



Entergy Operations, Inc.
17265 River Road
Killona, LA 70057-3093
Tel 504-739-6660
Fax 504-739-6678
mchisum@entergy.com

Michael R. Chisum
Site Vice President
Waterford 3

10 CFR 21.21

W3F1-2014-0069

November 12, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

Subject: Part 21 Report of Time-Delay Relay Failure
Waterford Steam Electric Station, Unit 3 (Waterford 3)
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

Pursuant to 10 CFR 21.21(d)(3)(ii), Entergy is providing the Waterford Steam Electric Station, Unit 3 (Waterford 3) required written notification of the identification of a defect associated with the failure of a time-delay relay. This information was initially reported to the NRC Operations Center on October 15, 2014.

The attachment to this letter provides the information required by 10 CFR 21.21, including details associated with the failure of a certain time-delay relay at Waterford 3.

This report contains no new commitments. Please contact John P. Jarrell, Regulatory Assurance Manager, at (504) 739-6685, if you have questions regarding this information.

Sincerely,


for Mike Chisum
MRC/JDW

Attachment: Waterford 3 Part 21 Report of Allen Bradley 700RTC Relay

cc: Mr. Marc L. Dapas, Regional Administrator
U.S. NRC, Region IV
RidsRgn4MailCenter@nrc.gov

U.S. NRC Project Manager for Waterford 3
Alan.Wang@nrc.gov
Michael.Orenak@nrc.gov

U.S. NRC Senior Resident Inspector for Waterford 3
Frances.Ramirez@nrc.gov
Chris.Speer@nrc.gov

Attachment to

W3F1-2014-0069

Waterford 3 Part 21 Report of Allen Bradley 700RTC Relay

Waterford 3 Part 21 Report of Allen Bradley 700RTC Relay

This written notification information follows the format of and addresses the considerations contained in 10CFR21.21(d)(4)(i)-(ix).

I. Name and Address

Michael R. Chisum
17265 River Road
Killona, LA 70057

II. Facility, Activity or Component

The basic component is an electrical relay. Allen Bradley 700RTC relays installed at Waterford Steam Electric Station, Unit 3 (Waterford 3) susceptible to the deviation are used in monitoring undervoltage conditions for the 3A3, 3B3, 3A31, and 3B31 safety related electrical buses, as well as other applications, such as time delay relays for starting Engineered Safety Features Actuation Signal (ESFAS) equipment.

III. Constructor or Supplier

The basic component containing a defect was provided by QualTech NP as the qualifying vendor of the Allen Bradley manufactured 700RTC relay. QualTech NP has been notified of the 10CFR Part 21 notification and provided failure analysis documentation.

IV. Defect and Safety Hazard

Nature of the defect:

Waterford 3 has experienced unexpected automatic starting of control room ventilation equipment on 4/23/2014 and 4/25/2014. The direct cause of the unexpected actuations of the equipment was determined to be the failure of an Allen Bradley model 700RTC relay, EG EREL2342 H. The failure of the associated relays caused the equipment to perform its required safety function. The relay, EG EREL2342 H, was replaced on 04/26/14 due the relay LED lamp being found off with power on the relay coil terminals. No additional auto starts of the associated control room ventilation equipment have been reported after the relay replacement.

Independent failure analysis performed by Southwest Research Institute (SwRI) on an Allen Bradley model 700RTC00110U1 relay that failed in service at Waterford 3 identified the relay's L22 coil was electrically open. Detailed destructive analysis of L22 coil revealed corrosion of the winding in multiple locations near the start-end terminal and in the bobbin-flange slot for the start-end winding pigtail. At one point near the start end of the winding there was a corrosion-induced open circuit in one of the coil-winding turns. Corrosion products removed from various locations near the failure site on L22 coil contained significant concentrations of chlorine. The independent failure analysis concluded the in-plant failure observed at Waterford 3 was caused by corrosion near the start end of the relay's L22 coil winding. Source of the corrosive material that damaged

the winding was not apparent, but it is likely that it was introduced during manufacture of the coil based on review of storage practices at WF3. The qualifying vendor (Qual Tech NP) has been contacted and they have provided the completed failure analysis to the manufacturer (Allen Bradley).

Safety hazard which could have been created:

Four Allen Bradley 700RTC relays susceptible to the deviation are used in monitoring undervoltage conditions for the 3A3, 3B3, 3A31, and 3B31 safety related electrical buses. If an undervoltage condition occurs, then these relays provide a "Bus Voltage Lost" alarm. This "Bus Voltage Lost" alarm will be actuated if a failure of one of the Allen-Bradley relays listed above occurs while the bus remains energized. Additionally, if an undervoltage condition occurs concurrent with a Loss of Offsite Power or concurrent with a Safety Injection Actuation Signal while the Emergency Diesel Generator Load Sequencer is between the S3 and S8 load blocks (192 seconds), then the failure of these relays will initiate a sequencer lock out and the white "Lock Out" light for the sequencer will be lit. Under this scenario, the Emergency Diesel Generator will automatically start and come up to rated voltage within 10 seconds. Once the sequencer detects the bus is at full rated voltage after a Loss of Offsite Power, it will begin to sequence on loads. During the loading sequence, if the observed failure mode occurs between the S3 and S8 load block, then the lockout feature will be active. All loads previously sequenced on, prior to the lockout, will remain running. At the point of coil failure of the relay, no further automatic loading will occur. The relay failure at Waterford 3 occurred after being in service only three to four months. The under voltage relays listed above have been installed for over five months. The relays installed in the 3A3, 3B3, 3A31, and 3B31 safety related electrical buses could have been susceptible to this condition if a relay with this deviation were installed in these applications. In this instance, the relays could prevent safety functions from being accomplished due to Engineering Safety Features equipment not receiving power in the time sequence assumed by the safety analysis, and thus could have created a substantial safety hazard.

V. Date

On 10/10/2014, Engineering evaluation determined the Deviation could create a Substantial Safety Hazard, as defined in 10CFR21, and subsequently provided the Site Vice President (responsible officer) information of the Defect two working days later, on 10/14/2014. NRC Headquarters Operations Center was notified by telephone on 10/15/2014 (Ref. EN#50539).

VI. Location and Number of Defective Components

Thirty three (33) Allen Bradley 700RTC relays are installed at Waterford 3. These applications are used in monitoring undervoltage conditions for the 3A3, 3B3, 3A31, and 3B31 safety related electrical buses, as well as other applications, such as time delay relays for starting Engineered Safety Features Actuation Signal (ESFAS) equipment.

Only one Allen Bradley 700RTC relay has been identified with this Deviation and associated failure mode.

VII. Corrective Action

The failed Allen Bradley 700RTC relay (EG EREL2342 H) was replaced by Entergy's Electrical Maintenance organization at Waterford 3 as of 4/26/2014.

Perform an Engineering Study to determine possible solution to resolve Allen Bradley 700RTC relay failures that have occurred at Waterford 3. Issue additional actions to implement the results of the engineering study to resolve Allen Bradley 700RTC relay failures at Waterford 3. This action is to be performed by Entergy's Engineering organization at Waterford 3 and is due by 1/15/2015.

VIII. Advice

None.

IX. Early Site Permit

This is not an early site permit concern.