



April R. Rice
Manager
New Nuclear Licensing

July 20, 2017
NND-17-0408
10 CFR 52.99(c)(1)

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Virgil C. Summer Nuclear Station (VCSNS) Unit 3
Combined License No. NPF-94
Docket Number 52-028
ITAAC Closure Notification on Completion of ITAAC 2.5.01.03d [Index No. 514]

Attachments: (1) References
(2) Excerpt from COL Appendix C Table 2.5.1-5
(3) DAS Applicable Test Standards, Baseline (MIL-STD) Emissions Testing Program
(4) DAS Applicable Test Standards, Alternate (IEC) Susceptibility Testing Program

The purpose of this letter is to notify the Nuclear Regulatory Commission (NRC) in accordance with 10 CFR 52.99(c)(1) of the completion of Virgil C. Summer Nuclear Station (VCSNS) Unit 3 Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Item 2.5.01.03d for verifying that a report exists and concludes the Diverse Actuation System (DAS) equipment can withstand the surge withstand capabilities (SWC), electromagnetic interference (EMI), radio frequency (RFI) and electrostatic discharge (ESD) conditions that exist where the DAS equipment is located in the plant. The closure process for this ITAAC is based on the guidance described in NEI 08-01 (Reference 1), which was endorsed by the NRC in Regulatory Guide 1.215.

South Carolina Electric and Gas (SCE&G) previously submitted ITAAC Closure Notification on Completion of ITAAC 2.5.01.03d [Index Number 514], NND-17-0012 [ML17093A315], dated March 30, 2017. This resubmittal provides additional details requested by the NRC staff during public meetings and supersedes NND-17-0012 in its entirety.

ITAAC Statement

Design Commitment:

- 3.d) *The DAS has electrical surge withstand capability (SWC), and can withstand the electromagnetic interference (EMI), radio frequency (RFI), and electrostatic discharge (ESD) conditions that exist where the DAS equipment is located in the plant.*

Inspections, Tests, Analyses:

Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment.

Acceptance Criteria:

A report exists and concludes that the DAS equipment can withstand the SWC, EMI, RFI and ESD conditions that exist where the DAS equipment is located in the plant.

ITAAC Determination Basis

Electromagnetic Compatibility qualification of the non-safety related Diverse Actuation System (DAS) was performed by a combination of type tests and analyses to demonstrate that the equipment has electrical surge withstand capability (SWC), and can withstand electromagnetic interference (EMI), radio frequency interference (RFI), and electrostatic discharge (ESD) conditions that exist where the DAS equipment is located in the plant (i.e., Auxiliary Building). The DAS equipment is shown in Combined License (COL) Appendix C, Table 2.5.1-5 (Attachment 2).

The DAS equipment was qualified by a combination of type testing and analysis using guidance of Regulatory Guide (RG) 1.180, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems" (Reference 2) and the methodology in APP-GW-G1-002, "AP1000 Plant Equipment Qualification Methodology" (Reference 3) to demonstrate that DAS equipment can withstand the SWC, EMI, RFI and ESD conditions that exist where the DAS equipment is located in the plant.

RG 1.180 defines a range of tests that satisfy the SWC, EMI, and RFI requirements. The RG 1.180 baseline program [military standards (MIL-STD)] is used in its entirety for emissions testing as described in Attachment 3, and shows the EMC type test, the test standard, and the application. The RG 1.180 alternate program [International Electrotechnical Commission (IEC)] is used in its entirety for susceptibility testing as described in similar fashion in Attachment 4.

APP-GW-G1-002 used the guidance of Electric Power Research Institute (EPRI) TR-102323 (Reference 4). EPRI TR-102323 specifies the criteria and test methods for the emissions and susceptibility tests, including the use of IEC 61000-4-2 (Reference 5) to satisfy the ESD requirement.

Emissions and susceptibility testing was performed on the qualification test cabinets by completing the prescribed tests under conditions representing the auxiliary building. The equipment under test was monitored to confirm it operates as designed during and after EMC testing, with no degradation or loss of required functions, or spurious actuation.

A reconciliation analysis on the differences between the qualification test cabinet configuration and the production DAS cabinets was performed to show that test configuration was representative of the production cabinets. Operating and installation restrictions were established based on test results to ensure DAS continues to meet EMC qualification in its final location.

The results of the tests and analyses are documented in the Equipment Qualification Summary Report (Reference 6) and Equipment Qualification Data Package (Reference 7) and conclude that the DAS equipment can withstand the SWC, EMI, RFI and ESD conditions that exist where the DAS equipment is located in the plant.

ITAAC Finding Review

In accordance with plant procedures for ITAAC completion, the Licensee performed a review of all findings pertaining to the subject ITAAC and associated corrective actions. This review found two (2) closed notices of nonconformance (NON) and one (1) closed unresolved item (URI) associated with this ITAAC:

1. 99901043/2012-201-03
2. 99901043/2012-201-04
3. 99901043/2012-201-05

The corrective actions for the findings have been completed and the findings are closed. This review is documented in the completion package for ITAAC 2.5.01.03d (Reference 8), which is available for NRC inspection.

ITAAC Completion Statement

Based on the above information, SCE&G hereby notifies the NRC that ITAAC 2.5.01.03d was performed for VCSNS Unit 3 and that the prescribed acceptance criteria are met.

Systems, structures, and components verified as part of this ITAAC are being maintained in their as-designed, ITAAC compliant condition in accordance with approved plant programs and procedures.

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We request NRC staff confirmation of this determination and publication of the required notice in the Federal Register per 10 CFR 52.99(e)(1).

If there are any questions, please contact Ryder Thompson at (803) 941-9812.

Sincerely,

A handwritten signature in black ink, appearing to read "April R. Rice".

April R. Rice
Manager
Nuclear Licensing
New Nuclear Deployment

RT/AR/hz

Attachment 1

References (available for NRC inspection):

1. NEI 08-01, "Industry Guideline for the ITAAC Closure Process Under 10 CFR Part 52"
2. Regulatory Guide 1.180, "Guidelines for Evaluating Electromagnetic and Radio-Frequency Interference in Safety-Related Instrumentation and Control Systems"
3. APP-GW-G1-002, "AP1000 Equipment Qualification Methodology"
4. Electric Power Research Institute Report TR-102323, "Guidelines for Electromagnetic Interference Testing of Power Plant Equipment," Electric Power Research Institute, Inc., Final Report, November 2000.
5. International Electrotechnical Commission, Test Standard 61000-4-2, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 2: Electrostatic Discharge Immunity Test," 2008
6. APP-DAS-VBR-002, "Equipment Qualification Summary Report for the Diverse Actuation System for Use in the AP1000 Plant"
7. APP-DAS-VBR-003, "Equipment Qualification Data Package for the Diverse Actuation System for Use in the AP1000 Plant"
8. ITAAC 2.5.01.03d Completion Package

Attachment 2

Equipment Qualification ITAAC Compliance Table

***Excerpt from COL Appendix C Table 2.5.1-5**

System: Diverse Actuation System

Component Name*	Tag No.*	Component Location*	Type of Qualification	Equipment Qualification Report
DAS Processor Cabinet 1	DAS-JD-001	Auxiliary Building	Type Testing and Analysis	APP-DAS-VBR-002 APP-DAS-VBR-003
DAS Processor Cabinet 2	DAS-JD-002	Auxiliary Building	Type Testing and Analysis	APP-DAS-VBR-002 APP-DAS-VBR-003
DAS Squib Valve Control Cabinet	DAS-JD-003	Auxiliary Building	Type Testing and Analysis	APP-DAS-VBR-002 APP-DAS-VBR-003

Attachment 3

DAS Applicable Test Standards, Baseline (MIL-STD) Emissions Testing Program

EMC Type Test	Test Standard	Application
Conducted Emissions, Low Frequency, 30 Hz to 10 kHz (EMI/ RFI)	MIL-STD-461E (CE101) "Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment," U.S. Department of Defense, August 1999.	Power Leads (Note 1)
Conducted Emissions, High Frequency, 10 kHz to 2 MHz (EMI/ RFI)	MIL-STD-461E (CE102), "Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment," U.S. Department of Defense, August 1999.	Power Leads
Radiated Emissions, Magnetic Field, 30 Hz to 100 kHz (EMI/ RFI)	MIL-STD-461E (RE101), "Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment," U.S. Department of Defense, August 1999.	DAS Cabinet
Radiated Emissions, Electric Field, 2 MHz to 10 GHz (EMI/ RFI)	MIL-STD-461E (RE102), "Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment," U.S. Department of Defense, August 1999.	DAS Cabinet

Note:

1. Voltage Total Harmonic Distortion (VTHD) tests were performed to support exemption of these power leads from CE101 tests under Regulatory Guide 1.180 Position 3.1.

Attachment 4

DAS Applicable Test Standards, Alternate (IEC) Susceptibility Testing Program

EMC Type Test	Test Standard	Application
Conducted Susceptibility, Low Frequency, 15 Hz to 150 kHz (EMI/ RFI)	IEC 61000-4-16, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 16: Test for Immunity to Conducted, Common Mode Disturbances in the Frequency Range of 0 Hz to 150 kHz," 1998.	Power & Signal Leads
Conducted Susceptibility, Low Frequency, 16 Hz to 2.4 kHz (EMI/ RFI)	IEC 61000-4-13, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 13: Harmonics and Interharmonics Including Mains Signaling at AC Power Port, Low Frequency Immunity Tests," 2002.	AC Power Leads
Conducted Susceptibility, High Frequency, 150 kHz to 80 MHz (EMI/ RFI)	IEC 61000-4-6, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 6: Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields," 1996 & 2008.	Power & Signal Leads
Radiated Susceptibility, Magnetic Field, 50 Hz & 60 Hz (EMI/ RFI)	IEC 61000-4-8, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 8: Power Frequency Magnetic Field Immunity Test," 1993 & 2009.	DAS Cabinet
Radiated Susceptibility, Magnetic Field, 50/60 Hz to 50kHz (EMI/ RFI)	IEC 61000-4-9, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 9: Power Frequency Magnetic Field Immunity Test," 1993 & 2009.	DAS Cabinet
Radiated Susceptibility, Magnetic Field, 100 kHz and 1 MHz (EMI/ RFI)	IEC 61000-4-10, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 10: Damped Oscillatory Magnetic Field Immunity Test," 1993.	DAS Cabinet
Radiated Susceptibility, Electrical Field, 26 MHz to 1 GHz (EMI/ RFI)	IEC 61000-4-3, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 3: Radiated, Radio-Frequency, Electromagnetic Field Immunity Test," 1995 & 2010.	DAS Cabinet
Radiated Susceptibility, Electrical Field, 1 GHz to 10 GHz (EMI/ RFI) (Note 1)	MIL-STD-461E (RS103), "Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment," U.S. Department of Defense, August 1999.	DAS Cabinet

Electrical Fast Transient (SWC)	IEC 61000-4-4, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 4: Electrical Fast Transient/Burst Immunity Test," 1995 & 2010.	Power & Signal Leads
Surge, Combination Wave (SWC)	IEC 61000-4-5, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 5: Surge Immunity Test," 1995 & 2005.	Power & Signal Leads
Surge, 100kHz Ring Wave (EMI/ RFI)	IEC 61000-4-12, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 12: Oscillatory Waves Immunity Test," 1995.	Power & Signal Leads
Electrostatic Discharge Immunity (ESD)	IEC 61000-4-2, "Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques, Section 2: Electrostatic Discharge Immunity Test," 2008.	DAS Cabinet DAS Blasting Device (Note 2)

Notes:

1. MIL-STD-461E RS103 (Radiated susceptibility, electric field) test is used to extend the alternative (IEC) test range of the radiated electrical fields susceptibility above 1 GHz, as indicated in RG 1.180 Position 6.
2. Supplemental testing was performed on the blasting device located in the DAS squib controller cabinet. The device provides an alternate manual means of actuating the squib valves from the DAS cabinets if onsite power is lost and all other PMS and DAS components become inoperable.