

March 31, 2014

Mr. Brian Martin, Quality Assurance Manager  
Pentair Valves and Controls  
55 Cabot Boulevard  
Mansfield, MA 02048

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION OF  
PENTAIR VALVES AND CONTROLS REPORT NO. 99901431/2014-201 AND  
NOTICE OF VIOLATION

Dear Mr. Martin:

On February 12 – 13, 2014, the U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Pentair Valves and Controls (Pentair) facility in Mansfield, Massachusetts. The purpose of this limited-scope inspection was to assess Pentair's compliance with 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 was a follow-up to the June 2013 NRC inspection that specifically evaluated Pentair's quality assurance (QA) activities associated with the testing of the pressurizer safety valve (PV-62), for the Westinghouse Electric Company (WEC) AP1000 reactor design and implementation of its Part 21 program. The inspection also evaluated activities related to Section III, "Rules for Construction of Nuclear Power Plant Components," of the American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code* and ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants." The enclosed report presents the results of the inspection. This NRC inspection report does not constitute the NRC endorsement of your overall QA or 10 CFR Part 21 programs.

During this inspection, the NRC inspectors observed the re-test of the pressurizer safety valve (PV-62) on February 12, 2014, for the ASME QME-1 functional qualification in accordance with the WEC design certification. This test is associated with inspections, tests, analyses, and acceptance criteria (ITAAC) from Revision 19 of the certified AP1000 Design Control Document, Tier 1. Specifically, these activities were associated with ITAACs 2.1.2.0.5.a.ii, 2.1.2.08.a.i, and 2.1.2.08.a.ii. The NRC inspectors did not identify any findings associated with ITAACs contained in Section (4) of the attachment to this report with respect to Pentair activities.

Based on the results of this inspection, the NRC has determined that one Severity Level IV violation of NRC requirements occurred. The NRC evaluated the violation in accordance with its enforcement policy, which is available on the NRC's Web site at <http://www.nrc.gov/about-nrc/regulatory/enforcement/enforce-pol.html>.

The enclosed notice cites the violation, and the subject inspection report details the circumstances surrounding it. The violation is cited because Pentair did not evaluate deviations documented in corrective action reports (CARs) 673, 674, and 675 to identify defects that could

be associated with substantial safety hazards within 60 days of discovery or file an interim report to inform the NRC that the evaluation would not be completed within 60 days of discovery. The NRC inspectors confirmed that Pentair shipped these AP1000 pressurizer safety valves (PV-62) to its customers without evaluating the deviations documented in CARs 673, 674, and 675 that were identified during the NRC June 2013 inspection. The affected pressurizer safety valves are N900028-00-0009, N900028-00-0010, N900028-00-0013, and N900028-00-0014 for Vogtle Units 3 and 4; and N900028-00-0011, N900028-00-0012, N900028-00-0015, and N900028-00-0016 for V.C. Summer Units 2 and 3.

You are required to respond to this letter and should follow the instructions specified in the enclosed notice when preparing your response. If you have additional information that you believe the NRC should consider, you may provide it in your response to the notice. The NRC's review of your response to the notice will also determine if further enforcement action is necessary to ensure compliance with regulatory requirements.

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 Violation. Please include your assessment of the issue on the quality of previous work. 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, (if applicable), 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,

*/RA/*

Edward H. Roach, Chief  
Mechanical Vendor Inspection Branch  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

be associated with substantial safety hazards within 60 days of discovery or file an interim report to inform the NRC that the evaluation would not be completed within 60 days of discovery. The NRC inspectors confirmed that Pentair shipped these AP1000 pressurizer safety valves (PV-62) to its customers without evaluating the deviations documented in CARs 673, 674, and 675 that were identified during the NRC June 2013 inspection. The affected pressurizer safety valves are N900028-00-0009, N900028-00-0010, N900028-00-0013, and N900028-00-0014 for Vogtle Units 3 and 4; and N900028-00-0011, N900028-00-0012, N900028-00-0015, and N900028-00-0016 for V.C. Summer Units 2 and 3.

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Sincerely,

/RA/

Edward H. Roach, Chief  
Mechanical Vendor Inspection Branch  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

Docket No.: 99901431

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NRO-002

<b>OFFICE</b>	NRO/DE/MEB	NRO/DCIP/MVIB	NRO/DCIP	NRO/DCIP/MVIB
<b>NAME</b>	TScarbrough	JOrtega-Luciano	TFrye	ERoach
<b>DATE</b>	03/28/2014	03/28/2014	03/28/2014	03/31/2014

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## NOTICE OF VIOLATION

Pentair Valves and Controls  
55 Cabot Boulevard  
Mansfield, MA 02048

Docket No.: 99901431  
Inspection Report No.: 2014-201

During a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Pentair Valves and Controls (Pentair) facility in Mansfield, MA, on February 12–13, 2014, the NRC inspectors identified a violation of NRC requirements. In accordance with the NRC Enforcement Policy, the violation is listed below:

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 21.21, “Notification of failure to comply or existence of a defect and its evaluation,” states, in part, that, “(a) Each individual, corporation, partnership, dedicating entity, or other entity...shall adopt appropriate procedures to (1) evaluate deviations and failures to comply to identify defects and failures to comply associated with substantial safety hazards as soon as practicable, and, except as provided in paragraph (a)(2) of this section, in all cases within 60 days of discovery, in order to identify a reportable defect or failure to comply that could create a substantial safety hazard, were it to remain uncorrected, and (2) Ensure that if an evaluation of an identified deviation or failure to comply potentially associated with a substantial safety hazard cannot be completed within 60 days from discovery of the deviation or failure to comply, an interim report is prepared and submitted to the Commission...This interim report must be submitted in writing within 60 days of discovery of the deviation or failure to comply.”

Pentair’s procedure QA-48-3016, “Reporting of Defects and Noncompliance – Section III/Nuclear,” Revision 10 dated October 13, 2009, Section 5.2, “Evaluation,” states, in part, that “The Evaluation Committee shall complete their evaluation report within 60 days of discovery. If an evaluation cannot be completed within 60 days of discovery, an interim report shall be prepared and submitted to the NRC within 60 days of discovery. The interim report shall describe the deviation or failure to comply being evaluated and state when the evaluation will be completed.”

Contrary to the above, as of February 13, 2014, Pentair failed to evaluate deviations documented in corrective action reports 673, 674 and 675 to identify defects that could be associated with substantial safety hazards within 60 days of discovery or file an interim report to inform the NRC that the evaluation would not be completed within 60 days of discovery. Specifically, Pentair failed to evaluate the deviations identified during the NRC June 2013 inspection associated with the qualification testing of the AP1000 pressurizer safety valve (PV-62). Also, Pentair failed to submit an interim report to inform the NRC that the pressurizer safety valves (PV-62) shipped to Vogtle Units 3 and 4 and VC Summer Units 2 and 3 had deviations that required evaluation and when such evaluations would be completed. The affected pressurizer safety valves (PV-62) are N900028-00-0009, N900028-00-0010, N900028-00-0013, and N900028-00-0014 for Vogtle Units 3 and 4; and N900028-00-0011, N900028-00-0012, N900028-00-0015, and N900028-00-0016 for V.C. Summer Units 2 and 3.

This issue has been identified as Violation 99901431/2014-201-01.

This is a Severity Level IV violation (Section 6.9.d of the NRC Enforcement Policy).

Pursuant to the provisions of 10 CFR 2.201, "Notice of Violation," Pentair is hereby required to submit a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-001, with a copy to the Chief, Mechanical 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 Violation. This reply should be clearly marked as a "Reply to a Notice of Violation;" and should include for each violation: (1) the reason for the violation, or, if contested, the basis for disputing the violation or severity level, (2) the corrective steps that have been taken and the results achieved, (3) the corrective steps that will be taken, and (4) the date when full compliance will be achieved. Your response may refer to or include previous docketed correspondence if the correspondence adequately addresses the required response. Where good cause is shown, consideration will be given to extending the response time.

If you contest this enforcement action, you also should provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington DC 20555-0001.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>, to the extent possible, it should not include any private personal or proprietary information or Safeguards Information so that it can be made available to the public without redaction. If private personal 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, "Protection of Safeguards Information: Performance Requirements."

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

Docket No.: 99901431

Report No.: 99901431/2014-201

Vendor: Pentair Valves and Controls  
55 Cabot Boulevard  
Mansfield, MA 02048

Vendor Contact: Mr. Brian Martin  
Quality Assurance Manager  
Brian.Martin@Pentair.com

Nuclear Industry Activity: Pentair Valves and Controls is an American Society of Mechanical Engineers (ASME) certificate holder with a scope of supply that includes ensuring design as procured; control and testing of safety-related ASME Boiler & Pressure Vessel (B&PV) Code valves; QME-1, "Qualification of Active Mechanical Equipment Used in Nuclear Power Plants," testing; safety-related instrumentation, diagnostic and test equipment, service and repair; and engineering services to the nuclear power industry. Pentair has been contracted by the Westinghouse Electric Company to provide pressurizer safety valves, auxiliary relief valves, and vacuum breaker valves for the AP1000 reactor design and to complete QME-1 testing for those valves.

Inspection Dates: February 12-13, 2014

NRC inspectors: Jonathan Ortega-Luciano NRO/DCIP/MVIB Team Leader  
Thomas Scarbrough NRO/DE/MEB

Approved: Edward H. Roach, Chief  
Mechanical Vendor Inspection Branch  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

## EXECUTIVE SUMMARY

### Pentair Valves and Controls 99901431/2014-201

The U. S. Nuclear Regulatory Commission (NRC) staff conducted this limited scope inspection to verify that Pentair Valves and Controls (Pentair) qualification testing of the pressurizer safety valve (PV-62) for the Westinghouse Electric Company's (WEC) AP1000 reactor design was adequate and correct, and met the applicable requirements of Appendix B to 10 CFR Part 50, 10 CFR Part 21, American Society of Mechanical Engineers (ASME) *Boiler & Pressure Vessel Code*, Section III, "Rules for Construction of Nuclear Facility Components", and ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment used in Nuclear Power Plants." The NRC inspection team conducted this inspection on February 12 – 13, 2014.

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

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

The NRC inspectors used Inspection Procedure (IP) 43003, "Reactive Inspections of Nuclear Vendors," dated October 13, 2013, IP 35034, "Design Certification Testing Inspection," dated January 27, 2010, and IP 65001.E, "Inspection of the ITAAC-Related Qualification Program," dated August 19, 2008, and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance," dated February 13, 2012.

The results of the inspection are summarized below.

#### Part 21

The NRC inspectors concluded that Pentair's implementation of 10 CFR Part 21 did not meet the requirements of 10 CFR Part 21. The NRC inspectors identified Violation 99901431/2014-201-01, for Pentair's failure to evaluate deviations, documented in corrective action reports 673, 674, and 675 to identify defects that could be associated with substantial safety hazards within 60 days of discovery or file an interim report to inform the NRC that the evaluation would not be completed within 60 days of discovery. Specifically, Pentair failed to evaluate the deviations identified during the NRC June 2013 inspection associated with the qualification testing of the AP1000 pressurizer safety valve (PV-62). Also, Pentair failed to submit an interim report to inform the NRC that the pressurizer safety valves shipped to Vogtle Units 3 and 4 and VC Summer Units 2 and 3 had deviations that required evaluation and when such evaluations would be completed. The affected pressurizer safety valves (PV-62) are N900028-00-0009, N900028-00-0010, N900028-00-0013, and N900028-00-0014 for Vogtle Units 3 and 4; and N900028-00-0011, N900028-00-0012, N900028-00-0015, and N900028-00-0016 for V.C. Summer Units 2 and 3.

#### Design Control

The NRC inspectors evaluated the implementation of the design control process associated with the functional qualification of the AP1000 PV-62 valve. PV-62 is commodity number assigned by WEC to make reference and keep track of activities related to the AP1000 pressurizer safety valve. Based on the February 2014 inspection, the NRC inspectors concluded that Pentair had conducted a re-test of the pressurizer safety valve (PV-62) that satisfied the design control

requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Specifically, the NRC inspectors concluded that Pentair's QME-1 qualification testing for the pressurizer safety valve conformed to the seismic qualification provisions specified in the Pentair Valve Qualification Test Procedure and the WEC design specifications to verify that the AP1000 pressurizer safety valves will perform their intended safety functions. No findings of significance related to Pentair design control activities for the pressurizer safety valve (PV-62) were identified.

#### Test Control

The NRC inspectors observed the qualification testing of the pressurizer safety valve (PV-62) at Pentair associated with inspections, tests, analyses, and acceptance criteria in the certified AP1000 DCD, Tier 1, incorporated in the combined licenses of Vogtle Units 3 and 4, and Summer Units 2 and 3. Specifically, the NRC inspectors reviewed Pentair's test control activities to verify that they were being implemented in accordance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. The NRC inspectors concluded that the ASME Standard QME-1 re-qualification testing of the pressurizer safety valve conformed to the test provisions specified in the Pentair Valve Qualification Test Procedure and the WEC AP1000 design specifications. At the time of the inspection, the NRC inspectors performed a detailed evaluation of the valve test results and observed the disassembly and inspection of the pressurizer safety valve. Pentair plans to perform the production test of the pressurizer safety valve in accordance with the Pentair Production Test Procedure following minor polishing and reassembly of the valve internals with installation of the full size spring. No findings of significance related to Pentair test control activities for the pressurizer safety valve (PV-62) were identified.

#### Control of Testing Equipment

The NRC inspectors concluded that Pentair's control of test equipment were adequate to meet the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. No findings of significance related to Pentair control of testing equipment activities for the pressurizer safety valve (PV-62) were identified.

#### Training and Qualification of Personnel

The NRC inspectors concluded the qualification records included the necessary education, on-the-job training, examinations and annual vision examination for the specific method and level for which the individual was qualified, and that the records were current. No findings of significance related to Pentair training and qualification activities for the pressurizer safety valve (PV-62) were identified.



## REPORT DETAILS

### 1. Part 21

#### a. Inspection Scope

As a follow-up to the NRC June 2013 inspection at Pentair, the NRC inspectors reviewed Pentair's corrective actions. In addition, the NRC inspectors reviewed the implementation of the policies and procedures that govern Pentair's Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21 program to verify compliance with the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance." Specifically, the NRC inspectors reviewed Pentair's procedure that describes the authorities and responsibilities for reporting defects and noncompliance. Further, the NRC inspectors interviewed the quality assurance (QA) director and technical staff members of Pentair, on the implementation of the Part 21 program.

#### b. Observations and Findings

During the re-test of the AP1000 the pressurizer safety valve (PV-62) in February 2014, the NRC inspectors identified that corrective action report (CAR) 673 stated that the deviation associated with the pressurizer safety valve did not need to be evaluated under Pentair's Part 21 program. Further, the NRC inspectors reviewed CARs 674 and 675 which document deviations that contributed to Pentair's decision to re-test the pressurizer safety valve. These deviations documented in CARs 673, 674, and 675 associated with the pressurizer safety valve were identified as potential findings during the NRC June 2013 inspection. Those findings identified during the June 2013 inspection were evaluated in accordance with Inspection Manual Chapter (IMC) 0617, "Vendor and Quality Assurance Implementation Inspection Reports." The evaluation resulted in findings greater-than-minor in accordance with Appendix E of IMC 0617. These greater-than-minor findings were documented in the Notice of Nonconformance of inspection report 99901431/2031-201, dated August 8, 2013.

Pentair's Part 21 implementing procedure QA-48-3016 explains the process that establishes the requirements of notification to the NRC and affected customer(s) of: (a) a failure to comply with the Atomic Energy Act of 1954, as amended, or any applicable rule, regulation, order, or license of the Commission relating to substantial safety hazards, or (b) the existence of a defect and its evaluation. Section 5.2, "Evaluation," of this procedure provides guidance to the QA Manager to evaluate deviations to determine if such a deviation could create a substantial safety hazard and this determination needs to be completed in conjunction with the Engineering Manager. Further, the procedure states that if the component has been shipped, the QA Manager needs to involve the Evaluation Committee to determine whether the deviation could create a substantial hazard or determine whether a failure to comply is associated with a substantial safety hazard. As part of the evaluation, the Evaluation Committee also considers the extent of the condition to identify other components that may also be affected.

The NRC inspectors confirmed that Pentair shipped these AP1000 pressurizer safety valves (PV-62) to its customers without evaluating the deviations documented in CARs 673, 674, and 675 that were identified during the NRC June 2013 inspection. The affected pressurizer safety valves are N900028-00-0009, N900028-00-0010, N900028-00-0013, and N900028-00-0014 for Vogtle Units 3 and 4; and

N900028-00-0011, N900028-00-0012, N900028-00-0015, and N900028-00-0016 for V.C. Summer Units 2 and 3. The NRC inspectors discussed with Pentair's QA manager that Pentair failed to evaluate this deviation as soon as practicable within 60 days of discovery and failed to submit an interim report to the NRC. This issue is identified as Violation 99901431/2014-201.

c. Conclusion

The NRC inspectors issued Violation 99901431/2014-201-01 for Pentair's failure to evaluate deviations, documented in CARs 673, 674, and 675 to identify defects and failures to comply that could be associated with substantial safety hazards as soon as practicable within 60 days of discovery or file an interim report. Specifically, Pentair failed to evaluate the deviations identified during the NRC June 2013 inspection, and failed to submit an interim report to inform the NRC, that the pressurizer safety valves shipped to Vogtle Units 3 and 4 and VC Summer Units 2 and 3 had deviations that required evaluation and when such evaluations would be completed.

2. Design Control

a. Inspection Scope

As a follow-up to the NRC June 2013 inspection at Pentair, the NRC inspectors reviewed Pentair's design control activities to verify that they were being implemented in accordance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. The NRC inspectors evaluated the implementation of the design control process associated with the functional qualification of the AP1000 PV-62 valve. PV-62 is commodity number assigned by Westinghouse Electric Company (WEC) to make reference and keep track of activities related to the AP1000 pressurizer safety valve. The re-test was designed to satisfy the functional qualification testing provisions in ASME Standard QME-1-2007, "Qualification of Active Mechanical Equipment used in Nuclear Power Plants," as specified in the WEC AP1000 design specifications. Also, the NRC inspectors evaluated the implementation of the corrective actions to address the seismic qualification of the pressurizer safety valve (PV-62) in response to the NRC staff findings during the June 2013 inspection. The NRC inspectors verified that these corrective actions were included in the latest revision of Pentair's Valve Qualification Test Procedure (VQT) 38173. The attachment to this inspection report lists the documents reviewed by the NRC inspectors.

b. Observations and Findings

The WEC design specifications require that the AP1000 valve qualifications meet ASME Standard QME-1-2007 which allows seismic qualification by static deflection testing. The Pentair test procedures require the performance of seismic qualification testing with the determination of an appropriate static load to be applied to the least rigid axis during the valve tests to demonstrate the seismic qualification of the tested valve. Pentair Test Report (TR) 5509 determined that the resonance frequency of the pressurizer safety valve (PV-62) in the side-to-side orientation (also referred to as horizontal), is lower than the front-to-back orientation (also referred to as axial). During the NRC June 2013 inspection, the NRC inspectors determined that the previous Pentair QME-1 seismic qualification test for the pressurizer safety valve (PV-62) was not performed in

accordance with VQT-38173, because Pentair applied the static load in the front-to-back orientation (i.e., more rigid).

During the NRC February 2014 inspection, the QME-1 qualification testing performed by Pentair of the pressurizer safety valve (PV-62) included operational tests with a prorated spring and appropriate set pressure, and 15-minute seat leakage tests, which were conducted before, during, and following application of the seismic static load. The NRC inspectors confirmed during the re-test of the pressurizer safety valve that Pentair applied the seismic static load along the least rigid axis. In addition, the NRC inspectors reviewed Pentair's seismic static load calculation and the specific pressure applied by the pneumatic cylinder to reflect the seismic static load during the QME-1 qualification test of the pressurizer safety valve. Pentair used a prorated spring for the pressurizer safety valve QME-1 qualification testing to allow sufficient steam flow to demonstrate the valve performance characteristics. The NRC inspectors reviewed the engineering justification for the prorated spring and its set pressure to demonstrate QME-1 qualification of the full size spring including comparison of work deflection, deflection at setpoint, and spring ratio for the prorated spring at a set pressure of 900 psig and the full size spring at a set pressure of 2485 psig.

During production tests, the full size spring will be installed in each of the pressurizer safety valves (PV-62) in accordance with Pentair Production Test Procedure T-161093 to demonstrate set pressure operation at 2485 psig and seat leakage requirements.

c. Conclusion

The NRC inspectors concluded that Pentair had conducted a re-test of the pressurizer safety valve (PV-62) that satisfied the design control requirements of Criterion III of Appendix B to 10 CFR Part 50. Specifically, the NRC inspectors concluded that Pentair's QME-1 qualification testing of the pressurizer safety valve conformed to the seismic qualification provisions specified in the Pentair Valve Qualification Test Procedure and the WEC design specifications to verify that the AP1000 pressurizer safety valves will perform their intended safety functions.

3. Test Control

a. Inspection Scope

As a follow-up to the inspection at Pentair in June 2013, the NRC inspectors reviewed Pentair's test control activities to verify that they were being implemented in accordance with the regulatory requirements of Criterion XI, "Test Control," of Appendix B to 10 CFR Part 50. In particular, the NRC inspectors evaluated the implementation of the Pentair test control process associated with the re-test of the pressurizer safety valve (PV-62). Further, the NRC inspectors reviewed Pentair's current VQT-38173 and T-161093 for the pressurizer safety valve (PV-62). The NRC inspectors discussed these design control activities with Pentair's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspectors.

b. Observations and Findings

The NRC inspectors confirmed that Pentair test engineers performed the QME-1 qualification testing using the updated Pentair Valve Qualification Test Procedure VQT-38173. The NRC inspectors confirmed the identification numbers for the pressurizer safety valve (PV-62) being tested and the test equipment being used to monitor the valve performance characteristics. Also, the NRC inspectors observed that Pentair test personnel followed VQT-38173 for the QME-1 qualification test for the pressurizer safety valve including repetitive operational tests and seat leakage tests before, during, and following application of the static seismic load. The operability test included acceptance criteria for opening pressure, maximum overpressure, lift, reseal pressure, and ambient temperature. The seat leakage test included acceptance criteria of no fog, condensate or droplets; this was performed by holding a cold polished rod over the valve exhaust path. The NRC inspectors confirmed that no condensation or fog was present over the cold polished rod when it was positioned over the valve exhaust path with the valve seated.

The NRC inspectors verified that the WEC Valve Datasheet APP-PV62-Z0R-001 for the AP1000 pressurizer safety valve (PV-62) specifies that testing shall be performed at an ambient temperature between 50 and 120 °F. During the re-test of the pressurizer safety valve, the NRC inspectors confirmed that Pentair test personnel maintained the ambient temperature in the 70 to 80 °F range to satisfy the WEC design specification.

Following the QME-1 qualification tests, the NRC inspectors observed the disassembly and inspection of the pressurizer safety valve tested. The NRC inspectors found that the disassembly process was well coordinated and completed with no significant disassembly issues. The NRC inspectors observed that the valve internals revealed no degradation with only typical loading indications visible on the nozzle seat and disc insert. Pentair documented these results in a disassembly and inspection record, and it was verified and signed in accordance with Pentair's quality control acceptance process.

Based on the observation of the Pentair QME-1 qualification testing and inspection activities during the 2014 inspection, the NRC inspectors considered the pressurizer safety valve (PV-62) to have successfully satisfied its QME-1 functional qualification testing within the specified test acceptance criteria with repetitive operational tests and seat leakage tests before, during, and following the application of the seismic static load along the least rigid axis of the valve. Pentair planned to perform the production test of pressurizer safety valve in accordance with Pentair Production Test Procedure T-161093 following minor polishing and reassembly of the valve internals with installation of the full size spring.

c. Conclusions

Based on the February 2014 inspection, the NRC inspectors concluded that Pentair had conducted a re-test of the pressurizer safety valve (PV-62) that satisfied the test control requirements of Criterion XI of Appendix B to 10 CFR Part 50. Specifically, the NRC inspectors concluded that the AP1000 pressurizer safety valve re-test was successful based on the detailed evaluation of the test results and internal inspection of the valve as verified by Pentair and WEC in accordance with QA program requirements to determine the applicability of the test results in supporting completion of inspections, tests, analyses, and acceptance criteria (ITAAC). The list of applicable ITAAC can be

found in Section (4) of the attachment to this report with respect to Pentair pressurizer safety valve (PV-62) re-test activities.

#### 4. Control of Testing Equipment

##### a. Inspection Scope

The NRC inspectors reviewed policies and procedures associated with the control of the equipment being utilized by Pentair to perform the qualification testing of the pressurizer safety valve (PV-62) to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. The NRC inspectors reviewed calibration records for a sample of measurement and test equipment used during the qualification testing and discussed the Measuring and Test Equipment (M&TE) program with Pentair's technical staff

##### b. Observations and Findings

No findings of significance were identified.

##### c. Conclusions

The NRC inspectors determined that test records were completed as required and that set-up activities were performed consistent with the requirements specified in the test procedures. The NRC inspectors concluded that Pentair is implementing its M&TE program in accordance with the regulatory requirements of Criterion XII of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspectors also determined that Pentair is implementing its policies and procedures associated with the M&TE program. No findings of significance were identified.

#### 5. Training and Qualification of Personnel

##### a. Inspection Scope

The NRC inspectors reviewed policies, implementing procedures, and records that govern Pentair's training and qualification to verify compliance with Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR Part 50. The NRC inspectors verified that Pentair has programs in place to address the training and qualification of personnel performing activities that affect quality. The programs include procedures that incorporate appropriate training and qualification practices. The NRC inspectors reviewed the qualification of two Pentair employees who participated in the qualification testing of the pressurizer safety valve (PV-62). The NRC inspectors confirmed the qualification records included the necessary education, on-the-job training, examinations and annual vision examination for specific method and Level for which the individual was qualified, and that the records were current.

##### b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspectors concluded that Pentair is implementing its training and qualification program in accordance with Criterion II of Appendix B to 10 CFR Part 50. Based on the documents reviewed, the NRC inspectors also determined that Pentair is implementing its policies and procedures associated with its training and qualification programs. No findings of significance were identified.

6. Exit Meeting

On February 13, 2014, the NRC inspectors presented their inspection scope and findings during an exit meeting with Mr. David Smith, General Manager, and Pentair management and engineering personnel.

## ATTACHMENT

### 1. ENTRANCE/EXIT MEETING ATTENDEES AND INDIVIDUALS INTERVIEWED

Name	Title	Affiliation	Entrance	Exit	Interviewed
John Webb	QA Engineer	Pentair	X	X	X
Dave Smith	General Manager	Pentair	X	X	
Brian L. Martin	QA Manager	Pentair	X	X	X
Michael Rider	Engineering Manager	Pentair	X	X	X
Michael Myette	Special Product Assembly	Pentair	X	X	X
Gerry L. Doney	Supplier Quality Oversight	Westinghouse	X	X	
Lynn Skarin	Nuclear Projects Manager	Pentair	X	X	X
Michael DiProni	Project Engineer	Pentair	X		X
Jin Yu	Engineering	Pentair			X
Carol Stevens	QA Supervisor	Pentair	X		

### 2. INSPECTION PROCEDURES USED

- Inspection Manual Chapter (ICM) 2507, "Construction Inspection Program Vendor Inspections," dated October 3, 2013
- IMC 0617, "Vendor And Quality Assurance Implementation Inspection Reports," dated October 3, 2013
- IP 35034, "Design Certification Testing Inspection," dated January 27, 2010
- IP 43003, "Reactive Inspections of Nuclear Vendors," dated October 3, 2013
- IP 65001.E, "Inspection of the ITAAC-Related Qualification Program," dated August 19, 2008

### 3. LIST OF ITEMS OPENED AND CLOSED

Item Number	Status	Type	Description	Applicable ITAAC
99901431/2014-201	Open	NOV	Part 21	N/A
99901431/2013-201-01	Open <sup>1</sup>	NON	Criterion III	2.1.2.02.a, 2.1.2.05.a.ii 2.1.2.08.a.ii 2.2.3.02.a 2.2.3.05.a.ii.
99901431/2013-201-02	Open <sup>1</sup>	NON	Criterion XI	N/A
99901431/2013-201-03	Close	NON	Criterion III	N/A
99901431/2013-201-04	Open <sup>1</sup>	NON	Criterion IV & VII	N/A

<sup>1</sup> This NON was discussed with Pentair as part of the follow-up inspection to evaluate implementation of the corrective actions.

99901431/2013-201-05	Open <sup>1</sup>	NON	Criterion VII	N/A
99901431/2013-201-06	Open <sup>1</sup>	NON	Criterion IX	N/A

#### 4. INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA

The U.S. Nuclear Regulatory Commission (NRC) inspectors identified the following inspections, tests, analyses, and acceptance criteria (ITAAC) related to components being tested by Pentair. At the time of the inspection, Pentair was involved in qualification testing of the pressurizer safety valves (PV-62) for the AP1000 reactor design. For the ITAAC listed below, the NRC inspectors reviewed Pentair's quality assurance controls in the areas of design control, test control, control of measuring and test equipment, and corrective actions. The ITAAC's design commitment referenced below are for future use by the NRC staff during the ITAAC closure process; the listing of these ITAAC design commitments does not constitute that they have been met and/or closed. The NRC inspectors did not identify any findings associated with the ITAAC identified below.

ITAAC	Design Commitment	Acceptance Criteria
2.1.2.02.a	2.a) The components identified in Table 2.1.2-1 as ASME Code Section III are designed and constructed in accordance with ASME Code Section III requirements.	PV62 valves RCS-PL-V005A & B (Pressurizer Safety Valves)
2.1.2.04.a	4.a) The components identified in Table 2.1.2-1 as ASME Code Section III retains their pressure boundary integrity at their design pressure.	PV62 valves RCS-PL-V005A & B (Pressurizer Safety Valves)
2.1.2.05.a.ii	5.a) The seismic Category I equipment identified in Table 2.1.2-1 can withstand seismic design basis loads without loss of safety function.	PV62 valves RCS-PL-V005A & B (Pressurizer Safety Valves)
2.1.2.08.a.i	8.a) The pressurizer safety valves provide overpressure protection in accordance with Section III of the ASME Boiler and Pressure Vessel Code.	PV62 valves RCS-PL-V005A & B (Pressurizer Safety Valves)
2.1.2.08.a.ii	8.a) The pressurizer safety valves provide overpressure protection in accordance with Section III of the ASME Boiler and Pressure Vessel Code.	PV62 valves RCS-PL-V005A & B (Pressurizer Safety Valves)

#### 5. Documents Reviewed

##### Specifications, Test Plans, Procedures, and Drawings

- Pentair Quality Assurance Manual QC-110, Revision 42, dated June 13, 2013.
- Departmental Operating Instruction (DOI) Quality Assurance (QA) 48-3016, "Reporting of Defect and Noncompliance-Section III / Nuclear," Revision 11, dated January 6, 2014
- Pentair Drawing DS-B900028 (Revision J, July 7, 2008), "Nozzle Type Relief Valve."
- Pentair Engineering Procedure – Production Test Procedure T-161093 (Revision 7, February 4, 2014), "Production Test Procedure – 6" P 8" HB-BP-86 Pressurizer Safety Valves."
- Pentair Test Report TR-5509 (Revision 4, June 5, 2012), "ASME QME-1 Functional Qualification Test Report for Active Valve Assemblies – 6 P 8 HB-BP-86 Type E, Pressurizer Safety Valves."



- Pentair Test Report TR-5556 (Revision 2, June 6, 2012), “Qualification Test Report Summary for Style 6” P8” HB-BP-86 Pressurizer Safety Valve.”
- Pentair Engineering Procedure - Valve Qualification Test Procedure VQT-38173 (Revision 7, February 6, 2014), “ASME QME-1 Functional Qualification Test Program for Active Valve Assemblies – 6” P 8” HB-BP-86 Pressurizer Safety Valves.”
- Pentair ASME Section XI Repair Route Sheet QC-253, Pressurizer Safety Valve N900028/HB-BP-86 (2/10/2014).
- Pentair NR – Receipt Inspection Report QC-438, Pressurizer Safety Valve N900028/HB-BP-86 (2/13/2014).
- Pentair ASME QME-1 Qualification Test Program Valve Test Report Form, Valve N900028-00-0009 (2/13/2014).
- Pentair Section III Gage Calibration Test Form QC-92, Gage Serial #721577 (2/13/14).
- Pentair Section III Gage Calibration Test Form QC-92, Gage Serial #R00099 (2/13/14).
- Pentair Section III Gage Calibration Test Form QC-92, Gage Serial #A25359 (2/13/14).
- Pentair Thermocouple/Recorder Loop Calibration QC-260, Recorder Serial #92905 (2/13/14).
- Pentair LVDT Step Block Calibration, Step Block Serial #SPA015J (1/30/14).

#### Corrective Action Requests

- Pentair Corrective Action Request (CAR) Nos. 665, 666, 667, 673, 674, 675, 707, 708, and 709

#### Corrective Action Request Generated as a Result of this Inspection

- CAR No. 745, dated February 13, 2014

#### Westinghouse

- Westinghouse Design Specification APP-GW-VP-010 (Revision 2, April 2010), “AP1000 Plant Equipment Qualification Methodology and Documentation Requirements for AP1000 Safety-Related Valves and Valve Appurtenance.”
- Westinghouse Design Specification APP-PV62-Z0-001 (Revision 7, September 2012), “Pressurizer Safety Valve, ASME B&PV Code, Section III, Class 1.”
- Westinghouse Design Specification APP-PV62-Z0R-001 (Revision 4, September 2012), “Pressurizer Safety Valves (PSV), ASME Code Section III, Class 1 Valve Datasheet Report.”

#### Other

- Instron Certificate of Calibration No. 09252012SSA, 30000lb OMEGADYNE Load Cell Serial # 034482 (10/2/12).
- Process Instruments Inc. Certificate No. CAL132787A, Dead Weight Tester Serial #94062 (10/18/13).