# NRC NEWS

**U.S. NUCLEAR REGULATORY COMMISSION**
2443 Warrenville Road
Lisle IL 60532
Web Site: http://www.nrc.gov E-mail: opa3@nrc.gov

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## NRC REGION III TRITIUM INSPECTION ACTIVITIES

NRC Region III (Chicago) is reviewing tritium-related issues at Illinois nuclear power plants after groundwater contaminated with tritium was discovered offsite at the Braidwood Nuclear Power Station in November 2005. Braidwood and the other nuclear plants in Illinois are operated by Exelon Generation Co.

On March 20, 2006, the NRC also announced that it has assembled a group of experts from its offices around the nation to examine the issue of inadvertent, unmonitored releases of radioactive liquids containing tritium from U.S. commercial nuclear power plants. The task force is required to address several topics, including:

- A general assessment of the potential public health impact from these releases;
- How the issue was communicated to the public, state and local officials, other federal agencies, Congress and other interested groups;
- A review of other inadvertent releases at nuclear power plants, including decommissioning sites, from 1996 to the present;
- Industry actions in response to the releases, including the timing of remediation efforts; and,
- NRC oversight of inadvertent releases, both under the Reactor Oversight Process (ROP) and the process in place prior to the ROP.

The task force's charter is available on the NRC's Web site by entering ML060690186 at this address: http://adamswebsearch.nrc.gov/dologin.htm.

Tritium is a radioactive form of hydrogen. Tritium occurs naturally in the environment in very low concentrations. Most tritium in the environment is in the form of tritiated water, which easily disburses in the atmosphere, water bodies, soil, and rock. Tritium is produced naturally in the upper atmosphere when cosmic rays strike air molecules. Tritium is also produced as a byproduct of the fission process in nuclear power reactors. According to the Environmental Protection Agency, tritium is one of the least dangerous radioactive materials because it emits very weak radiation and leaves the body relatively quickly. Long term exposure to significant concentrations of tritium, however, may increase the risk of developing cancer. The EPA has established drinking water standards for tritium to minimize the risk of exposure to water containing tritium.

**Braidwood**

Exelon has collected groundwater samples from numerous monitoring wells on and near the Braidwood site. The data confirms the migration of tritium-containing water from an area where leaks have occurred in a 42-inch diameter pipe which carries cooling water discharge to the Kankakee River. This pipe, though usually carrying non-radioactive water, has also been used for the release of low-level radioactive effluent from the plant, which is permitted under limits and conditions imposed by the NRC. Significant leaks in the pipeline occurred in 1996, 1998, and 2000, and other, lesser leaks that occurred between 1996 and 2005.

On Nov. 30, 2005, Exelon informed the NRC that it had detected elevated tritium levels in recently installed monitoring wells on the site and that tritium-bearing groundwater may have migrated off the site to the north. In addition, the Exelon informed the NRC that it had suspended all liquid radioactive effluent releases, pending its evaluation of the elevated tritium levels.

The NRC promptly began inspection activities to assess the groundwater conditions and to review Exelon's activities in response to the problem. These inspection activities were carried out by radiation specialists from the Region III office as well as the two NRC resident inspectors assigned to the Braidwood site. The NRC collected and analyzed independent samples of some area residential wells and, in addition, analyzed "split" samples of groundwater collected by Exelon. The results of the NRC analyses have been consistent with Exelon's laboratory results. In addition, Exelon and NRC environmental groundwater measurements have confirmed that the tritium contamination levels are low and that the radioactivity does not pose a hazard to the public. Initial inspection findings, through Dec. 31, are contained in Inspection Report 05-10, which is available on the NRC web site (http:www.nrc.gov/NRR/OVERSIGHT/ASSESS/REPORTS/brai_2005010.pdf).

In mid-February the NRC began an additional inspection focusing on the historical leaks from the circulating water discharge line beginning in 1996 – what information was available at the time, what actions Exelon took, and what followup activities occurred. The report of the inspection is expected to be released later in May.

Exelon groundwater monitoring has continued to identify tritium contamination in areas near the discharge line. As a result of that monitoring, Exelon has identified tritium in the groundwater along the discharge line adjacent to 3 vacuum breakers (Nos. 1, 2, and 3) on the plant site, ranging from 6,000 picocuries per liter to 58,500 picocuries per liter. The licensee has also measured tritium levels up to about 247,000 picocuries per liter in deeper onsite and offsite wells in the vicinity of vacuum breakers Nos. 2 and 3. Lower level contamination has been measured in monitoring wells near 3 off-site vacuum breakers (Nos. 4, 6, and 7). No contamination has been found in groundwater near the remaining 5 vacuum breakers.

Beginning in April 2006, Exelon and the Will County Health Department began an extensive sampling and analysis program that included numerous residential wells in the nearby community of Godley, in locations adjacent to areas with previously identified tritium contamination, and along the discharge pipe between the plant and the Kankakee River. The initial results, with some wells remaining to be sampled and analyzed, showed samples slightly above the minimum measurement level for tritium in two of the wells sampled by Will County and in two other wells sampled by Exelon.

Exelon is developing potential options to mitigate the tritium contamination that is in the environment. Presently, the licensee is developing activities to transfer contamination from an offsite pond through the blowdown line to the Kankakee River. The NRC is reviewing that activity to ensure that Exelon is in full compliance with Federal requirements and the Braidwood operating license. A Will County permit and state approval of the project are pending.

Braidwood, like most nuclear plants, normally releases water containing low levels of radioactivity under controlled and monitored conditions. These releases have been halted since late November while the company reviews its release procedures and verifies the integrity of the pipeline to the Kankakee River (ADAMS ML060670040 and ML060660590). In addition to liquid radioactive effluents, nuclear plants also release gaseous radioactive effluents into the atmosphere in a controlled and monitored process.

**Byron**

Because the Byron Nuclear Power Station has a circulating water discharge line similar to that at Braidwood, the NRC resident inspectors are monitoring Exelon's activities there to determine what leakage may have occurred there and if there has been any possible groundwater contamination. Exelon has identified measurable levels of tritium in standing water in the concrete vaults surrounding the vacuum breakers, the same types of valves which caused the leaks at Braidwood. In addition, the licensee has measured low levels of tritium in groundwater wells near two of the vacuum breakers (about 3800 and 450 pCi/l). The company is continuing its monitoring activities to characterize any migration of tritium-bearing water outside the vaults.

The NRC continues to collect independent samples and/or "split" samples of residential drinking water wells and other groundwater wells in the Byron plant area to determine the extent of the tritium contamination. Sample results thus far have been consistent with those collected by Exelon.

Exelon suspended routine releases of liquid radioactive effluents through the discharge line earlier this year. In April, after inspections and improvements to the discharge line components, the plant resumed periodic effluent releases through the line. When releases are in progress, plant staff members observe the vacuum breaker valves to make sure no leakage is occurring. The company plans to install leak detection and monitoring equipment in the future.

**Dresden**

The NRC inspectors at the Dresden Nuclear Power Station are assessing a leak in an underground pipe which resulted in tritium-bearing water being released to a small area on the plant site – about 30 feet square. This leak, which was reported to the NRC on Feb. 10, appears to originate from an underground pipe that carries water from a large water storage tank into the plant. The leak was detected through the licensee's existing, onsite groundwater monitoring program. Exelon replaced a portion of the pipe in 2004 when it developed a leak, and planned to replace the remainder of the pipe in June. The suspected pipe was isolated by closing valves and drained to prevent further leakage. The licensee's excavation, characterization, and corrective actions are ongoing.

**Other Illinois Nuclear Plants**

NRC's resident inspectors at the other nuclear power plant sites in Illinois – LaSalle, Quad Cities, and Clinton – are also gathering information about how tritium-bearing water is handled on each site and whether there have been leaks or unplanned releases of tritium-bearing water in the past. The LaSalle and Clinton plants do not release liquid effluents containing tritium or other radioactive materials. The NRC will also observe Exelon's collection of certain groundwater samples at these plants, as well as the Zion plant, which is permanently shut down, and collect "split" samples for analysis by the NRC's contractor laboratory. These reviews and sample collection are part of the day-to-day NRC inspection activities at the plants and will not result in a separate inspection report. Any inspection findings will be documented in the resident inspector's quarterly reports and the periodic Zion decommissioning reports which will be available on the NRC web site.

**NRC Documents Online**:

Preliminary Notifications with additional details on Braidwood, Dresden, and Byron:

http://www.nrc.gov/reading-rm/doc-collections/event-status/prelim-notice/ – Select 2006 for the most recent reports on Braidwood, Byron, and Dresden.

NRC Inspection Reports

http://www.nrc.gov/info-finder/reactor/ - Select the reactor site from the alphabetical list, and then select inspection reports from the list of links.

**For additional information**:

Jan Strasma, Public Affairs Officer
630/829-9663 - rjs2@nrc.gov

Victoria Mitlyng, Public Affairs Officer
630/829-9663 - vtm@nrc.gov

Roland Lickus, Chief, State and Government Affairs
630/829-9660 - rml2@nrc.gov

US Nuclear Regulatory Commission
Office of Public Affairs
2443 Warrenville Rd
Lisle IL 60532