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Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Re: Information Letter - Unplanned Release of Reactor Pool Water
License R-2, Docket No. 50-005

Dear Sir or Madame:

This information letter is being submitted to describe a non-reportable occurrence at the Penn State Breazeale Reactor. The occurrence was an unplanned release of approximately 2000 gallons of reactor pool water over the period of 2 - 11 August 1998. The unplanned release was leakage from a storage tank (ST) located within the fenced boundary of the reactor facility. The leakage took place as a result of undetected corrosion in the bottom portion of the ST. The leakage which was directly into the ground under the ST was discovered and terminated on 11 August. Reporting of this occurrence is not required by either our license or our Technical Specifications. This conclusion was confirmed during discussions with Marvin Mendonca, our NRC Project Manager.

The occurrence and our subsequent actions were discussed with Mr. Mendonca and/or Tom Dragoun (NRC Region 1) several times on 12 August as well as over succeeding days.

Additionally, there were communications (without the reactor staff involvement) about the release between the Penn State University Office of Environmental Health and Safety (PSUEH&S) and the Pennsylvania Department of Environmental Protection (PADEP). This led to further communications between the PADEP and the Pennsylvania Emergency Management Agency (PEMA) with resultant communications between several state and federal agencies. To the best of our knowledge, these communications were of an information transfer nature.

Prior to further use of the ST the bottom will be repaired and/or replaced and a more sensitive means of leak detection of similar leakage will be installed.

Description of Event:

A 48,000 gallon capacity cylindrical aluminum ST is located in a grassy area to the rear of the reactor facility. Its purpose is to store reactor pool water during the draining of either side of the reactor pool. The perimeter of the ST bottom is anchored to a concrete ringwall that is 12 inches wide, 4 1/2 feet in height and approximately 19 1/2 feet in diameter. This ringwall extends to below the frost line. The remainder of the 1/4 inch thick aluminum ST bottom sits on a 6 inch compacted bed of sand with soil beneath. The ST was installed in 1961.

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A reactor outage was conducted during the period 2 - 7 August 1998 in order to install new equipment to allow the use of another beam port in the south end of the reactor pool. On 2 August , the reactor and all irradiated fuel were moved to the north end of the reactor pool. The divider gate was installed in the pool and the south end of the pool was drained. Since the divider gate does not reach to the top of the normal pool full mark, about three feet of water in the north side of the pool was also drained. Initially a small volume of water (less than 100 gallons) was transferred to the evaporator building holdup tank to flush the lines and then about 41,000 gallons were transferred to the ST. During the storage phase, the water level in the ST was checked daily from a manhole in the top of the ST by observing the level on an internal tank ladder. These daily observations assured no gross loss of water but provided no precise indication of water level.

The water remained in the ST until the morning of 7 August when the transfer back to the pool began. Just before the transfer, the last visual observation of the ST water level indicated that the level may have been lower than observed on previous days. Because of air in-leakage to the transfer pump, the transfer from the ST back to the reactor pool was terminated prior to fully emptying the ST. The ST has no level gauge and an accurate measurement of water remaining was not possible. 2850 gallons were added to the reactor pool from the evaporated water storage tank, in order to make up for the water thought to be remaining in the ST. Final makeup (about 100 to 300 gallons) to bring the reactor pool to normal level was from the air conditioning return over the next several days.

On 11 August, the water remaining in the ST was transferred to the evaporator building holdup tank. The final removal of water involved personnel in the tank to assist in water movement. Several very small holes were observed in the bottom of the tank during that operation. At this time it became apparent that the volume transferred to the evaporator building holdup tank during initial line flushing on 2 August (less than 100 gallons), the volume transferred for line flushing prior to refill on 7 August (less than 50 gallons), and the volume transferred on 11 August to empty the ST (about 950 gallons) did not add up to the total volume needed to complete the reactor pool refill on 7 August.

The unplanned release of reactor pool water to the environment is at most 2000 gallons. Further refinement of this figure is not possible. Because of the construction of the ST and its ringwall, the leakage was directly into the ground under the ST.

Following the final transfer of water from the ST on 11 August, the tank was swabbed dry. Upon close examination and probing of the ST floor on 12 August, eight locations were identified where through floor penetrations existed.

Six one foot square coupons were cut from the ST bottom to help determine the extent and direction of the corrosion. Based on examination of those coupons, the corrosion was from beneath the bottom and was extremely localized. No specific causes for the corrosion were found. No further through bottom penetrations were found. During examinations of the ST drawings and the actual conditions of the ST bottom it was determined that there had been considerable settling of the soil and sand under the ST bottom(up to 5 or 6 inches in the areas examined). As installed the ST bottom was flat; as it currently exists the bottom is concave.

Environmental Considerations:

The major component of radioactive material in the reactor pool water is tritium. A pool water grab sample is analyzed monthly for tritium content and the average concentration for the months of April, May and June of 1998 was 6.2×10^{-5} µCi/ml. The most recent measurement on 27 July 1998 just prior to the pool drain, also indicated a concentration of 6.2×10^{-5} µCi/ml. This concentration is significantly less than the 1×10^{-3} µCi/ml effluent concentration limit in 10CFR20 Appendix B, Table 2, Column 2. For 2000 gallons of reactor pool water the total tritium activity would be 469 µCi.

The EPA Drinking Water MCL for tritium is 20,000 pCi/L (2×10^{-5} µCi/ml). Drinking 2 liters of water a day for a year with that concentration would result in a committed dose of 4 millirem according to a memo from Randolph Easton of the Pennsylvania Bureau of Radiation Protection. Therefore, drinking the unplanned pool discharge "straight" for a year at the rate of 2 liters a day would result in a committed dose of about 12 mrem. Mr. Easton further pointed out that the EPA standard was for finished drinking water. He stated that "Given the limited quantity which leaked, and the dilution which will occur, exceeding the MCL for tritium in drinking water is not forseen."

On the afternoon of 13 August, officials of the PADEP and Bureau of Radiation Protection visited the Penn State Breazeale Reactor. Based on their knowledge of geology, aquifers and water suppliers in the area, they took water samples from three selected wells for tritium analyses. PSUEH&S personnel took parallel samples. The PADEP also took samples from these wells on 18 August. The samples showed no evidence of tritium above normal background levels.

A pool water grab sample is analyzed approximately weekly for gross alpha and beta activity. If action limits are exceeded, then gamma spectroscopy is performed. At a minimum, gamma spectroscopy is performed once a quarter. An additional grab sample of the pool water was taken as it was being transferred to the storage tank on 2 August. In addition to the natural, non reactor produced radioisotopes of K-40, Ra-226, Th-232, Pb-214 and Ac-228 other isotopes identified were Cr-51, Sb-122, Sb-124, Cs-137, Co-58, Mn-54 and Co-60. These radioisotopes are all routinely found in the reactor pool water. All of the reactor produced isotopes are well less than effluent concentration limits in 10CFR20 Appendix B, Table 2, Column 2. For 2000 gallons of reactor pool water (disregarding tritium) the total concentration is 1.4×10^{-6} µCi/ml and the total activity is 11 µCi.

Soil samples were taken from under the six coupons which have been removed. Due to the extremely low levels of radioactivity in those samples and the difficulty in providing defensible measurements at those levels, no definitive results are yet available. This in itself is a further statement of the negligible impact of this release on the environment.

No remediation is planned. This release of 2000 gallons of pool water will not have a significant effect on public health and safety.

Historical Note:

Previous to the usage on 2 - 11 August, the ST was last used during April of 1997 when the south side of the pool was drained to the storage tank. Just prior to that use, the ST was filled one-quarter full with city water to test the system prior to its use for pool water.

No leakage was noted. Records are not accurate enough to indicate whether there was any water loss during the April 1997 pool water transfer. Since the make-up to the reactor pool following pool refill was less in April of 1997 than on 7 August, we can reasonably say that if there was a water loss in April of 1997 it was less than in August of 1998. Radioactive content of the reactor pool water in 1997 was basically the same as it is at present in 1998. Prior to April of 1997, the ST had not been used for at least a decade.

Corrective and Preventative Action:

The ST is currently empty and prior to further use the ST bottom will be repaired and/or replaced. In addition, a more sensitive level measuring system will be installed. Such a system will provide early detection of leaks which will allow mitigation and quantification of any such leaks.

Procedures will be modified to assure better accounting of pool water volumes during and following transfers.

This letter and supporting information will be added to a decommissioning file as per the requirements of 10CFR50.75.g.

Sincerely,

C. Frederick Sears

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Director, Penn State Breazeale Reactor

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