

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, D.C. 20555-0001

August 24, 2006

NRC INFORMATION NOTICE 2006-19: LEAKING FUEL ELEMENT CAUSES FALSE  
INDICATION OF STEAM DRYER LEAKAGE IN  
BOILING-WATER REACTOR

**ADDRESSEES**

All holders of operating licenses for boiling-water reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

**PURPOSE**

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of the potential false indication of a steam dryer leak caused by a leaking fuel element. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

**DESCRIPTION OF CIRCUMSTANCES**

On February 10, 2006, the licensee at River Bend Station shut down the unit to perform steam dryer inspections based on suspected steam dryer damage as indicated by high moisture carryover (NRC Inspection Report 05000458/2006002, Agencywide Documents Access and Management System (ADAMS) Accession No. ML061250505).

The saturated steam that exits the reactor vessel of a boiling-water reactor contains a small amount of liquid water entrained in the steam flow (i.e., moisture carryover) that is transported through the main turbines to the condenser hotwell. Because the liquid water (i.e., reactor coolant) that is entrained in the steam flow contains sodium-24 (Na-24), the amount of moisture carryover may be calculated based the concentration of Na-24 in the condenser hotwell. Over a 60-day period, the gamma spectroscopy results for condenser hotwell samples showed a steady increase in Na-24. Because such an increase is normally an indication of steam dryer damage, the licensee shut down the unit to inspect the dryer. Upon inspection, the licensee found no detectable damage to the steam dryer.

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Upon further investigation, the licensee determined that the apparent increase moisture carryover was the result of inaccurate Na-24 measurements. Degraded fuel caused leakage of iodine-135 (I-135) into the reactor coolant that impacted the Na-24 analysis. The predominant gamma energy for Na-24 is 1368.5 keV which is close to gamma energy of 1367.9 keV for I-135. The licensee sets up the gamma spectroscopy equipment by inputting a "library" of isotopes and their energy level for only those isotopes that the licensee expects could be present in meaningful quantities. The sample analysis results produced by the gamma spectroscopy software reflects only those isotopes the licensee inputs into the isotope library. Because the quantity of I-135 in normal reactor coolant (without failed fuel) is negligible, the licensee did not include I-135 in the isotope library. Therefore, for the condenser hotwell sample, although the gamma spectroscopy sensor detected the gamma from I-135, the gamma spectroscopy software determined the gamma was from Na-24 because Na-24 was included in the isotope library and has a gamma energy close to that of I-135. This resulted in a false high indication of Na-24. As a corrective action, the licensee added I-135 to the gamma spectroscopy equipment isotope library to facilitate distinction between I-135 and Na-24.

## **DISCUSSION**

Fuel failures have a significant impact upon the radionuclide composition of reactor water and associated systems and could impact the gamma spectroscopy analyses for both chemistry and radiation protection purposes. In order to obtain accurate analysis results, plants operating with failed fuel can modify their gamma spectroscopy analysis libraries to reflect the change in radio isotopic composition. Accurate analysis results are particularly important when the quantity of an isotope is tied to particular plant actions or responses, including post-accident responses.

## **CONTACTS**

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below.

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Note: NRC generic communications may be found on the NRC public Website, <http://www.nrc.gov>, under Electronic Reading Room/Document Collections.