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SCE&G®
A SCANA COMPANY

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Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Attention: Ms. K. R. Cotton

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
60 DAY FOLLOW-UP LETTER TO NRC BULLETIN 2003-02, LEAKAGE FROM REACTOR PRESSURE VESSEL LOWER HEAD PENETRATIONS AND REACTOR COOLANT PRESSURE BOUNDARY INTEGRITY

Reference: S. A. Byrne (SCE&G) letter to Document Control Desk (NRC), RC-03-0200, Response to NRC Bulletin 2003-02, September 19, 2003

NRC Bulletin 2003-02 required all licensees that entered refueling outages before December 31, 2003; provide a follow-up letter to the NRC within 60 days of the completion date of the refueling outage. South Carolina Electric & Gas Company (SCE&G) completed its Fall 2003 refueling outage (RF-14) on November 26, 2003.

SCE&G acting for itself and as agent for South Carolina Public Service Authority, hereby submits the attached in response to NRC Bulletin 2003-02.

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

I certify under penalty of perjury that the information contained herein is true and correct.

1/23/04
Executed on

Stephen A. Byrne
Senior Vice President, Nuclear Operations

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PAR/SAB/dr
Attachments

c: N. O. Lorick
N. S. Carns
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NRC Resident Inspector
NSRC
RTS (C-03-2647)
File (815.02)
DMS (RC-04-0022)

NRC Bulletin 2003-02 Follow-up Letter

This response addresses the requested post outage information in NRC Bulletin 2003-02 and discusses: 1) a summary of the inspections performed, 2) the extent of the inspections, 3) the methods used, 4) a description of the as-found condition of the lower head, 5) any findings of relevant indications of through-wall leakage, 6) and a summary of the disposition of any findings of boric acid deposits and any corrective actions taken as a result of indications found.

1) SUMMARY OF INSPECTIONS PERFORMED

South Carolina Electric & Gas (SCE&G), with the assistance of a vendor, has performed a bare metal remote visual inspection of the lower reactor pressure vessel (RPV) head to determine if boric acid has accumulated on the lower RPV head and if indications of lower RPV head instrumentation penetration through-wall leakage exists. In addition, a visual inspection of the region below the RPV and the walls surrounding the RPV was conducted for boric acid deposits. Part of this inspection was performed with a camera (between the RPV and the inside of the reflective metal insulation), while the more accessible areas were inspected visually. A video recording was made of the bottom of the reactor vessel. Swipes were taken at multiple locations on the lower RPV head where some dried boric acid was detected and areas around the in-core pit. Several "rocks" of dried boric acid were removed from the in-core area in order to establish the age of the dried boric acid.

The inspection results demonstrate that there are no active leaks in the RPV pressure boundary, there is no indication of RPV pressure boundary degradation, and the as-found boric acid residue is from refueling cavity leakage during refueling or wash down of the boric acid accumulations associated with the "A" hot leg throughwall indication, discovered and cleaned up during the winter of 2001.

2) THE EXTENT OF THE INSPECTIONS

The direct and remote visual inspections were performed on the lower RPV head and the annulus between the vessel and insulation to the extent possible. The coverage of the remote visual inspection of the lower RPV head was 100 percent (including 360 degrees around every penetration). While obstructions in the annulus between the vessel wall and the insulation prevented a complete inspection up the side of the vessel, an attempt to determine the source of the dried boric acid residue was made using remote visual aids.

3) THE METHODS USED

The remote visual inspection of the lower RPV head was performed using a robotic camera with a minimum resolution of 380,000 pixels. The record produced from this method was reviewed and evaluated by SCE&G personnel qualified to at least VT-2, level II.

Both qualified Quality Control inspectors and Engineering personnel, who were trained in inspection and evaluation of boric acid leakage, performed the direct visual examination.

A failure modes analysis was performed to determine the source of the boron on the vessel and in the vicinity of the vessel.

Plant chemistry personnel performed the determination of age of the deposits. Boric acid deposits collected from the Reactor Vessel and In-Core Pit area were analyzed to determine the age of the deposits using an in-house protocol modeled after the EPRI methodology developed for aging deposits found on the bottom mounted instrument nozzles at the South Texas Project.

From these samples, it was determined that the average age of the residue found in the in-core pit area is 1.80-1.98 years, based on RCS data. No Co-58 was identified on samples from the sides and bottom of the reactor vessel. The lack of Co-58 on the sides and bottom of the Reactor Vessel indicates that the boric acid residue on the Reactor Vessel is older than the samples found in the in-core pit area.

4) THE AS-FOUND CONDITION OF THE LOWER HEAD

Some dried boric acid residue was noted on the bottom and sides of the Reactor Vessel. The boric acid originated from above and has run down the sides of the vessel onto the bottom. Several bottom mounted instrumentation nozzles were identified as having dried boric acid accumulation around the penetration into the Reactor Vessel. No active leaks were detected.

Additionally, residue was found on the Reactor Vessel insulation (on both sides of the mirror insulation), the in-core pit walls, and on the floor below the RPV.

5) FINDINGS OF RELEVANT INDICATIONS OF THROUGH-WALL LEAKAGE

No relevant indications of through-wall leakage were detected.

6) SUMMARY OF THE DISPOSITION OF ANY FINDINGS OF BORIC ACID DEPOSITS

Samples of dried boric acid were obtained from the Reactor Vessel and from the floor below as well as from the walls around the bottom of the Reactor Vessel. Chemical analysis of the samples was performed to determine the age of the boric acid residue. Samples from the reactor vessel had no Cobalt-58 (Co-58) present, which indicated the boric acid on the vessel was present for greater than 1.9 years. Some of the boric acid residue on the floor did contain some Co-58, which indicates that there was a different source for those deposits. The most likely source for the deposits on the floor was the refueling cavity, filled with primary water, during RF-13. The most likely source for the residue on the Reactor Vessel is water used to wash down the boric acid accumulations associated with the "A" hot leg throughwall indication, discovered and cleaned up during the winter of 2001.

Approximately 20 instrument nozzles had white residue bridging the gap between the nozzle and its associated socket. Additional inspection determined that none of the "socket gaps" were filled with boric acid residue. It was concluded that there were no nozzle socket weld leaks present. Samples of the boric acid on these "socket gaps" were analyzed for Cobalt-58. No Co-58 was detected, which indicates the dried boric acid at these locations has been present for greater than 1.9 years. It should be noted that these welds are j-groove welds, not socket welds.

The lack of Co-58 activity in the samples taken from the Reactor Vessel sides and Bottom Mounted Instrumentation nozzles indicates there is no active through-wall RPV pressure boundary leak at this time. Additionally, it was clearly demonstrated via direct visual examination that the accumulations of dried boric acid at the penetration annulus were bridged over the annulus and did not originate from the annulus.

No evidence of degradation was detected on either the bottom of the Reactor Vessel or any of the components in the vicinity.

7) CORRECTIVE ACTIONS TAKEN

A plan was generated to direct the involved groups in cleaning and inspection activities. The goal of the cleaning effort was to remove 100 percent of the boric acid residue. Engineering evaluated the results and determined whether additional effort was necessary to obtain 100 percent removal of the boric acid residue. A specific sequence of cleaning activities and inspections was developed that would allow for optimum removal of the dried boric acid, while minimizing the residue left on the RPV. Any fluid that remained on the RPV after cleaning was allowed to dry prior to final acceptance of the cleaning effort. The final cleaning was determined to be acceptable by engineering. The as-found and as-left conditions are summarized in Attachment 2.

Quality Control performed the required inspections for boric acid corrosion to assure any degradation was identified, evaluated, and resolved. An as-left video was made with the same detail as the initial as-found inspection. This allowed for a detailed record of conditions before start-up and provided the necessary labels of the penetrations, both of which are necessary for future evaluations.

The inspection, cleaning, and analysis performed has demonstrated that there is no RPV pressure boundary leakage and the structural integrity of the RPV lower head penetrations is unaffected by the boric acid deposits that came from leakage in the cavity seal during refueling outages or wash down activities related to the "A" loop hot leg throughwall indication.

REF: Drawing 1MS-07-148-2 for the penetration locations

Pen #	"As-found" condition (10/12/03)	"As-left" condition (11/13/03) See note below
1	Significant wash across, brown and white deposits on pad and in the gap	White stain on the tubing and near the pad - Evidence the penetration was in the wash flowpath
2	Brown & white stain on tube and on the pad	White stain on the tube – Evidence the penetration is near a wash flowpath
3	No deposits noted	Clean - Evidence penetration is near a wash down flowpath
4	Slight brown stain on the pad	Clean (white spot in video is due to the lighting effect on a burr)
5	Deposits on the tube and on the pad	Clean
6	Slight brown stain on the pad	Minor white stain on the tube
7	Brown stain on the pad	Minor white stain on the tube
8	Brown and white staining on the tube and the pad	Clean - Evidence the penetration is near a wash down flowpath
9	Brown stain on the pad	Minor white stain on the tube
10	Slight brown stain on the pad	Clean - Brown spots (minor surface corrosion) near the penetration
11	Slight brown stain on the pad, evidence of wash across the pad and in the gap	White stain on the tube – Evidence the penetration is near a wash flowpath
12	Slight brown stain on the pad, white particles in the gap, white stain on the tube	Light brown streak on the pad, white stain on the tube
13	Slight brown stain on the pad	Clean - Evidence the penetration is near a wash flowpath
14	White and brown stain on the pad and white particles in the gap	Clean - White stain by the pad
15	White and brown stain on the pad and tubing, white particles in the gap	Clean
16	White stain around the pad and white particles in the gap	Clean - Brown spots (minor surface corrosion) near the penetration
17	Slight brown stain on the pad	Clean
18	Slight brown stain on the pad, slight boron deposits on the outer edge of pad (minor surface corrosion)	White residue on the tube - Brown spots (minor surface corrosion) near the penetration
19	Moderate amount of white and brown deposits on the pad, white particles in the gap, evidence of wash across the pad and in the gap	Small brown streak on the pad – Evidence the penetration was in the wash flowpath
20	Slight brown stain on the pad	Small brown streak on the pad
21	Slight white and brown stain on the pad	Clean
22	White deposits around the pad, on the pad, on the tube, and in the gap	Clean - Evidence the penetration was in the wash flowpath
23	Slight white and brown stain on the pad	White stain on the tube
24	No deposits noted	Clean - White stain near the penetration - also a small burr on the pad
25	Brown stain on the pad, brown and white stain on the tube, brown deposits near pad (minor surface corrosion)	Clean - Brown spots (minor surface corrosion) near the penetration

Pen #	"As-found" condition (10/12/03)	"As-left" condition (11/13/03) See note below
26	Evidence of wash across, white and brown deposits in the gap	Clean - Evidence the penetration was in the wash flowpath
27	Slight white and brown stain on the pad and on the tube, white particles in the gap.	Clean
28	Brown stain on the pad	Clean - Evidence the penetration was near a wash flowpath
29	Slight brown stain on the pad and on the tube, white particles in the gap	Small white particle in the gap
30	White film on the tube and on the pad	Clean
31	Slight brown stain on the pad and on the tube	Clean
32	Slight brown and white stain on the pad and on the tube, brown deposits near pad (minor surface corrosion)	Clean - Brown spots (minor surface corrosion) near the penetration
33	Slight brown and white stain on the pad	Clean
34	Slight brown and white stain on and brown deposits near around the pad (minor surface corrosion)	Clean - Brown spots (minor surface corrosion) the penetration
35	Slight brown stain on the pad, brown deposits near the edge of the pad (minor surface corrosion)	Clean - Brown spots (minor surface corrosion) near the penetration
36	No deposits or stains noted	Clean
37	Brown stain on the pad and white residue on the tube and white particles in the gap	Clean
38	No deposits noted	White residue on the pad (near the base) and on the tube
39	Brown and white stain on the pad and on the tube, brown deposits near the pad and white particles the gap	Clean - Evidence the penetration was in the wash in flowpath
40	Slight brown and white stain on the pad and on the tube	Clean
41	Brown stain on the pad and tube, evidence of washdown at the penetration, brown deposits near the pad (minor surface corrosion)	Clean - Brown spots (minor surface corrosion) near the penetration
42	Brown and white deposits on the pad and on the tube, white particles in the gap, evidence of washdown at the penetration	Minor white stain on the pad and the tube - Evidence the penetration was in the wash flowpath
43	Brown and white deposits on the pad, on the tube, and in the gap	Minor white residue on the tube - Evidence the penetration was in the wash flowpath
44	Brown and white deposits on the pad - brown deposits near the pad (minor surface corrosion)	Clean - Brown spots (minor surface corrosion) near the penetration
45	Brown and white deposits on the pad, on the tube, and in the gap	White particles in the gap, white residue on the tube, - Evidence the penetration was in the wash flowpath
46	Brown and white residue on the pad. white particles in the gap	White residue on the tube
47	White deposits on the pad and white particles in the gap	White stain on the tube
48	Brown and white stain on the pad and on the tube, white particles in the gap	Brown stain at the base of the tube

Pen #	"As-found" condition (10/12/03)	"As-left" condition (11/13/03) See note below
49	Brown and white residue on the pad and on the tube	White stain on the tube - Evidence the penetration was in the wash flowpath
50	Thin white film on the tube and a brown stain on the pad	Clean - Small steel wool particle on the tube near the base (shows up as a small white particle on the video)

NOTE: There are some small white spots on the majority of the tubes as a result of the cleaning activities. There is also some boron residue remaining on the stainless steel insulation after the cleaning activity. None of these discrepancies represents a concern. The final cleaning activity was performed on 11/13/03.