



November 16, 2004  
RC-04-0185

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 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

Reference: 1. Stephen A. Byrne letter to document Control Desk, RC-04-0100, June  
11, 2004  
2. Stephen A. Byrne letter to document Control Desk, RC-04-0113, July  
26, 2004

On May 28, 2004, the U.S. Nuclear Regulatory Commission (NRC) issued NRC Bulletin 2004-01 to request that utilities provide information regarding Alloy 82/182/600 materials used in the fabrication of pressurizer penetrations and steam space piping connections at their plants. Information was requested related to the materials, the methods of inspection and repair, and individual inspection schedules.

Licensees were requested to provide a response within 60 days of issuance of the bulletin. If a licensee could not provide the information or could not meet the requested completion date, they were required to submit a written response indicating this within 15 days of the date of the bulletin.

South Carolina Electric & Gas Company (SCE&G) determined that all necessary actions to provide the requested information for VCSNS could not be achieved within 60 days; therefore, a letter was submitted on June 11, 2004 (Reference 1) to address the 15-day response action required by the bulletin.

Subsequent to the referenced submittal during a telephone discussion between the VCSNS NRC Project Manager, NRC reviewer, and SCE&G, the NRC directed that SCE&G submit an interim response providing available-VCSNS information in regards to the Bulletin items. This interim response (Reference 2) provided the available inspection information. As noted by the referenced response, SCE&G identified the intent to provide a full response to the bulletin by November 17, 2004.

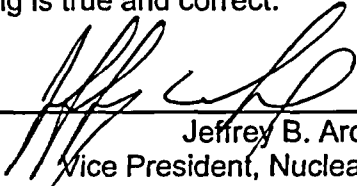
The attached provides the complete response to the bulletin.

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Should you have questions, please call Mr. Ron Clary at (803) 345-4757.

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

November 16, 2004  
Executed on

  
Jeffrey B. Archie  
Vice President, Nuclear Operations

JT/JBA/mb

c: N. O. Lorick  
S. A. Byrne  
N. S. Carns  
T. G. Eppink  
R. J. White  
W. D. Travers  
K. R. Cotton  
NRC Resident Inspector  
K. M. Sutton  
NSRC  
RTS (0-C-04-1719)  
File (815.02)  
DMS (RC-04-0185)

**SCE&G  
RESPONSE TO USNRC BULLETIN 2004-001  
FOR  
V.C. SUMMER NUCLEAR STATION (VCSNS)**

Requested Information from Bulletin 2004-001 issued May 28, 2004:

- (1) All subject PWR licensees are requested to provide the following information within 60 days of the date of this bulletin.
  - (a) A description of the pressurizer penetrations and steam space piping connections at your plant. At a minimum, this description should include materials of construction (e.g., stainless steel piping and/or weld metal, Alloy 600 piping/sleeves, Alloy 82/182 weld metal or buttering, etc.), joint design (e.g., partial penetration welds, full penetration welds, bolted connections, etc.), and, in the case of welded joints, whether or not the weld was stress-relieved prior to being put into service. Additional information relevant with respect to determining the susceptibility of your plant's pressurizer penetrations and steam space piping connections to PWSCC should also be included.

**RESPONSE (1)(a):**

The requested information is provided below. The components and relevant information are provided as requested.

The following notes apply:

- N/A designates "not applicable."
- All units given in table are in inches unless specified otherwise.
- All notations of Inconel "x/y" indicate that the connection was first tack welded with Inconel "x" and then welded with Inconel "y."
- All notations of SS 309/308 indicate that the connection was welded with stainless steel 308, 308L, 309, or 309L or some combination

V. C. Summer Unit 1 Pressurizer Penetrations				
Penetration	Materials	Joint Design	Stress Relieved?	Susceptible to PWSCC?
4" Spray Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, Inconel 182 buttering, SS 309/308 cladding	N/A	Yes (cladding and buttering)	No Inconel Not wetted
	Weld Nozzle to Safe-end: Inconel 82/ 182	Full penetration butt weld	No	No Inconel Not wetted
	Safe-end: SS ASME SA-182, Grade 316L Forging	N/A	N/A	No Stainless Steel
	Thermal Sleeve: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A	No Stainless Steel
	Thermal Sleeve to Safe-End Weld: Inconel 82	45°, 0.12 bevel groove partial penetration butt weld 45° around	No	Yes
	Liner: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A	No Stainless Steel
	Liner to safe end Weld: Inconel 82	30°, 0.12 fillet weld all around	No	Yes
	Liner to cladding Weld: SS 309/308	0.12 x 0.31 fillet weld all around	No	No Stainless Steel filler
6" Safety Nozzle (qty. 3)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, SS 309/308 cladding, Inconel 182 buttering	N/A	Yes (cladding and buttering)	No Inconel Not wetted
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld	No	No Inconel Not wetted
	Safe-end: SS ASME SA-182, Grade 316L Forging	N/A	N/A	No Stainless Steel
	Liner: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A	No Stainless Steel

<b>V. C. Summer Unit 1 Pressurizer Penetrations</b>				
<b>Penetration</b>	<b>Materials</b>	<b>Joint Design</b>	<b>Stress Relieved?</b>	<b>Susceptible to PWSCC?</b>
	Liner to safe end Weld: Inconel 82	30°, 0.12 fillet weld all around	No	Yes
	Liner to cladding Weld: SS 309/308	0.12 x 0.31 fillet weld all around	No	No Stainless Steel filler
6" Relief Nozzle (qty. 1)	Nozzle: Low Alloy Steel Forging SA-508 Class 2a, SS 309/308 cladding, Inconel 182 buttering	N/A	Yes (cladding and buttering)	No Inconel Not wetted
	Weld Nozzle to Safe-end: Inconel 82/182	Full penetration butt weld	No	No Inconel Not wetted
	Safe-end: SS ASME SA-182, Grade 316L Forging	N/A	N/A	No Stainless Steel
	Liner: ASME SA-213 Grade TP-304 SS Seamless Tubing	N/A	N/A	No Stainless Steel
	Liner to safe end Weld: Inconel 82	30°, 0.12 fillet weld all around	No	Yes
	Liner to cladding Weld: SFA SS 309/308	0.12 x 0.31 fillet weld all around	No	No Stainless Steel filler
Heater Penetrations (qty. 78)	Heater: SS: SA-213, Grade TP 316 tubing	N/A	N/A	No Stainless Steel
	Heater Adaptor: SS SA-182, Grade F316 Forging	N/A	N/A	No Stainless Steel
	Adapter to Heater Element Weld: SS 309/308	0.19 fillet weld all around	No	No Stainless Steel filler
	Heater Well to Adapter Weld: SS 309/308	0.19 fillet weld all around	No	No Stainless Steel filler
	Heater Well to Lower Head Cladding Weld: SS 309/308	0.19 radius partial penetration J-groove butt weld and 0.19 fillet weld all around	No	No Stainless Steel filler

<b>V. C. Summer Unit 1 Pressurizer Penetrations</b>				
<b>Penetration</b>	<b>Materials</b>	<b>Joint Design</b>	<b>Stress Relieved?</b>	<b>Susceptible to PWSCC?</b>
<b>Level &amp; Temperature Instrumentation Taps (qty. 9)</b>	Tubing: SS ASME SA-213, Grade TP 316 Tubing	N/A	N/A	No Stainless Steel
	Coupling: SS ASME SA-182, Grade F316 Forging	N/A	N/A	No Stainless Steel
	Pipe to Lower Head Assy. Cladding Weld: SS 309/308	0.19 radius partial penetration J-groove butt weld and 0.12 fillet weld all around	No	No Stainless Steel filler
	Pipe to Coupling Weld: SS 309/308	Partial penetration J-groove butt weld and fillet weld all around	No	No Stainless Steel filler
<b>Manway (qty. 1)</b>	Forging: Low Alloy Steel Forging SA-508 Class 2a	N/A	N/A	No Carbon Steel w/ Stainless Steel Clad
	Insert: SS, ASME 21-240, Type 304, Plate	N/A	N/A	No Stainless Steel
	Cover: MN-MO St. Plate – SA-533 Gr. A Cl. 1	N/A	N/A	No Carbon Steel, not wetted

- (b) A description of the inspection program for Alloy 82/182/600 pressurizer penetrations and steam space piping connections that has been implemented at your plant. The description should include when the inspections were performed; the areas, penetrations and steam space piping connections inspected; the extent (percentage) of coverage achieved for each location which was inspected; the inspection methods used; the process used to resolve any inspection findings; the quality of the documentation of the inspections (e.g., written report, video record, photographs); and, the basis for concluding that your plant satisfies applicable regulatory requirements related to the integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections were found, indicate what followup NDE was performed to characterize flaws in the leaking penetrations.

**RESPONSE (1)(b):**

The inspection program implemented at VCSNS consists of the following entities:

1. ASME Section XI ISI examinations have been conducted, including those volumetric, surface, and visual examinations addressed via the ASME Code. The ASME Code ISI volumetric and surface examinations conducted, for the components addressed in the referenced bulletin, are as follows with exceptions or limitations to coverage noted:

COMPONENT	WELD ID	RFO	METHOD	RESULTS	EXAM. COVERAGE
A' PRESS. SAFETY	4501- 1DM	RF 6	PT	NRI	
A' PRESS. SAFETY	4501- 1DM	RF 6	UT	NRI	100% one sided exam
A' PRESS. SAFETY	4501- 1DM	RF 8	PT	NRI	
A' PRESS. SAFETY	4501- 1DM	RF 8	UT	NRI	100% one sided exam
B' PRESS. SAFETY	4501-12DM	RF 6	PT	NRI	
B' PRESS. SAFETY	4501-12DM	RF 6	UT	NRI	100% one sided exam
B' PRESS. SAFETY	4501-12DM	RF 8	PT	NRI	
B' PRESS. SAFETY	4501-12DM	RF 8	UT	NRI	100% one sided exam
C' PRESS. SAFETY	4501-23DM	RF 6	PT	NRI	
C' PRESS. SAFETY	4501-23DM	RF 6	UT	NRI	100% one sided exam
C' PRESS. SAFETY	4501-23DM	RF 8	PT	NRI	
C' PRESS. SAFETY	4501-23DM	RF 8	UT	NRI	100% one sided exam
PRESS. RELIEF	4502- 1DM	RF 2	PT	NRI	
PRESS. RELIEF	4502- 1DM	RF 2	UT	NRI	100% one sided exam
PRESS. RELIEF	4502- 1DM	RF 8	PT	NRI	
PRESS. RELIEF	4502- 1DM	RF 8	UT	NRI	100% one sided exam
PRESS. SPRAY	4503-46DM	RF 2	PT	NRI	
PRESS. SPRAY	4503-46DM	RF 2	UT	NRI	100% one sided exam
PRESS. SPRAY	4503-46DM	RF 5	PT	NRI	
PRESS. SPRAY	4503-46DM	RF 5	UT	NRI	100% one sided exam
PRESS. SPRAY	4503-46DM	RF 8	PT	NRI	
PRESS. SPRAY	4503-46DM	RF11	PT	NRI	
PRESS. SPRAY	4503-46DM	RF11	UT	NRI	90.38% one sided exam

RF-2-Spring 1984, RF-5-Spring 1990, RF-6-Fall 1991, RF-8-Fall 1994,  
RF-11-Spring 1999  
NRI-No Recordable Indications

In addition to the volumetric and surface examinations addressed above, the VCSNS conducts the VT-2 examinations addressed by ASME Section XI each outage.

2. Bare Metal Visual (BMV) Examinations, as addressed in MRP Letter 2003-039 and as directed by MRP Letter 2004-05, were performed on the Pressurizer Safety, Pressurizer Relief, and Pressurizer Spray lines during our Fall 2003 refueling outage. These visual inspections encompassed 100% of the weld and surrounding areas.

The above listed examinations are documented in appropriate written reports, which are archived as station records. The examinations have not revealed any discontinuities or flaws that have required evaluation, analysis, repair or replacement. There have been no leaks detected via the above examinations therefore there has been no basis to perform follow-up examinations. SCE&G has completed the required Code examinations as well as BMV's of the dissimilar metal butt welds, addressed by this bulletin, that we are currently knowledgeable of and have not identified any pressure boundary leakage.

- (c) **A description of the Alloy 82/182/600 pressurizer penetration and steam space piping connection inspection program that will be implemented at your plant during the next and subsequent refueling outages. The description should include the areas, penetrations and steam space piping connections to be inspected; the extent (percentage) of coverage to be achieved for each location; inspection methods to be used; qualification standards for the inspection methods and personnel; the process used to resolve any inspection indications; the inspection documentation to be generated; and the basis for concluding that your plant will satisfy applicable regulatory requirements related to the structural and leakage integrity of pressurizer penetrations and steam space piping connections. If leaking pressurizer penetrations or steam space piping connections are found, indicate what follow-up NDE will be performed to characterize flaws in the leaking penetrations. Provide your plans for expansion of the scope of NDE to be performed if circumferential flaws are found in any portion of the leaking pressurizer penetrations or steam space piping connections.**

**RESPONSE (1)(c):**

Bare Metal Visual (BMV) Examinations, as addressed in MRP Letter 2003-039 and as directed by MRP Letter 2004-05, will be performed on the Pressurizer Safety, Pressurizer Relief, and Pressurizer Spray lines during our Spring 2005 refueling outage (RF-15). These visual inspections will encompass 100% of the weld and surrounding areas. VCSNS intends to profile these locations in RF-15. Any indications identified via these BMV inspections will be addressed through the VCSNS corrective action program. Should these BMV inspections reveal the potential for leakage at a penetration, VCSNS will conduct surface examinations as well as analysis of the residue to confirm the source of the leakage.

It is expected that the nozzle configurations for these weldments will not lend themselves to the performance of a fully qualified Appendix VIII volumetric examination. However, If leakage is confirmed VCSNS will conduct volumetric examination using a qualified Appendix VIII process to the extent possible and/or a best effort volumetric using ultrasonic in combination with



radiography to characterize the indication. Scope expansion will be performed to the requirements of the ASME Code.

Although it is highly unlikely, based on the current knowledge of PWSCC cracking in this type weldment, that a circumferential flaw would be identified, VCSNS would expand the examination scope to all Alloy 600/82/182 butt welds having like design and operating parameters. As a minimum the future inspections and all associated activities will meet or exceed those required by the ASME Code or other regulation in effect at the time, to the extent possible using the technology available at the time.

- (d) In light of the information discussed in this bulletin and your understanding of the relevance of recent industry operating experience to your facility, explain why the inspection program identified in your response to item (1)(c) above is adequate for the purpose of maintaining the integrity of your facility's RCPB and for meeting all applicable regulatory requirements which pertain to your facility.**

**RESPONSE (1)(d):**

The inspection results provided in the response to item (1)(b) gives assurance that the welds in question are currently structurally sound. Additionally, the pressurizer heater sleeves at VCSNS are stainless steel and are not susceptible the type of corrosion mechanism discussed in the bulletin.

The EPRI MRP is currently developing inspection and evaluation guidance for all Alloy 600 butt weld locations in the primary system. VCSNS will evaluate recommendations and guidance from EPRI and various other industry groups for applicability to our welds. We will determine the extent of and optimum examination methodologies from this information and employ it as appropriate to assure continued integrity of these primary system butt welds. In the interim VCSNS will continue to perform BMV inspection, of the weldments addressed via this bulletin, each outage.

Performance of these BMV inspections as well as future compliance with industry initiatives and all codes and regulations will provide continued confidence that the integrity of the reactor coolant pressure boundary at VCSNS is preserved.