

September 17, 2014

Ms. Adrienne Smith  
Quality Assurance Manager  
501 South 11th Street  
Mount Vernon, IL 62864

SUBJECT: NUCLEAR REGULATORY COMMISSION INSPECTION OF NUTHERM  
INTERNATIONAL, INC. REPORT NO. 99900779/2014-201 AND NOTICE OF  
NONCONFORMANCE

Dear Ms. Smith:

On August 4 to August 8, 2014, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the Nutherm International, Inc. (Nutherm) facility in Mount Vernon, IL. The purpose of the limited-scope inspection was to assess Nutherm's compliance with the provisions of selected portions of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 21, "Reporting of Defects and Noncompliance."

This inspection specifically evaluated Nutherm's qualification and commercial-grade dedication (CGD) of class 1E components supplied to U.S. operating reactor plants. The enclosed report presents the results of this inspection. This NRC inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

Based on the results of this inspection, the NRC inspection team found that the implementation of your QA program did not meet certain NRC requirements imposed on you by your customers or NRC licensees in the area of design control. Specifically, Nutherm failed to perform an engineering evaluation to justify how a design change on a level switch was still bounded by the initial seismic qualification. In addition, Nutherm failed to translate contract requirements into test procedures associated with the testing of certain safety-related components. Furthermore, Nutherm failed to qualify direct current (DC) starter panels under the most severe test sequence specified by the Institute of Electrical and Electronics Engineers (IEEE) 323-1974, "Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations." Lastly, Nutherm did not identify or verify critical characteristics in their CGD of Global Testing Laboratories or Elite Electronics Engineering that would ensure that either commercial testing laboratory would have the capabilities necessary to perform the requirements of the electromagnetic interference (EMI) / radio-frequency interference (RFI) standards requested through Nutherm's purchase orders. The specific findings and references to the pertinent requirements are identified in the enclosures to this letter.

Please provide a written statement or explanation within 30 days from the date of this letter in accordance with the instructions specified in the enclosed Notice of Nonconformance. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC's Public Document Room or through the NRC's document system, Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

Sincerely,

Richard A. Rasmussen, Chief **/RA/**  
Electrical Vendor Inspection Branch  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

Docket No.: 99900779

Enclosures:

1. Notice of Nonconformance
2. Inspection Report 99900779/2014-201  
and Attachment

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC's Public Document Room or through the NRC's document system, Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>. To the extent possible, your response should not include any personal privacy, proprietary, or Safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material is withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

Sincerely,

Richard A. Rasmussen, Chief **/RA/**  
 Electrical Vendor Inspection Branch  
 Division of Construction Inspection  
 and Operational Programs  
 Office of New Reactors

Docket No.: 99900779

Enclosures:

1. Notice of Nonconformance
2. Inspection Report 99900779/2014-201 and Attachment

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<b>DATE</b>	09/05/14	09/17/2014	09/15/2014

## NOTICE OF NONCONFORMANCE

Nutherm International, Inc.  
501 South 11th Street  
Mount Vernon, IL 62864

Docket No.: 99900779  
Report No.: 99900779/2014-201

Based on the results of a Nuclear Regulatory Commission (NRC) inspection conducted at the Nutherm International, Inc. (Nutherm) facility in Mount Vernon, IL, on August 4–8, 2014, certain activities were not conducted in accordance with NRC requirements which were contractually imposed on Nutherm by NRC licensees:

- A. Criterion III, "Design Control," of Appendix B to Title 10 of the Code of Federal Regulation (10 CFR) Part 50 states, in part, that "The design control measures shall provide for verifying or checking the adequacy of 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."

Contrary to this, Nutherm failed to verify the adequacy of a design change on a level switch for purchase order (PO) 4500731551 for Public Service Enterprise Group (PSEG). Specifically, Nutherm did not perform an adequate engineering evaluation to justify how a design change on a level switch, from a weld to a fitting, was evaluated and is bounded by initial seismic qualification.

This issue has been identified as Nonconformance 99900779/2014-201-01.

- B. Criterion III, "Design Control," of Appendix B to Title 10 of the Code of Federal Regulation (10 CFR) Part 50 states, in part, that, "Measures shall be established to assure that applicable regulatory requirements and the design basis... are correctly translated into specifications, drawings, procedures, and instructions."

Contrary to this, Nutherm failed to translate contract requirements into test procedures associated with the testing of a transfer switch associated with PO 00406653 and an isolation system associated with PO 734527. Both POs stated that Nutherm test procedures shall be used for electromagnetic compatibility (EMC) testing. Nutherm's test procedures for EMC testing were written in accordance with Electric Power Research Institute (EPRI) technical report TR-102323, "Guidelines for Electromagnetic Interference Testing in Power Plants," Revision 2. The EPRI standard requires specific International Electrotechnical Commission (IEC) standards and revisions to ensure that the EMC testing is performed in accordance with specific criteria. Since Nutherm did not explicitly state the proper IEC revisions as referenced by the EPRI guidance in their test procedures, the commercial labs that performed the testing used different revisions of the IEC standards. In both cases there was no documentation of test set ups and other variables that may have changed in the standards and no technical evaluation to ensure that the differences were accounted for and bounded by the EPRI requirements in the licensee POs.

This issue has been identified as Nonconformance 99900779/2014-201-02

- C. Criterion III, "Design Control," of Appendix B to Title 10 of the Code of Federal Regulation (10 CFR) Part 50 states, "Where a test program is used to verify the adequacy of a specific design feature in lieu of other verifying or checking processes

Enclosure

it shall include suitable qualifications testing of a prototype unit under the most adverse design conditions.”

Contrary to this, Nutherm failed to qualify direct current (DC) starter panels under the most severe test sequence specified by the Institute of Electrical and Electronics Engineers (IEEE) 323-1974, “Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations.” Specifically, Florida Power & Light (Turkey Point) PO 02312805 stated that the DC starter panels would be qualified in accordance with IEEE 323-1974. IEEE 323-1974, Section 6.3.2, “Test Sequence” paragraph (7) states that the equipment shall be operated while exposed to the simulated post-accident conditions (following exposure to accident conditions).” Since Turkey Point did not provide specific post-accident conditions, Nutherm performed a final baseline test of the panels at normal operating conditions to satisfy this condition. However, since accident conditions are 212 F and 100% humidity and the normal conditions are 104 F and humidity is assumed to be non condensing, testing at the normal conditions does not satisfy the most adverse test sequence specified in IEEE 323-1974; nor was a justification provided to show that operating the panels at normal operating conditions after the design basis accident is more severe or equal to operating the panels at simulated post-accident conditions after the design basis accident.

This issue has been identified as Nonconformance 99900779/2014-201-03.

- D. Criterion III, “Design Control,” of Appendix B to Title 10 of the Code of Federal Regulation (10 CFR) Part 50 states, in part, that, “Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems, and components.”

Contrary to the above, Nutherm failed to establish adequate measures for the selection and review for suitability of processes performed at Global Testing Laboratories and Elite Electronics Engineering that are essential to the safety-related functions of the structures, systems, and components. Specifically, Nutherm did not identify or verify critical characteristics in their commercial grade dedication that would ensure that either commercial testing laboratory would have the capabilities necessary to perform the requirements of the electromagnetic interference (EMI) / radio-frequency interference (RFI) standards requested through Nutherm and licensee purchase orders.

This issue has been identified as Nonconformance 99900779/2014-201-04.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Electrical Vendor Inspection Branch, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a “Reply to a Notice of Nonconformance” and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken to avoid noncompliance’s; and (4) the date when your corrective action will be completed. Where good cause is shown, consideration will be given to extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or through the NRC's Agencywide Documents Access and Management System (ADAMS), accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>, to the extent possible, it should not include any personal privacy, proprietary, or safeguards Information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request withholding of such material, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If safeguards information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21.

Dated this the 17th day of September 2014.

**U.S. NUCLEAR REGULATORY COMMISSION  
OFFICE OF NEW REACTORS  
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS  
VENDOR INSPECTION REPORT**

Docket No.: 99900779

Report No.: 99900779

Vendor: Nutherm International, Inc.  
501 South 11th Street  
Mount Vernon, IL 62864

Vendor Contact: Ms. Adrienne Smith, Quality Assurance Manager  
[adrienne.smith@nutherm.com](mailto:adrienne.smith@nutherm.com)

Background: The Nutherm facility is located in Mount Vernon, IL. This facility provides Class 1E components for safety-related applications to operating U.S. nuclear power plants. This facility is involved with the repair, qualification, electromagnetic and radio-frequency interference (EMI/RFI) compatibility, and commercial-grade dedication activities associated with electrical and instrumentation equipment.

Inspection Dates: August 4-8, 2014

Inspection Team Leader: Stacy Smith NRO/DCIP/EVIB

Inspectors: Eugene Huang NRO/DCIP/EVIB  
Annie Ramirez NRO/DCIP/EVIB  
Nicholas Savwoir NRO/DCIP/EVIB

Approved by: Richard A. Rasmussen, Chief  
Electrical Vendor Inspection Branch  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

## **EXECUTIVE SUMMARY**

Nutherm International, Inc.  
99900779/2014-201

The U.S. Nuclear Regulatory Commission (NRC) conducted this vendor inspection to verify that Nutherm International, Inc.'s (hereafter referred to as Nutherm) implemented an adequate quality assurance (QA) program that complies with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," and 10 CFR Part 21, "Reporting of Defects and Noncompliance."

This inspection specifically evaluated Nutherm's qualification and commercial-grade dedication (CGD) of class 1E electrical and instrumentation components supplied to U.S. operating reactor plants. The NRC inspection team reviewed the environmental and seismic qualifications of a sample of components and observed testing and CGD activities performed during the inspection. In addition, the inspection team reviewed Nutherm's nonconformance, corrective action, and 10 CFR Part 21 programs. The NRC conducted this inspection at Nutherm facility in Mount Vernon, IL.

The following regulations served as the bases for this NRC inspection:

- Appendix B to 10 CFR Part 50
- 10 CFR Part 21

Inspection procedures (IP) to be used include IP 43002, "Routine Inspections of Nuclear Vendors," IP 43004, "Inspection of Commercial-Grade Dedication Programs," and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance."

The information below summarizes the results of this inspection.

### **10 CFR Part 21**

The inspectors determined that Nutherm appropriately translated the requirements of 10 CFR Part 21 into their implementing procedures and, for those activities that the inspectors reviewed, implemented them as required. No findings of significance were identified.

### **Design Control and Qualification**

The NRC inspectors determined that Nutherm did not adequately implement the programs used to qualify and test class 1E electrical and instrumentation components to satisfy the regulatory requirements in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC issued Nonconformance 99900779/2014-201-01, for Nutherm's failure to perform an engineering evaluation to justify how a design change on a level switch, from a weld to a fitting, was evaluated and is bounded by initial seismic qualification. In addition, the NRC inspection team issued Nonconformance 99900779/2014-201-02, for Nutherm's failure to properly translate contract requirements into test procedures associated with the testing of certain safety-related components. Furthermore, the NRC issued Nonconformance 99900779/2014-201-03, for Nutherm's failure to qualify DC starter panels under the most severe test sequence specified by the Institute of Electrical and Electronics Engineers (IEEE) 323-1974.

### Commercial-Grade Dedication

The inspectors determined that Nutherm's CGD program for the assembly, inspection and testing were consistent with the regulatory requirements of Criterion X, "Inspection," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. However, the inspectors determined that Nutherm did not adequately implement the programs used to dedicate services in accordance Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99900779/2014-201-04, for Nutherm's failure to identify or verify critical characteristics in their CGD of Global Testing Laboratories and Elite Electronics Engineering that would ensure that either commercial testing laboratory would have the capabilities necessary to perform the requirements of electromagnetic interference (EMI) / radio-frequency interference (RFI) standards requested through Nutherm's purchase orders (POs).

### Procurement Document Control and Oversight of Contracted Activities

The NRC inspection team determined that the implementation of Nutherm's programs for governing the oversight of contracted activities and procurement processes to verify compliance was consistent with the requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

### Measuring and Test Equipment

The NRC inspectors concluded that Nutherm has established a program that adequately controls calibration and use of measuring and test equipment (M&TE) in accordance with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

### Nonconformances and Corrective Actions

The inspectors determined that the implementation of Nutherm's programs for control of nonconforming material, parts, or components and corrective action were consistent with the regulatory requirements in Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

## **REPORT DETAILS**

### **1. 10 CFR Part 21 Program**

#### **a. Inspection Scope**

The inspectors reviewed Nutherm's policies and implementing procedures that govern its 10 CFR Part 21 program to verify compliance with the requirements of 10 CFR Part 21. Quality Assurance Manual (QAM) section 19.0 discussed the high level program requirements and responsibilities of implementing Part 21. Quality Assurance Procedure (QAP) 19.1.00, "Reporting of Defects and Noncompliance," Revision 9, established the procedural requirements, including methods for evaluation of deviations and reporting, for compliance with the requirements of Part 21. The inspectors reviewed Nutherm's 10 CFR Part 21 policy and procedures and related documentation, and interviewed QA staff members. The inspection team verified that QAP 15.0.00, "Control of Nonconforming Items," and QAP 16.1.00, "Corrective Action," provide adequate links to the Part 21 procedure. In addition, the inspectors reviewed that evaluation of deviations for a General Electric single pole overload relay, kilovac relay, and motor control center.

#### **b. Observations and Findings**

No findings of significance in this area were identified.

#### **c. Conclusions**

The inspectors determined that Nutherm appropriately translated the requirements of 10 CFR Part 21 into their implementing procedures and, for those activities that the inspectors reviewed, implemented them as required. No findings of significance were identified.

### **2. Design Control and Qualification**

#### **a. Inspection Scope**

The inspectors reviewed Nutherm's policies and implementing procedures for qualification of 1E components to verify compliance with Criterion III, "Design Control," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The inspectors evaluated a sample of qualification packages to ensure that they were properly qualified to the appropriate IEEE standards as required by customer POs. Additionally, the inspectors reviewed how Nutherm procured safety-related electromagnetic interference (EMI) / radio-frequency interference (RFI) tests for the purpose of environmental qualification.

#### **b. Observations and Findings**

The NRC inspectors sampled PO 4500731551 for five level switches for Public Service Enterprise Group (PSEG). The PO specified that the level switches be reworked and seismically qualified to previous qualification report PSE 9671R, dated 2004, performed in accordance with IEEE 344-1975, "IEEE Standard for Seismic Qualification of Equipment for Nuclear Power Generating Stations." Since Nutherm used qualification by similarity to bound the qualification of the reworked level switches, the inspectors compared the drawings of the level switch seismically qualified in PSE 9671R and the reworked level

switch for this PO. The inspectors noticed that there were several differences between the designs and that Nutherm evaluated and documented these differences on a Records of Dedication (ROD). These records document design changes for the level switch and the engineering evaluations used to establish qualification equivalency between the design changes. The design changes included changing the material of the explosion proof enclosure from Cast Iron to Aluminum, the terminal box design, flange size and length of the stem assembly. The inspectors observed that the design changes documented were properly analyzed with the exception of a weld between the stem and the flange. The inspectors noted that the drawing of the qualified level switch indicated that there was a welded junction between the stem and the flange. In contrast, the inspectors noticed that drawing of the reworked level switch indicated that the same junction contained a Swagelok fitting in place of the weld. Nutherm failed to perform an equivalency evaluation to demonstrate that the Swagelok fitting was equivalent to the weld and that it would not prevent the level switch from meeting its performance requirements during and following a seismic event, as required in IEEE-344-1975. During the inspection, Nutherm generated ROD-1324 to document how the weld and fitting were equivalent; however, the inspectors found this inadequate since the equivalency evaluation was between the Swagelok fitting and a different qualified fitting from a different supplier with different fit, form, and material properties.

The failure to perform an engineering evaluation to justify how the design change on a level switch was evaluated and is bounded by initial seismic qualification has been identified as Nonconformance 99900779/2014-201-01.

Additionally, the NRC inspection team sampled PO 00406653, Exelon-Quad Cities to Nutherm, and PO 10049-003, Nutherm to Global Testing Laboratories, that required EMI testing to be performed in accordance with Nutherm's test procedure, 10049-EMC-01, "EMC test procedure for D432 ASCO transfer switch." Nutherm's qualification report EGC-10049R, states in part that, "This report establishes that the transfer switch would provide the required safety function during a seismic event enveloped by the Test Response Spectra included in this report and meets the EMC requirements of Exelon Specification CC-AA-103-1005 and Electric Power Research Institute (EPRI) TR-102323, Revision 2." Nutherm's test procedure referenced EPRI TR-102323, Revision 2, and stated to set up each test to the applicable International Electrotechnical Commission (IEC) standard, but did not explicitly state the proper IEC revisions as referenced by the EPRI guidance. As a result, Global Testing Laboratories' report G811197 referenced different revisions of the IEC standards than what the EPRI guidance endorses. There was no documentation of test setups and other variables that may have changed in the different revisions and no technical evaluation added to ensure that the differences were accounted for and bounded to the EPRI guidance requirements.

Similarly, the NRC inspection team identified that PO 734527, "Wolf Creek Generating Station to Nutherm for Qualification and dedication of the control system for the replacement main steam & feedwater isolation system (MSFIS)," and PO 9715-003, "Nutherm to Elite Electronics Engineering for EMC testing on MSFIS rack," required testing to be performed to Nutherm EMC test procedure 9715-EMC-01. Qualification report WCN-9715ER, "EMC test report on CS Innovations replacement MSFIS system," stated that, "EMC testing was performed in accordance with EPRI TR-102323-R2-1997." Nutherm's test procedure referenced EPRI TR-102323, Revision 2, and stated to set up each test to the applicable IEC standard but did not explicitly state the proper IEC revisions as referenced by the EPRI guidance. As a result, Elite Electronics Engineering's test report, 37485-01 references

different revisions of the IEC standards than what the EPRI guidance endorses. Again, there was no documentation of test setups and other variables that may have changed in the different revisions and there was no technical evaluation added to ensure that the differences were accounted for and bounded to the EPRI guidance requirements.

The failure to properly translate contract requirements into test procedures and ensuring that qualification reports conformed to the POs is identified as Nonconformance 99900779/2014-201-02.

The NRC inspectors sampled Florida Power & Light (Turkey Point) PO 02312805 for DC starter panels to be qualified in accordance with IEEE 323-1974. IEEE 323-1974, Section 6.3.2, "Test Sequence" paragraph (7) states that the equipment shall be operated while exposed to the simulated post-accident conditions (following exposure to accident conditions)." However, since Turkey Point did not provide specific post-accident conditions, Nutherm performed a final baseline test of the panels at normal operating conditions to satisfy this condition. However, since the accident conditions are 212 F and 100% humidity and normal conditions are 104 F and humidity is assumed to be non-condensing, testing the panels at normal operating conditions does not satisfy the most adverse test sequence specified in IEEE 323-1974, nor was a justification provided to show that the test sequence used by Nutherm was the most severe for the item being tested (i.e. that operating the panels at normal operating conditions after the design basis accident is more severe than or equal to operating the panels at simulated post-accident conditions after the design basis accident).

The failure to qualify DC starter panels under the most severe test sequence specified by IEEE 323-1974 is identified as Nonconformance 99900779/2014-201-03.

### c. Conclusions

The NRC inspectors determined that Nutherm did not adequately implement the programs used to qualify and test class 1E electrical and instrumentation components to satisfy the regulatory requirements in Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC issued Nonconformance 99900779/2014-201-01, for Nutherm's failure to perform an engineering evaluation to justify how a design change on a level switch, from a weld to a fitting, was evaluated and is bounded by initial seismic qualification. In addition, the NRC inspection team issued Nonconformance 99900779/2014-201-02, for Nutherm's failure to properly translate contract requirements into test procedures associated with the testing of certain safety-related components. Furthermore, the NRC issued Nonconformance 99900779/2014-201-03, for Nutherm's failure to qualify DC starter panels under the most severe test sequence specified by IEEE 323-1974.

## 3. Commercial-Grade Dedication

### a. Inspection Scope

The NRC inspectors reviewed Nutherm's policies and implementing procedures governing the implementation of its CGD program, including assembly and testing, to verify compliance with Criterion III, "Design Control," Criterion X, "Inspection," Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed QAP-9.7.10.19, "Dedication of Commercial Grade Items" which provides the methodology for dedicating commercial-grade items for use as basic components, including the technical

evaluation to determine safety function and identification of critical characteristics and acceptance criteria.

The NRC inspection team observed the functional testing for micro switch precision limit switches, and specifically verified that the requirements listed in the PO were adequately translated to the test plan. In addition, the inspectors observed Nutherm's receipt inspection process for five manual switches from Eaton Cutler Hammer. These activities included visual, labeling, functionality among other physical characteristics of the item. Additionally, the inspectors reviewed how Nutherm dedicated safety-related services for EMI/RFI testing.

b. Observations and Findings

The NRC inspection team reviewed the qualification and testing associated with safety-related PO 00406653 for ASCO transfer switches and PO 734527 for a control system for the main steam & feedwater isolation system (MSFIS). Both POs required EMI/RFI testing. Nutherm dedicated the services of two different commercial labs to perform this service, Elite Electronics Engineering for PO 734527 and Global Testing Laboratories for PO 00406653. The inspectors observed that Nutherm only utilized commercial grade surveys to dedicate the services provided by Elite Electronics Engineering and a commercial grade survey and a source evaluation to dedicate the services provided by Global Testing Laboratories. However, Nutherm's commercial grade surveys of both Elite Electronics Engineering and Global Testing Laboratories consisted of the review and verification of selected critical characteristics that only verified programmatic capabilities. These surveys lacked technical evaluations of services as well as identification of the safety function of the testing services to ensure the requirements for EMI/RFI testing would be met. For example, MIL-STD-461E lists specific equipment, calibration, procedures, and test setups depending on the type of test. The applicable IEC standards list test equipment and setups with required characteristics and parameters, as well as specific criteria for the test procedure and test plan. Both of Nutherm's commercial grade survey reviews did not review whether the applicable commercial labs had the necessary equipment, requirements and parameters, procedures, or test plans for the applicable tests that Nutherm was procuring.

The failure to properly dedicate and review the services that Elite Electronics Engineering and Global Testing Laboratories provided for the safety-related ASCO transfer switches, that went to Quad Cities Nuclear Generating Station, and the replacement control system for the MSFIS, that went to Wolf Creek Generating Station, are identified as examples of Nonconformance 99900779/2014-201-04.

c. Conclusions

The inspectors determined that the implementation of Nutherm's CGD program for the assembly, inspection and testing were consistent with the regulatory requirements of " Criterion X, "Inspection," and Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. However, the inspectors determined that Nutherm did not adequately implement the programs used to dedicate services in accordance Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspection team issued Nonconformance 99900779/2014-201-04, for Nutherm's failure to identify or verify critical characteristics in their CGD of Global Testing Laboratories and Elite Electronics Engineering that would ensure that either commercial testing laboratory would have the capabilities necessary to perform the requirements of EMI/RFI standards requested through Nutherm's purchase orders.

#### **4. Procurement Document Control and Oversight of Contracted Activities**

##### **a. Inspection Scope**

The NRC inspection team reviewed policies and implementing procedures to determine if Nutherm's procurement controls and oversight of contracted activities were in compliance with Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. Specifically, the NRC inspection team verified that applicable quality requirements, including technical, regulatory, and reporting requirements, were specified in the procurement documents reviewed and extended to lower-tier suppliers when necessary. Additionally, the NRC inspection team reviewed the procedures to select and qualify vendors supplying basic components and services and verified implementation through a sample of certificates of calibrations, audits, and surveys.

##### **b. Observations and Findings**

No findings of significance in this area were identified.

##### **c. Conclusions**

The NRC inspection team determined that the implementation of Nutherm's programs for governing the oversight of contracted activities and procurement processes was consistent with the requirements of Criterion IV, "Procurement Document Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50.

#### **5. Measuring and Test Equipment**

##### **a. Inspection Scope**

The NRC inspectors reviewed M&TE policies and implementing procedures to determine if Nutherm's controls were in compliance with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. In addition, the inspectors verified the implementation of M&TE control through direct observation of inspection activities of Nutherm personnel and review of certificates of calibration for a sample of M&TE.

In addition, the NRC inspectors evaluated a sample of M&TE associated with the functional testing of limit switches. The inspectors sampled some of the instruments used during the testing to ensure they were calibrated and appropriate for the range of operation for each described activity.

##### **b. Observations and Findings**

No findings of significance in this area were identified.

c. Conclusions

The NRC inspectors concluded that Nutherm has established a program that adequately controls calibration and use of M&TE in accordance with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50.

**6. Nonconformances and Corrective Actions**

a. Inspection Scope

The inspectors reviewed Nutherm's policies and procedures governing the implementation of nonconforming components and corrective actions to verify compliance with Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. The inspectors reviewed Nutherm documented conditions adverse to quality such as corrective action reports to verify actions to resolve the identified conditions were implemented in a timely matter. In addition, the inspectors reviewed nonconformance report justifications to verify appropriate disposition of reworked and use-as-is items. The inspectors also conducted several interviews of Nutherm's management and technical staff about the evaluation of nonconforming components and corrective actions. The inspectors verified that Nutherm's nonconformance process provides guidance to evaluate nonconformance for reportability under Nutherm's 10 CFR Part 21 program.

b. Observations and Findings

No findings of significance in this area were identified.

c. Conclusions

The inspectors determined that the implementation of Nutherm's programs for control of nonconforming material, parts, or components and corrective action were consistent with the regulatory requirements in Criterion XV, "Nonconforming Materials, Parts, or Components," and Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50. No findings of significance were identified.

**7. Entrance and Exit Meetings**

On August 4, 2014, the NRC inspection team presented the inspection scope during an entrance meeting with Nutherm personnel including Judy Hinson, CEO of Nutherm. On August 8, 2014, the inspectors presented the inspection results during an exit meeting with Nutherm personnel.

## ATTACHMENT

### 1. PERSONS CONTACTED AND NRC STAFF INVOLVED:

Name	Title	Affiliation	Entrance	Exit	Interviewed
Adrienne Smith	QA Manager	Nutherm	X	X	X
Aaron Evrard	QA/QC	Nutherm	X	X	
Judy Hinson	Owner	Nutherm	X	X	
Tom Sterbis	President	Nutherm	X	X	X
Rodger Edwards	Engineering Manager	Nutherm	X	X	X
Wade Bowlin	Vice President	Nutherm	X	X	
Stan Stack	Sales Manager	Nutherm	X	X	
Lee Summers	EQ Manager	Nutherm	X	X	X
David McIntosh		Nutherm			X
Louis Mines		Nutherm			X
Colleen White		Nutherm			X
Dennis Miller	Receipt Inspector	Nutherm			X
Stacy Smith	Inspection Team Leader	NRC	X	X	
Eugene Huang	Inspection Team Member	NRC	X	X	
Annie Ramirez	Inspection Team Member	NRC	X	X	
Nicholas Savvoir	Inspection Team Member	NRC	X	X	

### 2. INSPECTION PROCEDURES USED:

IP 43002, "Routine Inspections of Nuclear Vendors"

IP 43004, "Inspection of Commercial-Grade Dedication Programs"

IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance"

### 3. ITEMS OPENED, CLOSED, AND DISCUSSED:

<u>Item Number</u>	<u>Status</u>	<u>Type</u>	<u>Description</u>
99900779/2014-201-01	OPEN	NON	Criterion III
99900779/2014-201-02	OPEN	NON	Criterion III

99900779/2014-201-03	OPEN	NON	Criterion III
99900779/2014-201-04	OPEN	NON	Criterion III

#### 4. **DOCUMENTS REVIEWED:**

##### Procedures

- QA-N-10179-5, "Quality Assurance Manual", Revision 5, dated March 8, 1993
- QAP 3.0.0 Design Control, Rev 14, dated September 22, 2005
- QAP 7.1.00, "Control of Purchased Items and Services," Revision 21, dated March 6, 2014
- QAP 9.7.6.03 Equipment qualification, Revision 7, September 22, 2005.
- QAP 9.7.10.19, "Dedication of Commercial Grade Items," Revision 18, dated June 1, 2011
- QAP 10.0.00, "Inspection," Revision 5, dated September 22, 2005
- QAP 11.0.00, "Test Control," Revision 6, dated March 26, 2007
- QAP 15.0.00, "Control of Nonconforming Items," Revision 10, dated March 25, 2014
- QAP 16.1.00, "Corrective Action," Revision 9, dated October 2, 2009
- QAP 19.1.00, "Reporting of Defects and Noncompliance," Revision 9, dated October 29, 2010

##### Nonconformance Reports (NCRs) and Corrective Action Reports (CARs)

- 14-CAR-01, dated February 20, 2014
- 14-CAR-03, dated July 2, 2014
- 14-CAR-04, dated August 29, 2014
- 14-CAR-05, dated August 6, 2014
- 13-CAR-01, dated January 17, 2013
- 13-CAR-02, dated January 29, 2013
- 13-CAR-03, dated July 12, 2013
- 13-CAR-04, dated September 12, 2013
- 12-CAR-01, dated March 20, 2012
- 12-CAR-02, dated August 30, 2012
- NCR 6503, dated January 10, 2014, rework
- NCR 6512, dated February 25, 2014, rework
- NCR 6551, dated April 21, 2014, use-as-is
- NCR 6564, dated May 1, 2014, documentation
- NRC 6584, dated June 24, 2014, use-as-is

##### Audits

- 09-02, "Commercial grade survey of Global Testing Laboratories," dated November 20, 2009
- 06-04, "Commercial grade survey of Elite Electronic Engineering," dated November 24, 2006
- Audit No. 14-03 National Technical Systems (NTS)- Huntsville: Limited Scope Audit to qualify EMI/RFI testing dated 6/11/2014.
- Audit 14-01 Applied Technical Services completed work 3/21/2014.
- NIAC Audit Report No. 17051 WYLE, 3/22/2012.

## Procurement Documents

- PO 00406653, "Exelon-Quad Cities to Nutherm," Revision 006, dated July 7, 2010
- PO 10049-003, "Nutherm to Global Testing Laboratories," Revision 1
- PO 00511902, "Exelon-Quad Cities to Nutherm," Revision 004, dated April 1 2014
- PO 12812-001, "Experitec to Nutherm for Hytork Actuators," Revision 0, dated November 13, 2013
- PO 7732072, "Nine Mile Point to Nutherm for SBM Switches," Revision 2, dated June 24, 2013
- PO 12958-001, "Nutherm to Zeller Technologies, Inc. for General Electric Switch, control," Revision 1, dated February 27, 2013
- PO 12958-002, "Nutherm to Applied Technical Services for FTIR tests," Revision 0, dated April 3, 2013
- PO #734527, "Wolf Creek Generating Station to Nutherm for Qualification and dedication for the controls system of the replacement main steam & feedwater isolation system," Revision 3, dated March 6, 2008
- PO 9715-003, "Nutherm to Elite Electronics Engineering for EMC testing on MSFIS rack in accordance with Nutherm EMC test procedure 9715-EMC-01," Revision 4, dated December 19, 2006
- P.O. 13430-02, Limit Switches, Revision 0
- P.O 4500731551 Switch Level Stainless Steel
- PO No. 10831-047, EMI/RFI testing of NTL 8850 in accordance with Nutherm
- EMC Procedure No.10831-EMC, Revision 2, dated January 21, 2014

## Qualification Reports and Test Procedures/Reports

- 10049-EMC-01, "EMC test procedure for D432 ASCO transfer switch," dated November 12, 2008
- EGC-10049R, "Nutherm qualification report for ASCO transfer switch P/N D00432020100K100-NM147 Model Number 71203," dated August 14, 2009
- G811197, "Global Testing Laboratories test report for Nutherm EMC test procedure for D432 ASCO transfer switch 10049-EMC-01," Revision 1, dated December 2, 2008
- 12812-DP-01, "Nutherm dedication plan for Hytork spring return actuator P/N XL-681S80," dated March 31, 2014
- EGC-12812R, "Nutherm Qualification Report for Hytork Spring Return Actuator P/N: XM-681S80," dated April 10, 2014
- CWE-8740R, "Nutherm Qualification Report on XOMOX/Hytork valve assembly," Revision 9, dated February 8, 2002
- 12958-DP-01, "Nutherm dedication plan for general electric SBM switch P/N: 16SBMB3A02S1A2V1," Revision 0, dated March 11, 2013
- 12958-DD-01, "Nutherm dedication documentation package for general electric SBM switch P/N: 16BMB3A02S1A2V1-NM227," Revision 0, dated August 9, 2013
- EGC-12958R, "Nutherm Qualification Report for Nutherm GE SBM Switches P/N 16SBMB3A02S1A2V1-NM227," Revision 0, dated April 29, 2013

- 9715-EMC-01, "EMC Test Procedure for replacement MSFIS System," Revision 4, dated December 19, 2006
- WCN-9715ER, "EMC test report on CS innovations replacement MSFIS system," revision 0, dated February 15, 2007
- Engineering test report #37485-01, "Electromagnetic compatibility tests on a MSFIS system part no. 5101-100," dated December 22, 2006
- FPL-12808P, "Qualification plan for Nutherm Model 72978 & model 73010 DC starter panels," Revision 1, dated January 25, 2013
- FPL-12808R, "Qualification report for Nutherm Model 72978 & model 73010 DC starter panels," Revision 2, dated June 18, 2013
- Type of Testing Performed- Project Traveler EGC-13430- test completed August 4, 2014
- Nutherm Qualification Report on Nutherm Model 70959(Manufacturer LS-50272) Top Mounted Level Switch for PSE&G Nuclear LLC. Hope Creek Nuclear Power Plant.
- Test Specimen Order No. 6110- for Top mounted Level Switch Part Number LS50272. Dated June 25, 1996.Nutherm Reference Number BPC 7419

#### Measuring and Test Equipment Documents

- Certificate of calibration #1327597 for Jodice power system timer, dated January 24, 2014r
- NT-573 Multimeter Voltmeter/Ammeter, Due August 6, 2014. Serial # 13310025.
- NT-514 Multimeter Voltmeter/Ammeter, Due April 25, 2014. Serial 90350135.
- NT-515 Clamp meter, due October 3, 2014. Serial No. 380942
- NI-527 Vibrational Research Controller Model No. VR8500-16 consisting of 4 Input Modules numbered: NI-527A-S/N 1C8792, NI-527B-S/N 1DF78D, NI-527C-S/N 1C802B, NI-527D-S/N 1C6D5E.
- NI- 591 Source Calibrator, S/N IL50537
- NI-592 Digital Meter, S/N MY47055400
- NI-483 Thermometer Thermocouple, S/N 74900200

#### Miscellaneous Documents

- 13198-FR-01R, "Failure Analysis Report on Nutherm MCC Size 1 FVR 18" Cuble," for Exelon PO 00514293, dated July 29, 2014
- 11535-FR-01R, "Failure Analysis Report on Kilovac Relay P/N PD10AC57," for Nebraska Public Power PO 4500112515, dated November 23, 2009
- 12802-FR-01R, "Failure Analysis Report on General Electric Single Pole Overload Relay P/N CR124F028," for Exelon PO 00487089, dated February 21, 2013
- RIR 1503 P.O. No. MRA102636, date receives October 5, 2012. Traceability MRA 102636-1/01-1/05.
- RIR 15335, Switch 214023 PO. No. 12777-001 Rev.0, Date approved by QAM February 12, 2013. Traceability 01R0/01-2/05. QTY 5
- RIR 15505, Switch 214023 PO. 12777-0005 Rev. 0, QAM May 7, 2013. Traceability 12777-05RO 2/01.QTY 1
- RIR 15448, Tube Switch 214023 P.O.12777-002 Rev 0, QAM April 12, 2013. Traceability 1277-02RO 1/01-1/03.QTY 3.

- RIR 15392, PO 12777-03, Rev. 1, QAM March 20, 2013. Traceability 12777-03-R1 2/01.QTY 1
- RIR 15389 Union 24413, PO. 12777-003, Rev. 0, QAM, March 18, 2013. Traceability # 12777-03 RO 1/01.QTY1
- RIR 15553, Switch 214024, P.O. No.12777-006, Rev 0. Traceability 12777-06R 1/01. QAM May 29, 2013. QTY 1
- Dedicated Item-Custom Level Switch Outline Dimensional Drawing No. 72678 Size D Rev. C, dated September 26, 2012.
- Switch Tube ASS'Y, Drawing No. 214023, Rev A, Size C, dated November 24, 2004.
- Switch Capsule ASS'Y N.O. DRY 100W, Red Leads, Drawing No. 213940, Revision A, Size A, November 23, 2004.
- Level Switch (SPST) (LS-43932 type) Drawing No. LS-50272 Size D, Revision K.

## 5. **ACRONYMS USED:**

ADAMS	Agencywide Documents Access and Management System
CAR	corrective action report
CGD	commercial grade dedication
CFR	<i>Code of Federal Regulations</i>
DC	direct current
DCIP	Division of Construction Inspection and Operational Programs
EMC	electromagnetic compatibility
EMI/RFI	electromagnetic and radio-frequency interference
EPRI	Electric Power Research Institute
EVIB	Electrical Vendor Inspection Branch
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IP	inspection procedure
M&TE	measuring and test equipment
MSFIS	main steam & feedwater isolation system
NCR	nonconformance report
NON	Notice of Nonconformance
NRC	(U.S.) Nuclear Regulatory Commission
NRO	Office of New Reactors
PO	purchase order
PSEG	Public Service Enterprise Group
QA	quality assurance
QAM	quality assurance manual
QAP	quality assurance procedure
ROD	Records of Dedication
U.S.	United States (of America)