

January 15, 2016

Mr. Tad Gray, General Manager  
Nova Machine Products Company  
18001 Sheldon Road  
Middleburg Heights, Ohio

SUBJECT: NUCLEAR REGULATORY COMMISSION VENDOR INSPECTION OF NOVA  
MACHINE PRODUCTS COMPANY REPORT NO. 99901052/2015-201,  
NOTICE OF VIOLATION AND NOTICE OF NONCONFORMANCE

Dear Mr. Gray,

From November 30 through December 4, 2015, U.S. Nuclear Regulatory Commission (NRC) staff conducted an inspection at the Nova Machine Products Company (hereafter referred to as Nova) facility in Middleburg Heights, OH. The purpose of this limited scope routine inspection was to assess Nova's compliance with provisions of Title 10 of the Code of Federal Regulations (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions 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."

This technically-focused inspection specifically evaluated Nova's implementation of quality activities associated with the design and fabrication of safety-related American Society of Mechanical Engineers (ASME) Code fasteners and machined components, and Nova's reverse engineering processes for safety-related components supplied to U.S. nuclear power plants. The enclosed report presents the results of the inspection. This NRC inspection report does not constitute NRC endorsement of Nova's overall quality assurance (QA) program.

Based on the results of this inspection, the NRC staff determined that a violation of NRC requirements occurred. The violation is cited in the enclosed Notice of Violation (Notice) and the circumstances surrounding it are described in detail in the subject inspection report. The violation is being cited in the Notice of Violation because Nova failed to conduct a Part 21 evaluation for a deviation concerning two degraded hydraulic control unit accumulators potentially associated with a substantial safety hazard as soon as practical and within 60 days of discovery.

You are required to respond to this letter and should follow the instructions specified in the enclosed Notice of Violation 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 review of your response to the Notice will also determine whether further enforcement action is necessary to ensure compliance with regulatory requirements.

During this inspection, NRC inspectors also found that the implementation of your QA program failed to meet certain NRC requirements imposed on you by your customers. The inspectors determined that Nova was not fully implementing its QA program in the areas of: design control, commercial grade dedication, and internal audits. Specifically; 1) Nova failed to establish adequate design control measures to verify and check the adequacy of the design of hydraulic control unit accumulators used in the control rod drive system of boiling water reactors, 2) Nova failed to establish adequate measures for the selection and review for suitability of application of materials and processes that are essential to the safety-related functions of the structures, systems, and components. Nova failed to assure that purchased material and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents; and 3) Nova failed to verify that audits were performed by personnel not having direct responsibilities in the areas being audited. The enclosed Notices of Nonconformance (NON) cite these nonconformances, and the enclosed report describes 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 Notice of Nonconformance. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosures, and your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System (ADAMS) accessible 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).

Sincerely,

***/RA/ Laura Micewski for***  
Richard McIntyre, Acting Chief  
Mechanical Vendor Inspection Branch  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

Docket No.: 99901052

Enclosures:

1. Notice of Violation
2. Notice of Nonconformance
3. Inspection Report 99901052/2015-201  
And Attachment

Docket No.: 99901052

Enclosures:

1. Notice of Violation
2. Notice of Nonconformance
3. Inspection Report 99901052/2015-201

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<b>DATE</b>	1/13/2016	1/11/2016	1/15/2016

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## NOTICE OF VIOLATION

Nova Machine Products Company  
Middleburg Heights, Ohio

Docket No.: 99901052

During an U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Nova Machine Products Company (Nova) facility in Middleburg Heights, OH from November 30 through December 4, 2015, a violation of NRC requirements was identified. In accordance with the NRC Enforcement Policy, the violation is listed below:

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, Reporting of Defects and Noncompliance, Paragraph 21.21(a)(1), "Notification of Failure to Comply or Existence of a Defect and Its Evaluation," requires, in part that entities subject to Part 21 evaluate deviations and failures to identify defects and failures to comply associated with substantial safety hazards as soon as practical, 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.

Nova Procedure 8.3.1, "10 CFR 21", Revision 10, dated April 30, 2015, specifies that QA [quality assurance] will initiate an evaluation of the suspected defect, and complete the evaluation within 60 days of discovering the suspected defect.

Contrary to the above as of December 4, 2015, Nova failed to conduct a Part 21 evaluation for a deviation potentially associated with a substantial safety hazard as soon as practical and within 60 days of discovery concerning two degraded hydraulic control unit (HCU) accumulators installed at Fermi Unit 2, which were reverse-engineered and supplied by Nova. Specifically, Nova initiated Corrective Action Request #246 on January 24, 2014 to document the leakage issue concerning the two HCU accumulators but failed to identify a deviation associated with the degraded accumulator assemblies, and subsequently did not perform a Part 21 evaluation.

This issue has been identified as Violation 99901052/2015-201-01.

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," Nova 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, Quality Assurance Vendor Inspection Branch 2, 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 (Notice). 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 reference or include previously docketed correspondence, if the correspondence adequately addresses the required response. Where good cause is shown, consideration will be given to extending the response time.

Enclosure 1

If you contest this enforcement action, you should also provide a copy of your response, with the basis for your denial, to the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, and 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 (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, "Protection of Safeguards Information: Performance Requirements."

Dated this 15th day of January 2016.

## NOTICE OF NONCONFORMANCE

Nova Machine Products Company  
Middleburg Heights, Ohio

Docket No. 99901052

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the Nova Machine Products Company (Nova) facility in Middleburg Heights, OH, from November 30 through December 4, 2015, certain activities were not conducted in accordance with NRC requirements that were contractually imposed on Nova by its customers or NRC licensees:

- A. Criterion III, "Design Control", of Appendix B, "Quality Assurance Program 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," states, in part, that design control measures shall provide for verifying or checking for adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.

Nova Quality Assurance Manual (QAM), Edition 10, Section 4, "Design Control-Reverse Engineering," dated November 20, 2014, requires design inputs be addressed during the application of each safety-related reverse-engineering package. Those design inputs include, but are not limited to; system and component function, environmental and loading conditions, and material, mechanical, and performance requirements. Design verification is then required to assure that design input and output requirements have been met through design review, alternate calculations, and/or through qualification testing as appropriate to demonstrate the adequacy of the performance of design against the design input requirements.

Nova Work Instruction 7.1.1, "Safety-Related Reverse Engineering," dated August 16, 2010, implements Nova QAM Section 4 and directs the development of a Technical Evaluation Document (TED) for each pending safety-related reverse engineering application.

Contrary to the above, as of December 4, 2015, Nova failed to establish adequate design control measures to verify and check the adequacy of the design of hydraulic control unit (HCU) accumulators used in the control rod drive system of boiling water reactors. Specifically, Nova failed to establish equivalency to the design parameters of the General Electric (GE)-design accumulators upon which the Nova accumulators were reverse-engineered. Nova reverse-engineered and subsequently manufactured approximately 881 safety-related HCU accumulator assemblies without proper design verification in the form of a design review, use of calculational methods, or through a suitable qualification testing program.

This issue has been identified as Nonconformance 99901052/2015-201-02.

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

Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B, to 10 CFR 50 states, in part, "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."

Nova Work Instruction 7.3.20, "Commercial Grade Dedication," Revision 3, dated September 11, 2012, states, in part, that "Each dedication plan shall establish the following: 1) Safety function of the item, 2) The item failure mode, 3) Critical characteristics for acceptance, 4) Engineering basis for selection of the critical characteristics, 5) The detailed acceptance requirements for verification of the critical characteristics including the group or department responsible for performing the activity and assignment of acceptance criteria with tolerances if applicable, and 6) Identify the sample size or reference the required sampling plan." It also states, "A commercial grade item may have some or all characteristics verified and tested by the vendor in accordance with the dedication plan provided that QA audits, surveys, or approves the vendors program for those activities and or performs surveillance of those activities."

Contrary to the above, as of December 4, 2015, NRC staff identified three (3) examples where Nova failed to establish adequate measures for the selection and review for suitability of application of materials and processes that are essential to the safety-related functions of the structures, systems, and components. Also, Nova failed to assure that purchased material and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. Specifically, Nova failed to perform an adequate dedication plan to establish the engineering basis for selection of the critical characteristics related to plating services. Nova failed to identify the critical characteristics and appropriate acceptance methods associated to the plating material for a charging pump plunger, a stainless steel cylinder, and hex socket head cap screws.

This issue has been identified as Nonconformance 99901052/2015-201-03.

- C. Criterion XVIII, "Audits," of Appendix B, to 10 CFR Part 50, states, in part, that "audits shall be performed in accordance with the written procedures or checklists by appropriately trained personnel not having direct responsibilities in the areas being audited."

Subsection 17.4, "Internal Audits," of Nova's Quality Assurance Manual, Edition 10, Revision 0, dated November 20, 2014, states, in part, that "Auditors selected shall not have direct responsibilities in the area he/she is auditing."

Contrary to the above, as of December 4, 2015, Nova failed to verify that audits were performed by personnel not having direct responsibilities in the areas being audited. Specifically, the NRC inspection team identified that during a 2015 internal audit, the QA Manager, who has direct responsibility for the implementation of Nova's QA program,



participated in an internal audit as a member of the audit team and audited areas for which he had direct responsibility.

This issue has been identified as Nonconformance 99901052/2015-201-04.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Quality Assurance Vendor Inspection Branch 2, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformance. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance; (2) the corrective steps that have been taken and the results achieved; (3) the corrective steps that will be taken. 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, which is 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 that such material be withheld, 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."

Dated this the 15<sup>th</sup> day of January 2016.

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

Docket No.: 99901052

Report No.: 99901052/2015-201

Vendor: Nova Machine Products Company (Nova)  
18001 Sheldon Road  
Middleburg Heights, OH 44130

Vendor Contact: Frank Furfari, Quality Assurance Manager  
[Ffurfari@curtisswright.com](mailto:Ffurfari@curtisswright.com)  
Phone: 216-898-8394

Nuclear Industry Activity: Nova, a business unit of Curtiss-Wright, manufactures safety-related American Society of Mechanical Engineers (ASME) Code fasteners and machined components, bolting and construction products, and engineering products for the commercial nuclear power industry.

Inspection Dates: November 30, 2015 – December 4, 2015

Inspectors: Jermaine Heath NRO/DCIP/QVIB, Team Leader U/I  
Jonathan Ortega NRO/DCIP/MVIB, Assistant Lead  
Richard Laura NRO/DCIP/QVIB  
Raju Patel NRO/DCIP/MVIB

Approved by: Richard McIntyre, Acting Chief  
Mechanical Vendor Inspection Branch  
Division of Construction Inspection  
and Operational Programs  
Office of New Reactors

## **EXECUTIVE SUMMARY**

### Nova Machine Products Company Inspection Report No. 99901052/2015-201

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a vendor inspection at the Nova Machine Products Company (hereafter referred to as a Nova) facility located in Middleburg Heights, Ohio, to verify that it had implemented an adequate quality assurance (QA) program that complies with the requirements of Title 10 of the Code of Federal Regulations (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions 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." The NRC inspection team conducted the inspection from November 30 through December 4, 2015. This was the second NRC inspection conducted at the Nova facility.

This technically-focused inspection evaluated Nova's implementation of quality activities associated with safety-related systems, structures, and components (SSCs) to determine if those activities were being effectively implemented. The NRC inspection team evaluated design control, reverse engineering, oversight of contracted activities, control of special processes, commercial-grade dedication, procurement document control, control of measuring and test equipment (M&TE), and internal audits.

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

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

During the course of this inspection, the NRC inspection team implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors"; IP 43004, "Inspection of Commercial-Grade Dedication Programs"; and IP 36100, "Inspection of 10 CFR Part 21 and Programs for Reporting Defects and Noncompliance."

Some of the specific activities observed by the NRC inspection team included:

- Setup and performance of hardness test of a 1/2 inch-20 UNF-2B-Heavy Hexagonal (hex) Nut, Lot No. 50474034 to confirm material meets ASME SA194 Grade 8, 1986 Edition Code requirements
- Setup and performance of mechanical proof load test of a 1/2 inch-20 UNF-2B-Heavy Hex Nut, Lot No. 50474034 to confirm material meets ASME SA194 Grade 8, 1986 Edition Code requirements
- Wet Fluorescent Magnetic Particle examination of 1-1/4 inch-12 UNF-2B Hex Nuts, Lot No. 50473476 for Nova work order number (No.) 297221
- Setup and performance of Water Washable Fluorescent Liquid Examination of 26 bonnet studs size 2.00-8-UN-2A x 13 inch for Nova work order No. 297061
- Conduct of Material Review Board disposition of nonconforming materials
- Receipt Inspection of safety-related studs size 1/2-inch-13 UNC 2A x 10-1/4 inch zinc plated by Kelly Plating on purchase order (PO) No. 3160859

- Setup and performance of chemical analysis of 3/8" hot finished bar, lot No. 50475602 Nova work order No. 298600, to confirm material meets ASME SA36, 2011 Addenda requirements
- Setup and performance of tensile test of 7/8 inch-9 round test pieces, lot No. 50474254 for work order No. 297786-430, to verify material conforms to ASME SA193 Grade B7 requirements

In addition to observing these activities, the NRC inspection team verified that the M&TE was properly identified, marked, calibrated, and used within its calibrated range. The inspectors also walked down Nova's physical and chemical test laboratories and assembly floor to verify that nonconforming components were properly identified, marked, and segregated when practical, and to ensure that they were not reintroduced into the manufacturing processes.

The information below summarizes the results of this inspection.

#### 10 CFR Part 21 Program

The NRC inspection team issued Violation 99901052/2015-201-01 in association with Nova's failure to implement the regulatory requirements of 10 CFR Part 21. Violation 99901052/2015-201-01 cites Nova for failure to conduct a Part 21 evaluation for a deviation potentially associated with a substantial safety hazard as soon as practical and within 60 days of discovery concerning two degraded hydraulic control unit (HCU) accumulators installed at Fermi Unit 2 which were reverse-engineered and supplied by Nova. Specifically, Nova initiated Corrective Action Request #246 on January 24, 2014, to document a leakage issue concerning two HCU accumulators but failed to identify a deviation associated with the degraded accumulator assemblies, and subsequently did not perform a Part 21 evaluation.

#### Design Control

The NRC inspection team issued Nonconformance 99901052/2015-201-02 in association with Nova's failure to implement the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 99901052/2015-201-02 cites Nova for failure to establish adequate design control measures to verify and check the adequacy of the design of hydraulic control unit (HCU) accumulators used in the control rod drive system of boiling water reactors. Nova failed to establish equivalency to the design parameters of the General Electric (GE)-design accumulators upon which the Nova accumulators were reverse-engineered. Nova failed to perform an adequate technical evaluation that identified and verified the critical design attributes under all credible failure modes necessary to provide reasonable assurance that the HCU accumulator could perform its intended safety function and meet all design basis requirements as part of the control rod drive system. Nova reverse-engineered and subsequently manufactured approximately 881 safety-related HCU accumulator assemblies without proper design verification in the form of a design review, use of calculational methods, or through a suitable qualification testing program.

### Commercial-Grade-Dedication

The NRC inspection team issued Nonconformance 99901052/2015-201-03 in association with Nova's failure to implement the regulatory requirements of Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR 50. Nonconformance 99901052/2015-201-03 cites Nova for the failure to establish adequate measures for the selection and review for suitability of application of materials and processes that are essential to the safety-related functions of the structures, systems, and components. Also, Nova failed to assure that purchased material and services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents. Specifically, Nova failed to perform an adequate dedication plan to establish the engineering basis for selection of the critical characteristics related to plating services. Nova failed to identify the critical characteristics and appropriate acceptance methods associated to the plating material for a charging pump plunger, a stainless steel cylinder, and hexagonal socket head cap screws.

### Internal Audits

The NRC inspection team issued Nonconformance 99901052/2015-201-04 in association with Nova's failure to implement Criterion XVIII "Audits," of Appendix B to 10 CFR Part 50. Nonconformance 99901052/2015-201-04 cites Nova for failing to verify that internal audits were performed by personnel not having direct responsibilities in the areas being audited. Specifically, the NRC inspection team identified that during a 2015 internal audit, the QA Manager, who has direct responsibility for the implementation of Nova's QA program, participated as a member of the audit team and audited areas for which he had direct responsibility.

### Other Inspection Areas

The NRC inspection team determined that Nova is implementing its programs for Control of Special Processes, Nonconforming Material, Parts, or Components; Control of Measuring and Test Equipment; Procurement Document Control; Oversight of Suppliers; Control of Purchased Materials, Equipment, and Services, and Corrective Actions in accordance with the applicable regulatory requirements of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed and activities observed, the NRC inspection team also determined that Nova is implementing its policies and procedures associated with these programs. No findings of significance were identified.

## REPORT DETAILS

### 1. 10 CFR Part 21 Program

#### a. Inspection Scope

The NRC inspection team reviewed Nova's policies and implementing procedures that govern the facility's compliance with the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance." In addition, the NRC inspection team evaluated the 10 CFR Part 21 postings and a sample of Nova purchase orders for compliance with the requirements of 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation," and 10 CFR 21.31, "Procurement Documents." The NRC inspection team verified the content of Nova's 10 CFR Part 21 posting, as well as the location of the posting. The NRC inspection team also verified that Nova's nonconformance and corrective action procedures provide a link to the 10 CFR Part 21 program.

The attachment to this inspection report lists the individuals interviewed and documents reviewed by the NRC inspection team.

#### b. Observations and Findings

The NRC inspection team identified that Nova failed to conduct a Part 21 evaluation for degraded hydraulic control unit (HCU) accumulators that exhibited excessive water leakage shortly after they were installed.

In May 2013, Detroit Edison (DTE) informed Nova of issues associated with two (2) Nova-supplied reverse-engineered accumulators, serial number (S/N) A1126-1 for Purchase Order (PO) 4700248996 and S/N H5065A-1-2 for PO 4700401567. The accumulator assemblies were installed in Fermi Unit 2 nuclear power plant between 2010 and 2011, but were removed from service in 2013, due to excessive water leakage.

In November 2013, DTE returned the accumulator assemblies to Nova for investigation and analysis. Nova contracted specific testing of the accumulators to Alaron Nuclear Services (Alaron) where the leakage was subsequently replicated during testing conducted at an Alaron test facility. Upon disassembly and examination of the accumulator assemblies, Nova identified foreign material contamination in the HCU accumulator assembly internals which Nova determined could affect seal and leak rate integrity. Nova also observed an excess amount of lubricant on the HCU accumulator piston wiper seals which was determined could harden over time and degrade the accumulator piston rings. It was also noted that Nova was able to duplicate the leakage condition utilizing foreign material from brushes used to apply the lubrication oil on the piston seals, and other installation tools used during the accumulator assembly manufacturing process.

On January 24, 2014, Nova initiated corrective action report (CAR) #246 to document its analysis and testing of two HCU accumulator assemblies. Ultimately, Nova determined

the root cause of the HCU accumulator leakage to be inconclusive. However, Nova did implement permanent corrective actions to revise their accumulator assembly test procedure to include a more robust leak testing and foreign material exclusion attributes.

Reviewing CAR #246, the NRC inspection team questioned Nova's Part 21 screening process associated with the issue. Specifically, in the Part 21 screening form, Nova failed to indicate that 1) the nonconformance associated with the degraded HCU accumulators affected a basic component, and 2) the nonconformance represented a deviation in accordance with 10 CFR Part 21. As a result of the screening, Nova did not perform a Part 21 evaluation. Further discussion of this issue with Nova management revealed that Nova assumed that it was not accepting Part 21 reporting responsibilities upon receipt of the degraded accumulators from DTE.

The NRC inspection team determined that Nova's screening and evaluation for Part 21 applicability of the HCU accumulator leakage issue under CAR #246 was inadequate and that the leakage condition documented in the corrective action report constituted a deviation that required a Part 21 evaluation. Nova did not document the degraded HCU accumulators as a deviation in their corrective action program, but commenced an informal evaluation process of the analysis and testing documented only through company electronic mails.

As of December 4, 2015, Nova had not conducted a Part 21 evaluation for a deviation potentially associated with a substantial safety hazard adversely as soon as practical, within 60 days of discovery concerning affecting two degraded HCU accumulators installed at Fermi Unit 2 which were reverse-engineered and supplied by Nova. This is contrary to the requirements of 10 CFR 21.21(a)(1), which requires timely evaluation of deviations and failures to comply potentially associated with substantial safety hazards. This issue is identified as Violation 99901052/2015-201-01.

The NRC previously documented weaknesses in Nova's implementation of its 10 CFR Part 21 program in NRC Inspection Report No. 99901052/2009-201 (ADAMS Accession No. ML031520376). Specifically, the report documented that Nova personnel "did not appear to have a thorough understanding of the regulation [10 CFR Part 21]," and the NRC inspection report also identified examples concluding that Nova did not have an understanding of what constitutes a deviation. The NRC dispositioned this issue as Nonconformance 99901052/2009-201-01 for failure to identify deviations as part of its nonconformance process.

c. Conclusions

The NRC inspection team issued Violation 99901052/2015-201-01 in association with Nova's failure to implement the regulatory requirements of 10 CFR Part 21. Violation 99901052/2015-201-01 cites Nova for failing to evaluate a deviation potentially associated with a substantial safety hazard in accordance with 10 CFR 21.21. Specifically, Nova failed to perform a Part 21 evaluation for a deviation potentially associated with a substantial safety hazard as soon as practical, and within 60 days of discovery concerning two degraded HCU accumulators removed from Fermi Unit 2 which were reverse-engineered and supplied by Nova.

## 2. Design Control

### a. Inspection Scope

The NRC inspection team reviewed Nova's policies and implementing procedures that govern design control programs to verify their compliance with the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Specifically, the NRC inspection team reviewed Nova's reverse engineering policies and procedures associated with the manufacturing and supplying of items under a 10 CFR 50 Appendix B quality assurance program.

### b. Observations and Findings

The NRC inspection team reviewed a sample of safety-related piece parts and also one component that was reverse-engineered. The specific piece parts reviewed are listed in the attachment to this report. The NRC inspection team focused on the reverse engineering activities associated with the HCU accumulators used in the control rod drive system for boiling water reactors. Starting in 2004, Nova manufactured and distributed approximately 881 HCU accumulators which were sold as safety-related components.

The NRC inspection team selected the HCU accumulator package to review based on the safety function of the accumulators to provide energy to insert all control rods into the reactor core in the event of a reactor scram. The accumulator is a piston type, vertical unit, with water on top and a gas charge on the bottom. The original accumulators were made of stainless steel and supplied by General Electric (GE) as safety related components.

In 2004, Nova obtained a GE accumulator and performed reverse engineering pursuant to a Nova Equivalency Evaluation dated May 2004 for HCU accumulators. Nova also issued Manufacturing and Inspection Plan (MIP) No. 061704, "Accumulator Assembly Manufacturing and Inspection Plan," dated June 2004, and subsequently revised to Revision 5 dated February 2014. Nova sold the accumulators as safety related to their customers as equivalent replacements of the GE-design accumulators.

As part of the reverse-engineering process, Nova disassembled the component into various parts such as the piston, piston rings, cylinder and end plates. Nova then performed extensive measurements of the various accumulator parts using industry measuring standards. Additionally, Nova procured laboratory services to perform material and plating analysis of the accumulator parts. Based on these measurements and analyses, Nova created technical drawings for each part which were sent to their customers for approval. After assembly of the accumulator, Nova performed a water leakage test using nitrogen.

Regarding the reverse-engineering of the HCU accumulator, Nova did not have access to the original design and machining specifications produced by GE, the original manufacturer. Since the reversed engineered accumulator was not a "like-for-like" replacement and was essentially a new component, similarity could not be established back to the GE component. Credit could not be taken for any testing that may or may



not have been done by GE to verify the design of its products. The NRC inspection team assessed the extent to which the design of the accumulator had been verified by Nova. The NRC inspection team expressed design concerns to Nova management, at which Nova stated it was their understanding that they did not have design responsibility of the accumulator under Appendix B. Section 4, "Design Control-Reverse Engineering," of Nova Quality Assurance Manual (QAM), states in part, that the Reverse Engineering function is not technically a "Design" function. The NRC inspection team determined that Nova improperly took credit for design work performed by GE and sold the HCU accumulators as meeting Appendix B requirements without verifying the adequacy of the design.

While reviewing the Nova equivalency evaluation, the NRC inspection team identified that other than ASME pressure ratings, dimensions and material requirements, Nova did not address critical design and functional requirements in the technical evaluation for the accumulators. Design parameters that could be critical to the performance of the accumulators such as flow rates, leakage rates, and pressure ranges of operation, stroke times, temperature ranges of operation, and seismic testing or analysis were not addressed in the equivalency evaluation, nor was sufficient testing or analysis performed as necessary to demonstrate the component could meet of the design requirements as part of the control rod drive system.

The NRC inspection team identified these design control issues as Nonconformance 99901052/2015-201-02 for failure to perform adequate design verification for the reverse-engineered HCU accumulators.

c. Conclusion

The NRC inspection team issued Nonconformance 99901052/2015-201-02 in association with Nova's failure to implement the regulatory requirements of Criterion III, "Design Control," of Appendix B to 10 CFR Part 50. Nonconformance 99901052/2015-201-02 cites Nova for failure to establish adequate design control measures to verify and check the adequacy of the design of HCU accumulators used in the control rod drive system of boiling water reactors. Nova failed to establish equivalency to the design parameters of the GE-design accumulators upon which the Nova accumulators were reverse-engineered. Nova failed to perform an adequate technical evaluation that identified and verified the critical design attributes under all credible failure modes necessary to provide reasonable assurance that the HCU accumulator could perform its intended safety function and meet all design basis requirements as part of the control rod drive system. Nova reverse-engineered and subsequently manufactured approximately 881 safety-related HCU accumulator assemblies without proper design verification in the form of a design review, use of calculational methods, or through a suitable qualification testing program.

### 3. Commercial-Grade Dedication

#### a. Inspection Scope

The NRC inspection team reviewed Nova's policies and implementing procedures that govern the dedication of commercial-grade items (CGIs) for use in safety-related applications to verify compliance with the applicable regulatory requirements of 10 CFR Part 21, Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR Part 50. Specifically, the NRC inspection team reviewed dedication packages to assess the different elements of the commercial-grade dedication (CGD) program, which included purchase orders, the technical evaluation process including the commercial-grade item evaluations, receipt inspection reports, certificates of compliance, quality control source inspection reports, various design drawings, and piece part technical information. The team evaluated the criteria for the identification of item functions, credible failure mechanisms/modes, selection of critical characteristics and acceptance criteria, and the identification of verification methods to verify effective implementation of Nova's dedication process.

The NRC inspection team discussed the conduct of the commercial-grade dedication activities with Nova's management involved in the development of the commercial-grade item evaluations. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

#### b. Observations and Findings

The NRC inspection team reviewed Nova procedure 7.3.20, "Commercial Grade Dedication," Revision 3 dated September 11, 2012, which provided the methodology for dedicating commercial-grade items and services for use in safety-related applications, including the development of critical characteristics, identification of dedication methods and the acceptance criteria. The inspectors reviewed a sample of completed and in-process dedication packages of CGIs performed as part of supply of basic components to domestic utilities.

The NRC inspection team reviewed the procurement and dedication activities related to Work Order (WO) 204168 for twenty-one 1-7/8 inch-diameter X 18-3/8 inch long, Inconel N06625 plungers to be used in a charging pump. Nova procured the raw material for the plungers from Castle Metals, an approved commercial supplier. Nova machined the raw material to the specifications provided by Xcel Energy PO 00057943. Once the plungers were machined and inspected, Nova sent the pieces to Praxair Surface Technologies (Praxair) to be plated with LC-4 Plasma Sprayed Chrome Oxide with UCAR 100 epoxy sealant as required by the Xcel Energy PO. The inspectors reviewed the dedication package and acceptance activities prepared by Nova. This included the Commercial Grade Dedication Plan (CGDP) form, which is the document where Nova identified the item to be dedicated, the identification of the critical characteristics and acceptance criteria, and the identification of the verification methods. The CGDP only covered the critical characteristics and acceptance method for the base material of the plungers. Nova was not able to provide objective evidence that a CGPD was developed to demonstrate that a technical evaluation was performed to determine the critical characteristics and the acceptance methods required by Nova procedure 7.3.20 before

procuring the commercial LC-4 Plasma Sprayed Chrome Oxide plating services from Praxair. The inspectors reviewed the Commercial Grade Survey (CGS) of Praxair Surface Technologies dated July 17, 2015, and noticed that the critical characteristics documented in the front of the CGS were related to generic Appendix B QA controls. 10 CFR Part 21 defines critical characteristics as those important design, material, and performance characteristics of a commercial grade item that, once verified, will provide reasonable assurance that the item will perform its intended safety function. In addition, Nova procedure 7.3.21, "Commercial Grade Survey," Revision 1 dated August 15, 2011, defines a CGS as "an activity to verify that a supplier of commercial grade items controls, through quality activities, the critical characteristics of specifically designated commercial grade items, as a method to accept those items for safety-related use." After evaluation of the CGS and the documentation associated with this dedication package, the NRC inspection team concluded that Nova failed to perform an adequate technical evaluation for the LC-4 Plasma Sprayed Chrome Oxide plating services. Nova did not identify appropriate critical characteristics associated with the LC-4 Plasma Sprayed Chrome Oxide plating process and failed to perform an adequate CGS of Praxair to assure that the material used in the LC-4 Plasma Sprayed Chrome Oxide plating process conformed to the Xcel Energy PO. The NRC inspection team identified this issue as an example of Nonconformance 99901052/2015-201-03 for the failure to establish adequate measures for the selection and review for suitability of application of materials and processes that are essential to the safety functions of certain structures, systems, and components and failure to assure that purchased material conformed to the procurement documents.

The NRC inspection team also reviewed WO 197579 for twelve ASME/SA 351 CF8 Stainless Steel 1A Cylinders. Nova procured the raw material for the cylinders from American Spincast and upgraded the material per paragraph NCA-3855.5 of the ASME code. After the cylinders were machined and inspected, Nova sent the pieces to ACME Industrial Group (ACME) for plating. Nova contracted ACME services to perform a hard and flash chrome plating on the cylinders. The CGDP developed by Nova only covered the machining operation and verification of the base material for these cylinders. Nova was not able to provide objective evidence that a CGPD was developed to demonstrate that a technical evaluation was performed to determine the critical characteristics and the acceptance methods required by Nova procedure 7.3.20 before procuring the commercial hard and flash chrome-plating services from ACME. The inspectors reviewed the CGS of ACME dated June 27, 2014, and noticed that the critical characteristics documented in the CGS were related to generic Appendix B controls. After evaluation of the CGS and the documentation associated with this dedication package, the NRC inspection team concluded that Nova failed to perform an adequate technical evaluation for the hard and flash chrome plating services. As a result, Nova did not identify appropriate critical characteristics associated with the hard and flash chrome plating processes and failed to perform an adequate CGS of ACME to assure that the material used in the plating process conformed to Nova PO 3149045. The NRC inspection team identified this issue as an example of Nonconformance 99901052/2015-201-03 for the failure to establish adequate measures for the selection and review for suitability of application of materials and processes that are essential to the safety functions of certain structures, systems, and components and assure that purchased material conformed to the procurement documents.

In addition, the NRC inspection team found a similar issue while reviewing WO 208704 for two #10-32 UNF X 2-1/2" long ASTM A574 Hex Socket Head Cap Screws. The raw material was procured commercially and dedicated by Nova in accordance with CGDP for Head Cap Screw dated September 15, 2010. Once the machining and inspection of the head cap screws were completed, Nova sent the pieces to Kelly Plating Company (Kelly) to perform a zinc plating application. The inspectors reviewed the CGS of Kelly dated October 30, 2015, and noticed that the critical characteristics documented in the CGS were related to generic Appendix B controls. After evaluation of the CGS and the documentation associated with this dedication package, the NRC inspection team concluded that Nova failed to perform an adequate technical evaluation for the zinc plating service. As a result of this Nova did not identify appropriate critical characteristics associated with the zinc plating process and failed to perform an adequate CGS of Kelly to assure that the material used in the zinc plating process conformed to QualTech-NP PO CP00009964. The NRC inspection team identified this issue as an example of Nonconformance 99901052/2015-201-03 for the failure to establish adequate measures for the selection and review for suitability of application of materials and processes that are essential to the safety functions of certain structures, systems, and components and failure to assure that purchased material conformed to the procurement documents.

On December 4, 2015, Nova issued CAR #282 and #283 to document that technical evaluations were not performed to select the critical characteristics and associated acceptance methods for coating, plating, and heat treatment that would provide reasonable assurance that the structure, systems or components would perform their intended safety functions.

c. Conclusion

The NRC inspection team issued Nonconformance 99901052/2015-201-03 in association with Nova's failure to implement the regulatory requirements of Criterion III, "Design Control," and Criterion VII, "Control of Purchased Material, Equipment, and Services," of Appendix B to 10 CFR 50. Nonconformance 99901052/2015-201-03 cites Nova for the failure to establish adequate measures for the selection and review for suitability of application of materials and processes that are essential to the safety functions of certain structures, systems, and components and failure to assure that purchased material conformed to the procurement documents. Specifically, Nova failed to identify the appropriate critical characteristics (e.g., material composition) and the associated acceptance methods for plating services, procured from ACME, Praxair, and Kelly to provide reasonable assurance that the structure, systems or components would perform their intended safety functions.

4. Procurement Document Control

a. Inspection Scope

The NRC inspection team reviewed Nova's policies and procedures governing the procurement document control program to verify compliance with Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50. The NRC inspection team reviewed a sample of safety-related POs initiated to its approved

suppliers for the procurement of safety-related items, equipment and services supplied to the operating fleet of nuclear utilities, to verify that specific procurement requirements were met and documented correctly. The NRC inspection team verified that the POs included, as appropriate: scope of work; right of access to facilities; extension of contractual requirements to subcontractors; records for source inspections and audits; reporting and approving disposition of nonconformances; supplier restrictions; and reference to specific drawings, codes, and specifications. In addition, the NRC inspection team confirmed that all reviewed safety-related POs invoked the requirements of 10 CFR Part 21 and required the supplier to conduct safety-related work under its approved QA program.

The NRC inspection team discussed the procurement activities with Nova's management. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observation and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team determined that Nova is implementing its procurement document control program in accordance with the regulatory requirements of Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Nova is effectively implementing its policies and procedures associated with procurement document control program. No findings of significance were identified.

5. Oversight of Suppliers and Internal Audits

a. Inspection Scope

The NRC inspection team reviewed Nova's policies and implementing procedures that govern the implementation of its oversight of contracted activities and internal audits program to verify compliance with the requirements of Criterion IV, "Procurement Document Control," Criterion VII, "Control of Purchased Material, Equipment, and Services," and Criterion XVIII, "Audits," of Appendix B to 10 CFR Part 50.

The inspectors reviewed Nova's process of selecting and approving suppliers and service providers for safety-related components. The inspector reviewed Nova's approved vendor list (AVL) and selected a sample of suppliers for safety-related components and a sample of suppliers of services and reviewed the methodology of conducting and documenting audits.

The NRC inspection team reviewed a sample of POs, external and internal audits, and receipt inspection records to evaluate compliance with Nova's program and technical requirements. In addition, the NRC inspection team reviewed the disposition of audit findings to resolve for adequacy and timeliness. The NRC inspection team reviewed a sample of training and qualification records of Nova's lead auditors, auditors and

inspection personnel and confirmed that auditing and inspection personnel had completed all the required training and had maintained qualification and certification in accordance with Nova's policies and procedures.

The NRC inspection team discussed the oversight of contracted activities and internal audits program with Nova's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

During a review of internal audits, the NRC inspection team identified an issue associated with Nova's 2015 internal audit package. Each audit package consisted of an audit plan, audit checklist, and audit report approved by Nova management. Nova subcontracts internal audits to Axion Technical Services, as an auditing service provider on Nova's AVL. Upon review of 2015 internal audits led by Axion Technical Services with Nova's QA Manager as the team member, the NRC inspection team noted that several sections of the QA program audit were performed by the QA Manager who had direct responsibilities of those areas. Specifically, the NRC inspection team identified that during a 2015 internal audits in which the QA Manager, who has direct responsibility for the implementation of Nova's QA program, participated in an internal audit as a member of the audit team and audited areas for which he had direct responsibility. This issue is identified as Nonconformance 99901052/2015-201-04.

c. Conclusion

The NRC inspection team issued Nonconformance 99901052/2015-201-04 in association with Nova's failure to implement Criterion XVIII of Appendix B to 10 CFR Part 50. Nonconformance 99901052/2015-201-04 cites Nova for failing to verify that internal audits were performed by personnel not having direct responsibilities in the areas being audited. Specifically, the NRC inspection team identified that during a 2015 internal audit, the QA Manager, who has direct responsibility for the implementation of Nova's QA program, participated in an internal audit as a member of the audit team and audited areas for which he had direct responsibility. This issue is identified as Nonconformance 99901052/2015-201-04.

6. Control of Special Processes

a. Inspection Scope

The NRC inspection team reviewed Nova's policies and implementing procedures that govern the control of special processes to verify compliance with the regulatory requirements of Criterion IX, "Control of Special Processes," of Appendix B to 10 CFR Part 50. Nova's special processes include nondestructive examination (NDE), and mechanical and chemical testing. During the week of inspection, the NRC inspection team directly observed a number of NDE activities at the Nova facility.

The NRC inspection team observed the performance of magnetic-particle (MP) inspections on safety-related studs using the wet fluorescent method as well as observed performance of liquid penetrant (LP) inspection on ASME Section III bonnet

studs using the water washable fluorescent method. The NRC inspection team reviewed qualification and certification records for NDE inspectors and confirmed they were qualified in accordance with the requirements in ASME Section III, and ASNT SNT-TC-1A and that they had sufficient training and inspection experience to meet their level of certification. The inspectors verified that the NDE materials used were identified by their lot/batch number and expiration date.

In addition, the NRC inspection team observed the performance of a chemical analysis and physical analysis of safety-related items to confirm the material met the requirements of ASME material specification.

The NRC inspection team discussed the control of special processes program with Nova's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that Nova has established a program to control special processes in accordance with the regulatory requirements of Criterion IX, "Special Processes," of Appendix B to 10 CFR Part 50. Based on the limited sample of activities observed and documents reviewed, the inspectors also determined that Nova is effectively implementing its policies and procedures associated with special processes program. No findings of significance were identified.

7. Control of Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team reviewed Nova's policies and implementing procedures that govern the measurement and test equipment (M&TE) program to verify compliance with the requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. The inspectors reviewed the use of M&TE during inspections and tests to ensure it was calibrated, controlled, and documented in accordance with the procedural requirements. The inspectors reviewed a sampling of records to ensure documentation matched the observed use of M&TE, and that M&TE was calibrated to a nationally recognized standard, and the calibration was current. The inspectors verified that Nova staff properly segregated, documented and evaluated, in accordance with procedures, when M&TE was found out of calibration or broken.

The inspectors performed a walk-down to ensure that equipment located in the M&TE storage area, the M&TE hold area, and the fabrication shop were labeled, handled, and stored in a manner that indicated the calibration status of the instrument and ensured its traceability to calibration test data.

The NRC inspection team interviewed Nova management and gage calibration technician to assess their understanding of the requirements for M&TE. The attachment to this inspection report lists the documents reviewed by the inspectors.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team determined that Nova is implementing its M&TE program consistent with the regulatory requirements of Criterion XII, "Control of Measuring and Test Equipment," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team determined that Nova is effectively implementing its policies and procedures associated with M&TE. No findings of significance were identified.

8. Nonconforming Materials, Parts, or Components

a. Inspection Scope

The NRC inspection team reviewed policies and implementing procedures that govern the control of nonconforming materials, parts, and components to verify compliance with Criterion XV, "Nonconforming Materials, Parts, or Components," of Appendix B to 10 CFR Part 50. The inspectors verified that Nova's processes and procedures include the identification, documentation, segregation, evaluation, and disposition of nonconforming items.

The NRC inspection team verified that Nova's nonconformance process provides a link to the 10 CFR Part 21 program. The inspectors performed walk-downs of material storage areas and fabrication and assembly areas to inspect the segregation of nonconforming materials, the control of nonconformance reports (NCR) for ongoing work, and material conditions that could contribute to quality issues. The NRC inspection team observed ongoing craft work and inspection activities for the identification and control of NCRs. The NRC inspection team also verified that nonconforming materials were properly identified, marked, and segregated, when practical, to ensure that they were not reintroduced into the production processes. In addition, the NRC inspection team observed the Material Review Board (MRB) conduct disposition of nonconforming items.

The NRC inspection team verified implementation of Nova's nonconformance process during observation of receipt inspection being performed for bonnet studs. The inspectors selected a sample of several NCRs and verified that Nova: (1) dispositioned the nonconformances, (2) documented an appropriate technical justification for various dispositions, (3) took adequate action with regard to the nonconforming material or item, and (4) subjected any identified nonconformances, as appropriate, for 10 CFR Part 21 applicability. For those NCRs that were dispositioned as "repair" or "use as is," the inspectors confirmed that the technical justifications were documented to verify the acceptability of nonconforming items and had been reviewed and approved by Nova's



customer. Further, the NRC inspection team verified Nova processed all customer-returned items under its nonconformance program by initiating a return material authorization (RMA) and an NCR.

The NRC inspection team discussed the nonconformance process with Nova's management and technical staff. The attachment to this inspection report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusion

The NRC inspection team concluded that Nova is implementing its nonconformance program in accordance with Criterion XV, "Control of Nonconforming Materials, Parts or Components," of Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Nova is implementing its policies and procedures associated with its nonconforming material, parts, and components. No findings of significance were identified.

9. Corrective Action

a. Inspection Scope

The NRC inspection team reviewed Nova's policies and implementing procedures for the Corrective Action Program (CAP) to verify compliance with the requirements of Criterion XVI, "Corrective Action," in Appendix B to 10 CFR Part 50. The NRC team reviewed a sample of CARs to view the adequacy of Nova's implementation and control of the CAP. Nova implements the CAP using Procedure 8.7, "Continual Improvement Thru Corrective and Preventive Actions," Revision 3, dated June 30, 2015. The NRC inspection team discussed the CAP status and effectiveness with Nova's management and staff. In addition, the NRC inspection team reviewed Nova's corrective actions for nonconformances associated with NRC inspection report number 99901052/2009-201, dated June 3, 2009, to evaluate the adequacy of corrective actions taken by Nova to the NRC's findings. The attachment to this report lists the documents reviewed by the NRC inspection team.

b. Observations and Findings

No findings of significance were identified.

c. Conclusions

The NRC inspection team determined that Nova is implementing its CAP in accordance with the requirements of Criterion XVI in Appendix B to 10 CFR Part 50. Based on the limited sample of documents reviewed, the NRC inspection team also determined that Nova is implementing its policies and procedures associated with its corrective action program. No findings of significance were identified.

10. Entrance and Exit Meetings

On November 30, 2015 the NRC inspection team discussed the scope of the inspection during an entrance meeting with Mr. Tad Gray, General Manager, and other members of Nova management and technical staff. On December 4, 2015, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Tad Gray, General Manager, and other members of Nova management and technical staff. The attachment to this report lists the attendees at the entrance and exit meetings, as well as those individuals whom the NRC inspection team interviewed.

## ATTACHMENT

### 1. ENTRANCE/EXIT MEETING ATTENDEES

Name	Title	Affiliation	Entrance	Exit	Interviewed
Jermaine Heath	Inspection Team Leader	NRC	X	X	
Jonathan Ortega	Inspector	NRC	X	X	
Richard Laura	Inspector	NRC	X	X	
Raju Patel	Inspector	NRC	X	X	
Tad Gray	General Manager	Nova	X	X	
Frank Furfari	Quality Assurance Manager	Nova	X	X	X
John Burk	Director of Operations	Nova	X	X	
Jack Hoose	Sales Operations Manager	Nova	X	X	
Timothy D. Zisko	NDE Level II Inspector	Nova			X
Alex Petkov	Chemistry Laboratory Technician Level II	Nova			X
Brian Cook	Mechanical Laboratory Technician Level III	Nova			X
Dave Werchiwsky	Lead Machinist Technician	Nova			X
Lana Frizel	Quality Control Inspector Level II	Nova			X
Dave Zapotosky	Gage Technician/QC Inspector Level II	Nova			X
Wayne Glinski	NDE Level III	NDE Consulting LLC.			X*
Richard McIntyre*	Senior Reactor Inspector	NRC		X*	
Paul Prescott*	Senior Reactor Inspector	NRC		X*	

\*Participated by teleconference

**2. INSPECTION PROCEDURES USED**

Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors"

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

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

**4. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

Item Number	Status	Type	Description
99901052/2015-201-01	Opened	NOV	10 CFR 21.21(a)
99901052/2015-201-02	Opened	NON	Criterion III
99901052/2015-201-03	Opened	NON	Criterion III and VII
99901052/2015-201-04	Opened	NON	Criterion XVIII
99901052/2009-201-01	Closed	NON	Criterion XVI
99901052/2009-201-02	Closed	NON	Criterion VII
99901052/2009-201-03	Closed	NON	Criterion XVIII

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

##### Policies and Procedures

- Nova Quality Assurance Manual (QAM), Edition 10, Revision 0, dated November 20, 2014
- Procedure 7.4, "Process Control," Revision 3, dated November 20, 2014
- Procedure 7.8, "Control of Measuring and Test Equipment," Revision 8, dated May 18, 2015
- Procedure 8.3, "Control of Nonconforming Products," Revision 4, dated November 20, 2014
- Procedure 8.6, "Customer Satisfaction, Revision 0, dated July 8, 2005.
- Procedure 8.7, "Continual Improvement Through Corrective and Preventative Actions," Revision 3, dated June 30, 2015.
- Procedure NP-NDT-WP-3 "NDT Personnel Qualification and Certification Written Practice" Revision 7, dated May 28, 2014
- Procedure NP-NDT-MT-2, "Test and Inspection Procedure Magnetic Particle Examination Wet Fluorescent Method ASTM A275-90," Revision 4, dated November 13, 2012
- Procedure NP-NDT-MTA-13, "Acceptance Standard Procedure, Special Requirements for Magnetic Particle Examination for forgings, bars, for Nuclear and Other Special Applications," Revision 1, dated October 20, 2015
- Procedure NP-NDT-PT-1, "Test and Inspection Procedure Liquid Penetrant Examination Water washable Fluorescent Method," Revision 11, dated August 5, 2011
- Procedure NP-NDT-PTA-1, "Acceptance Criteria Procedure for forgings, bars, bolting studs, and nuts threaded structural fasteners – ASME Section III," Revision 5, dated October 27, 2005
- Procedure Demonstration Statement for NP-NDT-PT-1, Revision 11, qualified on November 19, 2014
- Work Instruction (WI) 6.1.1, "Qualifications for Inspection and Test Personnel," Revision 5, dated July 15, 2006
- WI 6.1.2, "Training of Quality Departmental Personnel," Revision 2, dated September 26, 2005
- WI 6.1.4, "Visual Examination Qualification," Revision 8, dated April 13, 2009
- WI 7.3.7, "Chemical Testing," Revision 4, dated September 13, 2012,
- WI 7.3.8, "Heat Treating," Revision 6, dated January 21, 2010
- WI 7.3.9, "Mechanical Testing," Revision 5, dated April 14, 2003
- WI 7.3.10, "Subcontract Plating," Revision 4, dated August 26, 2005
- WI 7.3.15, "Hydrant Pressure and Proof Load Test," Revision 4, dated August 27, 2012
- WI 7.3.21, "Commercial Grade Survey," Revision 1, dated August 15, 2011
- WI 7.3.20, "Commercial Grade Dedication," Revision 3, dated September 11, 2012
- WI 7.8.2, "Micrometer Calibration," Revision 0, dated August 30, 2005
- WI 7.8.3, "Indicator Calibration (Dial and Digital)," Revision 1, dated June 21, 2006
- WI 7.8.4, "Plug Gauges (Hex, Round, etc.)," Revision 0, dated August 29, 2005
- WI 7.8.7, "Super Mic Calibration," Revision 0, dated August 29, 2005
- WI 7.8.12, "Hardness Tester Calibration," Revision 0, dated August 29, 2005
- WI 7.8.14, "Thread Wires," Revision 0, dated August 29, 2005

- WI 7.8.15, "Gauges Calibrated by Qualified Vendors," Revision 2, dated April 26, 2011
- WI 7.3.20 Commercial Grade Dedication," Revision 4, dated September 11, 2012.

#### Purchase Orders (POs)

- Exelon PO # 80180864 to Nova for a Stud ASTM A193 Grade B7, dated November 14, 2015
- Georgia Power PO # SNG36051-0243 to Nova for a Bolt Machine Head Hex, dated November 17, 2015
- Nova PO # 298625-260, for Fastener Wedge Tensile/Hardness test for PO209028-1
- PO # 3161170 to Brighton-Best International, Inc. for Bolt Machine Head Hex, dated November 11, 2015
- PO # 3145550 to Star Stainless Screw Co. for 5/8"-11 UNC 2Ax3" Heavy HEX Screw ASME SA 193 Grade B8M Class, dated June 30, 2014
- PO # 3149849 to Broadview Instrumentation Services Inc. for calibration of 62 MINI Infrared Thermometer S/N 17420424, dated December 2, 2014
- PO # 3154781 to Jorgenson, Earl, M& CO for RNBR-00940-10, SAE J-99S Grade 8, Heat 14204339 dated May 4, 2015
- PO # 3160080 to United Testing Systems Inc. for calibration services of NDT equipment, dated October 16, 2015
- PO # 3160277 to Castle Metals for AISI E4340-H low Alloy Steel, RNBR 000045-50, dated October 23, 2015
- PO # 3152931 to AmeriBolt Inc. for a 1/2"-13 UNC 2Ax3" Heavy Hex Screw A/SA 193 Grade B7, dated March 5, 2015
- PO # 3160922 to Cleveland Specialty Inspection Services, LLC., for calibration of plug gages s/n's SP-173, SP-26E, SP-93, SP-182C, SP-142D, SP-143C, SP-449, SP-19D, SP-20, SP-400, SP-365, and SP-391, dated November 11, 2015
- PO # 3160323 to Ohio Metallurgy for Heat-treating of RNBR00045.50, Heat # J6548, P000083 Bonnet Stud 2.00-8-UN-2A x 13.00 SA540 Gr. B23 Class 4, dated October 26, 2015
- PO # 3149849 to Broadview Instrumentation Services, Inc., for calibration of Infrared Thermometer Fluke S/N 17420424, ID# CP-05, dated December 2, 2014
- PO # 3154790 to Fluke Corporation for calibration of Analog Pressure Gauge S/N HP-30, dated May 20, 2015
- PO # 3158934 to Tinus Olsen Testing Machine Co, Inc., for calibration of Mechanical Test Equipment S/N 303600, S/N 201439, S/N 192754, S/N 313804, S/N 3233620, dated September 8, 2015
- PO # 3160080, to United Testing Systems for calibration of Magnaflux S/N ND-1098232, ND-223280, ND-761059, ND-811013, ND-D 5820P, ND-00FCFT, and CT-01, dated October 16, 2015
- PO # 3160859 to Kelly Plating Co., for Iron Zinc-25 Type 1 (no bake) electroplating of thread studs size 1/2-13 UNC-2A x 10-1/4 inch to ASTM B633 specification, dated November 10, 2015

### Drawings, Design Documents, and Specifications

- Accumulator Assembly Equivalency Evaluation, Revision 0, dated May 2005, and Revision 3, dated September 2009
- Manufacturing and Inspection Plan (MIP) 061704, Accumulator Assembly, Revision 0, dated June 2004, through Revision 5, dated February 2014

### Calibration, Heat Treatment, NDE, and Inspection Reports

- Inspection Plan for 26 pieces of bonnet studs size 2.00-8-UN-2A x 13" ASME SA540 Grade B23 Class 4 traceable lot No. 50473191, heat No. J6548 on Work Order No. 297061 for Entergy Corporation, with dimensional verification performed on November 30, 2015
- Liquid Penetrant inspection Technique Report for bonnet studs size 2.00-8-UN-2A x 13" ASME SA540 Grade B23 Class 4, work order No. 297061 tested using water washable Fluorescent Method, results accepted by Tim Zisko, Level II, dated November 30, 2015
- Magnetic Particle Technique report No. 151101130, dated November 30, 2015 for 44 pieces of heavy hexagonal nuts size 1-3/8- 8 inch Lot No. 50474648 for work order No. 298103 tested using Wet Fluorescent Method results accepted by Tim Zisko, Level II
- Magnetic Particle Technique report No. 15110132, dated November 30, 2015 for 4 pieces of threaded rods size 1-1/4- 8 x10 inch Lot No. 50474329 for work order No. 297847 tested using Wet Fluorescent Method results accepted by Tim Zisko, Level II
- Magnetic Particle Technique report No. 151101050, dated November 25, 2015 for 16 pieces of studs size 1-3/8- 8 x 6-3/4 inch Lot No. 50475839 for work order No. 298745 tested using Wet Fluorescent Method results accepted by Tim Zisko, Level II
- United Testing Systems Inc., Certificate of Calibration for Thermometer Nova S/N 01020098 calibrated on October 16, 2015 due January 16, 2016
- United Testing Systems Inc., Certificate of Calibration for Magnetic Particle Demagnetizer Nova S/N 811013 calibrated on October 16, 2015 due January 30, 2016
- United Testing Systems Inc., Certificate of Calibration for Digital Radiometer Nova S/N 1098232 calibrated on October 16, 2015 due January 30, 2016
- United Testing Systems Inc., Certificate of Calibration for Gauss Meter Nova S/N 223280/003242 calibrated on October 16, 2015 due January 30, 2016
- United Testing Systems Inc., Certificate of Calibration for Magnetometer Nova S/N D5820P calibrated on October 16, 2015 due January 30, 2016
- United Testing Systems Inc., Certificate of Calibration for White Light meter Nova S/N 1649912 calibrated October 16, 2015 due January 30, 2016
- United Testing Systems Inc., Certificate of Calibration for Magnaflux Equipment Nova Model No, H-720, S/N 811013 calibrated October 16, 2015 due January 30, 2016
- United Testing Systems Inc., Certificate of Calibration for Ketos Test Ring Nova S/N 99438 calibrated November 25, 2015 due November 30, 2016 per ASTM E-1444
- United Testing Systems Inc., Certificate of Calibration for Liquid Penetrant System, Model No. ZA28, Nova S/N 761059 calibrated October 16, 2015 due January 30, 2016
- United Testing Systems Inc., Certificate of Calibration for Liquid Penetrant Check Star Panel, Model No. TAM Panel, Nova S/N 42137 calibrated May 30, 2015 due May 30, 2016

- Broadview Instrumentation Services Inc., Certificate of Calibration for Infrared Thermometer Model No. 62 S/N 17420424 calibrated December 30, 2014 due December 30, 2015
- Wilson Rockwell Hardness Tester calibration certificate for Nova S/N 4JR calibrated on May 14, 2015 due May 28, 2016
- Certificate of Calibration for Rockwell Hardness Block HRB 96.94, S/N 3672868, calibrated on September 29, 2015
- Tinus Olsen Certificate of Calibration for Tinus Olsen tensile tester S/N TO-03, calibrated on October 7, 2015 due October 7, 2016
- Tinus Olsen Certificate of Calibration for Extensiometer Model No. E-04 calibrated October 7, 2015 due October 7, 2016
- Nova 6-inch Vernier Caliper S/N C163C calibrated June 27, 2015 due December 28, 2015 using standard traceable to known national standard
- Tensile Punch Tool S/N PP-02 calibrated on October 28, 2015 due April 28, 2016

#### Commercial Grade Dedication Packages

- Commercial Grade Survey of ACME Industrial Group, dated June 27, 2014
- Commercial Grade Survey of BFG Manufacturing Services, dated June 22, 2015
- Commercial Grade Survey of Cleveland Specialty Inspection Services, dated August 28, 2014
- Commercial Grade Survey of Kelly Planting Company dated October 30, 2015
- Commercial Grade Survey of MT Heat Treating dated December 6, 2012
- Commercial Grade Survey of Ohio Vertical Heat Treatment dated July 18, 2014
- Commercial Grade Survey of Praxair Surface Technologies dated July 17, 2015
- Commercial Grade Survey of RIE Coating, dated May 29, 2013

#### Audit/Surveys Reports

- 2014 Internal Audit Report dated July 31, 2014
- 2015 Internal Audit Report dated September 12, 2015
- Nuclear Industry Assessment Committee (NIAC) Audit # 18113 of Westinghouse Electric Co. dated October 16, 2013
- NIAC Audit # 20009 of Swagelok Co. dated July 24, 2015
- NIAC Member Assessment of American Tank & Fabricating Co. dated September 15, 2015
- NIAC Member Assessment of Dominion Engineering Inc., schedule for June 23-25, 2015, NIAC Assessment No. 20070, AREVA Inc. Audit No. 15:17

#### Nonconformance Reports (Return Material Authorization)

- 2015 - 1396(44433), 2513(44439), 1186(44441), 1061(44447), 1095(44452), 1108(44453)
- 2014 - 1166(44066), 1095(44127), 1293(43451), 2433(43473), 1059(43659), 1396(44120)



#### Corrective Actions Reports (CAR) reviewed

- CAR #239, 244, 246, 255, 257, 258, 262, 264, 265, 266, 267, 268, 270, & 272

#### Corrective Action Reports (CAR) Generated during the NRC Inspection

- CAR #275, No indoctrination or training provided to NDE Consulting, a provider of Level III NDE services.
- CAR #276, Incomplete dedication process (Method 1 ) for Cleveland Specialty and United Testing Systems (supplier of calibration services)
- CAR #277, Improper scope of audit for MT Heat Treat
- CAR #278, Invalid audits credited for QA manager initial Lead Auditor Qualification
- CAR #279, Design control issue related to HCU Accumulator reverse engineering
- CAR #280, inadequate internal audit
- CAR #281, Failure to conduct Part 21 evaluation for HCU Accumulator issues
- CAR #282, Failure to assure purchased services conform to PO requirements
- CAR #283, Inadequate dedication of services for heat treatment, coating, and plating.

#### Qualification and Certification Records

- NDT Personnel qualification certification for Wayne J. Glinski as Level III Magnetic Particle qualified to ASNT-TC-1A (Certificate No. 4677) dated February 4, 2014, February 2019, certified through continuous performance by Level III on May 16, 2015
- NDT Personnel qualification certification for Wayne J. Glinski as Level III Penetrant Testing, qualified to ASNT-TC-1A (Cert No. 4677) dated February 17, 2014, February 2019, certified through continuous performance by Level III on February 17, 2014
- Form 6.1-7, "Initial Certification Record," for Sandy Mariotti as Level I QC Inspector, dated November 19, 2015 with annual eye examination dated November 19, 2015
- Form 6.1-8, "Certification Records," for Lana Frizal as Quality Coordinator Level II, re-certified through continuous satisfactory performance dated March 12, 2015 with eye exam due March 12, 2016
- Form 6.1-8, "Certification Records," for David Werchiwsky as Level I Inspector/Test Technician re-certified through continuous satisfactory performance dated March 12, 2015 with eye exam due March 12, 2016
- Form 6.1-8, "Certification Records," for Alex Petkov as Level II Laboratory Technician re-certified through continuous performance dated March 12, 2015 with eye exam due March 12, 2016
- Form 6.1-8, "Certification Records," for Brian Cook as Level III Test technician re-certified through continuous performance dated March 12, 2015 with eye exam due March 12, 2016
- Form 6.1-8, "Certification Records," for Dan Zapatosky as Level II QC Inspector and Level I Lab and Gage Control technician re-certified through continuous performance dated March 13, 2015 with eye exam due March 13, 2016

- NDT Personnel qualification certification for Wayne J. Glinski as Level III Ultrasonic Examination qualified to ASNT-TC-1A (Cert No. 4677) dated February 18, 2014, February 2019, certified through continuous performance by Level III on February 18, 2014
- NDT Personnel qualification certification for Ron Oravec as Level III Ultrasonic Examination qualified to ASNT-TC-1A dated , September 19, 2014, September 2019, certified through continuous performance by Level III on September 19, 2014
- NDE Consulting LLC's letter dated May 6, 2015, appointment of David Morgan, as NDE Consulting LLC personnel certification program to perform review training, experience, and tests
- NDT Personnel Eye Exam record for Wayne Glinski to Jaeger J-1 performed on December 31, 2014
- Material Review Board Report dated December 1, 2015

#### Miscellaneous

- Nova Approved Vendor List dated October 13, 2015
- Nova Equipment Condition Report No. 123013 reviewed by QA Manager and closed on December 30, 2013 for nonconforming thread plug gages S//N's TP-152H, TP-464O, TP-472L, TP-82F, TP-448L, TP449, TP-156G, TP-157. TP-188F, and TP-206J,
- Engineering Change Request Report No. 060414, reviewed by QA Manager and closed on June 4, 2014 for nonconforming thread plug gauges
- Chemistry Laboratory test work sheet for test No. 2015-10-00095, lot No. 50470590, job order No. 295331-310, dated October 2, 2015, lot failed chemistry, dispositioned as scrap
- NP-NDT-WP-3-ADD-1 "NDT Personnel Qualification and Certification Addendum T9074-ASGIB-010/271 and ASME Section III," Revision 7 dated May 28, 2014
- Chemistry laboratory test work sheet for test No. 2015-11-00891, lot No. 50473312, job order No. 297157-220, dated November 20, 2015, lot failed chemistry, dispositioned as scrap
- Chemistry laboratory work sheet for test No. 2015-11-00749, lot No. 50474444, work order No. 297945-265, dated November 17, 2015, lot failed chemistry, dispositioned as scrap
- Magnaflux Certificate of Analysis for Magnaglo powder S/N 14A batch No. 14L017 dated November 5, 2014 meets ASME Section V Code requirements
- Magnaflux Certificate of Analysis for Carrier II batch No. 14M044 dated December 10, 2014 meets ASME Section V Code requirements
- Magnaflux Certificate of Analysis for developer Model No. ZP-4B, batch No. 14E072, dated December 10, 2014 meets ASME Section V Code requirements
- Magnaflux Certificate of Analysis for penetrant Model No. ZL-60D, batch No. 13D077 dated December 10, 2014 meets ASME Section V Code requirements

- Nova NDT Procedure Demonstration Statement for NP-NDT-MT-1, Revision 5, qualified on November 19, 2014
- HSCS.003277.30 Nova Work Order for 5/8"-11 UNRC 3A x 1 3/4" HEX Socket Head Cap Screw Hex Socket Head Cap Screw A/SA 193 Grade B6X dated September 14, 2015
- Reverse Engineering: Connecting rod bolt, PO 430012147-1, June 8, 2015
- Reverse Engineering: Control rod drive strainer, PO 80-042861, November 24, 2015
- Reverse Engineering: Swing check valve pin, PO 742020/75940-21, October 1, 2014
- Reverse Engineering: Hex cap screw – EDG, Part 115-01603, December 19, 2013
- NDE Consulting LLC, WP-3, "Personnel Qualification and Certification in Nondestructive Testing, ASNT-TC-1A," Revision 0, dated January 2, 2014
- NDE Consulting LLC, Addendum 1 to WP-3, "Personnel Qualification and Certification in Nondestructive Testing, ASNT-TC-1A, Reference ASME Section III," Revision 0, dated January 2, 2014
- NDE Consulting LLC TO-3, "Attachment TO-3 NDT Training Outlines Personnel Qualification and Certification in Nondestructive Testing for use with WP-3," Revision 0, dated January 2, 2014