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Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Special Report: Inoperable Loose-Part Detection System

Dear Madam or Sir:

Clinton Power Station (CPS), Operational Requirements Manual (ORM), Operational Requirement 2.2.10, "Loose-Part Detection System," Action "a" requires inoperabilities of the Loose-Part Detection System with one or more loose-part detection system channels inoperable for more than 30 days to be reported to the Nuclear Regulatory Commission (NRC) within the next 10 days pursuant to Operational Requirement 6.9.2. On November 10, 2000, at 1442 hours, the loose-part detection system was declared inoperable because the Channel Calibration Test ("ping" test), required every 18 months by ORM Testing Requirement 4.2.10.3, was not successfully completed for two of the six required channels, Channels 3 and 6, and these channels were not returned to an operable status by December 10, 2000, at 1442 hours.

Due to the extended inoperability of these two channels, the attached Special Report is being submitted in accordance with the aforementioned CPS ORM requirement, to provide information regarding the cause of the inoperability and plans for restoring the system to an operable status.

Sincerely yours,



Paul D. Hinnenkamp
Manager - Clinton Power Station

JLP/blf

cc: NRC Clinton Licensing Project Manager
NRC Resident Office, V-690
Regional Administrator, Region III, USNRC
Illinois Department of Nuclear Safety

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SPECIAL REPORT: INOPERABLE LOOSE-PART DETECTION SYSTEM

Equipment Description

The Loose Parts Monitoring System (LPMS), described in the Clinton Power Station (CPS) Updated Safety Analysis Report (USAR) Section 4.4.6.1, is a multi-channel instrumentation system consisting of an indicator assembly with accelerometers and alarm lights, a channel selector, a recorder with audio playback and channel selection capability and connections to interface with a spectrum analyzer. The design and operation of the LPMS satisfies the requirements of CPS Operational Requirements Manual (ORM) Operational Requirement 2.2.10, "Loose-Part Detection System." The LPMS continuously monitors the reactor pressure vessel internals and the reactor coolant system for indications of loose parts.

The LPMS has six channels. Each channel has a piezoelectric sensor (accelerometer) that generates a charge signal in proportion to the amplitude of vibration (mechanical and acoustic) at the sensor. The charge signal is transmitted to a charge converter preamplifier that has a voltage output proportional to the charge input. The electrical voltage output of the charge converter is then transmitted to a signal processor that uses analog and digital circuits for generating indication and alarms. A "Loose Part Monitoring System Trouble" alarm will annunciate in the Main Control Room when either a vibration exceeds a preset level for signal frequencies of 17 kHz and less, or when a loose part signal exceeds a preset level for signal frequencies greater than 17 kHz but less than 25 kHz. When a channel alarms, subsequent alarms are prevented from occurring until the alarm is acknowledged by the control room operator and reset. The LPMS has other design features, including automatic starting of the tape recorder when a channel alarms, a speaker and audio jack for listening to a selected channel, and a meter display for observing the selected channel amplitude. Up to four channels are recorded by a tape recorder that records real-time signals for later analysis.

The six sensors are positioned at different locations. Two sensors (Channels 1 and 2) are mounted on opposite sides of the vessel bottom on the control rod drive housings as close as possible to the vessel, two sensors (Channels 3 and 4) are mounted on the reactor recirculation system pump suction lines inside the CPS Drywell, and two sensors (Channels 5 and 6) are mounted on feedwater lines also inside the CPS Drywell.

Description/Cause of Problem

During the recently completed CPS refueling outage (RF-7), regularly scheduled calibration of the Loose Parts Monitoring System utilizing CPS procedure 9437.20, "Loose Parts Detection System Channel Calibration," was performed. (The performance of this procedure satisfies the requirements of ORM Testing Requirement 4.2.10.3, which requires performance of a channel calibration to be performed every 18 months.) To support satisfactory completion of the procedure, maintenance work was performed on three of the six channels (Channels 3, 5, and 6). Prior to calibration attempts,

replacement of the vibration and loose parts monitoring amplifiers was completed for Channels 3 and 5, and a connector was replaced on Channel 3 to address a previous noise issue. Following the repair activities noted above, calibration testing was attempted for Channels 5 and 6. Testing was completed satisfactorily on Channel 5, however, Channel 6 was not satisfactorily completed due to a weak signal and an electrical noise (hum/buzz) being detected. The Channel 6 charge converter was subsequently replaced.

Later during the outage, testing was attempted for Channels 3 and 4, but neither test was satisfactorily completed. The “ping” test methodology was thought to be a possible cause for the unacceptable test results. Additionally, after performance of the test, it was discovered that the instrument (punch) being utilized to perform the “ping” test had a sharp point versus the required rounded tip. The use of the sharp-tipped punch caused potential damage to the piping associated with the Loose Parts Monitoring System sensors. Later during the outage after it had been determined that piping damage had not occurred, “ping” testing was attempted and completed satisfactorily for Channels 1, 2, and 4.

No additional attempts were made to complete testing for Loose Parts Monitoring System Channels 3 and 6. Additional testing for Channels 3 and 6 was not attempted for several reasons. Inconsistent results had been obtained during the performance of the testing described above. Because of these inconsistent results, it was decided to not attempt additional testing because of ALARA concerns (testing is required to be performed in high radiation dose rate areas), concern with regard to potential damage to piping in the area of the Channel 3 and 6 sensors caused by the “ping” test methodology, and the belief that an alternate testing methodology (other than “ping” testing) could be determined for completion of required testing. Subsequent evaluation of the attempts to perform the required calibrations has also shown that CPS procedure 9437.20 lacked sufficient guidance for where to specifically conduct the “ping” test (i.e., where on the associated piping to utilize punches to produce the required “ping”).

Subsequently, the plant entered Mode 2 on November 10, 2000, at 1442 hours, which caused entry into ORM Action 3.2.10 a. which states:

“With one or more loose-part detection system channels inoperable for more than 30 days, prepare and submit a Special Report to the Commission pursuant to Operational Requirement 6.9.2 within the next 10 days outlining the cause of the malfunction and the plans for restoring the channel(s) to Operable status.”

Plans for Restoring Channels to Operable

AmerGen is pursuing several options for resolving the inoperability of Channels 3 and 6. One option is to pursue an alternative calibration methodology for the Loose Parts Monitoring System that will not require the performance of a “ping” test, thus eliminating the ALARA concerns and potential piping damage concerns associated with this test.

Another option being pursued includes the capability to perform the calibration test with the plant on line and that does not require “ping” testing.

These two options are being sought in conjunction with the CPS Loose Parts Monitoring System vendor. If a method is developed to perform the calibration test with the plant on line without a “ping” test, this testing will be performed at the earliest available opportunity. If a new test methodology is developed which does not require a “ping” test, but does require the plant to be shut down to perform, the test will be performed during the next plant shutdown.

A third option being pursued is to eliminate the Loose Parts Monitoring System based upon the BWR Owners’ Group (BWROG) Licensing Topical Report NEDC-32975P, “Regulatory Relaxation for BWR Loose Parts Monitoring Systems,” dated July 2000. The report provides justification for eliminating the LPMS with no impact on safety. AmerGen will monitor BWROG efforts in this regard and implement this alternative following regulatory endorsement of the subject Topical Report.

Currently, four of the six LPMS channels are Operable and functioning properly. Although technically inoperable due to not performing the required channel calibration, Channels 3 and 6 are operating and functional, meaning these channels provide some value and are able to be monitored if a loose part was detected. Despite the inoperabilities of Channels 3 and 6, CPS will continue to perform daily audio monitoring of these channels by Operations, as well as weekly and quarterly audio monitoring by the system manager.