

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

February 17, 2016

NRC INFORMATION NOTICE 2016-01: RECENT ISSUES RELATED TO THE  
COMMERCIAL GRADE DEDICATION OF ALLEN  
BRADLEY 700-RTC RELAYS

## ADDRESSEES

All holders of an operating license or construction permit for a nuclear power reactor under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," except those that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

All holders of and applicants for a power reactor early site permit, combined license, standard design approval, or manufacturing license under 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." All applicants for a standard design certification, including such applicants after initial issuance of a design certification rule.

All contractors and vendors that supply basic components to U.S. Nuclear Regulatory Commission (NRC) licensees under 10 CFR Part 50 or 10 CFR Part 52.

## PURPOSE

The NRC is issuing this information notice (IN) to inform addressees about recent issues related to the commercial grade dedication (CGD) of Allen Bradley 700-RTC time delay relays, which the manufacturer redesigned to use a complex programmable logic device (CPLD). The dedicating entities, as defined in 10 CFR 21.3, "Definitions," did not identify this design change, and as a result, failed to evaluate it as required by 10 CFR Part 50 Appendix B Criterion III, "Design Control." The NRC expects that recipients of this information notice will review the information for applicability to their facilities, and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

## DESCRIPTION OF CIRCUMSTANCES

On May 20, 2015, Duke Energy, the licensee for the Brunswick Steam Electric Plant (BSEP) submitted Licensee Event Report (LER) 325/2015-002, "Emergency Diesel Generator Loss of Safety Function," (Agencywide Documents Access and Management System (ADAMS) Accession No. [ML15149A148](#)) to the NRC. On November 16, 2015, the licensee submitted Revision 1 to LER 325/2015-002 (ADAMS Accession No. [ML15329A374](#)), which among other things, reflected a change in the corrective actions. Following an engineering evaluation, the licensee determined that for a period of 12 minutes on March 21, 2015, during an emergency

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diesel generator (EDG) loading test, EDGs 3 and 4 could simultaneously have been unable to tie to their respective emergency busses. This was due to Allen Bradley 700-RTC time delay relays in the breaker control logic that were susceptible to electrical noise from electrically connected or nearby relays de-energizing, which could have prevented the output breakers from properly closing under certain conditions. The NRC considers this a loss-of-safety-function of the onsite standby alternating current power source. The licensee implemented corrective actions that included the installation of transient voltage suppressors across all four EDG relays. Following this event, the licensee issued a 30-day notification to the NRC following the requirements of 10 CFR 21.21, "Notification of failure to comply or existence of a defect and its evaluation," (ADAMS Accession No. [ML15196A034](#)). In this notification, the licensee identified that the newer Allen Bradley 700-RTC time delay relays contain an unevaluated CPLD. The incorporation of this CPLD was an unpublished design change that was implemented to replace an integrated circuit chip, and did not result in a part number change.

NRC Problem Identification and Resolution Inspection Report 05000325/2015007 and 05000324/2015007 (ADAMS Accession No. [ML15210A725](#)), dated July 29, 2015, identified that the licensee purchased and dedicated the relays using a material evaluation performed in 1999. This material evaluation relied, in part, on dimensional and configuration checks to ensure that no unforeseen design changes had occurred. The purchase specification for the commercial grade component failed to identify a critical characteristic that needed to be verified for this relay, (i.e., no inadvertent change in state). Allen Bradley's design change to replace an integrated circuit with a different type of component introduced a new failure mechanism for the relay's safety function. The NRC requires that dedicating entities identify and evaluate such a design change as part of their CGD processes. The aforementioned LER provides more information on the specifics of the BSEP event, whereas the references mentioned in the background section provide additional information associated with the development, selection, and testing of important critical characteristics when utilizing a CGD process.

In addition to BSEP, three additional dedicating entities (AZZ/ Nuclear Logistics, Inc., Nutherm International, and United Controls International) informed the NRC through 10 CFR 21.21 notifications (ADAMS Accession Nos. [ML15134A016](#), [ML15161A230](#), and [ML15205A293](#)) that they had supplied similar Allen Bradley 700-RTC time delay relays to licensees without identifying a design change that introduced the potential for a new failure mechanism.

## **BACKGROUND**

Regulations in 10 CFR Part 21, "Reporting of Defects and Noncompliance," define CGD, in part, as an acceptance process undertaken to provide reasonable assurance that a commercial grade item used as a basic component will perform its intended safety function, and in this respect, is deemed equivalent to an item designed and manufactured under a quality assurance program that meets the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." This assurance is achieved by identifying the critical characteristics of the item, and verifying their acceptability by inspections, tests, or analyses performed by the purchaser or third-party dedicating entity.

Regulations in 10 CFR Part 50 Appendix B, Criterion III, "Design Control" require, in part, subjecting design changes to control measures commensurate with those applied to the original design.

#### Related NRC Generic Communications

Information Notice 2014-11, "Recent Issues Related to the Qualification and Commercial Grade Dedication of Safety-Related Components" (ADAMS Accession No. [ML14149A520](#)), informs addressees of issues identified during NRC vendor inspections with the qualification and CGD of safety-related replacement components.

Information Notice 2011-01, "Commercial-Grade Dedication Issues Identified During NRC Inspections" (ADAMS Accession No. [ML103220180](#)), summarizes the NRC staff's observations and findings during vendor inspections in the area of CGD, as it applies to operating reactors.

Information Notice 1994-20, "Common-Cause Failures Due to Inadequate Design Control and Dedication" (ADAMS Accession No. [ML031060589](#)), describes a common cause failure (CCF) of an EDG load sequencer after the replacement of electromechanical time delay relays with microprocessor-based time delay relays. The incident illustrates that a digital replacement can produce a new susceptibility to CCF. In this case, the CGD did not adequately consider the in-service environment to demonstrate the compatibility of the replacement component with the operating environment.

Generic Letter 1991-05, "Licensee Commercial-Grade Procurement and Dedication Programs" (ADAMS Accession No. [ML031140508](#)), expresses staff positions regarding certain aspects of licensee commercial grade procurement, and dedication programs which would provide acceptable methods to meet regulatory requirements.

Generic Letter, 1989-02, "Actions to Improve the Detection of Counterfeit and Fraudulently Marketed Products" (ADAMS Accession No. [ML031140060](#)), describes the NRC staff's perspective on good practices in procurement and dedication. The generic letter (GL) also provided the NRC's conditional endorsement of the guidelines contained in Electric Power Research Institute NP-5652, "Guideline for the Utilization of Commercial-Grade Items in Nuclear Safety-Related Applications," issued in June 1988, for evaluating commercial grade products for suitability for use in safety-related applications.

#### **DISCUSSION**

According to the requirements of 10 CFR Part 21, the CGD process is undertaken to provide reasonable assurance that the relays will perform their intended safety functions, and in this respect, are deemed equivalent to relays designed and manufactured under a 10 CFR Part 50, Appendix B, quality assurance program. This assurance is achieved by identifying the critical characteristics of the relays and verifying their acceptability by inspections, tests, or analyses performed by the purchaser or third-party dedicating entity. For over two decades, the nuclear industry has been applying the CGD process to Allen Bradley 700-RTC time delay relays for use in safety-related applications at various nuclear facilities. At some point in time, the design of the Allen Bradley 700-RTC time delay relay was changed by the original equipment

manufacturer (OEM) in order to replace a solid-state integrated circuit logic chip with a CPLD. This design change introduced the potential for new failure mechanisms such as greater susceptibility to electrical noise, and may have invalidated the relay's ability to meet certain critical characteristics (e.g., no inadvertent change in state).

This event highlights the challenges that occur when dedicating entities rely, without proper verification, on commercial OEM's design controls, such as a part number, to conclude that internal components have remained unchanged. The CGD process of the modified relays performed by various dedicating entities failed to detect the design change described above, which prevented evaluating its impact on the safety of the affected plants as required by Criterion III, "Design Control" of 10 CFR Part 50 Appendix B and 10 CFR Part 50.59, "Changes, tests and experiments". As a result, the CGD of the modified relays did not identify and address the new failure mechanisms associated with the design change. According to the related 10 CFR Part 21 notifications submitted to the NRC, the design change was not detected by the dedicating entities because the part number and the external physical dimensions of the relays remained the same. Both GL 1989-02 and GL 1991-05 referenced above, state that reliance on part number verification and certification documentation is insufficient to ensure the quality of procured products.

The references mentioned in the background section of this IN provide additional information associated with the development, selection, and testing of important critical characteristics when utilizing a CGD process.

## CONTACT

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation or Office of New Reactors project manager.

**/RA/**

**/RA/**

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