



December 23, 2015
RPT-0380-0058-310, Rev. 0

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Report in Accordance with 10 CFR Part 21

Dear Sir or Madam:

MPR investigated the failure of a replacement timing module that was one of several MPR supplied to the Edwin I. Hatch Nuclear Plant.

The investigation determined that this failure is reportable based on the requirements of 10 CFR Part 21. The attached 10 CFR Part 21 Report provides the required information.

If you have any questions, please contact the undersigned.

Sincerely,

Paul S. Damerell
Principal Officer

Attachment

IE19
NRR



Attachment to
MPR Letter dated
December 23, 2015
RPT-0380-0058-310, Rev. 0

10 CFR Part 21 Report on Replacement Timing Module Failure at Hatch Nuclear Plant

This attachment provides the information required for reporting a defect in accordance with 10 CFR Part 21.

1. Reporting Individual

Paul Damerell, Principal Officer
MPR Associates, Inc.
320 King Street
Alexandria, VA 22314

2. Identification of the Basic Component that Contains a Defect

The basic component that contains a defect is an MPR Model 0380-1103 Timing Module. Six modules are in use at Edwin I. Hatch Nuclear Plant (Plant Hatch) for the three Emergency Diesel Generators (EDGs) at Plant Hatch Unit 2. Eight modules are at Plant Hatch as spares. The modules use a field programmable gate array (FPGA) to implement a specific pre-programmed load shedding and load sequencing logic associated with the standby power source safety function of the Hatch Unit 2 EDGs.

The modules were designed and supplied specifically for use at Plant Hatch Unit 2. There are two modules installed in each EDG. One of the modules implements a timing sequence associated with a Loss of Off Site Power (LOSP). The other module implements a timing sequence associated with a Loss of Coolant Accident (LOCA). Both modules are required to function for the EDG to perform its intended safety functions. Both modules include logic for diagnostics and annunciate an alarm upon failure. The pre-programmed FPGA logic cannot be modified in the field.

The extent of condition evaluation determined that all of the modules supplied to Plant Hatch are affected. The defect results from the selection of a circuit board component and is not associated with the FPGA logic. No other modules of this type were supplied by MPR.

3. Identification of the Supplier

MPR Associates (headquarters in Alexandria, VA) supplied the timing module.

4. Nature of the Defect and the Safety Hazard Created

4.1. Nature of the Defect

MPR Timing Module Part Number 0380-1103, Serial Number 16 failed after operating successfully, along with five other installed modules, for more than eight months. The module failure resulted from a capacitor short in the input power circuit. When the capacitor shorted, the module ceased to function and annunciated its failure in the Main Control Room. The other five installed modules have given no indication of failure to date.

The MPR investigation determined that four paralleled tantalum capacitors in the input power circuit are used beyond the manufacturer's recommendations. The manufacturer recommends use at no more than 50% of the rated voltage. The capacitors are used in an application that applies voltage within the capacitor voltage rating, but above the recommended derated voltage. The design life of the capacitor at the applied voltage cannot be determined with certainty from available data.

Since no life cycle information is available for the installed condition, MPR estimated the mean time between failure (MTBF) for the four paralleled tantalum capacitors based on MIL-HDBK-217F Notice 2. The collective MTBF estimated for the 6 timing modules currently installed at Plant Hatch does not indicate an imminent failure of the modules but does show that there is an increased possibility of module failure within the next 20 months.

The module design was tested extensively as part of the equipment qualification process and during module burn in. The tests bounded the installed operating conditions and verified that the design functions correctly in service. However, the module's design life is now known to be limited by the design life of the capacitors in the input power circuit. Since the design life of the capacitors, and thus the modules, cannot be determined with certainty, MPR concludes the deviation, use of capacitors beyond the manufacturer's recommendations, results in a defect.

4.2. The Safety Hazard Created by the Defect

The failure of one of the modules results in loss of safety function, which adversely impacts the ability to provide emergency power from the EDGs. The EDG loads can still be sequenced manually.

5. Date the Defect Information was Obtained

One of six installed modules failed on October 8, 2015. The failed module was returned to MPR for failure analysis. MPR received the returned item and began troubleshooting activities on October 12, 2015. Troubleshooting activities identified the failed capacitor on October 26, 2015. MPR Condition Report CR-15-178 was written on October 26, 2015 to document the module failure and establish actions to address the failure.

6. Number and Location of these Basic Components Supplied

MPR supplied fourteen Model 0380-1103 timing modules to Plant Hatch. Six are currently installed. Eight items are in storage at Plant Hatch as spares. The failed item was returned to MPR. One of MPR's retained spare modules was provided to Plant Hatch to replace the failed module. Plant Hatch has retained the replacement module as one of the eight spares. No other timing modules were supplied by MPR.


7. Corrective Action Plan

MPR notified Plant Hatch regarding the results of the failure analysis. MPR performed another independent review of the design to determine the adequacy of the other components on the module. This review confirmed that no other tantalum capacitors are used above the manufacturer's recommended derating. The review did not identify any other components that are unsuitable for the application.

MPR identified a replacement capacitor model that is suitable for the application and the application is within the manufacturer's recommendations. MPR is working with Plant Hatch to develop a schedule for rework to restore the expected design life of the timing modules.

8. Advice Given to Purchasers or Licensees

This report generates no additional advice for purchasers or licensees.

QA Approval: 
Michael K. Dunkelberger, QA Director

Date: 12/23/2015

Final Approval: 
Paul S. Damerell, Principal Officer

Date: 12/23/2015