



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

November 18, 2021

Mr. John Ferrick, Site Vice President
Entergy Operations, Inc.
17265 River Road
Killona, LA 70057

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 – DIGITAL
INSTRUMENTATION AND CONTROL INSPECTION REPORT
05000382/2021011

Dear Mr. Ferrick:

On October 19, 2021, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Waterford Steam Electric Station, Unit 3 and discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

No findings or violations of more than minor significance were identified during this inspection.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

Nicholas H. Taylor, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 05000382
License No. NPF-38

Enclosure:
As stated

cc w/ encl: Distribution via LISTSERV®

WATERFORD STEAM ELECTRIC STATION, UNIT 3 – DIGITAL INSTRUMENTATION AND CONTROL INSPECTION REPORT 05000382/2021011 – DATED NOVEMBER 18, 2021

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SUNSI Review: ADAMS: Non-Publicly Available Non-Sensitive Keyword:
 By:STM Yes No Publicly Available Sensitive

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**U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report**

Docket Number: 05000382

License Number: NPF-38

Report Number: 05000382/2021011

Enterprise Identifier: I-2021-011-0051

Licensee: Entergy Operations, Inc.

Facility: Waterford Steam Electric Station, Unit 3

Location: Killona, LA

Inspection Dates: July 25, 2021 to October 19, 2021

Inspectors: S. Makor, Reactor Inspector, Team Lead
M. Brown, Senior Reactor Engineer
S. Darbali, Electronics Engineer
K. Lawson-Jenkins, IT Specialist

Approved By: Nicholas H. Taylor, Chief
Engineering Branch 2
Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a Digital Instrumentation and Control Inspection at Waterford Steam Electric Station, Unit 3, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

List of Findings and Violations

No findings or violations of more than minor significance were identified.

Additional Tracking Items

None.

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards. Starting on March 20, 2020, in response to the National Emergency declared by the President of the United States on the public health risks of the coronavirus (COVID-19), inspectors were directed to begin telework. In addition, regional baseline inspections were evaluated to determine if all or a portion of the objectives and requirements stated in the IP could be performed remotely. If the inspections could be performed remotely, they were conducted per the applicable IP. In some cases, portions of an IP were completed remotely and on site. The inspections documented below met the objectives and requirements for completion of the IP.

OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL

52003 - Digital Instrumentation and Control Modification Inspection

Digital Instrumentation and Control Modification Inspection (1 Sample)

- (1) Westinghouse Electric Company (WEC) located in Warrendale, PA, provides the Core Protection Calculator System (CPCS) for Entergy's Waterford Unit 3 (WF3) digital modification project. For this project, WEC develops the system requirements, software and hardware requirements, detailed software and hardware design; implements the software and manufactures the hardware; integrates the software and hardware; conducts testing and delivers the completed CPCS to the WF3 site.

The inspectors performed this inspection to evaluate whether the licensee:

- (1) Conducted acceptance reviews of the design outputs for this phase, including but not limited to the following: test plans, test procedures, independent verification & validation (IV&V) reports, test records, test result reports, anomaly reports, and regression analysis performed to identify additional or modified tests, in accordance with the licensee's procedures identified in the VOP and (2) confirmed that the vendor performed the factory acceptance tests in accordance with the processes described in the license amendment request. Specific activities evaluated during this inspection are described in the following paragraphs.

The inspectors evaluated whether the licensee performed enhanced vendor oversight activities as defined by the Vendor Oversight Plan (VOP) for designs licensed by NRC staff using the Digital Instrumentation and Control (I&C) Interim Staff Guidance (ISG)-06 Revision 2, Alternate Review Process. The inspectors verified that the licensee implemented procedures, documented audit results, and initiated corrective action documents.

This confirmatory inspection focused on the Factory Acceptance Testing (FAT) and verified the licensee's performance of VOP activities through direct observation of the

licensee's VOP performance at the vendor facility. The inspectors reviewed supporting documents including implementing procedures, work orders, inspection reports, engineering evaluations, and condition reports; and conducted interviews with licensee staff.

INSPECTION RESULTS

Observation: Factory Acceptance Testing (FAT)	52003
<p><u>Factory Acceptance Testing (FAT) (1 Sample)</u></p> <p>1. The inspectors conducted an inspection of the FAT Phase of the digital instrumentation and control modification as described below:</p> <p>1.1 <u>Licensee Vendor Oversight Plan</u></p> <p>a. <u>Inspection Scope</u></p> <p>The inspectors verified that the licensee is performing vendor oversight in accordance with their VOP through document reviews and observation of Entergy's staff performing oversight. The inspectors reviewed Entergy's VOP, observed the licensee staff performing vendor oversight in accordance with the VOP, and verified that the licensee had performed the FAT related VOP activities. The inspectors reviewed ENT-WF3-CPC-374, "Witness of Four Channel Factory Acceptance VOP Audit," dated July 23, 2021, which documents Entergy's audit plan to witness the FAT. The plan covers witnessing the test of the secure operational environment design features and verification of design requirements. The inspectors observed that Entergy and its contractor, Enercon, were witnessing the various FAT tests according to the FAT audit plan. The inspectors interviewed Entergy staff which explained that most of the test plan covered V&V activities that would take place the week after the completion of the tests. Entergy also informed the inspectors that the technician writing the Site Acceptance Testing (SAT) procedure was present witnessing the FAT.</p> <p>The inspectors observed Entergy's review and oversight of various Westinghouse artifacts, Westinghouse staff performing samples of the FAT procedure, communicating with Westinghouse at daily meetings during the inspection, and the capturing of issues in the corrective action program (CAP).</p> <p>The inspectors observed the licensee's oversight by reviewing the Test plan and Procedure, IV&V reports, and the test records generated during the FAT performance. The inspectors verified the licensee's observation that the vendor performed the tests as described in the license amendment request. The tests observed during the FAT included safety functions, proper communications between various modules, operability of the displays, diagnostics associated with hardware inputs, and performance (e.g., time response).</p> <p>The inspectors verified that the licensee had conducted acceptance reviews of the test plan and FAT procedures. The inspectors reviewed letter ENT-WF3-CPC-368, "Test Plan for the Common Q Core Protection Calculator System," dated July 20, 2021, which documents Entergy's review and approval of comment resolutions to WNA-PT-00303-CWTR3, "CPCS Test Plan," Revision 2. The NRC inspectors also reviewed ENT-WF3-CPC-369, "Four Channel Factory Acceptance VOP Audit," dated July 23, 2021, which documented Entergy's review and approval of comment resolutions to the CPCS Four Channel Test Procedure, WNA-TP-06781-CWTR3. The inspectors determined the licensee performed the FAT vendor</p>	

oversight in accordance with their VOP but will inspect the licensee's review and acceptance of the FAT audit report during SAT.

This combined inspection scope portion partially completed sections 2.01(a), 2.01(b), 2.01(c), and 2.01(d) of Inspection Procedure 52003, Digital Instrumentation and Control Modification Inspection, dated July 1, 2021 (IP52003).

b. Observations and Findings

No findings were identified.

1.2 Requirements Phase

a. Inspection Scope

The inspectors reviewed the EN-IT-103-15, "Cyber Security Defensive Architecture & Technical Controls Integration Form," Revision 1, attachment 9.6, to verify that key cyber security capabilities were included in system requirements and that the licensee was communicating the requirements for the digital modification to the vendor. This portion of the inspection partially completed section 2.01(c)(1)(a)(1) of IP52003.

The inspectors verified the status of supply chain protection, trustworthiness, integration of security capabilities in accordance with the CSP had been included in system requirements. Supply chain protections were discussed with licensee and vendor and the inspectors were informed that the CPCS components would be shipped with tamper seals. The inspectors noted that the licensee requested several security capabilities be added to the CPCS and the inspectors plan to look at this in more detail during the SAT. The security test and evaluation plan required by NEI 08-09, E.11.5, "Developer Security Testing," at the time of this inspection was still under development and would not be available until SAT. This portion of the inspection partially completed section 2.01(c)(1)(a)(3) of IP52003.

The inspectors were unable to verify that testing and independent verification and validation (IV&V) requirements since the FAT audit report was not complete. Verification will be completed during the SAT. This portion of the inspection partially completed section 2.01(c)(1)(a)(5) of IP52003.

b. Observations and Findings

No findings were identified.

1.3 Design Phase

a. Inspection Scope

The inspectors held meetings with the licensee and vendor to verify that the licensee required the vendor to create a security and evaluation test plan and conducted cyber security acceptance reviews of the design outputs for this phase in accordance with the licensee's Cyber Security Plan.

The inspectors were informed that this test plan would not be completed until SAT. This portion of the inspection partially completed sections 2.01(c)(2)(c) and 2.01(c)(2)(d) of IP52003.

The inspectors verified that the licensee conducted acceptance reviews by interviewing staff and reviewing Entergy's audit reports for the requirements phase (AUD-WF3-2019-00236-CA127) and the design phase (AUD-WF3-2019-00236-CA189). During these audits, the licensee performed requirements traceability from the system requirement specification to the software requirement specification, and to the software design descriptions, and identified discrepancies that the vendor incorporated into the Regulatory Issues Tracking System (RITS). NRC staff will inspect the licensee's FAT audit report during SAT. This portion of the inspection partially completed sections 2.01(c)(2)(a)(1), 2.01(c)(2)(a)(2), and 2.01(c)(2)(b) of IP 52003.

b. Observations and Findings

No findings were identified.

1.4 Design and Documentation Verification

a. Inspection Scope

The inspectors verified that applicable operating experience (OE) was correctly applied to the system. The inspector interviewed the licensee's staff on their testing approach, benchmarking, and review of OE from WEC and Palo Verde Nuclear Generating Station for implementation issues and lessons learned. This portion of the inspection completed section 2.02(a)(4) of IP52003 for the FAT phase.

The inspectors verified that the CPCS was being developed and tested in a secure environment commensurate with the system's secure operational environment. The inspectors verified that the test floor where the CPCS equipment FAT was being performed incorporated logical, physical, and administrative protective measures to control access and prevent unauthorized and undocumented changes to the system. NRC staff will inspect the licensee's FAT audit report during SAT. This portion of the inspection partially completed section 2.02(a)(10) of IP52003.

b. Observations and Findings

No findings were identified.

1.5 Vendor Oversight

a. Inspection Scope

The inspectors verified that the licensee's audit of vendor activities to ensure establishment and implementation of each Quality Assurance (QA) program attribute were performed in accordance with the licensee's NRC-approved QA program and the VOP. The inspectors witnessed the four-channel FAT testing activities and reviewed the requirements in the CPP-WF3-2019-002, "Critical Procurement Plan," revision 1, and purchasing contract, the QA

surveillance plan, and the FAT audit plan. The inspectors verified that the licensee performed the oversight activities in accordance with the procedures referenced in the VOP and reviewed the four-channel test procedure and QA surveillance plan.

The inspectors verified the licensee auditor's training and qualifications to perform audits/surveillances of vendor by reviewing the training certifications and through interviews.

The inspector verified the effectiveness of the licensee and vendor interface during system development by observing meetings, discussions, testing, and demonstrations between the licensee and vendor. The inspectors reviewed the licensee's audit plan for the four-channel factory acceptance VOP audit, the four-channel system test procedure, and the vendor's final compliance matrix.

This portion of the inspection completed section 2.01(g), 2.01(h), 2.01(i), 2.02(e) of IP52003 for the FAT phase.

b. Observations and Findings

No findings were identified

1.6 Review of Testing, Operations

a. Inspection Scope

The inspectors observed the licensee's involvement in the FAT and reviewed supporting documentation. The inspectors verified that the licensee had reviewed the equipment qualification test results and anomalies. The inspectors reviewed Westinghouse document CWTR3-20-113, "Transmittal of Westinghouse Responses to Entergy Comments on EQ-QR-412-CWTR3," dated April 29, 2021, which addressed 20 comments provided by Entergy on EQ-QR-412-CWTR3, "Equipment Qualification Summary Report (EQSR)," Revision 2-A, and documents Westinghouse's responses to Entergy's comments. Entergy comments 13, 14, 16 and 17 are related to the EQSR test anomalies.

The inspectors also reviewed Entergy's letter ENT-WF3-CPC-331, "EQSR EQ-QR-412-CWTR3, Rev 2-A," dated May 4, 2021, which documents Entergy's review of CWTR3-20-113 and includes clarifications to be added in the EQSR for the test anomalies that do not apply to the Waterford 3 CPCS or were successfully dispositioned. The inspectors reviewed licensee provided comments regarding the testing configuration and test results. Entergy's comment 5 refers to the installation, operational and maintenance restrictions provided by the EQSR to ensure they are followed through the design and implementation process. The inspectors assessed Entergy staff's review of RITS 75864 and their oversight of Westinghouse's response which is to track all restrictions from Section 5 of the EQSR by RITS 75864.

This portion of the inspection completed section 3.04(c) and 3.04(d) of IP52003 for the FAT phase.

b. Observations and Findings

No findings were identified

1.7 Identification and Resolution of Problems

a. Inspection Scope

The inspectors reviewed the CAP for the vendor, Westinghouse, and for Entergy. The inspectors reviewed the licensee's CAP and verified that they were identifying issues related to the FAT at an appropriate threshold. The inspectors focused on the licensee's oversight of the vendor and noted that the licensee also reviewed the items the vendor entered in their CAP for deficiencies identified during VOP activities.

Additionally, the inspectors followed up on a change made to the test procedure, WNA-TP-06781-CWTR3, Four Channel Test Procedure, Revision 0, acceptance criteria for the cold leg temperature response time test. The inspectors observed the licensee's oversight of this change and had multiple discussions on the site's plan to review and approve the revisions to the cold leg temperature response time test procedure using EN-DC-149. The inspectors reviewed the revised test procedure, WNA-TP-06781-CWTR3, Revision 1, and the EN-DC-149 form the licensee used to document their review and acceptance of the change.

This portion of the inspection completed section 2.01(e) of IP52003 for the FAT phase.

b. Observations and Findings

No findings were identified

EXIT MEETINGS AND DEBRIEFS

The inspectors verified no proprietary information was retained or documented in this report.

- On October 19, 2021, the inspectors presented the Digital Instrumentation and Control Inspection results to John Ferrick and other members of the licensee staff.
- On August 4, 2021, the inspectors presented the Debrief inspection results to John Hornsby, Manager of Project Management and other members of the licensee staff.

DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
52003	Corrective Action Documents	2021-00558, 2021-00322, 2019-08344, 2021-00014, 2021-03981, 2021-00722, 2021-00088, 2021-00747, 2021-00557, 2020-06033, 2021-03554, 2021-00723, 2021-00594, 2021-00550, 2021-00060, 2021-00965		
		RITS 75864	EQ restrictions documented into the technical manuals, CPC and Mux	04/15/2021
	Drawings	2E10700	CPCS Mounting and Installation	2
		2E10726	APC MUX Assembly	7
	Engineering Changes	0000083843	Core Protection Calculator System Replacement	0
	Miscellaneous	AUD-WF3-2019-00236-CA 189	Entergy VOP Audit Report: Design Phase IV&V VOP Audit	0
		AUD-WF3-2019-00236-CA127	Entergy VOP Audit Report: Requirements Phase IV&V Audit	04/07/2021
		CPP-WF3-2019-002	Critical Procurement Plan- Procure Waterford 3 Core Protection Calculator (CPC) System Common Q Platform	1
		CWTR3-19-23	Transmittal of Westinghouse Final Compliance Matrix-RTM for ENT-IT-15-ATT-9.6 Cyber Security Checklist	2
		CWTR3-20-113	Transmittal of Westinghouse Responses to Entergy Comments on EQ-QR-412-CWTR3, Revision 2-A, "Core	04/29/2021

Inspection Procedure	Type	Designation	Description or Title	Revision or Date	
			Protection Calculator System Upgrade Project Equipment Qualification Summary Report for Waterford Unit 3"		
		ENT-WF3-CPC-064	Core Protection Calculator (CPC) System Input Processing Uncertainty Calculation, WNA-CN-00566-CWTR3, Rev A and Rev 0 Draft	12/09/2019	
		ENT-WF3-CPC-317	WNA-DS-04650-CWTR3, Hardware Design Description for the Core Protection Calculator System, Draft Rev 3	04/15/2021	
		ENT-WF3-CPC-331	EQSR EQ-QR-412-CWTR3 Rev 2-A	05/04/2021	
		ENT-WF3-CPC-353	CPC SRS, WNA-DS-04618-CWTR3, Draft Revision 3	06/21/2021	
		ENT-WF3-CPC-358	CEAPDS SRS, WNA-DS-04617-CWTR3, Draft Revision 3	06/21/2021	
		ENT-WF3-CPC-368	Test Plan for the Common Q Core Protection Calculator System, WNA-PT-00303-CWTR3	06/20/2021	
		ENT-WF3-CPC-369	Four Channel Test Procedure, WNA-TP-06781-CWTR3 Rev A & Draft Rev 0 Approval	07/21/2021	
		ENT-WF3-CPC-374	Witness of Four Channel Factory Acceptance VOP Audit	06/23/2021	
		SQ-SQHQN-2021-00146	Contract 10575450-01 WF3 Core Protection Calculator (CPC) System Common Q Platform	07/20/2021	
		VOP-WF3-2019-00236	Waterford Unit Steam and Electric Station Unit 3 Core Protection Calculator System Replacements Project Vendor Oversight Plan	4	
		WNA-TP-06781-CWTR3	Four Channel System Test Procedure for the Common Q Core Protection Calculator System	08/08/2019	
		Procedures	EN-DC-115	Engineering Change Process	31
			EN-DC-149	Acceptance of Vendor Documents	15
			EN-DC-163	Human Factors Evaluation	2
EN-HU-104	Technical Task Risk & Rigor		11		
EN-IT-103	Nuclear Cyber Security Program		15		
EN-IT-103-15	Cyber Security Procurement and Disposal Requirements		2		
EN-IT-104	Software Quality Assurance Program		16		

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
		EN-LI-102	Corrective Action Program	44
		EN-MP-100	Critical Procurements	16
		EN-OM-132	Nuclear Risk Management Process	3
		EN-QV-108	QA Surveillance Process	12
		Entergy	Quality Assurance Program Manual	41