

July 2, 2012

Mr. David Vellecoop, Quality Manager  
800 Kipling Avenue, Unit 2  
Toronto, ON, Canada  
M8Z 5G51000

SUBJECT: NRC VENDOR INSPECTION REPORT NO. 99901415/2012-201 AND NOTICE OF  
NONCONFORMANCE

Dear Mr. Vellecoop:

From May 14 to 18, 2012, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the Kinectrics facility in Toronto, Ontario. The purpose of this inspection was to review implementation of your quality assurance program in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," and 10 CFR Part 21, "Reporting of Defects and Noncompliance." This inspection specifically evaluated the quality assurance program as it pertains to Kinectrics supply of testing services to support environmental qualification of components being supplied as part of the Westinghouse AP1000 reactor design. The inspection team also reviewed selected Kinectrics activities in support of testing and dedication of safety related components to the U.S. nuclear operating fleet. 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.

During this inspection, the team found that the implementation of your QA program failed to meet certain NRC requirements imposed on you by your customers or NRC licensees. Specifically, the inspection team determined that in some instances, Kinectrics failed to: implement measures to ensure that testing performed by subcontractors was in conformance with procurement documents; ensure that applicable regulatory requirements and design bases were suitably included or referenced in procurement documents to subcontractors; ensure the adequacy of certain design features associated with components that were procured from commercial suppliers, dedicated by Kinectrics, and sold as safety related components; and failed to ensure that conditions adverse to quality were promptly identified and corrected. These Nonconformances are cited in the enclosed Notice of Nonconformance (NON), and the enclosed inspection report describes in detail the circumstances surrounding them.

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 NON. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," 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 Public Document Room or from the NRC's document 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, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

*/RA/*

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

Docket No. 99901415

Enclosures:

1. Notice of Nonconformance
2. Inspection Report No. 99901415/2012-201 and attachment

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, "Protection of Safeguards Information: Performance Requirements."

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Richard A. Rasmussen, Chief  
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**ADAMS ACCESSION No.:** ML12179A413

NRC-001

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<b>NAME</b>	PCoco	TFrye	RRasmussen	
<b>DATE</b>	6/25/2012	07/02/2012	07/02/2012	

## NOTICE OF NONCONFORMANCE

Kinectrics Inc.  
800 Kipling Avenue, Unit #2  
Toronto, Ontario M8Z5G5

Inspection Report 99901415/2012-201  
Docket No. 99901415

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Kinectrics Inc. facility in Toronto, Ontario, May 14-18, 2012, certain activities were not conducted in accordance with NRC requirements that were contractually imposed on Kinectrics by its customers or NRC licensees:

- A. Criterion VII, "Control of Purchased Material, Equipment, and Services," 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 purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor or subcontractor, inspection at the contractor or subcontractor source, and examination of products upon delivery."

Contrary to the above, as of May 18, 2012, Kinectrics failed to implement measures to ensure that testing performed by subcontractors was in conformance with procurement documents. Specifically:

1. Kinectrics did not properly dedicate the testing services provided by Global EMC, Inc., for the performance of electromagnetic compatibility testing, as necessary to ensure that the testing was performed in accordance with the requirements contained in Westinghouse Purchase Order (PO) #4500342823, dated 4/16/2010, and Kinectrics PO #280022400, dated 10/15/2010. For example, Kinectrics did not ensure that Global EMC had a program that properly controlled measuring and test equipment.
2. Kinectrics did not ensure that the test report produced by its subcontractor, Clark Testing Laboratories, for seismic testing of electrical penetration assemblies performed in accordance with PO 280022496, was in conformance with the procurement documents. Specifically the Clark test report did not contain records of calibration data for the test equipment used during the testing. These calibration data records were required per Section 7.0 of Test Procedure K403869-PSWI-0001 R07.

These issues have been identified as Nonconformance 99901415/2012-201-01.

- B. Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50, states, in part, that, "Measures shall be established to assure that applicable regulatory requirements, design bases, and other requirements which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services, whether purchased by the applicant or by its contractors or subcontractors."

Contrary to the above, Kinectrics PO #280022400, dated 10/15/10, to Global EMC Inc. did not explicitly state the proper technical standard and revision to be used for electromagnetic

compatibility testing of electrical penetration assemblies. Consequently the incorrect revision of the MIL-STD-461 was used to perform the testing.

This issue has been identified as Nonconformance 99901415/2012-201-02.

- C. Criterion III, "Design Control," of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that, "Where a test program is used to verify the adequacy of a certain design feature in lieu of other verifying or checking processes, it should include suitable qualification testing of a prototype unit under the most adverse design conditions."

Contrary to the above, Kinectrics failed to verify the adequacy of certain design features associated with molded case circuit breakers that were procured from commercial suppliers, dedicated by Kinectrics, and sold as safety related components. Specifically:

1. For molded case circuit breakers supplied to South Carolina Electric and Gas under PO #NU-02SR744190, dated 5/16/2011, and to Duke Energy under PO #149028, dated 7/31/2011, Kinectrics did not perform inspections, tests, or analyses sufficient to verify the interrupting rating, which is a critical characteristic of the subject breakers. Kinectrics also did not perform any actions that would have verified that the breakers were manufactured in accordance with a commercial program sufficient to verify the interrupting ratings.
2. For molded case circuit breakers supplied to South Carolina Electric and Gas under PO #NU-02SR744190, dated 5/16/2011, and to Duke Energy under PO #149028, dated 7/31/2011, Kinectrics did not perform testing or analyses sufficient to establish the seismic qualification of the subject breakers. Seismic qualification was based upon an assumption of similarity to breakers previously tested by Kinectrics; however, Kinectrics did not perform inspections, tests, or analyses sufficient to verify that the subsequent breakers were identical in form, fit, and function to those that were previously tested.

These issues have been identified as Nonconformance 99901415/2012-201-03.

- D. Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50, states, in part, that, "Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected."

Contrary to the above, as of May 18, 2012, Kinectrics did not take corrective actions sufficient to ensure that molded case circuit breakers, procured by Kinectrics from Tiger Controls (a commercial distributor), dedicated by Kinectrics for use in safety related applications, and then supplied to Duke Energy under PO #149028, dated 7/31/2011, were in fact authentic, new, and not refurbished. Specifically, after receiving a large percentage of breakers from Tiger controls that appeared to be either used, refurbished, or otherwise tampered with, Kinectrics corrective actions were insufficient to ensure that the replacement breakers they received from Tiger controls and shipped to Duke Energy were in fact authentic and could be traced back to the actual OEM factory.

This issue has been identified as Nonconformance 99901415/2012-201-04.

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 Richard Rasmussen, Chief, Electrical Inspection Branch, 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 noncompliances; 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 from the NRC's document 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 2<sup>nd</sup> day of July 2012

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

Docket No.: 99901415

Report No.: 99901415/2012-201

Vendor: Kinectrics Inc.  
800 Kipling Avenue, Unit #2  
Toronto, Ontario M8Z5G5

Vendor Contact: Mr. Dave Vellecoop, Quality Manager  
416-207-5686  
Dave.Vellecoop@Kinectrics.com

Nuclear Industry Activity: Kinectrics performs testing services to support the seismic and environmental qualification of safety related components currently being supplied as part of the Westinghouse AP1000 design. Kinectrics also performs dedication services (including testing) associated with their supply of safety related replacement components to the U.S. nuclear operating fleet.

Inspection Dates: May 14-18, 2012

Inspectors: Jeffrey Jacobson NRO/DCIP/CEVB Team Leader  
Paul Coco NRO/DCIP/CMVB  
Greg Galletti NRO/DCIP/CEVB  
Eugene Huang NRO/DCIP/CEVB  
Robert Mathis R-II/DCI  
Gabriele Giobbe (observer) Canadian Nuclear Safety Commission

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

## **EXECUTIVE SUMMARY**

The purpose of this inspection was to assess whether Kinectrics is adequately implementing the controls imposed on them by WEC and other customers with regard to the testing, qualification, and dedication of safety related components. Specific focus was given to the testing being performed by Kinectrics to environmentally qualify AP1000 safety related components to the requirements of Title 10 to the *Code of Federal Regulations* (10 CFR) Part 50.49. Such testing is required to demonstrate that components that perform a safety function can be relied upon to operate throughout their qualified life after exposure to design basis accident conditions, including radiation, thermal aging, pressure, temperature, humidity, and seismic vibration, as applicable. The qualification testing reviewed by the inspection team included tests that simulate design basis accident environments, seismic testing, and testing for electromagnetic interference (EMI). The results of these tests will also likely be used to support closure of selective Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC), as described in Revision 19 of the AP1000 Design Control Document.

In addition to the AP1000 related testing discussed above, the inspection team also reviewed activities associated with the testing of safety related components being supplied by Kinectrics to the U.S. operating nuclear fleet. The team's review included a review of the dedication processes used by Kinectrics to identify, and then verify, the critical characteristics of a commercial grade item or service, as necessary to ensure its suitability for use in a safety related application. Such a commercial grade dedication is required when components or services are procured from a commercial supplier whose quality program does not meet the requirements of Appendix B to 10 CFR Part 50.

The team confirmed that the Kinectrics "10 CFR 50 Appendix B Quality Assurance Program," Revision L, dated November 30, 2010, contains specific requirements addressing each of the 18 criteria of 10 CFR 50 Appendix B. In general, the procedures reviewed appeared to be adequate to govern the important quality and technical aspects of the reviewed testing programs.

With respect to the electrical penetration assembly (EPA) testing actually performed at Kinectrics, the NRC inspection team (the team) determined that the test procedures appropriately incorporated the key testing parameters and that the test equipment and sensors used to conduct the testing were properly calibrated and had identifiable markings. The team also determined that the measuring and test equipment utilized was appropriate for monitoring testing conditions. With respect to the EPA testing performed by subcontractors, the team identified two Nonconformances. Nonconformance 99901415/2012-201-01 concerned two examples where Kinectrics failed to implement measures to ensure that testing performed by subcontractors was conducted in conformance with procurement documents. Nonconformance 99901415/2012-201-02 concerned Kinectrics failure to explicitly state the technical standard and revision needed in a purchase order to Global EMC, Inc. for EMC testing. This EPA testing was commissioned by Westinghouse and is for components that are part of their AP1000 scope of supply.

The team had no findings with respect to their review of the neutron monitor testing or calibration of in house test equipment.

With respect to the dedication of commercial grade components, the team found that in general, Kinectrics had identified important critical characteristics for the components being tested, and had implemented effective methods of verifying that the component's critical characteristics



were met. The team identified two Nonconformances where the Kinectrics commercial grade dedication program was not consistent with regulatory requirements. Nonconformance 99901415/2012-201-03 concerned two examples where Kinectrics failed to verify the adequacy of certain design features associated with molded case circuit breakers that were procured from commercial suppliers, dedicated by Kinectrics, and sold as safety related components. Nonconformance 99901415/2012-201-04 concerned Kinectrics failure to take adequate corrective actions associated with a number of molded case circuit breakers that were received from a commercial supplier and determined to be suspect (e.g. used, refurbished, or tampered with).

## REPORT DETAILS

This inspection was performed as part of the U. S. Nuclear Regulatory Commission's (NRC's) overall strategy for inspecting targeted Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) related to the functional and type testing of components being supplied by Westinghouse Electric Company (WEC) and their sub-suppliers, as part of the AP1000 certified reactor design. The purpose of this inspection was to assess whether Kinectrics is adequately implementing the controls imposed on them by WEC and other customers with regard to the testing, qualification, and dedication of safety related components. Specific focus was given to the testing being performed by Kinectrics to environmentally qualify AP1000 safety related components to the requirements of Title 10 to the *Code of Federal Regulations* (10 CFR) Part 50.49 and industry standards as described in Revision 19 to the AP1000 Design Certification Document (DCD). Such testing is required to demonstrate that components that perform a safety function can be relied upon to operate throughout their qualified life after exposure to design basis accident conditions, including radiation, thermal aging, pressure, temperature, humidity, and seismic vibration, as applicable. Among the types of qualification testing reviewed by the inspection team were specific tests that simulate design basis accident environments, seismic testing, and testing for electromagnetic compatibility (EMC).

In addition to the AP1000 related testing discussed above, the inspection team also reviewed activities associated with the testing of safety related components being supplied to the U.S. operating nuclear fleet. The team's review included a review of the dedication processes used by Kinectrics to identify, and then verify, the critical characteristics of commercial grade items and service, as necessary to ensure their suitability for use in nuclear safety related applications. Such a commercial grade dedication is required when components or services are procured from a commercial supplier whose quality program does not meet the requirements of Appendix B to 10 CFR Part 50.

### 1. Electrical Penetration Testing (ITAAC 2.2.01.06a.ii and 2.2.01.5.a.ii)

#### a. Inspection Scope

Kinectrics was contracted by Westinghouse Electric Company (WEC) through Purchase Order (PO) 4500342823, dated 4/16/2010, to perform equipment qualification testing of medium voltage power (MVP), low voltage power (LV1), and low voltage instrumentation and control (LV2) electrical penetration assemblies (EPAs) in support of the AP1000 design. This included the application of radiation, functional testing, seismic testing, testing under design basis accident conditions, and electromagnetic compatibility testing. Per the WEC PO, the equipment qualification was to be executed in accordance with WEC's APP-EY01-VPH-001 "Westinghouse AP1000 Test Plan 60- year Qualification of Electrical Penetrations," Revision 0, dated 12/2009. The team reviewed the test procedures, available test data, and test reports for the EPAs to ensure that applicable NRC regulations and PO requirements were adequately addressed. The team also reviewed associated notice of anomaly's and calibration records for the instrumentation used during the testing.

Due to the physical size of the EPAs, Kinectrics subcontracted the seismic portion of the testing out to Clark Testing Laboratories, who performed the testing in accordance with their Appendix B quality assurance program. Clark then provided the data back to Kinectrics for inclusion into the overall EPA Equipment Qualification report provided to Westinghouse. For the seismic testing, the team verified that the control test equipment and data acquisition software were maintained in accordance with their program requirements. The team also reviewed seismic

testing purchase orders, industry codes, and test standards and compared them with the test plans to verify that all requirements were incorporated appropriately.

Kinectrics contracted out the Electromagnetic Compatibility testing of the EPAs to Global EMC Inc., a commercial service supplier. Since Global EMC does not have an approved nuclear quality assurance program that conforms to Appendix B to 10 CFR Part 50, the team reviewed the implementation of Kinectrics dedication process for this service. The team's review included the Kinectrics commercial grade survey of Global EMC, definition of critical characteristics, and verification methods.

The team also observed receipt inspection and testing activities associated with the testing of the Westinghouse excore power range neutron monitor detectors in accordance with PO 4500407152, "Harsh Environmental Testing to Qualify AP1000 NIS Excore Neutron Detectors."

#### b. Observations and Findings

The team confirmed that the Kinectrics "10 CFR 50 Appendix B Quality Assurance Program," Revision L, dated 11/30/2010, contained specific requirements addressing each of the 18 criteria of 10 CFR 50 Appendix B. The team reviewed the quality procedures most applicable to the qualification testing and verified that they contained appropriate requirements for performing safety related functions and activities. Among the procedures reviewed by the team were:

QAOP 11.1, "Test Control," establishes and defines requirements to assure control of test operations. The procedure also establishes the training requirements for staff, testing procedures, prerequisites for each test, and guidance to meet their customers testing specifications to which ever requirements or standard are imposed on the purchase order.

QAOP 5.1 "Preparation and Control of Quality Assurance Operating Procedures and Project Instructions," establishes the requirements and project instructions which become test plans that are reviewed and accepted by the customer prior to commencing work.

OP 3-1 "Proposal Preparation and Contract Review," governs the development of proposals and test plans to customer requirements.

AWI 3-1 "Complying with Nuclear Quality Program Requirements Imposed by Customer," provides guidance to ensure that all customer requirements in the PO are properly translated to a test plan.

AWI 6-2 "Nuclear Procurement Compliance," governs all nuclear procurement processes for 10CFR50 Appendix B.

The procedures reviewed appeared to be adequate to govern the important quality aspects of the test program.

## LOCA Testing of Electrical Penetration Assemblies (EPAs)

The team reviewed the following procedures, which were developed by Kinectrics specifically to perform the qualification work associated with the EPAs:

K-403869-PSWI-0001, "Kinectrics Inc. Test Procedure for Qualification Testing of IST Medium Voltage Electrical Penetrations"

K-403869-PSWI-0002, "Kinectrics Inc. Test Procedure for Qualification Testing of IST Low Voltage Electrical Penetrations"

K-403869-PSWI-0005, "Kinectrics Inc. Test Procedure for Qualification Testing of IST Low Voltage Power and I&C Electrical Penetrations"

The team verified that the test procedures appropriately incorporated the seismic testing requirements and were approved by WEC. The team verified that a sample of testing equipment and sensors used to conduct testing were properly calibrated and had identifiable markings. The team verified that the test equipment and sensors reviewed were classified as safety related and were calibrated at vendor sites which hold an International Laboratory Accreditation Cooperation (ILAC) accreditation in Canada.

The team observed the in-process design basis accident (DBA) qualification testing of the low voltage I/C (LV2) EPA, which was intended to be representative of the conditions that would exist during a Loss-of-Coolant Accident (LOCA). The team verified that Kinectrics was following the applicable test plan as well as Institute of Electrical and Electronics Engineers (IEEE) Standard 317-1983, "IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations". The inspectors verified the adequacy of the test setup including the configuration of the EPA, number of installed feed throughs (FTs), number of conductors for each FT, and conductor size and type. The team verified the appropriate use of measuring and test equipment (M&TE) for monitoring the test conditions described in test procedure K-403869-PSWI-0005, Rev. 05. The monitored test conditions included temperature, pressure, voltage, and current.

The monitoring and collection of test data was also observed by the team, including the monitoring of leakage current and circuit continuity. The inspectors reviewed the calibration records of the M&TE utilized for the qualification testing of the LV2 EPA including the data acquisition unit, corresponding data acquisition multiplexers, and pressure transducers. The team also reviewed the test data results from the testing of MVP EPA and verified that the testing followed the specified requirements.

The team noted that test procedure K-403869-PSWI-0005, Rev. 05, "Test Procedure for Qualified Testing of IST LV Power and I&C Electrical Penetrations", did not follow the preconditioning order of the test specimen prescribed in IEEE 317-1983. The feed-through assemblies (FT) of the electrical penetration assemblies (EPAs) were subjected to radiation exposure simulation first in the process instead of last. Kinectrics indicated that the preconditioning order was set in order to improve testing efficiency of the EPAs. The inspectors determined that performing the radiation exposure simulation at the beginning of preconditioning was a conservative approach in that the EPAs would undergo the remaining preconditioning steps in a further degraded state due to the preceding radiation exposure. This preconditioning order maintains the intent to demonstrate the environmental qualification of the EPAs in their respective environments.

During the review of test procedures for EPAs MV1, LV1, and LV2, the team observed a difference in the type of radiation exposure applied to the feed-through assemblies (FT) during preconditioning. FTs installed in EPAs MV1 and LV2 were exposed to gamma radiation and the FT for EPA LV1 was exposed to a combination of gamma and beta radiation. The team determined that this was acceptable as the Westinghouse AP1000 document APP-GW-VP-100, Rev. 0, "Equipment Qualification Specifications and Documentation Requirements for AP1000 Safety-Related Electrical and Electro-Mechanical Equipment", allowed for the radiation requirements to be met by converting the combination of gamma/beta radiation to an equivalent gamma only.

### EMC Testing of EPAs

As required by the Westinghouse PO to Kinectrics, the EPAs are also required to be tested for electromagnetic compatibility (EMC) in accordance with NRC Regulatory Guide 1.180. The team identified that Kinectrics contracted out this testing to another test facility, Global EMC. As with all the qualification testing being performed for the EPAs, such testing is considered to be a safety-related activity and thus is required to be performed in accordance with an approved quality assurance program that meets Appendix B to 10 CFR Part 50 and also 10 CFR Part 21. Should a licensee or a vendor chose to utilize a commercial supplier that does not conform to these requirements, such as Global EMC, NRC Generic Letter 89-02, allows the purchaser to alternatively, "dedicate" the item or service being procured, which is the path Kinectrics chose for the EMC testing. Through the dedication process, the critical characteristics of the service are identified, as are methods for verifying that the critical characteristics of the service have been achieved.

The team reviewed the Kinectrics commercial grade survey of Global EMC, which was part of the dedication process. The team identified that the dedication process implemented by Kinectrics was inadequate as it did not clearly list the critical characteristics of the service being procured and did not contain proper verification methods. Instead, the Kinectrics dedication basis seemed to depend primarily on the fact that Global EMC had received accreditation from the American Association for Laboratory Accreditation (A2LA); however, this is not an acceptable substitute for a dedication process.

The NRC has allowed licensee's and vendors to take credit for A2LA certification as part of a commercial grade dedication process, but only for the dedication of calibration services. See NRC Letter to Ms. Sherry Grier, NUPIC Chairman dated June 6, 2006, (ML061580386). The NRC has not reviewed the adequacy of A2LA oversight with respect to their certification of laboratory services, such as the testing being performed by Global EMC.

In addition, the team determined that Global EMC did not own all the necessary equipment to perform the EMC testing and that some of the test equipment used to perform the testing was rented. It was not evident that Kinectrics had ensured that the rented equipment had been properly calibrated or that proper controls had been placed on conducting the testing. Kinectrics failure to properly dedicate the testing services provided by Global EMC, as necessary to ensure that the testing was performed in accordance with the purchase order requirements is identified as an example of Nonconformance 99901415/2012-201-01.

The team also identified that EMC testing was performed to a revision of MIL-STD-461 that was different from that contained in the Westinghouse specification. The Westinghouse AP1000 Design Control Document, Revision 19, and Kinectrics test procedure K-403869-PSWI-0005 required that RE101, RE102, and RS103 EMC testing be performed to MIL-STD-461E. The

team reviewed purchase order (PO) 280022400 from Kinectrics to Global EMC and identified that Kinectrics requested RE101, RE102, and RS103 EMC testing, but did not specify the exact standard and revision required. The team determined that the testing was actually performed to MIL-STD-461F rather than MIL-STD-461E. The team identified that there are material differences between the two revisions that may affect the test data results. Kinectrics failure to ensure that the correct technical requirements and standards were identified in the purchase order to Global EMC is identified as Nonconformance 99901415/2012-201-02.

### Seismic Testing of EPAs

Due to EPA size restrictions, the seismic portion of the equipment qualification testing was subcontracted out by Kinectrics to Clark Testing Laboratories in PO 280022496. Clark then developed a test plan Clark-QP-280022496-RO that was derived from the Kinectrics testing procedures that had been approved by WEC. Kinectrics approved the test plan and sent an observer to view the testing performed on 3/11/2011 for the medium voltage EPA. Clark provided Kinectrics with the test log and graphic seismic data to be incorporated into equipment qualification test report K-403869-TR-0001 R00.

The team viewed the seismic portion of the test report and found that the test log for the seismic testing completed by Clark was missing the cover page. Through close inspection of the test log and data, it was determined that the information provided was performed to the correct IEEE 344 standard. Kinectrics issued a nonconformance report to recover the missing cover page. This was considered by the inspection team to be a minor issue.

The team also identified that contrary to the WEC and Kinectrics POs, Clark had not included calibration information for the test equipment used in the test log or anywhere in the test report. Test Procedure K403869-PSWI-0001 R07, Section 7.0, states that the completed report should include a listing of all measuring equipment including calibration dates. This discrepancy had not been identified by Kinectrics. Furthermore, Kinectrics was not able to produce any documents that indicated that they had performed an acceptance review of the data log or seismic graphs received from Clark, as necessary to determine if the requirements of their PO 280022496 had been properly executed.

All test data received by Clark was included in the larger scope test package for the equipment qualification of the medium voltage EPA and approved, by Kinectrics, in test Report K-403869-TR-0001 R00. Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50 states, in part, that "Measures shall be established to assure that purchased material, equipment, and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. These measures shall include provisions, as appropriate ...examination of products upon delivery." AWI 6-2 "Nuclear Procurement Compliance," part 5.8, "Verification of Purchased Products and Services," in section 5.8.2, states "for each purchase material or contracted service affecting quality, plans shall be executed by Kinectrics to ensure contract requirements have been met.

Contrary to the above Kinectrics did not perform an adequate review of the data provided by Clark, to ensure that all contractual requirements invoked by the Kinectrics and WEC PO's were met. This issue was identified as one example of Nonconformance 99901415/2012-201-01.

The team also identified that the Kinectrics PO to Clark referenced correspondence that invoked an incorrect revision of IEEE344. After this issue was identified by the team during the inspection, Clark sent a letter to Kinectrics stating that the procedures invoked during the testing

were in fact to the correct IEEE344 revision requested by the WEC PO. This was identified by the inspection team as a minor issue.

#### Observation of In-process Testing of Neutron Monitors

With respect to the excore power range neutron monitor detectors, the team witnessed resistance and capacitance measurement tests for the upper power range detector. The team compared the Westinghouse test plan, "AP1000 Excore Neutron Detectors Equipment Qualification Test Plans," EQ-TP-197-APP/APP-JE92-VPH-001 to the Kinectrics CGID ITP to confirm test requirements were adequately translated into test plans and test procedures. Included with the Westinghouse test plan were technical requirements for testing including: thermal aging, thermal cycling, radiation aging, normal pressurization cycling, abnormal extreme testing, seismic testing and DBA testing. The team determined that test requirements were being adequately translated into Kinectrics CGID ITP and test procedures. The team also reviewed pre-test thermal cycling of the detectors and confirmed that the thermal cycling test data contained in K-015991-DATA-0006-R01 was consistent with the requirements in the Kinectrics test procedure and the Westinghouse test plan. The team verified that the test setup, as evidenced through a detailed test description and actual photographs of the physical test configuration, was consistent with prescribed requirements.

#### Calibration of Test Equipment

The team reviewed a sample of inspection and testing equipment being utilized at Kinectrics to ensure that the equipment was being properly calibrated and controlled. The specific instruments sampled were associated with the baseline testing of the Westinghouse excore power range neutron monitor detectors (Keithley KN-01822 - Electrometer, Cal-Matrix KIN-01934 Amplifier – Current to Voltage Amplifier, Amprobe - LCR meter LCR55A KIN-00632). The team confirmed the instruments were calibrated and appropriate for the range of operation for each test. The NRC team reviewed the Kinectrics Instrument Sheet, K-015991, dated May 16, 2012, and confirmed that all equipment was identified, recorded, and confirmed to be within the calibration date range. The team confirmed that the calibration range was also consistent with the actual use of the equipment.

Additionally, the inspection team reviewed the calibration laboratory accreditation documentation associated with the test equipment, including documentation detailing each laboratory's scope of supply capability. The team confirmed that the laboratory accreditation covered the ranges of parametric values, such as voltage, current, and resistance for which the test equipment was being used. The team confirmed that traceability to the National Institute of Standards and Technology calibration standards was provided, and that all test and inspection equipment used for the observed inspection and test activities was controlled, documented, and current with respect to the calibration requirements. The team also confirmed that all test instrumentation was appropriate for the test use and was capable of measuring to the precision required in the test plan. No issues were identified with any of the calibration activities reviewed.

#### c. Conclusions

Kinectrics overall quality assurance procedures appeared to be adequate to govern the important quality aspects of the test program. With respect to portions of the EPA testing performed at Kinectrics, the team determined that the test procedures appropriately incorporated the key testing parameters. The testing equipment and sensors used to conduct

the testing were properly calibrated and had identifiable markings. The team verified the appropriate use and monitoring of M&TE to provide testing conditions, including temperature, pressure, voltage, and current.

With respect to testing of the EPAs being performed by subcontractors, the team identified two Nonconformances. Nonconformance 99901415/2012-201-01 concerned two examples where Kinectrics failed to implement measures to assure that testing performed by subcontractors was in conformance with procurement documents. Nonconformance 99901415/2012-201-02 concerned Kinectrics failure to explicitly state the technical standard and revision needed in a purchase order to Global EMC for EMC testing.

The team had no findings with respect to their review of the neutron monitor testing or calibration of in house test equipment.

## 2. Dedication of Commercial Grade Equipment

### a. Inspection Scope

The team reviewed the Kinectrics QA manual and implementing procedures that govern the Kinectrics process for commercial grade item dedication (CGID) to verify compliance with 10 CFR Part 21 and Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment and Services," of Appendix B to 10 CFR Part 50. In addition, the team reviewed a sample of procurement documentation and completed CGID packages, discussed the CGID program with Kinectrics management and technical staff, and observed dedication activities such as test and inspection in-process. The team assessed whether Kinectrics was adequately implementing key dedication activities consistent with the QA program manual and CGID procedures, QF 10-1, "Record of Inspection of Incoming Items." These dedication activities included: performance of a technical evaluation to identify critical characteristics for the items to be dedicated; identification of potential failure modes and acceptance criteria for each critical characteristic; identification of review methods for each characteristic; and various sampling strategies for both destructive and non-destructive tests and inspections. The team assessed whether the dedication activities were adequately documented in the CGID plan and CGID inspection and test plan, and reviewed purchase orders for each of the sample CGID packages reviewed.

For the sample dedication packages reviewed, the team assessed whether the CGD inspection and test plan and CGID plan identified critical characteristics, acceptance methods, and acceptance criteria that were generally consistent with the customer-identified requirements, manufacturer-identified requirements, or were incorporated by reference to applicable industry standards. The team reviewed each of the critical characteristic data sheets for all of the sample items. The attachment to this inspection report lists the documents reviewed by the inspectors.

### b. Observations and Findings

With the exception of the issues identified below, the team found that the records were complete, and all data was generally consistent with the acceptance criteria. In instances where test results did not meet the acceptance criteria (e.g., chemical analysis of the Fafnir bearing material) a nonconformance report (NCR) was initiated, work was stopped or evaluated for impact, and resolved in accordance with the Kinectrics CGID process.



## Fuses

The team identified that in one instance, Kinectrics failed to evaluate and document a departure from a test requirement associated with the CGID of 600v 80A fuses (CGID package CGD K-115012-ITP-0006). Specifically, the CGID ITP and CGID plan referenced a Joint Utility Technical Guideline for CGID of fuses (UL 198C) which required the fuses to be tested at 110% of rated current. Review of the test data revealed the actual constant current rating test was performed at 100% of rated current instead of the 110% specified in the guideline. The dedication package did not describe the basis for selection of a test current used, which did not meet the requirements of JUTG UL198C, nor was there any documented justification for performing the test at the current rating chosen. The inspection team determined this to be a minor issue as the testing that was performed was sufficient to verify the fuses critical characteristics.

## Molded Case Circuit Breakers

The team reviewed documentation pertaining to Kinectrics supply of two lots of Square D molded case circuit breakers to South Carolina Electric and Gas. The team identified that for seismic testing, Kinectrics uses Vibration View data acquisition software, developed by Vibration Research Corporation to generate the vibration signals, control the seismic qualification testing, and collect response data. The inspectors verified that the software reduces test data to a format that facilitates qualification of the components under testing. The inspectors interviewed the seismic test manager and discussed software verification and validation (V&V) of the Vibration View software. The V&V of the software used vibration controller vr8500-12 for verification of Seismic Response Spectra (SRS) calculation, IEEE-344 coherence/correlation coefficient requirements, and frequency content and stationary requirements. No findings were identified during the team's review the software V&V.

For the first lot of breakers, the team reviewed seismic qualification report K-403425-RA-0001, for class 1E Safety-Related Circuit Breakers, contracted under South Carolina Electric & Gas (SCEG) PO NU-02SR735911. The breakers were for use in Virgil C. Summer Nuclear Generating Station. Kinectrics Tested 36 Square D 600 Volt, molded case circuit breaker models per the requirements of IEEE 344-1975/1987/2004. The breakers were to replace an older set of breakers that were originally seismically tested by Wyle labs while still in the breaker panel. Since SCEG only provided the seismic floor spectra for testing, Kinectrics used the data report from Wyle labs and reduced the correct frequency response spectra to test the individual breakers outside the panel. The team's inspection of the test report verified that all data was collected in a proper manner and done in accordance with test procedure K-403425-PSWI-0001, Revision 3, dated 10/8/2009.

The second lot of breakers was supplied by Kinectrics under SCEG PO NU-02SR744190, dated 5/16/11. The PO was for six, 20 amp, 600 volt, square D molded case circuit breakers. The purchase order invoked 10 CFR Part 21, the Kinectrics QA program manual, and IEEE 344 for seismic qualification. Since Kinectrics had previously performed seismic testing (as described above) on similar beakers, the PO stated that the breakers should be the same as those previously qualified, as documented in Kinectrics Seismic Report K-403425, Revision 0. The SCEG PO also required that Kinectrics conform to EPRI NP-7218, "Guideline for Utilization of Sampling Plans for Commercial Grade Acceptance" for the dedication of any components and that Kinectrics provide documentation/justification for any evaluations made with regard to establishing lot homogeneity for the purpose of selecting sample sizes as part of the dedication process.

Since Kinectrics is not an OEM or authorized distributor, all components supplied by Kinectrics have to be procured from other sources. In this case, the team identified that Kinectrics procured the subject breakers (P.O. #280024653, dated 6/8/2011) through an authorized distributor of Square D, Becker Electric Supply in Cincinnati, Ohio. The breakers were procured as a commercial grade item and Kinectrics did not perform any survey or surveillance on the distributor. The SCEG purchase order required that the components be sourced from an OEM or an authorized OEM source. The breakers supplied by Becker were sent to the Kinectrics office in Cincinnati, Ohio. The team verified that even though the breakers were ordered through a distributor, the breakers were actually drop shipped direct from the OEM factory in Columbia, MO, and that Kinectrics had suitable documentation to establish the fact that all these breakers were from a homogenous lot. The Kinectrics office in Cincinnati then shipped the breakers to the Kinectrics testing facility in Toronto where the actual dedication testing was performed.

The dedication was performed in accordance with the previously issued Inspection and Test Plan, K-403425-ITP-0031, Revision 0, "Commercial Grade Dedication of Square D Pat# FIL-36020 Circuit Breakers," that had been created as part of the previous purchase order. The test plan included requirements for the documentation and verification of numerous critical characteristics for the subject breakers, including dimensions, mass, and various electrical performance properties. The critical characteristics were identified in accordance with EPRI guidance that had been developed specific for the dedication of molded case circuit breakers, CGICB01, Revision 1B. The team determined that while the EPRI guidance appeared to list all important critical characteristics as design considerations, the EPRI guidance did not specifically address how the interrupting capacity of the breakers was to be addressed as part of the dedication process. The team noted that the interrupting capacity of a breaker is an important safety related characteristic of a breaker as it ensures that should a severe short circuit occur, that the breaker could interrupt the fault without causing damage to surrounding equipment. Typically, such interrupting ratings are established by manufacturers and then verified by destructive tests that are performed on sample components, in accordance with industry standards.

The team identified that Kinectrics did not address the interrupting rating of the subject breakers as part of its dedication process, nor did they verify that the subject breakers, which were procured commercially, were manufactured in accordance with a commercial program sufficient to establish the interrupting ratings. Failure to verify the capability of the supplied circuit breakers to withstand their rated interrupting current capacity was identified by the team as one example of Nonconformance 99901415/2012-201-03.

Seismic qualification for this lot of breakers was based upon the similarity of the breakers to those previously tested and additional seismic tests were not performed. The team determined, however, that the dedication package did not contain sufficient information to conclude that the supplied breakers were in fact, the same in form, fit, and function as those previously qualified by direct seismic testing. Similarity was established only through a comparison of mass and dimensions which is not a sufficient basis by itself to establish similarity for the purposes of seismic qualification. Since Kinectrics does not maintain design control of the subject breakers, nor did they perform a survey of the OEM production facility, changes could have been made to the breakers by the OEM that might be inconsequential from a commercial standpoint but that could effect their seismic qualification. Failure to adequately establish seismic qualification for the supplied breakers was identified by the team as one example of Nonconformance 99901415/2012-201-03.

The team also identified that certain tests and inspections performed as part of the dedication process were performed on only a sample of the breakers. The sampling plans developed were based upon the EPRI guidance contained in TR-017218, Revision 1, "Guideline for Sampling in the Commercial Grade Item Acceptance Process." The team determined that the dedication package did not contain an evaluation of lot homogeneity for the purposes of establishing sampling plans, as required by the SCEG purchase order; however, in this case, since there were only six samples, the difference between the normal and tightened plan was minimal (3 versus 4 samples) and it appears the use of the normal sampling plan was reasonably justified.

The team also reviewed Duke Energy PO 149028, dated 7/31/2011, for the purchase of 36 HMCP100R3C, Eaton (Cutler Hammer) molded case circuit breakers. The PO was designated as Nuclear Safety Related and invoked 10 CFR Part 21 and Appendix B to 10 CFR Part 50. The PO required verification that the supplied breakers were new and not refurbished and the same in form, fit, and function as those previously tested by Kinectrics as part of a previous purchase order. The PO also provided specific instructions with regard to critical characteristics to be verified by Kinectrics as part of a dedication process.

Kinectrics in turn procured the subject breakers from various commercial sources. Twenty were procured from WESCO Distribution in Mississauga, Ontario; ten were procured from Tiger Controls, Greensboro, NC; and six were procured from Areva Inc., Cranberry Township, PA. All of these procurements were commercial grade and as such required dedication for use in a safety related application. Seven of the ten breakers supplied by Tiger Controls were initially rejected by Kinectrics as part of their receipt inspection and commercial grade dedication process. In response, Tiger Controls supplied Kinectrics with seven replacement breakers and of those seven, several more were rejected. Eventually, Kinectrics received ten breakers from Tiger Controls that passed all their receipt inspection and qualification testing. In general, the rejected breakers showed signs of being either used, damaged, or refurbished. Kinectrics identified no issues with the 26 breakers supplied by the other two sources.

Kinectrics issued nonconformance reports #783 and #805 on 8/4 and 8/23/2011 to document the non conforming conditions associated with the rejected breakers. The corrective actions simply consisted of returning the breakers to tiger Controls credit/replacement. No follow-up actions were taken to evaluate the acceptability of using this vendor or to determine why the originally supplied breakers showed signs of being suspect.

The team was concerned that even though the replacement breakers supplied to Kinectrics by Tiger Controls ultimately passed the Kinectrics receipt inspection and commercial grade dedication processes, the fact that a large majority of the breakers supplied by Tiger Controls on this order were identified as being suspect, would tend to question the authenticity of any of the breakers supplied by this distributor. Without ensuring the authenticity of the items being dedicated, credit cannot be taken for any sample testing that might have been performed at the OEM factory as part of industry certification programs (such as UL). Kinectrics did not perform a commercial grade survey of Tiger Controls and no information was available in the dedication package that would have provided traceability of the supplied and accepted breakers back to the actual OEM factory. Failure to take adequate corrective actions with regard to the breakers supplied by Tiger Controls was identified by the team as Nonconformance 99901415/2012-201-04.

The team also reviewed the Inspection and Test Plan for the subject breakers K0115012-ITP-0001, Revision 1, dated 8/3/2011. The test plan included the documentation of

and verification of numerous critical characteristics for the subject breakers including dimensions, mass, and various electrical performance properties. The critical characteristics were identified in accordance with EPRI guidance that had been developed specific for the dedication of molded case circuit breakers, CGICB01, Revision 1B. The identified tests and inspections were performed on 100% of the breakers. As with the molded case breakers discussed in the previous example, the Inspection and Test Plan did not address how the interrupting capacity was to be addressed as part of the dedication process. This was identified as another example of Nonconformance 99901415/2012-201-03.

With respect to seismic qualification, the team determined that the dedication package did not contain sufficient information to conclude that the supplied breakers were in fact, the same in form, fit, and function as those previously qualified by direct seismic testing. Similarity was established only through a comparison of mass and dimensions which is not sufficient basis by itself to establish similarity for the purposes of seismic qualification. Since Kinectrics does not maintain design control of the subject breakers, nor did they perform a survey of the OEM production facility, changes could have been made to the breakers that might be inconsequential from a commercial standpoint but that could effect their seismic qualification. Failure to adequately establish seismic qualification for the supplied breakers was identified by the team as another example of Nonconformance 99901415/2012-201-03.

### c. Conclusions

With respect to the dedication of commercial grade components, the inspection team found that the records were complete, and all data was generally consistent with the acceptance criteria specified in the test procedures. In general, Kinectrics had identified important critical characteristics for the components being tested, and had implemented effective methods of verifying that the component's critical characteristics were met.

The team identified two Nonconformances where Kinectrics commercial grade dedication program was not consistent with regulatory requirements. Nonconformance 99901415/2012-201-03 concerned two examples where Kinectrics failed to verify the adequacy of certain design features associated with molded case circuit breakers that were procured from commercial suppliers, dedicated by Kinectrics, and sold as safety related components. Nonconformance 99901415/2012-201-04 concerned Kinectrics failure to take adequate corrective actions associated with a number of molded case circuit breakers that were received from a commercial supplier and determined to be suspect (e.g. used, refurbished, or tampered with).

## **Documents Reviewed**

### Specifications, Test Plans, and Procedures

K-403869-PWSI-00001, "Test procedure supplier's document", Revision 7, June 29, 2011

LTR-EQ-10-5, "Equipment qualification testing requirements for AP1000 zone 1 group 2 abnormal events", January 22, 2010

K-403869-NOA-005, "Pre-shipping inspection (LV instrumentation EPA)", January 4, 2010

K-403869-TR-0001, "Test report of qualification testing of 1<sup>st</sup> medium voltage power electrical penetrations", Revision 0, March 22, 2012

K-403869-PSWI-0002, "Test procedure for qualification testing of 1<sup>st</sup> low voltage electrical penetration", Revision 7, June 30, 2011

K-403869-PSWI-0005, "Test procedure for qualification testing of 1<sup>st</sup> LV power and I&C electrical penetrations", Revision 05, April 19, 2012

OP-6-1, "Requisition and purchase of goods & services affecting quality", Revision 11, March 31, 2011

APP-EY01-Z0-001, "Electrical penetration assemblies", Revision 1

APP-GW-VP-100, "Equipment Qualification Specifications and Documentation Requirements for AP1000 Safety-Related Electrical and Electro-Mechanical Equipment", Revision 0

IEEE 317-1983, "IEEE Standard for Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations"

QAOP 11.1, "Test Control," Revision F, dated 11/30/2010

QAOP 5.1 "Preparation and Control of Quality Assurance Operating Procedures and Project Instructions," Revision G, dated 11/30/2010

OP 3-1 "Proposal Preparation and Contract Review," Revision 8, dated 11/30/2008

AWI 3-1 "Complying with Nuclear Quality Program Requirements Imposed by Customer," Revision 3, dated 3/31/2011

AWI 6-2 "Nuclear Procurement Compliance," Revision 5, dated 11/30/2010

K-403425-ITP-0031, Revision 0, "Commercial Grade Dedication of Square D Part# FIL-36020 Circuit Breakers"

K-403425-RA-0001, Revision 1, 9/9/2010, "Seismic Qualification Report for Class 1E Safety-Related Circuit Breakers"

Test Procedure for Square D molded case breakers, K-403425-PSWI-0001, Revision 3, 10/8/2009.

EPRI TR-017218, "Guideline for Sampling in the Commercial Grade Item Acceptance Process," Revision 1

Test Procedure, K-015963-PSWI-0005, "Test Procedure for Qualification of Square-D power Distribution Blocks, Littlefuse JLS-80 fuses, and GE Model AD Panels for Duke Oconee," Revision 01, dated August 18, 2011

CGICB01, "EPRI CGI Joint Utility Task Group Commercial Grade Item Evaluation for Molded Case Circuit Breakers," Revision 1B (draft)

Dedication Plan, K-503186-CGD-0001, "Fafnir Bearings," Revision 01, dated October 22, 2010

Inspection Plan, K-503186-ITP-0001, "Timken Bearings," Revision 00, dated October 8, 2010

Test Plan, K-503300-ITP-0001, "CGD of AGM Modules," Revision 01 dated May 6, 2011

Oconee Project Review K-115017, "Fuses, Fuseblocks, and Distribution Blocks," dated December 2011

Dedication Plan, K-115012-CGD-0003, "Block, Power Distribution 3 pole 600v 760A, Revision 01, dated August 2011

Test Plan, K-115012-ITP-0006, "Littlefuse Fuse JLS80," Revision 02, dated August 16, 2011

Dedication Plan, K-115012-CGD-0006, "Littlefuse Fuse JLS80," revision 05, dated August 19, 2011

Test Report, K-015963-DATA-5007, "Dimensional and Mass Record of Fuse and Holder, Distribution Block Assembly," Revision OO

Test Plan, K-115012-ITP-0005, "Test Plan for the Recent Holders," revision 02

Inspection and Test Plan K0115012-ITP-0001, Revision 1, dated 8/3/2011

Test Report, K-015963-RP-0005, "Test Report for Qualification of Square-D Power Distribution Blocks, Littlefuse JLS-80 fuses, and GE Model AD Panels for Duke Oconee," Revision 00, dated November 9, 2011

EPRI NP-7218, "Guideline for Utilization of Sampling Plans for Commercial Grade Acceptance"

Westinghouse Test Plan, EQ-TP-197-APP/APP-JE92-VPH-001, "AP1000 Excore Neutron Detectors Equipment Qualification Test Plans," dated July 2011

Test Data, K-015991-DATA-0006-R01, "Thermal Cycling Test Data," Revision 01

Oconee PO, 00153338, "Purchase Order for Terminal Blocks, Fuse Blocks, Fuses," dated December 19, 2011

Dedication Plan, K-115012-CGD-0005, "Block Fuse, 3-pole 600V, 100A," Revision 02

Test Plan, K-115012-ITP-0005, "Inspection and Test Plan," Revision 02, dated August 16, 2011

Quality Procedure, QF 10-1, "Record of Inspection of Incoming Items," Revision 10-12

EQ-TP-197-APP/APP-JE92-VPH-001, "AP1000 Excore Neutron Detectors Equipment Qualification Test Plan," July 2011

#### Purchase Orders

PO #280022400 from Kinectrics to Global EMC labs, 10/15/2010, for the performance of EMC testing

PO #4500342823, from Westinghouse to Kinectrics, 4/16/2010, for the testing of Electrical Penetration Assemblies

PO #280024653, from Kinectrics to Becker Electric Supply, 6/8/2011, for the purchase of Square D molded case circuit breakers

PO #149028, from Duke Energy to Kinectrics, 7/31/2011, for the purchase Eaton (Cutler Hammer) molded case circuit breakers

PO #NU-02SR735911, from South Carolina Electric and Gas to Kinectrics, for Square D molded case circuit breakers

PO #NU-02SR744190, dated 5/16/11, from South Carolina Electric and Gas to Kinectrics for Square D molded case circuit breakers

PO 4500407152, "Harsh Environmental testing to qualify AP1000 NIS Excore Neutron Detectors," dated September 9, 2011

#### Notice of Anomaly

N-403869-NOA-001, "Partial discharge test (MV penetration)", September 23, 2010

N-403869-NOA-0002, "Thermal operating cycle test (electrical penetration assemblies)", October 14, 2010

N-403869-NOA-0003, "Dielectric testing, (MV penetration)", October 26, 2010

N-403869-NOA-0004, "EMC\_EMI testing (MV penetration)", December 7, 2010

N-403869-NOA-0005, "Pre-shipping inspection (LV instrumentation EPA)", January 4, 2010

N-403869-NOA-0006, "Leak test (LV and MV EPAs)", July 7, 2010

N-403869-NOA-0007, "Continuity (LV2)", March 15, 2011

N-403869-NOA-0008, "DBA (LV1 and MVP)", July 11, 2011

N-403869-NOA-0009, "Insulation Resistance (LV1)"

N-403869-NOA-0010, "IR (LV1)", July 19, 2011

N-403869-NOA-0011, "Post DBA inspection (LV1)", July 26, 2011

N-403869-NOA-012, "DBA Chemical Injection (LV1 and MVP)"

N-403869-NOA-013, "Short Circuit Current Test (LV1)"

#### Procurement Advisory Release

PAR #4500342823-009-0, November 19, 2010

PAR #4500342823-002-G, July 13, 2011

PAR #4500342823-008-0, October 27, 2010

PAR #4500342823-010-0, December 3, 2010

PAR #4500342823-012-A, February 25, 2011

PAR #4500342823-019-0, April 27, 2011  
PAR #4500342823-025-A, February 6, 2012  
PAR #4500342823-029-0, October 7, 2011  
PAR #4500342823-028-0, November 7, 2011  
PAR #4500342823-026-0, October 7, 2011

### Calibration Certificates

Certificate # 58942, "Pressure transducer and sensor model PTX7217-a", serial #2245366, April 25, 2012

Certificate #30872, "Type T Duplex Thermocouple", serial #KIN-01819A, December 6, 2011  
Certificate #30871, "Type T duplex thermocouple", serial #kin01818-A, December 6, 2011  
Certificate #30870, "Type t duplex thermocouple", serial kin-01817A, December 6, 2011  
Certificate #2000155768, "Hioki 3283 amp clamp", kin-01608 serial #110403054, May 18, 2011  
Certificate #2000155767, "Hioki 3283 amp clamp", kin-01611 serial #110403062, May 18, 2011  
Certificate #2000155771, "Hioki 3283 amp clamp", kin-01609 serial #110403055, May 18, 2011  
Certificate #2000155766, "Hioki 3283 amp clamp", kin-01607 serial #110403056, May 18, 2011  
Certificate #2000159967, "Kinectrics fluke 80k-6 HV probe", kin-01714, serial #17030009, September 22, 2011

Certificate #2000156803, "Fluke 87 series III multimeter", serial #71900758, June 13, 2011  
Certificate #2000163841, "Agilent 34901A Multiplexer", serial #MY41003552  
Certificate #2000166742, "Agilent 34972A Data Logger", serial #MY49007957  
Certificate #2000168680, "Agilent 34901A Multiplexer", serial #MY41013812

### Other

Commercial Grade survey report for Global EMC using ISO 17025, February 11, 2011

A2LA certificate #255.01, "Scope of accreditation to ISO/IEC 17025:2005 for Global EMC, Inc.", May 31, 2011

Form QF11-2, "Voltage transducer, serial #10010772 extension for 30 days", Revision 00-08, May 11, 2012

K-403869-data-0001, "Medium voltage power", September 29, 2010

Global EMC labs EMI/EMC test report on low voltage instrumentation penetration (specimen k-403869-LV2), January 12, 2011



**Acronyms**

CGID	commercial grade item dedication
DBA	design basis accident
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EPA	electrical penetration assembly
FT	feed-through assembly
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
LOCA	loss-of-coolant accident
LV	low voltage
MV	medium voltage
NOA	notice of anomaly
PAR	procurement advisory release
PO	purchase order

<b>Applicable ITAAC From AP1000 Design Control Document, Tier 1, Revision 19</b>	
Electrical Penetration Assemblies	2.2.01.5.a.ii
Electrical Penetration Assemblies	2.2.01.6.a.ii

## ATTACHMENT

### 1. Exit Meeting

On May 18, 2012, the team presented the inspection scope and findings during an exit meeting with David Harris, President and Chief Executive Officer of Kinectrics Inc.. The following people were in attendance.

<b>Name</b>	<b>Title</b>	<b>Affiliation</b>	<b>Entrance</b>	<b>Exit</b>
David Harris	President and CEO	Kinectrics	x	x
S. Hussain Mehdi	General Manager, Generation Life Cycle Management	Kinectrics	x	x
Frank Bartoszek	Quality Assurance Supervisor	Kinectrics	x	x
Al Simonavicius	Project Manager	Kinectrics	x	
Bert Grespan	Manager, Nuclear Parts and Qualification	Kinectrics	x	X
Gary Chapman	Director, U.S. Nuclear Programs	Kinectrics	x	X
David Vellekoop	Quality Manager	Kinectrics	x	X
Dudley Mowery	Quality Assurance Engineer	Kinectrics	x	X
Gabriele Giobbe	Quality Management Officer	Canadian Nuclear Safety Comm.	x	X
Stephen Burany	Project Manager	Kinectrics		x
Jeremy Owen	Project Manager	Kinectrics		x
Justin Hubbard	Vendor Management Specialist	Kinectrics		x
Jeffrey Jacobson	Inspection Team Leader	NRC	x	x
Eugene Huang	Inspector	NRC	x	x
Richard Mathis	Inspector	NRC	x	x
Gregg Galletti	Inspector	NRC	x	x
Paul Coco	Inspector	NRC	x	x

### 2. INSPECTION PROCEDURES USED

IP 43002 - Routine Vendor Inspection

IP 43004 - Inspection of Commercial Grade Dedication Programs

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

IP 65001.E – Inspection of the ITAAC-Related Qualification Program

IP 35034 – Design Certification Testing Inspection

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

<u>Item Number</u>	<u>Status</u>	<u>Type</u>	<u>Description</u>
99901415/2012-201-01	Opened	NON	Criterion VII
99901415/2012-201-02	Opened	NON	Criterion IV
99901415/2012-201-03	Opened	NON	Criterion III
99901415/2012-201-04	Opened	NON	Criterion XVI