he ineffective monitoring and inspection of the leakage control system of the AOG pipe tunnel, i.e., the tunnel floor drain and sump pump" as the second root cause. Periodic inspections of the tunnel floor drain were not performed to detect obstructions and the sump pump operational frequency was not monitored or trended.

The inspectors concluded that the licensee's second root cause was also wellsupported. Corrective actions planned were appropriate to the circumstances and included: 1) install a run-timer on the AOG drain pit sump and ensure all other sump pumps have run-timers to trend sump pump operation (planned for completion by the end of 2010); and, 2) establish appropriate flow test surveillance for the AOG pipe tunnel (to be conducted by the end of 2010). The inspector also noted that Entergy completed excavation and proper disposal of 150 cubic feet of contaminated soil in the vicinity of the AOG pipe tunnel leak.

#### Contributing Cause: Impingement Erosion of 1" CNP-154A/B

The Entergy report stated: "Leaks occurred in the A and B Recombiner Steam Trap Drain Lines 1"-CNP-154A & B due to mechanical erosion. Lines 1"-CNP-154A & B are included in the Vermont Yankee Small Bore Pipe Program, but are classified as Category 2 and are not periodically inspected. The current susceptibility and consequence analysis ranking system does not include consideration of accessibility for inspection or leakage to the environment. Although a leak of a tritiated system was required to complete the event, the team concluded that the original design of the tunnel would have been able to adequately contain and process a leak from within the tunnel. It was only after modifications to the tunnel and poor housekeeping during and shortly after construction that the water was able to leak from the pipe tunnel to ground."

The inspectors concluded that the licensee's contributing cause was well-supported. Corrective actions taken or planned were appropriate to the circumstances and included: 1) revise the susceptibility/consequence analysis ranking system in the Vermont Yankee flow accelerated corrosion program; 2) implement periodic inspection requirements and schedules for steam trap 154A/B drains; 3) inventory each steam trap on systems with vulnerable piping carrying tritiated steam and/or water; 4) perform benchmarking of other plants with steam trap vulnerabilities; and, (5) as part of the extent of condition review, implement modifications to prevent excess condensation in the radwaste pipe tunnel.

### Organizational and Programmatic Causes:

Entergy's root cause evaluation report identified that implementation of the Nuclear Energy Institute (NEI) NEI 07-07, "Industry Groundwater Protection Initiative (GPI)," was not timely or complete, based upon: 1) Entergy's implementation of the NEI GPI, to date, has not adequately defined Fleet, Corporate, and Vermont Yankee accountabilities; and, 2) inadequate commitment by management to fully implement the NEI GPI. The inspector notes that these organizational and programmatic issues involving ground water monitoring were previously examined by the NRC (reference Inspection Report No. 05000271/2010006, dated May 20, 2010) and were consistent with the NRC's conclusions in that report.

With respect to ongoing buried piping corrective actions, Entergy has initiated actions to identify, inspect, and replace/reroute piping that was fabricated of material susceptible to corrosion/erosion. The inspector noted that several in-service pipes or pipe sections (including fittings and valves) identified by the licensee's review were not readily accessible. Using the accessible portions of these pipes, the licensee planned to inspect the pipes for leak tightness and structural integrity. Prior to the completion of the inspector's review, Entergy had replaced (including cutting, capping, and/or abandoning in place) a number of drain lines associated with the AOG system. Replacement drain lines are now readily accessible for periodic examinations. The inspector observed that the modification of these drain lines was done as part of Entergy's newly formulated buried pipe program, which includes: benchmarking other utilities; prioritizing structures, systems and components;

improving prevention, monitoring and mitigation strategies; and improving inspection techniques. The inspector considered the licensee's corrective actions to be extensive, but acknowledged that they would require significant time for complete implementation.

Entergy's causal evaluation identified deficiencies involving not having satisfied early-1970s non-safety-related construction and housekeeping standards, and weaknesses in the station's erosion/corrosion program. These deficiencies predated the Reactor Oversight Program (ROP) and do not reflect current station performance or practices. The licensee also identified that a lack of corporate emphasis and commitment to the timely implementation of a buried piping inspection and remediation program contributed to not having identified degraded piping before it leaked or having identified tritium contamination of the groundwater from leakage earlier. All of these deficiencies were judged to be of minor significance, as defined in Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports." Accordingly, these licensee-identified deficiencies do not meet the threshold for characterization as a finding. No violations of NRC requirements were identified.

# 2) Apparent Cause Evaluation, CR-VTY-2010-03071

The inspector noted that report CR-VTY-2010-03071 is designated as "Category B." Category B causal evaluations involve a limited, but formal investigation of the likely (apparent) cause of an event or condition. Entergy concluded that the apparent cause for the second leak was the result of internal and external corrosion of the two-inch drain line pipe CNPE-172A. The inspectors concluded that the licensee's apparent cause was well-supported.

The inspector observed that the leak in two-inch drain line CNPE-172A was outside the AOG tunnel, but in relatively close proximity to the leak from the AOG tunnel wall pipe penetration (from which the first leak emanated). It appeared to the inspector that based on its as-found condition, this pipe may have leaked previously during plant startup activities for some time, but was not actively leaking while the AOG system was out of service. Inspector discussions with Operations Department personnel determined that upon AOG system startup, some amount of condensate is discharged to a sump at atmospheric pressure via this two-inch drain line (from a 12inch AOG steam jet air ejector discharge header). During this mode of operation, the drain line discharged steam jet air ejector condensate fluid and limited amounts of steam, conditions which led to the detection of the leak by an operator on May 28, 2010. Following startup with the plant operating at or near full power, the drain line was not pressurized, by design.

The inspectors considered the licensee's apparent cause determination (corrosion of the two-inch drain line) for the second leak to be adequate. The inspector noted that the completed and planned corrective actions for this leak were appropriate to the circumstances and included further enhancements to the buried piping program to address corrosion issues. The two-inch AOG drain line was ultimately removed from service.

#### 3) <u>Entergy's Extent-of-Condition Review for the First Leak</u>

Based on review of Entergy's root cause evaluation (first leak) and apparent cause evaluation (second leak), the inspector determined that Entergy missed an opportunity to have identified the two-inch drain line leak prior to May 28, 2010, the day the second leak was discovered by an operator during AOG system startup. Specifically, the inspector identified that Entergy failed to perform an adequate extent of condition review of the water leakage detected during troubleshooting on February 27, 2010, contrary to the guidance in EN-LI-118, "Root Cause Evaluation Process."

The inspector determined that the troubleshooting performed on February 27 involved filling the AOG tunnel with demineralized water to test for leaks in the pipe tunnel concrete structure. Once the pipe tunnel was filled, water was identified leaking through both the concrete tunnel wall (at a pipe penetration) and in several locations along the concrete encasement of the two-inch drain line (CNPE-172A) that runs from the pipe tunnel (via this penetration) to the AOG sump room. Also, the inspector determined that following this leak test, Entergy did not conduct a thorough examination of the concrete encasement and the enclosed carbon steel two-inch drain line. Inspector discussions with the engineering staff and Root Cause Evaluation (RCE) team determined that the licensee had considered this two-inch drain line to be of sufficiently robust design (i.e., capable of withstanding a 1500-psig pressure wave associated with an inadvertent AOG system hydrogen detonation) that it did not warrant an immediate examination. In addition, the RCE team assumed (incorrectly) that all of the water leakage through the concrete encasement was water originating from the pipe tunnel and not via possible perforations in the encased two-inch drain line.

EN-LI-118, "Root Cause Analysis Process," was used by Entergy to facilitate their evaluation of the root cause for the buried piping leakage and to develop appropriate corrective actions. Because the non-safety related buried pipe and associated tritium ground water contamination do not fall under 10 CFR 50, Appendix B, Corrective Action Program requirements, Entergy's use of EN-LI-118 for its root cause evaluation constitutes a commitment to a self-imposed standard as defined in IMC 0612, "Power Reactor Inspection Reports." EN-LI-118, Section 5.5, "Entergy Root Cause Process Steps" and Attachment 9.7, "Generic Implications," require that corrective actions include consideration for generic implications and extent of condition for similar equipment or processes. Contrary to this EN-LI-118 requirement, the inspector determined that Entergy did not appropriately conduct an extent-of-condition review for the water leakage from the concrete pipe encasement detected on February 27, 2010. Specifically, the licensee did not evaluate the corrosive environment created by the water leakage along the exterior of the encased two-inch drain line which was later found to have contributed to the external corrosion and through-wall leak of drain line CNPE-172A. The failure to adhere to this self-imposed standard is a performance deficiency.

The NRC determined that Entergy's failure to have performed a thorough extent of condition review for the first leak was an issue of minor safety significance, per IMC

0612, Section 0612-11. Specifically, the failure to have promptly detected and corrected the second leak was of minimal consequence (no significant impact on personnel contamination or radiological effluent and environmental limits) and appropriately addressed via the licensee's corrective action process. Based on its minor significance, the performance deficiency did not meet the threshold for being characterized as an NRC finding.

#### 4) <u>Overall Summary</u>

The inspector concluded that the licensee's evaluation of the first leak and identified root and contributing causes were appropriate. The inspector found that the licensee's identified root and contributing causes were well-supported. The inspector also concluded that the licensee's corrective actions for each of the root and contributing causes were extensive.

With respect to the apparent cause evaluation for the second leak, the inspector similarly found the licensee's apparent cause (internal and external corrosion) to be appropriate. However, the NRC concluded that the second leak could have been identified and corrected earlier. Specifically, the licensee failed to perform an adequate extent-of-condition review of the water leakage detected during troubleshooting on February 27, 2010. This was contrary to the guidance in EN-LI-118, "Root Cause Evaluation Process," and was determined to be a performance deficiency. However, this performance deficiency was evaluated by the NRC as an issue of minor safety significance, consistent with IMC 0612 guidance.

No violations of NRC requirements or findings of significance were identified.

# 40A6 Exit Meeting

On August 30, 2010, the inspector and Mr. Richard J. Conte, Chief Engineering Branch No. 1, presented the inspection results to Mr. Michael Colomb, Site Vice President, and other members of the Vermont Yankee staff. Mr. Darrell Roberts, Director, Division of Reactor Safety, also participated by telephone. The inspectors confirmed that no proprietary information was provided during the inspection. At the meeting, the NRC staff requested a summary basis as to why a root cause evaluation was not done on the second leak, in order to understand the distinction between the two different levels of causal analyses used by the licensee for the two leaks.

During a September 10, 2010, telephone conference between Mr. R. Conte and Mr. Chris Wamser, Plant Manager, Mr. Wamser provided the following summary basis for Entergy's second leak evaluation method:

 There was confidence in the first leak root cause evaluation, which was very thorough in identifying the cause of the groundwater contamination. Entergy also felt confident with implementation of the long term organizational and program corrective actions associated with both the groundwater monitoring program and underground piping program.

- The facility uses a variety of methods (captured in a screening matrix) to evaluate issues based upon the significance and frequency of events. The station is not reluctant to apply safety-related evaluation processes to non-safety related activities.
- Based upon the screening matrix, the nature of the second leak did not warrant a full root cause evaluation because the leak was of short duration, the result was not a significant groundwater contamination event, and the leak was rapidly contained.

Based on this explanation provided by the licensee, the NRC did not have any concerns with Entergy's decision to conduct an apparent cause evaluation versus a root cause evaluation for the second leak.

# ATTACHMENT

# SUPPLEMENTAL INFORMATION

# **KEY POINTS OF CONTACT**

Entergy Personnel Richard Meister, Senior Licensing Specialist James Devincentis, Senior Lead Licensing Engineer Patrick Corbett, QA Manager Gary Bailey, Senior Engineer Rick Heathwaite, Chemistry Supervisor James Rogers, Manager, Design Engineering

### LIST OF OPENED, CLOSED, AND DISCUSSED

None

#### LIST OF DOCUMENTS REVIEWED

EN-LI-118 R12	Root Cause Evaluation Process
EN-LI-102 RI5	Corrective Action Process
EN-LI-119 R8	Apparent cause evaluation Process

CR-VTY-2010-00069 6/16/2010 R1 Root Cause Evaluation Report – Evaluation Performed on Groundwater Monitoring Well GZ-3 Identified Tritium Concentration that Exceeds Background Levels, Event 06/16/2010 CR-VTY-2010-00069 CA 37 Corrective Action for redesign of 172A drain line

CR-VTY-2010-00069CA 44 Corrective Action for revision of susceptibility rankingCR-VTY-2010-00069CA 44 Corrective Action for Development of buried piping inspection planCR-VTY-2010-03071CA 51 Corrective Action for Development of buried piping inspection planCR-VTY-2007-2950Tritium concentration above background levels in storm drainCR-VTY-2007-3860Unmonitored release paths from service buildingCR-VTY-2008-1407Ineffective corrective actions for reducing tritium releaseCR-VTY-2008-2392House heating boiler water contains tritiumCR-VTY-2008-3749Potential gaps in north wall of turbine buildingCR IP2-2005-3086Onsite monitoring wells indicated elevated to trace levels of tritium

Attachment

### A-1

- OE 21833 Identified low levels of elevated tritium in groundwater
- OE 22785 Tritium contamination found in liquid grab sample
- OE 26760 Tritium monitoring show influence of second source tritium in groundwater
- OE 25092 Tritium in air conditioning condensate and rainfall
- OE 26571 Tritium detected in foundation drain sump
- LO-HQNLO-2008-15 CA 209 Prepare Inspection Plan for identified items which contain radioactive material
- LO-HQNLO-2008-15 CA 249 Initiate PMs/Work Orders as Required for Performing Inspections of identified items containing radioactive material.

# LIST OF ACRONYMS

- AOG Advanced Off Gas
- CFR Code of Federal Regulations
- COB Construction Office Building
- CR Condition Report
- EC Engineering Change
- ENVY Entergy Vermont Yankee
- GPI Groundwater Protection Initiative
- NEI Nuclear Energy Institute
- NRC Nuclear Regulatory Commission
- OE Operating Experience
- PARS Publicly Available Records
- RCE Root Cause Evaluation
- VTY Vermont Yankee

Attachment