

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

September 19, 2014

NRC INFORMATION NOTICE 2014-11: RECENT ISSUES RELATED TO THE  
QUALIFICATION OF SAFETY-RELATED  
COMPONENTS

**ADDRESSEES**

All holders of and applicants for a specific source material license under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 40, "Domestic Licensing of Source Material."

All holders of and applicants for a construction permit or an operating license for a nonpower reactor (research reactor, test reactor, or critical assembly) or a medical isotope production facility under 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," except those that have permanently ceased operations.

All holders of an operating license or construction permit for a nuclear power reactor issued under 10 CFR Part 50, except those who 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 directly or indirectly supply basic components to U.S. Nuclear Regulatory Commission (NRC) licensees under 10 CFR Part 50 or 10 CFR Part 52.

All holders of and applicants for a fuel cycle facility license under 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material."

All holders of and applicants for a special nuclear material license authorizing the possession, use, or transport of formula quantities of strategic special nuclear material under 10 CFR Part 70.

All holders of and applicants for a gaseous diffusion plant certificate of compliance or an approved compliance plan under 10 CFR Part 76, "Certification of Gaseous Diffusion Plants."

**ML14149A520**

## PURPOSE

The NRC is issuing this information notice (IN) to inform addressees of issues identified during NRC vendor inspections with the qualification<sup>1</sup> of safety-related replacement components. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. The NRC acknowledges that many nonreactor facilities (such as those licensed or certified under 10 CFR Parts 40, 70, or 76) have quality assurance requirements and terminology that may differ from those applicable to nuclear power plants<sup>2</sup>. These licensees should review the content of the IN for awareness and consider the applicability of the circumstances described in the IN to ensure the availability and reliability of components that are relied upon for the safe operation of nonreactor facilities. Suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

## BACKGROUND

Criterion III, “Design Control,” of Appendix B of 10 CFR Part 50, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” requires that measures be established for the selection of parts and equipment essential to the safety-related functions of structures, systems, and components. Criterion III also requires that measures be established for verifying the adequacy of the design, such as by the performance of design reviews, by the use of alternate or simplified calculation methods, or by the performance of a suitable testing program. Vendors and contractors that supply safety-related components to licensees adhere to this requirement, when imposed on them by NRC licensees.

The NRC also has more specific requirements related to the qualification of certain classes of safety-related equipment. Vendors and contractors that supply safety-related components to licensees adhere to these requirements, when imposed on them by NRC licensees. These requirements include, but are not limited to:

- 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants,” which states that each item of electric equipment important to safety must be qualified by one of the following methods:

(1) Testing an identical item of equipment under identical

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<sup>1</sup> Qualification, as used in this notice, includes all testing and analysis required by NRC regulations as necessary to demonstrate that equipment and components can be relied upon to perform their intended safety function under all design basis conditions. Equipment qualification includes testing and analysis in areas such as functional, environmental, seismic, and radio electromagnetic/frequency interference (EMI/RFI).

<sup>2</sup> With regard to facilities licensed or certified under 10 CFR Parts 40, 70, or 76, (1) Appendix B to 10 CFR Part 50 applies only to facilities that engage in plutonium processing and fuel fabrication under 10 CFR Part 70, and (2) terms such as “items relied on for safety” are used in lieu of “safety-related.”

conditions or under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

(2) Testing a similar item of equipment with a supporting analysis to show that the equipment to be qualified is acceptable.

(3) Experience with identical or similar equipment under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

(4) Analysis in combination with partial type test data that supports the analytical assumptions and conclusions.

- Appendix A to 10 CFR Part 50, “General Design Criteria for Nuclear Power Plants,” General Design Criterion 2, “Design Bases for Protection Against Natural Phenomena,” which states in part, “Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions.”
- Appendix A to 10 CFR Part 100, “Seismic and Geologic Siting Criteria for Nuclear Power Plants,” Paragraph VI, “Application to Engineering Design”, which states in part:

The engineering method used to insure that the required safety functions are maintained during and after the vibratory ground motion associated with the Safe Shutdown Earthquake shall involve the use of either a suitable dynamic analysis or a suitable qualification test to demonstrate that structures, systems, and components can withstand the seismic and other concurrent loads, except where it can be demonstrated that the use of an equivalent static load method provides adequate conservatism.

Industry standards that apply to the design and qualification of safety-related equipment include:

- ASME Standard QME-1-2007, “Qualification of Active Mechanical Equipment Used in Nuclear Power Plants.”
- Electrical Power Research Institute, “Critical Characteristics for Acceptance of Seismically Sensitive Items (CCASSI),” Product ID TR-112579, dated March 19, 2007.
- Institute of Electrical and Electronics Engineers (IEEE) Std. 323-1974, “Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations.”
- IEEE Std. 344-1974, “Seismic Qualification of Equipment for Nuclear Power Generating Stations.”

NRC guidance documents that apply to the design and qualification of safety-related equipment include:

- IN 2014-04, “Potential for Teflon<sup>®</sup> Material Degradation in Containment Penetrations, Mechanical Seals and Other Components.”
- Regulatory Guide (RG) 1.29, “Seismic Design Classification,” dated March 2007.
- RG 1.89, “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants,” dated June 1984.
- RG 1.100, “Seismic Qualification of Electrical and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants,” dated September 2009.
- RG 1.180, “Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems,” dated October 2003.
- RG 1.209, “Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants,” dated March 2007.

To ensure compliance with the above regulations, industry standards, and regulatory guidance, licensees require that their vendors and contractors provide reasonable assurance that the supplied safety-related equipment meets system performance requirements. To accomplish these objectives, vendors perform testing and analyses that form the basis for the equipment qualification.

## **DESCRIPTION OF CIRCUMSTANCES**

During recent vendor inspections, the NRC identified deficiencies in certain aspects of vendors’ qualification programs. The following examples associated with the qualification of safety-related equipment were identified during recent NRC vendor inspections. In response to the NRC-identified issues, the vendors entered the issues into their corrective action programs<sup>3</sup> and took appropriate corrective measures.

1. On June 8, 2012, an NRC vendor inspection identified that Nuclear Logistics, Inc. had not established sufficient design controls for EMI/RFI qualification testing of safety-related pressure and flow transmitters. Additional information appears in NRC Vendor Inspection Report 99901298/2012-201, dated July 3, 2012, on the NRC’s public

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<sup>3</sup> The details regarding the identified issues and the associated vendor responses can be found on the NRC’s public Web site at <http://www.nrc.gov/reactors/new-reactors/oversight/quality-assurance/vendor-insp/insp-reports.html>.

Web site in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML12179A375.

2. On May 18, 2012, an NRC vendor inspection identified that Kinectrics had not taken sufficient actions to verify the applicability of previous testing to their supply of circuit breakers to be used in safety-related applications. Additional information appears in NRC Vendor Inspection Report 9901415/2012-201, dated July 2, 2012, on the NRC's public Web site in ADAMS under Accession No. ML12179A413.
3. On March 7, 2013, an NRC vendor inspection identified that Scientech, a subsidiary of the Curtiss-Wright Flow Control Company, had not taken sufficient actions to verify that previous seismic qualification testing remained valid for production modules that contained seismically sensitive relays for use in safety-related applications. Additional information appears in NRC Vendor Inspection Report 99901320/2013-201, dated April 5, 2013, on the NRC's public Web site in ADAMS under Accession No. ML13093A071.
4. On March 21, 2013, an NRC inspection identified that Meggitt Safety Systems, Inc. had not established sufficient design control parameters for the electrical testing of relays. Additional information appears in NRC Vendor Inspection Report 99901421/2013-201, dated May 7, 2013, on the NRC's public Web site in ADAMS under Accession No. ML13119A278.
5. On August 23, 2013, an NRC inspection identified that Argo Turboserve Corporation Nuclear-NY had not established appropriate measures for controlling material changes for environmentally qualified replicate interface boxes. Additional information appears in NRC Vendor Inspection Report 99901429/2013-201, dated October 7, 2013, on the NRC's public Web site in ADAMS under Accession No. ML13267A284.

## **DISCUSSION**

This IN provides examples where vendors had not implemented sufficient controls to verify that safety-related equipment supplied for use in nuclear power plants was qualified to meet its design requirements. In these examples, the vendors were unable to provide reasonable assurance that the supplied equipment would operate on demand and would meet its performance requirements for the designed life of the components and under the full range of operating conditions, up to and including design-basis accident conditions.

During recent inspections, the NRC identified issues with the implementation of processes used by vendors to qualify components to perform their safety functions. The NRC had identified issues both at original equipment manufacturers (OEMs) and at non-OEM or third-party suppliers. In some examples, the NRC staff identified issues associated with the applicability of the past qualification testing to the recently supplied components.

With regard to components supplied by OEMs, the NRC identified instances where the OEM had not maintained sufficient design controls for the specific components, as necessary to

establish the validity of past qualification testing to the components currently being supplied. This includes controls to evaluate changes to the material, design, or manufacturing of applicable components.

For replacement components no longer available from an OEM, non-OEM suppliers often procure components as commercial grade items (CGIs) and then qualify the components to perform their intended safety functions as part of a commercial grade dedication (CGD) process<sup>4</sup>. The dedication process includes verification of the component's critical characteristics, including functional, environmental, seismic, and EMI/RFI capability as well as other applicable qualification requirements specific to the component's application. In some instances, the verification process credits testing or analysis that was performed previously for similar components. The NRC has identified examples where this previous qualification testing and analysis was improperly applied, as similarity between the previously tested and the currently supplied components was not established. This is of particular concern for commercial grade items, as changes made by a commercial OEM could impact the component's qualification and could go undetected.

The NRC has provided guidance for the implementation of acceptable processes for the qualification of components to perform their safety functions in various documents, as listed in the "BACKGROUND" section of this IN. For example, the NRC staff accepted ASME Standard QME-1-2007 in RG 1.100 (revision 3) for the qualification of mechanical equipment used in nuclear power plants with applicable conditions. The process described in ASME QME-1-2007 as accepted in RG 1.100 (revision 3) may be applied to mechanical equipment to be used in a nuclear power plant regardless of the equipment's origin as a safety-related component or a CGI. As discussed in this IN, inadequate implementation of the CGD process might result in

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<sup>4</sup> As defined in 10 CFR 21.3:

*Dedication.* (1) When applied to nuclear power plants licensed pursuant to 10 CFR Part 30, 40, 50, 60, dedication is an acceptance process undertaken to provide reasonable assurance that a commercial grade item to be 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 10 CFR Part 50, appendix B, quality assurance program. 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 after delivery, supplemented as necessary by one or more of the following: commercial grade surveys; product inspections or witness at holdpoints at the manufacturer's facility, and analysis of historical records for acceptable performance. In all cases, the dedication process must be conducted in accordance with the applicable provisions of 10 CFR Part 50, appendix B. The process is considered complete when the item is designated for use as a basic component.

(2) When applied to facilities and activities licensed pursuant to 10 CFR Parts 30, 40, 50 (other than nuclear power plants), 60, 61, 63, 70, 71, or 72, dedication occurs after receipt when that item is designated for use as a basic component.

CGIs not being properly qualified to perform their safety functions. Particular attention to this potential concern is necessary when an item will be qualified by an entity other than the OEM where potential changes to the component design might impact its qualification. Therefore, care must be taken to ensure that replacement components are qualified to perform their safety functions prior to installation in a nuclear power plant.

The references mentioned in the background section of this IN could assist vendors and contractors with the development and selection of important critical characteristics on qualification testing.

The NRC expects that recipients will review the information, links, and references provided in this IN for applicability and consider actions, as appropriate, for their facilities to avoid similar problems. However, no specific action or written response to the NRC is required for this IN.

## **CONTACT**

This IN requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below.

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CGI. As discussed in this IN, inadequate implementation of the CGD process might result in CGIs not being properly qualified to perform their safety functions. Particular attention to this potential concern is necessary when an item will be qualified by an entity other than the OEM where potential changes to the component design might impact its qualification. Therefore, care must be taken to ensure that replacement components are qualified to perform their safety functions prior to installation in a nuclear power plant.

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