



NRC UPDATE

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EPRI JUTG

Dallas Fort Worth, Texas

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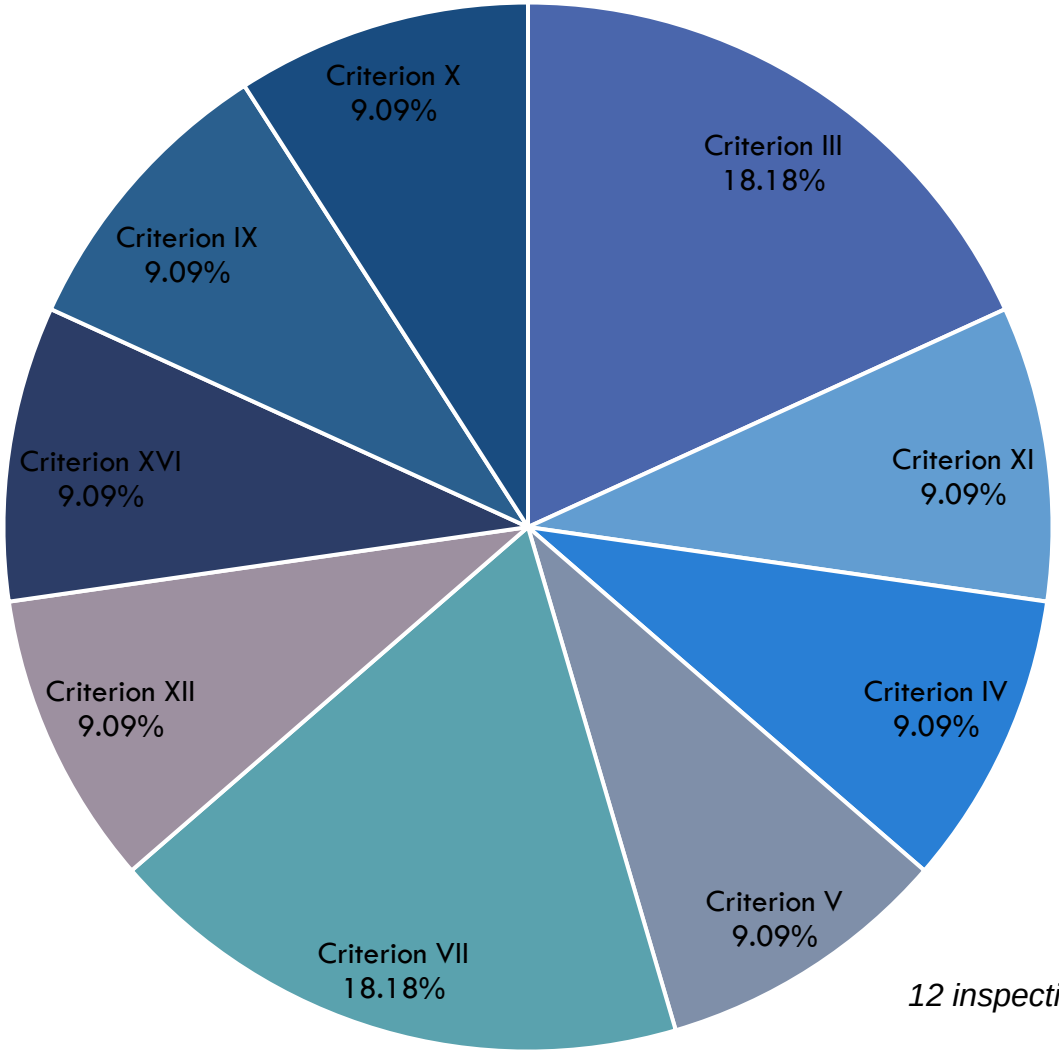
Topics

- Vendor Inspection Findings
- NRC Reverse Engineering Findings and EPRI Guidance
- NRC Vendor Inspection Report Improvement Plan
- Discussion of Waterford Inspection finding and Electroswitch's Part 21

NRC Vendor Inspection Findings

Breakdown of Vendor Inspection Findings



12 inspections - 11 NOVs/NONs

Vendor Inspection Trends

- Significant Findings
  - Design and Test Control
    - Translation of Design Requirements and Testing
  - Special Processes and Inspection
  - QA Process Oversight

Design and Testing Requirements

Gutor Electronic, Wettingen, Switzerland

- Inspection conducted in June 2018 to assess Gutor's quality activities associated with the design, fabrication, and testing of components that comprise the Uninterruptable Power Supply System for the Westinghouse AP1000 reactors being constructed at the Vogtle Units 3 and 4.
- Inspection Results
  - Gutor failed to ensure the suitability of materials, parts, equipment, and processes that are essential to the safety-related functions of the inverters being supplied to the Vogtle Units 3 and 4 nuclear power plants
  - Gutor failed to develop acceptance criteria to ensure that the battery chargers acceptance tests meet the design requirements as stated in Westinghouse's purchase order
  - Take-away: Suppliers need to ensure that design and testing requirements are met and document these design and testing requirements for activities affecting quality.

Special Processes and Inspection

Westinghouse Electric Sweden (WES) AB, Västerås, Sweden

- Inspection conducted in October 2018 to verify QA activities for design, fabrication, assembly, and testing of U.S. nuclear fuel assemblies.
- Inspection Results
  - WES Filler metal rods were observed to be inadequately controlled in the workshop.
    - Filler metal rods hanging from an air supply pipe in the liquid penetrant inspection booth where there was washing/hosing of penetrant with water, as well as spraying of developer and penetrant
  - WES did not inspect fit-up prior to welding of the absorber cross to the velocity limiter of the control rod blades to verify that the dimension of the root gap was within the drawing specifications by using an appropriate measuring device or gauge
    - Instead, the welder relied on visual estimation, based on experience only, to determine if the root gap met the required dimensions within necessary limits

QA Program Oversight

Hayward Tyler Inc., Colchester Vermont

- Inspection conducted in July 2018 to assess the design, fabrication, assembly, and testing of ASME B&PV Code Section III, Class 1, 2 & 3 and non-ASME safety-related, repair/replacement of parts and components
- Inspections Results
  - HTI failed to establish adequate measures for source evaluation and selection of contractors and subcontractors to ensure that purchased material, equipment, and services conformed to procurement documents
  - HTI did not impose the requirements of Appendix B to 10 CFR Part 50 in its safety-related procurement documents for materials and services procured as basic components. Procurement documents shall specify compliance with the requirements of Appendix B to 10 CFR Part 50 to ensure that adequate quality assurance is applied and passed down to the sub-suppliers

QA Program Oversight

Hayward Tyler Inc., Colchester Vermont

- Inspections Results, Continued
  - failed to establish measures to assure that services, whether purchased directly or through contractors and subcontractors, conform to the procurement documents
  - the pressure gauge used during hydrostatic testing of three ASME Section III safety-related diffusers were not calibrated within the tolerance range of 0-400 pounds per square inch gauge (PSIG) using a standard dead weight tester and calibration procedure
  - HTI's corrective actions to address the findings in the 2001 Inspection were ineffective as previous issues were identified in the 2018 inspection

NRC Reverse Engineering Findings and EPRI Guidance

NRC Reverse Engineering Findings and EPRI Guidance

- NRC Information Notice 2016-09 highlighted three examples of licensee and vendor issues regarding inadequate reverse engineering
- EPRI Revision 1(issued 2018) of TR-107372 (EPRI 3002011678) provided guidance on reverse engineering techniques
- NRC has not specifically endorsed 3002011678
- However, NQA-1 ballot in process to add guidance on reverse engineering, referencing 3002011678

NRC Reverse Engineering Findings and EPRI Guidance

1. Callaway, AFW controller cards (2015)

- Licensee did not establish suitable subsystem interface requirements.
  - 3002011678 step 4.2.6: Evaluate the interfaces, fit, tolerances, inputs, and outputs; and 4.3.4: Determine if interfaces are addressed

- Licensee did not verify adequacy by either design review or sufficient testing
  - 3002011678 step 4.2.7: Plan the activities required to demonstrate functionality, 4.3.6: Determine the activities required to demonstrate functionality, 4.3.7: Complete the activities required to demonstrate functionality

NRC Reverse Engineering Findings and EPRI Guidance

2. River Bend, control rod hydraulic accumulators (2015)

- Dating back to 1998, licensee procured reverse-engineered item commercially, then CGD.*
- Licensee did not verify adequacy by either design review or sufficient testing.
  - 3002011678 step 4.2.7: Plan the activities required to demonstrate functionality, 4.3.6: Determine the activities required to demonstrate functionality, 4.3.7: Complete the activities required to demonstrate functionality

*Commercial-Grade Dedication

NRC Reverse Engineering Findings and EPRI Guidance

3. Nova Machine Products, accumulators (2015-2016)

- Dating back to 2004, vendor reverse-engineered a GE component and manufactured/sold "equivalent" replacements.*
- Vendor failed to verify and check by either design review, calculational methods, or sufficient testing
  - 3002011678 step 4.2.7: Plan the activities required to demonstrate functionality, 4.3.6: Determine the activities required to demonstrate functionality, 4.3.7: Complete the activities required to demonstrate functionality

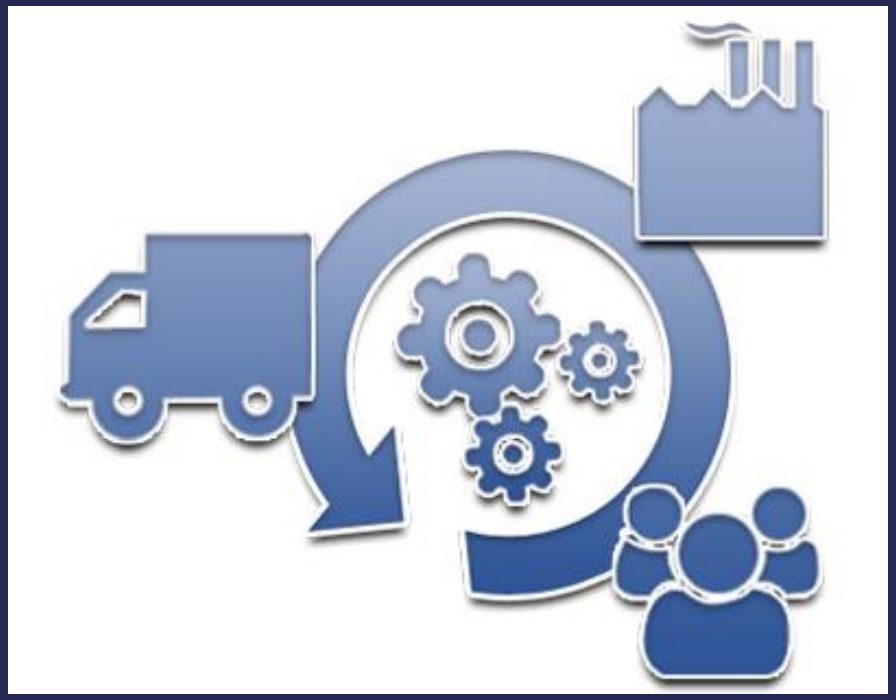
*Part 21 violation, as well as Appendix B nonconformances.

- Also: step 4.4.4 guidance on considering "new failure modes"

NRC Reverse Engineering Findings and EPRI Guidance

- In Conclusion
- 3002011678 (Rev. 1 to TR-107372) does provide adequate guidance that both licensees and vendors may use to identify/verify and check/test the critical design characteristics.

NRC Vendor Inspection Report Improvement Plan



NRC Vendor Inspection Report Improvement Plan

- **The NRC is currently in the process of evaluating past inspection reports content. The objective of this review is to identify and establish an inspection report format and level of detail that is informative and beneficial to stakeholders.**

NRC Vendor Inspection Report Improvement Plan

- Background Continued
  - Inspections up to 2012 were informative, but long.
  - Report details were reduced to lower the potential for proprietary vendor information.
  - In an effort to shorten the report, the NRC also changed the level of detail.

The staff is currently revising Inspection Manual Chapter 0617, "Vendor And Quality Assurance Implementation Inspection Reports."

Discussion of Waterford Inspection finding and Electroswitch's Part 21

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- In April 2016, the NRC conducted an inspection at Electroswitch (Report issued May 27th)
  - On May 10, 2016, vendor issued a Part 21
  - On March 24, 2016, vendor discontinued its Appendix B Program
  - Cited for failing to dedicate commercial materials or control under its Appendix B program
- Waterford inspection in October 2018 resulted in Green NOV for failure to take appropriate steps to accept commercial relays as basic components
  - Concern expressed that licensee must dedicate all relays in the plant used in safety-related applications.

Discussion of Waterford Inspection finding and Electroswitch's Part 21

- Licensee Response:
  - In May 2016, initiated a Condition Report.
  - In July 2016, completed Engineering Evaluation concluding performance history and vendor's corrective actions adequate.
  - In October 2018, provided White Paper to NRC. Justification was previous NUPIC audits and 2015 source surveillance.

Discussion of Waterford Inspection finding and Electroswitch's Part 21

- NRC's concern:
  - Inspectors identified that CR failed to evaluate for Part 21, as vendor lacked information to determine if issue was reportable.
  - Inspectors identified components in warehouse may be issued and used in safety-related application.
  - NUPIC audit and 2015 source surveillance failed to identify the existence of this programmatic weaknesses.

References

- EPRI TR-107372: http://jtaken.csoft.net/school/excelsior/Corco/School/EPRI%20TR-107372%20-%20Reverse%20Eng.PDF
- Gutor Inspection Report (IR): Agencywide Documents Management System (ADAMS) Accession No. ML18206A438
- Westinghouse Electric Sweden IR: ADAMS Accession No. ML18324A427
- Hayward-Tyler IR: ADAMS Accession No. ML18250A302
- IN 2016-09: ADAMS Accession No. ML16075A285 (Associated IRs for Callaway, River Bend and Nova Machine ADAMS No. provided in the IN)
- Waterford IR: ADAMS Accession No. ML18319A379
- Electroswitch Part 21Report: ADAMS Accession No. ML16243A472