



January 5, 2007
RC-06-0222

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

Dear Sir/Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
REGARDING NRC BULLETIN 2004-01
INSPECTION OF ALLOY 82/182/600 MATERIALS USED IN THE
FABRICATION OF PRESSURIZER PENETRATIONS AND STEAM SPACE
CONNECTIONS AT PRESSURIZED-WATER REACTORS (C-04-1719)

- Reference:
1. Robert E. Martin (NRC) letter to Jeffrey B. Archie (SCE&G), Virgil C. Summer Nuclear Station - Request for Additional Information Regarding Bulletin 2004-01, "Inspections Of Alloy 82/182/600 Materials Used In The Fabrication Of Pressurizer Penetrations And Steam Space Piping Connections At Pressurized-Water Reactors"(TAC NOS. MC3516), July 18, 2006
 2. Evangelos A. Marinos (NRC) letter to Jeffrey B. Archie (SCE&G), Virgil C. Summer Nuclear Station - Relief Request-III-02 Associated With The Risk-Informed Inservice Inspection Program (TAC NO. MC4323), September 6, 2005 [ML052300616]
 3. Jeffrey B. Archie letter to Document Control Desk, RC-05-0117, Response to NRC Bulletin 2004-01 Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors, July 29, 2005
 4. Stephen A. Byrne letter to Document Control Desk, RC-04-0185, Response to NRC Bulletin 2004-01 Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurized Penetrations and Steam Space Piping Connections at Pressurized Water Reactors, November 16, 2004

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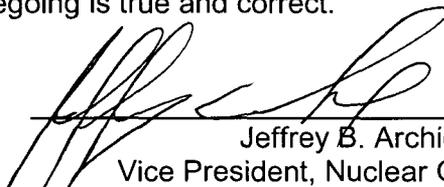
On July 18, 2006, the U.S. Nuclear Regulatory Commission (NRC) issued a request (Reference 1) for additional information to NRC Bulletin 2004-01, "Inspections Of Alloy 82/182/600 Materials Used In The Fabrication Of Pressurizer Penetrations And Steam Space Piping Connections At Pressurized-Water Reactors," to South Carolina Electric & Gas Company (SCE&G) regarding the response provided in Reference 3 and Reference 4 to Requested Information Item 1(c).

The attached provides the response for the additional information requested to Item 1(c) of the bulletin.

Should you have questions, please call Mr. Arnie Cribb at (803) 345-4346.

I certify under penalty of perjury that the foregoing is true and correct.

1/5/07
Executed on


Jeffrey B. Archie
Vice President, Nuclear Operations

JT/JBA/mb

Attachment

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RTS (C-04-1719)
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DMS (RC-06-0222)

SCE&G
RESPONSE TO USNRC REQUEST FOR ADDITIONAL INFORMATION
CONCERNING SCE&G RESPONSE TO BULLETIN 2004-001
FOR
V.C. SUMMER NUCLEAR STATION (VCSNS)
REGARDING REQUESTED INFORMATION ITEM 1(c)

Requested Information from request for additional information to Bulletin 2004-001 issued July 18, 2006 (TAC MC3516):

- 1. Item 1(c) in Bulletin 2004-01 requests, in part, that licensees provide a description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at the licensee's plant during the next and subsequent refueling outages. The description should include the qualification standards for the inspection methods and personnel and the inspection documentation to be generated. The SCE&G responses in the four references listed below did not provide this information. Please provide this information to supplement the response to item 1(c) in Bulletin 2004-01.**

RESPONSE 1:

Inspection Programs

Visual Examinations

A Risk Informed Inservice Inspection (RI-ISI) Program is currently being implemented for the ASME Class 1 and 2 piping systems at VCSNS. In accordance with the RI-ISI Program, surface examinations (MT/PT) are no longer required for piping pressure boundary weldments.

Each of the Pressurizer nozzle penetrations detailed in the SCE&G response dated November 16, 2004, section 1(a) have had a Bare Metal Visual (BMV) Examination performed during the 15th Refueling outage (Refuel 15) of Spring 2005 with no indication of any through-wall leakage. The procedures and personnel utilized for the performance of these visual inspections were qualified to be in compliance with ASME Code, Section XI, 1998 Edition through 2000 Addenda. The results of these BMV inspections are documented in compliance with the working procedures and available for review in the plant permanent records storage system. The pressurizer nozzle BMV examinations were performed again in the Fall of 2006 during Refuel 16. If the BMV of any nozzle had revealed evidence of leakage, analysis of the residue along with surface examinations would have been performed to characterize the suspected through-wall leakage. If confirmed to be an actual through-wall leak, volumetric examination (RT or UT) of the weld and immediate base material would have been performed to characterize the discernable flaw. No evidence of leakage was identified during these inspections.

VCSNS has collaborated with EPRI (Electric Power Research Institute) to assess the ability to perform ultrasonic examination of the pressurizer nozzles and has concluded that with the use of alternative angle beam examination techniques, a theoretical minimum of 79% Code required volume should be achievable. This examination would be classified as a best effort inspection under the guidelines of ASME Appendix VIII and would also require the demonstration of the alternative angles under the EPRI Performance Demonstration Initiative (PDI). Final examination and documentation would be performed by personnel and procedures qualified through EPRI PDI to Appendix VIII. Radiographic inspection would have been used to evaluate, characterize and investigate any identified through-wall leaks and to supplement other NDE methods, as necessary.

Per 10CFR 50.55a, by reference to ASME Section XI acceptance standards, through-wall degradation is not permitted. In the event of a through-wall degradation discovery, examination scope expansion will be determined in accordance with the ASME Section XI criteria and the RI-ISI analysis for degradation mechanism. In the event of a circumferential through-wall flaw, the expected expansion would include all similar pressurizer nozzle configurations.

Volumetric Examinations

The welds originally reported in section 1(a) of response dated November 16, 2004, for the pressurizer nozzle penetrations are included in the analysis and engineering evaluation of the VCSNS RI-ISI Program. These Alloy 82/182/600 welds are classified and risk evaluated as are the remaining welds in the Class 1 and Class 2 piping systems in accordance with prescribed RI-ISI practices. Currently, in accordance with the guidelines of the RI-ISI Program, the pressurizer nozzle welds are not selected nor scheduled for examination during the remainder of the Interval. If during the living program evaluations of the VCSNS RI-ISI program, it is determined these welds have increased risk, change in failure mechanism or have design specific industry scrutiny, an evaluation is required to be performed to assess the need to schedule or implement particular examinations. The VCSNS RI-ISI Program is scheduled for a living program engineering evaluation during 2007 with any required scheduling changes to be implemented for the Refueling 17 outage.

Examinations performed on this typical design of nozzle to pipe weld would be performed and documented in accordance with ASME Appendix VIII, utilizing approved PDI procedures and qualified PDI ultrasonic inspection personnel. In accordance with the collaborative effort between SCE&G and EPRI, it is expected that the minimum coverage achieved would be 79% with the aid of alternative angle beam paths which would require some surface conditioning.

Leakage Integrity

The EPRI MRP (Materials Reliability Program) has developed inspection and evaluation guidelines for Alloy 82/182/600 butt weld configurations in the reactor coolant pressure boundary (RCPB). These guidelines are provided in EPRI document MRP-139, "Materials Reliability Program: Primary System Piping Butt Weld Inspection and Evaluation Guidelines." The VCSNS engineering staff is directly involved with the MRP and is evaluating recommended criteria for inspection, evaluation and possible mitigation of specific designs that have been shown to be susceptible to aggressive failure mechanisms.

The VCSNS pressurizer nozzle welds have been examined during their existence in accordance with the applicable edition ASME Section XI Code by ultrasonic inspection and visual leak assessment with no indication of an initiating failure mechanism or through-wall degradation. In addition to the required scheduled tests and examinations, these welds have been recently examined by direct visual examination (BMV) within the last 18 months. The BMV examinations were repeated during Refuel 16. These examinations verified the leak tight integrity of the RCPB.

Inspection Program Summary

The programs and special inspections outlined above give assurance that SCE&G has verified the integrity of the RCPB, as required, and is maintaining the programs of inspection for continued high level of quality and safety.

- 2. Item 1(c) in Bulletin 2004-01 requests that the licensee provide the basis for concluding that their plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations, and steam space piping connections. The responses for VCSNS to this item do not provide a specific explanation of these items. Please supplement your response to provide this basis. The section titled, "Applicable Regulatory Requirements," starting on page 5 in Bulletin 2004-01 lists some of the regulatory requirements that should be addressed in your response.**

Response 2:

The completion of the ASME Code required examinations, as modified by the RI-ISI Program, of the Alloy 82/182/600 full penetration nozzle to safe-end welds addressed in this Bulletin without any evidence of recordable, relevant indications, through-wall leakage, or any recordable wastage of the low alloy steel surface is assurance of the prior integrity of the Alloy 82/182/600 connections. Ongoing integrity of the VCSNS pressurizer steam space Alloy 82/182/600 connections is assured by performing, at a minimum, 100% bare metal visual (BMV) examinations (which include examining 360° around each Alloy 82/182/600 connection) each refueling outage (approximately every 18 months).

SCE&G plans to follow the guidance of MRP-139 (EPRI Technical Report TR-1010087). In outages when volumetric examinations will not be performed on Category J welds, a visual examination will be performed every refueling outage in accordance with MRP-139 until mitigated or replaced. The specific regulatory requirements are listed below with the associated response addressing how each requirement is met.

Compliance with Design Requirements: 10 CFR 50. Appendix A - General Design Criteria (GDC)

Criterion 14 - Reactor Coolant Pressure Boundary

"The reactor coolant pressure boundary shall be designed, fabricated, erected and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture."

The reactor coolant system pressure boundary at VCSNS is designed to accommodate the system pressures and temperatures attained under all expected modes of plant operation, including all anticipated transients, and to maintain the stresses within applicable stress limits. The system is protected from overpressure by means of pressure-relieving devices as required by applicable codes. Materials of construction are specified to minimize corrosion and erosion and to provide a structural system boundary throughout the life of the plant. Fracture prevention measures are taken to prevent brittle fracture. Inspections in accordance with applicable codes and provisions are made for surveillance of critical areas to enable periodic assessment of the boundary integrity. These controls assure that the reactor coolant pressure boundary maintains an extremely low probability of rapidly propagating failure and gross rupture.

Also, in accordance with Westinghouse Owners Group (WOG) recommendations, the 100% BMV examination technique performed on the pressurizer steam space Alloy 82/182/600 connections at the VCSNS Spring 2005 refueling outage and during the recent Fall 2006 refueling outage is a reliable means for identifying the very low leakage rates potentially associated with Alloy 82/182/600 cracking. The WOG recommended 100% BMV examinations on the pressurizer steam space Alloy 82/182/600 connections at VCSNS are also scheduled for subsequent refueling outages. SCE&G plans to follow the guidance of MRP-139 (EPRI Technical Report TR-1010087). In outages when volumetric examinations will not be performed on Category J welds, a visual examination will be performed every refueling outage in accordance with MRP-139 until mitigated or replaced. Therefore, based on the design, materials, and examination methods, the VCSNS pressurizer continues to comply with the requirements of GDC 14.

Criterion 31- Fracture Prevention of Reactor Coolant Pressure Boundary

"The reactor coolant pressure boundary shall be designed with sufficient margin to assure that when stressed under operating, maintenance, testing, and postulated accident conditions (1) the boundary behaves in a non-brittle manner, and (2) the probability of rapidly propagating fracture is minimized. The design shall reflect consideration of service temperatures and other conditions of the boundary material under operating, maintenance, testing and postulated accident conditions and the uncertainties in determining (1) material properties, (2) the effects of irradiation on material properties, (3) residual, steady state and transient thermal stresses, and (4) size of flaws."

The VCSNS pressurizer steam space connections are designed to conform with the intent of Criterion 31. The reactor coolant pressure boundary, which includes the pressurizer steam space Alloy 82/182/600 connections, is designed so that, for all transients, normal, upset, and faulted, the reactor coolant pressure boundary behaves in a non-brittle manner. Ongoing EPRI MRP recommended 100% BMV examinations of the pressurizer steam space connections at VCSNS will assure sufficient margin from rapidly propagating fracture until specific industry guidance is available.

Criterion 32 - Inspection of Reactor Coolant Pressure Boundary

"Components which are part of the reactor coolant pressure boundary shall be designed to permit (1) periodic inspection and testing of important areas and features, to assess their structural and leak tight integrity, and (2) an appropriate material surveillance program for the reactor pressure vessel."

The VCSNS pressurizer steam space connections were designed to accommodate the visual, surface, and volumetric examinations of the ASME Code, Section XI. Future VCSNS Alloy 82/182/600 to safe-end connections will receive current, fully qualified performance demonstration initiative (PDI) volumetric examinations. In addition, the ongoing EPRI MRP recommended 100% BMV examinations performed on the pressurizer steam space Alloy 82/182/600 connections at VCSNS will assure the structural and leak tight integrity of the pressurizer steam space connections.

Compliance with Operating Requirement: 10 CFR 50.36 - Plant Technical Specifications

VCSNS Technical Specifications include requirements and associated action statements addressing reactor coolant pressure boundary (RCPB) leakage. The VCSNS Technical Specification limits for reactor coolant system operational leakage are one gallon per minute (gpm) for unidentified leakage, 10 gpm for identified leakage, and no pressure boundary leakage (reference VCSNS Technical Specifications Section 3.4.6.2, "Reactor Coolant System Operational Leakage"). Compliance with the zero non-isolable leakage criteria is met by conducting inspections and repairs in accordance with ASME Code, Section XI, and 10 CFR 50.55a, "Codes and Standards," as described below.

The unidentified leakage limit of one gpm is established as a quantity which can be accurately measured while sufficiently low to ensure early detection of leakage.

Leakage of this magnitude can be reasonably detected within a short time, thus providing confidence that cracks associated with such leakage will not develop into a critical size before mitigating actions can be taken. If a through-wall boundary leak is detected by reactor coolant system (RCS) leakage detection instrumentation or mass balance calculations, the plant must be shut down if the leak is determined to be the result of a non-isolable RCS pressure boundary fault.

Compliance with Inspection Requirements: 10 CFR 50.55a and the ASME Code, Section XI

10 CFR 50.55a, "Codes and Standards," requires that inservice inspection and testing be performed in accordance with the requirements of the ASME Code, Section XI, "Inservice Inspection of Nuclear Plant Components." Section XI contains applicable rules for examination, evaluation, and repair of code class components, including the RCPB.

However, it should be noted that implementation of a Risk Informed Inservice Inspection Program at VCSNS has been approved by the NRC (Reference 2). The surface examinations for these butt weld configurations are no longer required. However, the EPRI MRP recommended 100% bare metal visual (BMV) examinations (which include examining 360° around each Alloy 82/182/600 connection) were performed on the pressurizer steam space Alloy 82/182/600 connections at VCSNS during the Spring 2005 and Fall 2006 refueling outages. SCE&G plans to follow the guidance of MRP-139 (EPRI Technical Report TR-1010087). In outages when volumetric examinations will not be performed on Category J welds, a visual examination will be performed every refueling outage in accordance with MRP-139 until mitigated or replaced.

Should BMV of any nozzles reveal potential leaking penetrations, analysis of the residue and surface examinations will be performed for confirmation. If confirmed, volumetric inspections (ultrasonic, if possible) of the nozzles will be performed for flaw characterization. For VCSNS, it is expected that the steam space nozzles and the surge line nozzle configurations will have ultrasonic limitations. Surface conditioning will be performed to the extent practical to maximize ultrasonic coverage. A best effort qualified Appendix VIII examination will be performed. Radiography (RT) may be used to assist in characterization.

Per 10 CFR 50.55a, by reference to the ASME Code, through-wall degradation is not permitted. Scope expansion requirements will be performed to the requirements of ASME Code, Section XI. While not expected in these butt weld configurations, circumferential flaws, if discovered, would represent a more serious safety concern than axial flaws. If circumferential cracking is observed in the pressure boundary portions of any locations covered under the scope of this bulletin, SCE&G will develop plans to perform an adequate extent-of-condition evaluation and SCE&G will discuss those plans with cognizant NRC technical staff prior to restarting the plant.

Compliance with Quality Assurance Requirements: 10 CFR 50. Appendix B

Criterion V of Appendix B to 10 CFR 50

"Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished."

The ASME Code, Section XI required visual examinations are performed using procedures that contain specific acceptance criteria or detailed recording criteria that are subsequently evaluated for acceptability. The visual examinations are performed using detailed instructions with a combination of qualitative and quantitative standards for the essential examination variables. EPRI MRP recommended 100% BMV examinations of the pressurizer steam space Alloy 82/182/600 connections will be performed using standardized VCSNS procedures, which include appropriate acceptance criteria.

Criterion IX of Appendix B to 10 CFR 50

"Measures shall be established to assure that special processes, including welding, heat treating, and nondestructive testing, are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements."

The pressurizer steam space connection EPRI MRP recommended 100% BMV examinations will be performed by certified Level II or Level III examiners using VCSNS approved procedures with additional detailed instructions, as necessary.

Criterion XVI of Appendix B to 10 CFR 50

"Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the

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cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management."

The identification of an unacceptable visual indication requires repair, replacement, or acceptance by analytical evaluation. In all cases, these indications would be tracked by the VCSNS Corrective Action Program (CAP). In the case of a significant adverse condition, the CAP requires determination of the cause of the failure, evaluation of the extent of condition, and assignment of appropriate corrective actions to preclude recurrence. The VCSNS CAP meets the requirements of 10 CFR 50, Appendix B, Criterion XVI.