UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

April 4, 2002

NRC INFORMATION NOTICE 2002-13: POSSIBLE INDICATORS OF ONGOING REACTOR PRESSURE VESSEL HEAD DEGRADATION

ADDRESSEES

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

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice on recent Davis-Besse experience to alert addressees to possible indicators of reactor coolant pressure boundary degradation including degradation of the reactor pressure vessel (RPV) head material. The NRC anticipates that recipients will review this information for applicability to their facilities and consider taking appropriate actions. However, the suggestions contained in this information notice do not constitute NRC requirements and, therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

The Davis-Besse nuclear power plant recently discovered a significant cavity in the RPV head on the downhill side of control rod drive nozzle number 3 and some head wastage behind nozzle number 2. In response, the NRC issued Information Notice 2002-11, “Recent Experience With Degradation of Reactor Pressure Vessel Head,” on March 12, 2002, and Bulletin 2002-01, “Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity,” on March 18, 2002. NRC also sent an Augmented Inspection Team (AIT) to the plant to investigate the circumstances of the degradation of the RPV head material. Through the AIT, several possible indicators of reactor coolant pressure boundary degradation such as was observed at Davis-Besse were identified. These indicators include unidentified reactor coolant system (RCS) leakage and containment air cooler (CAC) and radiation element (RE) filter fouling.

Until 1998, RCS unidentified leakage at Davis-Besse was normally less than 0.1 gallons per minute (gpm). In October 1998, the licensee removed the rupture disks downstream of the pressurizer relief valves and bypassed a drain line that collected leakage from the relief valves in the quench tank (identified leakage). As a result, all leakage past the relief valves was vented directly into the containment atmosphere and collected in the sump, increasing the unidentified leakage to approximately 0.8 gpm. In May 1999, the licensee reinstalled the

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rupture disks and reconnected the drain line; however, the RCS unidentified leakage was only reduced to approximately 0.2 gpm (or approximately 0.1 gpm higher than normal). This elevated level of unidentified leakage was attributed by the licensee to control rod drive mechanism (CRDM) flange leakage since the plant had a past history of flange leakage.

The Davis-Besse CACs control containment temperature and humidity. In November 1998, the licensee identified increased CAC fouling caused by boron deposits. The licensee attributed the increase in CAC fouling to the venting of the pressurizer relief valve leakage directly to containment caused by the October 1998 modification discussed previously. The CACs were cleaned many times between November 1998 and May 1999. In May 1999, the licensee reinstalled the rupture disks and reconnected the drain line. After that modification, the licensee cleaned the CACs again in June and July 1999. At that time, the licensee noticed that the boric acid deposits removed from CAC number 1 exhibited a rust-like color. The licensee attributed the discoloration to migration of the surface corrosion on the CACs into the boric acid deposits and to the aging of the boric acid deposits. After the spring 2000 refueling outage, deposits again began to form on the CACs. Between June 2000 and May 2001, the licensee cleaned the CACs eight times. No further CAC cleaning was needed until the current outage when the licensee reported that fifteen 5-gallon buckets of boric acid were removed from the CAC ductwork and plenum. A flow from the CACs also resulted in boric acid deposits elsewhere within containment including on service water piping, stairwells, and other areas of low ventilation.

Davis-Besse also has REs that are two identical air sampling systems in containment. The RE filters accumulate particulates and may need to be changed to ensure acceptable system operation. Licensee records correlate RE filter changes with past RCS leakage increases. In March 1999, RE filter clogging from boric acid deposits was identified and attributed to the pressurizer relief valve modification discussed previously. In November 1999, after identifying yellowish brown deposits in the filters, the licensee obtained a chemical analysis of the filter particulates which identified the presence of ferric oxide in addition to boric acid crystals. Around this time, the licensee began changing the filters every one-to-three weeks. By November 1999, the frequency of filter changes had again increased.

DISCUSSION

RCS leakage, boron deposits, and corrosion products like ferric oxide in CACs and RE filters may indicate degradation of the reactor coolant pressure boundary materials. These indicators do not provide clear evidence of the degradation; however, they may provide an opportunity for licensees to suspect that degradation is ongoing. The NRC understands that the indications at Davis-Besse were sometimes complicated by other events (e.g., flange leaks). Nonetheless, in combination with other indicators, they may provide insights into whether degradation of the reactor coolant pressure boundary materials is occurring.

The information in this notice is, in part, based on preliminary information. The safety significance and generic implications of the information justify NRC's urgency to issue this information notice.

This information notice does not require any specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate project manager from the NRC's Office of Nuclear Reactor Regulation.

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LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
99-28, Supp 1	Recall of Star Brand Fire Protection Sprinkler Heads	03/22/2002	All holders of licenses for nuclear power, research, and test reactors and fuel cycle facilities.
2002-12	Submerged Safety-Related Electrical Cables	03/21/2002	All holders of operating licenses or construction permits for nuclear power reactors
2002-11	Recent Experience with Degradation of Reactor Pressure Vessel Head	03/12/2002	All holders of operating licenses for pressurized-water reactors (PWRs), except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor.
2002-10	Nonconservative Water Level Setpoints on Steam Generators	03/07/2002	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor.
2002-09	Potential for Top Nozzle Separation and Dropping of Certain Type of Westinghouse Fuel Assembly	02/13/2002	All holders of operating licenses for nuclear power reactors, and non-power reactors and holders of licenses for permanently shutdown facilities with fuel onsite.
2002-08	Pump Shaft Damage Due to Excessive Hardness of Shaft Sleeve	01/30/2002	All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor.

OL = Operating License
CP = Construction Permit