



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

April 21, 2015

Mr. B. L. Ivey  
Vice President, Regulatory Affairs  
Southern Nuclear Operating Company  
P.O. Box 1295  
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Birmingham, AL 35201

**SUBJECT: VOGTLE ELECTRIC GENERATING PLANT UNITS 3 AND 4 – NRC  
SIMULATOR INSPECTION REPORTS 05200025/2015301 AND  
05200026/2015301**

Dear Mr. Ivey:

On April 8, 2015, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Vogtle Electric Generating Plant (VEGP) Units 3 and 4. The enclosed inspection report documents the inspection results, which the inspectors discussed on February 26, 2015, with Ms. Karen Fili and other members of your staff.

The inspection partially completed Inspection Procedure 41502, Nuclear Power Plant Simulation Facilities. This inspection initiated an assessment of the simulation facility performance, simulation facility program adequacy and implementation, and the simulator deficiency reporting system. The inspectors examined a sample of activities performed by your staff to ensure that the Vogtle 3A and 3B simulation facilities were being tested in accordance with ANSI/ANS-3.5-1998, "Nuclear Power Plant Simulators for Use in Operator Training and Examination." Additionally, the inspectors reviewed the facility licensee's established programs and processes related to continued assurance of simulator fidelity in accordance with 10 CFR 55.46(d). The inspectors reviewed selected test procedures and programmatic procedures, reviewed simulator test records, observed activities, and interviewed personnel.

Based on the results of this inspection, no findings of significance were identified. In accordance with Inspection Manual Chapter (IMC) 0613 section 17.02, the Enclosure to this report includes documentation of the scope of the inspection and the factual observations of the inspectors.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Website at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

B. Ivey

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Should you have any questions concerning this letter, please contact us.

Sincerely,

*/RA/*

Eugene F. Guthrie, Chief  
Operations Branch 2  
Division of Reactor Safety

Docket Nos.: 5200025, 5200026  
License Nos: NPF-91, NPF-92

Enclosure: Inspection Report 05200025/2015301  
and 5200026/2015301 w/Attachment: Supplemental Information

cc: See page 3

B. Ivey

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Should you have any questions concerning this letter, please contact us.

Sincerely,

**/RA/**

Eugene F. Guthrie, Chief  
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cc: See page 3

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ADAMS: x  Yes    ACCESSION NUMBER: ML15113A028 \_\_\_\_\_      x  SUNSI REVIEW COMPLETE     FORM 665 ATTACHED

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DATE	4/7/2015	4/21/2015	4/7/2015	4/14/2015	4/9/2015	
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Letter to B. L. Ivey from Eugene F. Guthrie dated April 21, 2015.

SUBJECT: VOGTLE ELECTRIC GENERATING PLANT UNITS 3 AND 4 – NRC  
SIMULATOR INSPECTION REPORTS 05200025/2015301 AND  
05200026/2015301

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**U.S. NUCLEAR REGULATORY COMMISSION  
Region II**

Docket Numbers: 5200025  
5200026

License Numbers: NPF-91  
NPF-92

Report Numbers: 05200025/2015301  
05200026/2015301

Licensee: Southern Nuclear Operating  
Company, Inc. Facility: Vogtle Unit 3 Combined License  
Vogtle Unit 4 Combined License

Location: Waynesboro, GA

Inspection Dates: February 23 - 26, 2015 and April 6 -8, 2015

Inspectors: David R. Lanyi, Senior Operations Engineer  
Peter A. Presby, Senior Operations Engineer

Approved by: Eugene F. Guthrie  
Branch Chief  
Operations Branch 2  
Division of Reactor Safety

Enclosure



## **SUMMARY OF FINDINGS**

Inspection Report (IR) 05200025/2015301, 05200026/2015301; 02/23/2015 through 02/26/2015 and 04/06/2015 through 04/08/2015; Vogtle Unit 3, Vogtle Unit 4 simulator inspection report.

This report covers an announced, infrequently performed inspection completed by regional inspectors. The Nuclear Regulatory Commission's (NRC's) program for overseeing the construction of commercial nuclear power reactors is described in IMC 2506, "Construction Reactor Oversight Process General Guidance and Basis Document."

### **A. NRC-Identified and Self Revealed Findings**

No findings were identified.

### **B. Licensee-Identified Violations**

No findings were identified.

## REPORT DETAILS

### 1. CONSTRUCTION REACTOR SAFETY

#### Cornerstones: Design/Engineering, Procurement/Fabrication, Construction/Installation, Inspection/Testing

##### 1P01 Simulator Inspection (41502)

###### a. Inspection Scope

The inspectors partially completed Inspection Procedure (IP) 41502, Nuclear Power Plant Simulation Facilities. The inspectors examined a sample of activities performed by the facility licensee's staff to ensure that the Vogtle 3A and 3B simulation facilities were being tested in accordance with the ANSI/ANS-3.5-1998 standard, "Nuclear Power Plant Simulators for Use in Operator Training and Examination." Additionally, the inspectors reviewed and assessed the facility licensee's established programs and processes related to continued assurance of simulator fidelity in accordance with 10 CFR 55.46(d). The inspectors reviewed selected test procedures and programmatic procedures, reviewed simulator test records, observed activities, and interviewed personnel.

The Vogtle simulation facility is comprised of two AP1000 full scope simulators, designated "3A" and "3B." Both simulators are referenced to Vogtle Unit 3 and are intended to be maintained functionally identical.

The simulation facility design, models, and software are based upon what the reactor vendor has designated as the "Baseline 7" milestone for Instrumentation and Controls (I&C). The Baseline 7 milestone document established a set of requirements to ensure the integrated I&C system design is consistently implemented within various core I&C platforms and systems. The Vogtle simulation facility was also updated with various modifications (in coordination with the reactor vendor) as new I&C issues or design changes were identified and resolved during the finalization of the AP1000 design and/or initial test program. Additionally, the licensee has been updating the simulator with corrections to minor programming deficiencies as they have been identified by the licensee. The information associated with these updates has been forwarded to the reactor vendor for inclusion in the next baseline update.

The facility licensee committed to meet the requirements of ANSI/ANS-3.5-1998, as endorsed by Revision 3 of NRC Regulatory Guide 1.149, "Nuclear Power Plant Simulation Facilities for Use in Operator Training and License Examinations." This standard establishes the functional requirements for full scope nuclear power plant control room simulators used for operator training and examination. The ANSI/ANS-3.5 standard requirements for testing are specifically implemented in NMP-TR-422, "Simulator Configuration Control" and NMP-TR-422-001 "Simulator Configuration and Performance Criteria Instruction."

##### 1. On-Site Simulation Facility Testing and Test Results

As detailed in the attached list of documents reviewed, the inspectors reviewed simulator test results and records for one steady-state test, two transient tests, two core performance tests, and four malfunction tests. Along with the official test records,

inspectors also reviewed test data provided by the facility licensee from test runs that were performed to verify simulator response following installation of the simulator modifications mentioned above.

Based on the current status of the simulation facility reference unit, the facility licensee did not provide any test records related to Scenario Based Testing (SBT), or simulator post-event testing (reference IP 41502 section 02.03.b.4, 02.03.c, and 02.03.d.). As a note, in accordance with section 3.4.3.2 of the 2009 revision of the ANSI/ANS-3.5 standard, SBT is only required to be performed for (1) NRC initial license examination scenarios, (2) licensed operator requalification annual examination scenarios, and (3) scenarios used for reactivity control manipulation experience. The facility licensee has yet to administer any of these three required scenarios. These test records will be reviewed at a later date, once they are available, in order to complete the IP 41502 inspection.

The inspectors also observed and reviewed the simulation facility performance during two simulator “scenarios.” These two “scenarios” were developed by the NRC to assess simulation facility performance under controlled conditions. The facility licensee provided a team of four AP1000 Senior Reactor Operator (SRO) certified individuals to operate the simulation facility using the appropriate procedures for the associated events and transients as requested by the NRC inspectors.

The scope of the inspectors’ review of the above items was informed by the requirements of 10 CFR 55.46(c)(1).

## 2. Simulation Facility Procedural Development

The inspectors reviewed a sample of the facility licensee’s procedures related to the simulation facility conduct of testing, documentation of simulation facility issues requiring assessment and potential corrective actions, simulation facility modifications, and the use of the simulation facility for operator training and operator testing and evaluations. The inspectors ensured the procedures developed for the Vogtle simulation facility correctly reflected ANSI/ANS-3.5 requirements, where applicable, and were consistent with recognized practices as reflected in currently operating reactor plant reference simulators. The inspectors also reviewed a representative sample of the Vogtle training department procedures where there was associated involvement with the simulation facility

The inspectors also reviewed the facility licensee’s procedures related to maintaining examination and test integrity consistent with the requirements of 10 CFR 55.49. This review was informed by the requirement of 10 CFR 55.46(d)(4).

## 3. Simulation Facility Programs for Assurance of Continued Simulator Fidelity

In addition to reviewing the specified procedural requirements that define the Vogtle simulation facility programs for assurance of continued simulator fidelity, the inspectors also reviewed the facility licensee’s simulator deficiency reporting (SDR) program, including open and closed deficiencies. The inspectors also reviewed facility licensee records related to the determination of whether simulator discrepancies resulted in an impact on operator training, the determination of the impact of identified simulator discrepancies on the pass/fail criteria of the associated test results.

The inspectors compared the SDRs identified by the facility licensee against the simulator test records and results in order to assess the effectiveness of the facility

licensee's program for identification and prioritization of issues, reporting, evaluation, schedule for implementing timely corrective actions, and corrective actions. The inspectors assessed whether the facility licensee was effectively identifying any simulator discrepancies that could result in negative training of operators. The inspectors verified whether or not the facility licensee adequately captured simulator problems and deficiencies; and that corrective actions were performed, tracked, trended, and completed in a timely fashion commensurate with the safety significance of the item. Implicit in the inspector's review is confirmation that the corrective actions taken did not introduce new errors into the simulation facility modeling and response (reference IP 41502 section 02.02.a.2 and 02.02.b.5).

The scope of the inspectors' review of the above items was informed by the requirements of 10 CFR 55.46(d).

#### 4. Overall Summary of IP 41502 Completion

In summation, the inspectors completed or partially completed the following IP 41502 inspection requirements: 02.02.b.1.(a) through (d), 02.02.b.4.(a) through (c), 02.02.b.5, 02.02.b.6(c) and (d). Due to the construction status of the reference unit during the inspection timeframe, the following inspection requirements of IP 41502 were not begun and will need to be completed at a later date: 02.02.b.1.(e), 02.02.b.2, 02.02.b.3, 02.02.b.4(d) through (e), and 02.02.b.6(a) and (b).

#### b. Observations:

No findings were identified.

##### 1. On-Site Simulation Facility Testing and Test Results

(a) Steady-State Test Results. ANSI/ANS-3.5-1998 section 4.1.3.1 required steady-state testing and specified certain key parameters to be within certain expected tolerances throughout the steady-state test, as compared to reference unit data. Facility licensee procedure NMP-TR-422-006, Attachment 4, "Steady State Performance Test at 75% Power – Test # AP-OPS-SS-002" contained the same criteria as is listed in the ANSI/ANS-3.5 simulator standard. The inspectors found that the licensee had identified that eight values had fallen outside of the required range and that there was no data available with which to compare for rod height. The licensee documented these results in Conformance Report 3G-STS-2A-001, "Vogtle Unit 3 ANS-3.5-1998 Conformance Report" and stated that there was insufficient data from the vendor to determine if the test met the acceptance criteria. The report further specified that they will rerun this test annually. When additional data becomes available, the licensee will reanalyze the test.

The inspectors reviewed the licensee's actions and determined that it adequately addressed the requirements of ANSI/ANS-3.5-1998.

(b) Transient Test Results. ANSI/ANS-3.5-1998 section B1.2 stated that the acceptance criteria for the 11 transient tests required by section B3 (for Pressurized Water Reactors (PWRs)) was as listed in section 4.1.4 of the standard. The applicable sections of the licensee's procedure NMP-TR-422, "Simulator Configuration Control" contained the same required acceptance criteria for transient tests as listed in the ANSI/ANS-3.5 standard. The inspectors reviewed a sample of the licensee's packages that evaluated the transient responses obtained on the simulator to the design data.

The inspectors found that the documentation available was not sufficient to ensure that a full review of the data had occurred. The inspectors then questioned the members of the licensee's staff that had performed the evaluations. Multiple SDRs had been initiated to document and correct (if possible) issues identified during the testing. Tests were re-run as required to ensure that the corrections did not adversely affect the simulators. Each notable difference had a Training Needs Analysis performed to determine the effect on training and any mitigating actions that could be taken. It became apparent to the inspectors that a review of the data had been performed, but the documentation was deficient. The licensee then amended their documentation to include sufficient detail.

The inspectors reviewed the licensee's actions and determined that it adequately addressed the requirements of ANSI/ANS-3.5-1998.

(c) "Scenario" Results. The inspectors questioned the response of the simulation facility's modeling of Core Exit Thermocouple (CET) response in a superheated core condition (inadequate core cooling). The inspectors noted that all of the CETs were oscillating across a range of several hundred degrees Fahrenheit during a condition where there was no source of coolant injection to the reactor vessel.

The facility licensee captured this observation as SCR-DR-6427.

The inspectors reviewed the licensee's actions and determined that it adequately addressed the requirements of ANSI/ANS-3.5-1998.

## 2. Simulation Facility Procedural Development

The inspectors reviewed NMP-TR-422, "Simulator Configuration Control", NMP-TR-422-001, "Simulator Configuration and Performance Criteria Instruction", NMP-TR-422-002, "Scenario Based Testing Instruction", NMP-TR-005, "Simulator Testing Instruction" and NMP-006, "Plant Vogtle 3-4 Simulator Testing Instruction". The procedures laid out testing methodologies and schedules for all required tests. The procedures were part of the shared fleet procedures currently in use at all Southern Nuclear sites. The procedures accurately reflect the requirements of ANSI/ANS-3.5.

The inspectors reviewed the licensee's actions and determined that it adequately addressed the requirements of ANSI/ANS-3.5-1998.

## 3. Simulation Facility Programs for Assurance of Continued Simulator Fidelity

The inspectors reviewed a list of open and closed SDRs generated by the licensee to determine the types of issues that were being identified and included. Moreover, the inspectors reviewed a sample of the records to determine the impact on operator training and the effect on the previously completed ANSI/ANS-3.5 required testing. The inspectors found that the licensee had a very low threshold for submitting SDRs. When the deficiency could not be corrected, the staff then submitted the issue for a Training Needs Analysis.

The inspectors reviewed the licensee's database of outstanding deficiencies to ensure that they were being tracked adequately for eventual disposition. The licensee maintained a spreadsheet of all SDRs created. This spreadsheet included the SDR identification number, the test or procedure that in which it was identified, a brief status of the issue, and the status of the Training Needs Analysis. The inspectors found the spreadsheet an effective tool to track SDRs.

The inspectors reviewed the licensee's programs to assure continued simulator fidelity and found them to be adequate.

#### **4. OTHER INSPECTION RESULTS**

##### 4A06 Meetings, Including Exit

###### Exit Meeting

On February 26, 2015, the inspectors presented the preliminary inspection results to Ms. Karen Fili, Vogtle 3&4 Vice President, along with other members of her staff. On April 20, 2015, the inspector presented the Final inspection results to Mr. Mark Verbeck, AP-1000 Training Deployment Director. The inspectors stated that no proprietary information would be included in the inspection report.

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensees Personnel**

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K. Pope, Operations Director  
M. Verbeck, AP-1000 Training Deployment Director  
G. Crosby, Operations Training Manager  
T. Arnette, Operations Shift Manager  
C. Cannon, Nuclear Plant Operator in Training  
S. Gambaro-Perazza, Engineer  
B. Hirmanpour, Licensing Engineer  
K. Hoffman, Senior Engineer  
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L. Ray, Operations Support Manager  
K. Saxon, Project Manager  
D. Spielman, Simulator Coordinator  
C. Werneke, Nuclear Duty Officer  
R. Wilkes, Operations Shift Manager  
M. Williams, Site Licensing  
F. Willis, Licensing Supervisor

### **LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED**

None

## LIST OF DOCUMENTS REVIEWED

### **Simulator Deficiency Reports**

SDR 5632, Unexpected Alarms during AP-OPS-T-002A  
SDR 5636, DAS CET LEDs Flash to FAULT-OPS-T-002A  
SDR 5661, Unexpected Response from SWS-PY-S06A on Loss of Power  
SDR 5709, Simulated Xenon Concentration Diverges from Predicted by More than 10% at 36 Hours  
SDR 5973, RCPs Indicate 5 RPM when Secured  
SDR 6419, Calculated Model Values Observed to Level Out for 500msec Intervals  
SDR 6421, Investigate WLS Containment Sump Level Response to SBLOCA  
SDR 6425, Unexpected Reset of CVS Pump Breaker Alarm  
SDR 6427, Investigate Cutout of SR High Flux Bistables  
SDR 6428, CET Temperature Goes Erratic After a LBLOCA with no Passive Cooling in Place  
SDR 6434, Run Malf-20-3  
SDR 6436, Core Test Note for 2015

### **Plant Condition Reports**

CR 10032055, FR-P.1, Step 1 Needs Evaluated for Potential Continuous Action  
CR 10032190, Mitigation Strategy for Single Condensate Pump Operation Requested

### **Self-Assessments:**

Vogtle 3&4 Simulator Inspection Readiness and Configuration & Control Compliance, 10/20-22/14

### **Procedures:**

NMP-TR-422, Simulator Configuration Control, Ver. 6.0  
NMP-TR-422-001, Simulator Configuration and Performance Criteria Instruction, Ver. 3.0  
NMP-TR-422-002, Scenario Based Testing Instruction, Ver. 1.0  
NMP-TR-422-006, Plant Vogtle 3-4 Simulator Testing Instruction, Ver. 1.0  
NMP-TR-422-006-001, Plant Vogtle 3-4 Simulator Malfunction Testing Instruction, Ver 1.0

### **Simulator ANSI/ANS-3.5-1998 Appendix B Transient Tests:**

AP-OPS-T-001, Manual Reactor Trip, 12/8/14  
AP-OPS-T-010A, RCS Depressurization from Leaking Safety Valve, 11/4/14

### **Simulator ANSI/ANS-3.5-1998 Steady State Tests:**

AP-OPS-SS-002, Steady State Performance at 75% Power, 9/8/14

### **Simulator ANSI/ANS-3.5-1998 Malfunction Tests:**

AP-MALF-01-4, Small Break LOCA, 9/8/14  
AP-MALF-03-1, Loss of IDS Division A, 12/8/14  
AP-MALF-03-23, Loss of IDS Division B and C 72 Hour Instrument Buses, 9/8/14  
AP-MALF-20-3, IRC Main Feed Line Break, 12/8/14



**Simulator ANSI/ANS-3.5-1998, Core Performance Tests:**

AP-OPS-RX-003, Isothermal Temperature Coefficient, 9/8/14  
AP-OPS-RX-005, Control Rod Worth, 12/3/14

**Miscellaneous Documents:**

3G-ST5-2A-001, Vogtle Unit 3 ANS-3.5-1998 Conformance Report, 12/15/14  
PRS Core Testing Report, 2/4/15  
Listing of Open Deficiency Reports. 2/23/15  
Listing of Closed Deficiency Reports 2/23/15

**LIST OF ACRONYMS**

ANS	American Nuclear Society
ANSI	American National Standards Institute
CET	Core Exit Thermocouple
CR	Condition Report
DR	Deficiency Report
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	Inspection Report
NRC	Nuclear Regulatory Commission
PWR	Pressurized Water Reactor
SBT	Scenario Based Testing
SDR	Simulator Discrepancy Report
VEGP	Vogtle Electric Generating Plant