L-PI-03-101

December 9, 2003

10 CFR 50.54(f)
BL 2003-02

U S Nuclear Regulatory Commission
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Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
DOCKET NO. 50-306
LICENSE NO. DPR-60
60-DAY REPORT PURSUANT TO NRC BULLETIN 2003-02 FOR
2003 PRAIRIE ISLAND UNIT 2 LOWER HEAD PENETRATION INSPECTION

By letter dated August 21, 2003, the Nuclear Regulatory Commission (NRC) issued Bulletin (BL) 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity." By letter dated September 19, 2003, Nuclear Management Company, LLC, (NMC) responded to the BL and committed to attempt a 100% bare-metal visual exam of the lower reactor pressure vessel dome up to and including each bottom-mounted instrumentation (BMI) penetration to reactor pressure vessel (RPV) junction during the then current Unit 2 refueling outage.

The BL required an inspection summary within 60 days of plant restart following the next inspection of the RPV lower head penetrations. In response to these requirements, NMC notes the following with respect to the lower reactor pressure vessel (RPV) dome inspection conducted during the past Prairie Island Unit 2 refueling outage:

Summary of Inspections Performed

No indications were observed that were similar to the South Texas Project Unit #1 deposits. In addition, no indications were observed that were similar to any of those depicted in Electric Power Research Institute (EPRI) technical guidance for inspecting the vessel head. The examiners determined that the minor indications that were found were not characteristic of reactor coolant leakage from the tube/vessel interface. All penetrations with unusual indications (described below) are directly attributable to past leakage from the refueling cavity or to condensation from above. The results of radiochemical and chemical analysis of samples obtained from the dried liquid streaks on the bottom of the vessel and the minor deposit on Penetration #36 indicate that these accumulations are not consistent with dried reactor coolant.

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Method and Extent of Inspection

The RPV bottom head at Prairie Island contains 36 BMI nozzles. Closely conforming mirror insulation constructed in bolted together panels covers the bottom head with approximately one inch of clearance between the bottom head and the insulation.

At the very bottom of the vessel, a five-foot diameter circular section of mirror insulation was unbolted and dropped down approximately two feet. The 12 center BMI tubes penetrate this circular section of insulation so that it could not be removed, just slid down the tubes. With this panel lowered the 12 center tubes were exposed for direct visual inspection and were also inspected using a hand held video probe. The remaining 24 tubes penetrate the angled insulation sections adjacent to the circular section. A two to three inch gap exists between these insulation panels and the bottom of the vessel. These 24 tubes were visually inspected using the video probe manually manipulated underneath the insulation panels to obtain a full 360-degree view of the joint between each nozzle and the RPV bottom head. Metal flashing screwed into the insulation around each BMI tube was also removed and the inspection probe tip was inserted into the opening around each tube, however, since the insulation was so close to the tube a 360 degree view around the tube through this opening was not possible for any of the penetrations.

Qualified VT-2 inspectors visually inspected all 36 penetrations using a video probe with the VT-2 inspectors monitoring the inspection on a remote video monitor. Using this method we have high confidence the inspection covered 360 degrees around each penetration and, with moving the probe up to each penetration, 100% coverage of the bare metal of the bottom head up to the outermost penetrations. We cannot state that we have unequivocally seen 360 degrees around each penetration since we did not have reference marks around each penetration to judge by.

As-Found Condition of Prairie Island Unit 2 Lower Head

The general condition of the bottom of the vessel was good. The vessel is painted and the gray carbozinc paint has preserved the surface so that there is no surface rust. Many dried liquid streaks with a white powdery consistency were observed. These streaks emanated from above the BMI penetrations and ran down to the bottom of the vessel where they collected. The streaks were not caused by a large volume of liquid since there was not evidence of significant

amounts of the leakage dripping onto the mirror insulation. The liquid streaks impinged on four of the BMI penetrations; 10, 20, 31 and 36 (described below).

- Penetrations #10, 20 and 31

  Observed condition: These three penetrations were impinged on by a deposit that had no volume and appeared as a white streak.

  Disposition: From the inspection it was clear that the deposit on each of these tubes was caused by a liquid source from above the tube. The deposit looked like a water stain and had no apparent volume. This is not consistent with what would be expected for a boric acid leak. Samples of the deposits on the lower head below these penetrations did not contain any Lithium or Boron which would indicate that the source was neither refueling nor reactor water.

- Penetration #36

  Observed condition: Similar to the above penetrations except that the liquid streak from above had impinged on the tube penetration on the uphill side then flowed around the penetration and ran down the tube on the downhill side of the penetration. A small deposit of what appears to be loosely adherent white material with some volume exists at the downhill side of the penetration.

  Disposition: From the inspection it was clear that the deposit was caused by a liquid source from above the tube. The deposit looked like a water stain and had no volume except at the most downhill point of the tube annulus just where the running liquid would have flowed from the tube/vessel annulus to run down the tube. The white material at this juncture appears to be loosely adherent and has a slight sheen to it. This is not consistent with what would be expected for a boric acid leak, which would be crystalline or powdery in appearance and would be tightly adherent. Separate samples were taken and analyzed of the deposit uphill and downhill of the penetrations. The downhill sample included the small volume of material that existed at the tube/vessel juncture. Both the uphill and the downhill samples were found to be of similar composition. Radiochemical and chemical analysis of the samples indicate that the deposits are old and are highly unlikely to have been caused by reactor coolant leakage. In both samples boron and lithium were at (or below) the lower limits of detectability; low or no lithium indicates that the source was not reactor coolant. Levels of radioactive cobalt were

much less than the levels of radioactive zinc (by at least a factor of 100), which is more consistent with activation of the zinc coating and indicative that the source of the water was not reactor coolant.

In this letter we have made no new Nuclear Regulatory Commission commitments. Please contact Jeff Kivi (651-388-1121) if you have any questions related to this letter.

I declare under penalty of perjury that the foregoing is true and accurate. Executed on December 9, 2003.

Joseph M. Solymossy
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