

January 31, 2007
RC-07-0021



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
INSPECTION AND MITIGATION OF ALLOY 82/182 PRESSURIZER
BUTT WELDS (C-04-1719)

Reference: Marvin S. Fertel (NEI) Letter to Luis A. Reyes (NRC), Industry Actions
Associated with Potential Generic Implications of Wolf Creek Inspection
Findings, January 26, 2007

In October of 2006, while performing inspections of its pressurizer Alloy 82/182 butt welds in accordance with MRP-139, a PWR licensee discovered several circumferential indications in its pressurizer surge, safety and relief nozzles. Because of the potential importance of this issue, SCE&G is submitting this letter as notification of VCSNS actions taken or planned for inspecting or mitigating Alloy 82/182 butt welds on pressurizer spray, surge and relief lines.

Inspection of pressurizer Alloy 82/182 butt welds at VCSNS has not yet been completed, but SCE&G will complete the inspection and mitigation activities on these locations during the next refueling outage (RF17) currently scheduled for April 2008. Justification for delaying these activities beyond December 31, 2007 is provided in Attachment I. Details concerning the VCSNS inspection and mitigation activities are provided by Attachment II. Future inspections of pressurizer dissimilar metal (DM) butt welds at VCSNS will be performed in accordance with industry guidance (MRP-139).

In addition to the inspection and mitigation activities described above, low threshold procedures for monitoring primary system leakage are in place for VCSNS. If VCSNS should shut down due to excessive primary system unidentified leakage and, if the leakage can not be confirmed to originate from a source other than the pressurizer, a bare metal visual (BMV) examination of Alloy 82/182 butt weld locations on the pressurizer will be performed to determine whether the leakage originated at those locations.

Consistent with the actions discussed in the referenced letter, SCE&G is evaluating enhancements to leakage monitoring procedures for VCSNS and will provide the details of these actions to the NRC by March 31, 2007.

In addition, SCE&G is assessing the feasibility of on-line monitoring equipment for the VCSNS pressurizer to provide diverse leakage detection capabilities. The details of these actions will be provided to the NRC by May 31, 2007.

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SCE&G is also participating in, and sharing the cost of, a newly developed EPRI project to perform additional refined crack growth calculations of the limiting pressurizer nozzle Alloy 82/182 weld configuration using 3-dimensional finite element analysis.

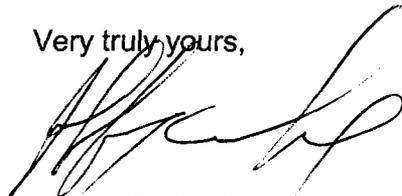
Commitments made through this letter are identified in Attachment IV.

The NRC will be informed if SCE&G deviates from any of the actions described in this letter.

SCE&G staff is available to meet with the NRC to discuss any of the information contained in this letter.

Should you have questions, please call Mr. Bruce Thompson at (803) 931-5042.

Very truly yours,



Jeffrey B. Archie

JWT/JBA/dr

- Attachment I Inspection and Mitigation Plan/Schedule for Alloy 82/182 Pressurizer Butt Welds at V.C. Summer Nuclear Station (VCSNS)
- Attachment II Inspection and Mitigation Summary for Alloy 82/182 Pressurizer Butt Welds
- Attachment III Previous ISI Program Examinations for Alloy 82/182 Pressurizer Butt Welds
- Attachment IV List of Commitments

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INSPECTION AND MITIGATION PLAN / SCHEDULE OF ALLOY 82/182 PRESSURIZER BUTT WELDS AT V. C. SUMMER NUCLEAR STATION (VCSNS)

Inspection and mitigation activities at VCSNS will be completed during the next refueling outage (RF17) currently scheduled for April 2008. The activities necessary to effectively address this issue warrant additional time beyond the MRP-139 prescribed end date of December 31, 2007. VCSNS utilized the last scheduled outage (RF-16 in October 2006) after MRP-139 was issued (September 2005) to plan the mitigation weld overlays. It was determined that the pressurizer welds could not be inspected in accordance with MRP-139 inspection requirements at all six pressurizer locations. In order to adequately plan implementation, address interference with the "as built" configuration, and minimize radiation dose during implementation, a pre-implementation walk-down was necessary. VCSNS has completed the necessary walk-downs, performed laser profiling to support design and implementation activities, and awarded a contract to perform full structural weld overlay application. The application of the structural weld overlay will allow the welds to be inspected in accordance with MRP-139. The weld overlay design process requires approximately seven months of engineering evaluation and design analysis to develop the appropriate weld overlay configuration. Upon issuance of the design package, three months is required for tooling design, welder qualification and the weld and NDE process mock-up and demonstration. Pre-outage planning and preparations require approximately three months following the completion of the mock-up demonstration. This allows for an appropriate amount of time to ensure ALARA planning as well as any specific plant support such as shielding, scaffolding and other logistical needs. Finally, a one month period is expected for contractor mobilization. The schedule outlined above provides assurance that the activity can be effectively completed, while assuring the radiological and industrial safety of the plant staff and our contractors.

This schedule is acceptable based on the following:

PREVIOUS INSPECTION RESULTS

Bare Metal Visual (BMV) inspections of the dissimilar metal (DM) Pressurizer welds were made in the Spring 2005 outage (RF-15) and also in the Fall of 2006 outage (RF16) as required by 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. Neither of these inspections identified any leakage. Volumetric and surface inspections (ultrasonic and dye penetrant) were performed on the subject welds in the period from September 1994 through April 1999 using non-PDI (Performance Demonstration Initiative) techniques with coverage and results shown in Attachment III. There were no recordable or reportable flaws from these pressurizer weld examinations.

WELD FABRICATION REVIEWS

An assessment of original fabrication weld documentation to identify welds that may have been reworked is currently in process. VCSNS has contracted with Westinghouse to perform a comprehensive review of the factory fabrication DM weld history.

The assessment is scheduled to be completed in mid-February 2007. SCE&G will make every effort to provide the NRC an update on the assessment results by February 28, 2007 but accounting for possible delays due to vendor delivery and/or SCE&G review and acceptance, no later than March 31, 2007.

ENHANCED LEAKAGE MONITORING FOR UNIDENTIFIED PRIMARY SYSTEM LEAKAGE

The VCS Reactor Coolant System (RCS) Leakage Management Program monitors RCS leakage at a very low threshold. While the VCSNS Technical Specifications 3.4.6.2 specifies that NO pressure boundary leakage is acceptable and that up to 1 gpm is allowed as unidentified leakage, the VCSNS monitoring thresholds are established to ensure that the Technical Specification requirements are not challenged. VCSNS monitors more frequently than required by Technical Specifications.

The current program identifies action levels which begin with a validated change in leakage rate of 0.05 gpm above the existing normal leak rate for a period of 3 days. Additional action levels have been established at a total unidentified leakage rate of 0.2 gpm and 0.6 gpm with prescribed actions to determine the source, evaluate and eliminate the source of the leakage. Various other procedures are utilized to perform measurements and determine the source of leakage.

RCS leakage is given a high priority by management which is reflected by taking actions above and beyond the procedure requirements on a routine basis:

- RCS unidentified leakage trend is part of the daily Plant Information Meetings and included in the Management Duty Supervisors daily report.
- The RCS Leakage Program Manager provides weekly updates to Operations.
- RCS leakage is a point of discussion at senior plant management meetings.

If VCSNS should shut down due to excessive primary system unidentified leakage and if the leakage cannot be confirmed to originate from a source other than the pressurizer, a bare metal visual examination of the DM butt weld locations on the pressurizer will be performed to determine whether the leakage originated from those locations.

PWR OWNERS GROUP ENHANCED LEAK DETECTION

In addition to the current RCS leakage monitoring program, VCSNS is currently evaluating the documents issued by the PWR Owners Group with respect to enhanced processes and methods of calculating RCS leakage.

SCE&G will update our response concerning this subject by March 31, 2007 in a follow-up letter.

INDUSTRY SAFETY ASSESSMENT

The conclusions from the butt weld safety assessment, MRP-109, indicate that there is no immediate safety concern associated with PWSCC of Alloy 82/182 butt welds based on the following:

- The case of the longitudinal flaw is a safe situation, because the length of the flaw is limited to the width of the weld material (~2.5"), which is less than the critical flaw size for burst. (MRP-109, Sect. 7)
- The circumferential crack growth analysis results for the Westinghouse designed spray nozzle showed it would take at least 2.5 years to propagate a flaw to a critical crack length from a 1 GPM leak. (MRP-109, Table 5-3 and Section 7)
- A very small number of leaks/cracks have been identified given the large number of locations worldwide. (MRP-139, Sect. 4.3)

- Axial cracking is much more likely than circumferential. (MRP-109 and MRP-139, Sect.1)
- Probabilistic analysis shows the impact of butt weld PWSCC on CDF is insignificant, but probability of leaks is not. (MRP-139, Sect. 1.3)
- The potential for boric acid corrosion (BAC) is considered low for all Alloy 82/182 pressurizer joint upper head locations since any leak at operating conditions would be essentially pure water/steam with little boric acid carryover to cause corrosion.
- The potential for BAC of the surge line as well as the top head pressurizer joint locations is addressed by the bare metal visual inspections.
- The Susceptibility Analysis performed by Westinghouse and documented in WCAP-16388, "PWSCC Susceptibility Assessment of the Alloy 600 and Alloy 82/182 Components in V. C. Summer Nuclear Station", indicates a very low probability of PWSCC failure of these components prior to the Spring 2008 outage timeframe.

As a result of the circumferential indications found in October 2006, the industry, through EPRI MRP, reviewed the Alloy 82/182 Pipe Butt Weld Safety Assessment (MRP-113) and the Primary System Piping Butt Weld Inspection and Evaluation Guideline (MRP-139). This review can be found in the white paper titled "Implications of Wolf Creek Pressurizer Butt Weld Indications to Safety Assessment and Inspection Requirements." The conclusions from the industry review included:

- MRP-113 and MRP-139 remain valid.
- Critical flaw sizes are several times larger than the indications observed in October 2006.
- Bare metal visual inspections during the last refueling outage (October 2006 for VCSNS) ensure a low risk of leaks and an extremely low risk of rupture through the spring of 2008.

Inspection and Mitigation Summary for Alloy 82/182 Pressurizer Butt Welds

| Nozzle | | MRP-139 Volumetric Inspection Requirement Met or to be Met | | Mitigation Completed or to be Completed | Comments |
|-----------------------------------|----------------------------------|--|----------------------|---|--|
| Function / Designation | Susceptible Material Description | Outage Designation | Start Date (MM/YYYY) | Outage Designation | |
| Spray / CGE-1-4503-46DM | Nozzle-to safe end weld | RF17 | 04/2008 | RF17 | Structural Weld Overlay followed by PDI Qualified Inspection |
| Surge / CGE-1-4500A-1DM | Nozzle-to safe end weld | RF17 | 04/2008 | RF17 | Structural Weld Overlay followed by PDI Qualified Inspection |
| Safety 8010A / CGE-1-4501-12DM | Nozzle-to safe end weld | RF17 | 04/2008 | RF17 | Structural Weld Overlay followed by PDI Qualified Inspection |
| Safety 8010B / CGE-1-4501-1DM | Nozzle-to safe end weld | RF17 | 04/2008 | RF17 | Structural Weld Overlay followed by PDI Qualified Inspection |
| Safety 8010C / CGE-1-4501-23DM | Nozzle-to safe end weld | RF17 | 04/2008 | RF17 | Structural Weld Overlay followed by PDI Qualified Inspection |
| Relief –PORV's/ CGE-1-4502-1DM | Nozzle-to safe end weld | RF17 | 04/2008 | RF17 | Structural Weld Overlay followed by PDI Qualified Inspection |

Previous ISI Program Examinations for Alloy 82/182 Pressurizer Butt Welds

| Nozzle | | Previous ISI/ UT examinations | | Bare Metal Visual Examinations | |
|------------------------------------|----------------------------------|-------------------------------|--|---------------------------------------|---------------------------------------|
| Function / Designation | Susceptible Material Description | Outage Date | NDE Designation PT/UT | RF-15 Spring 2005 | RF-16 Fall-2006 |
| Spray CGE-1-4503-46DM | Nozzle-to safe end weld | 4/8/99 | Surface PT-No Recordable Indications | BMV-No Evidence of Boric Acid Leakage | BMV-No Evidence of Boric Acid Leakage |
| | | 4/19/99 | UT-No Recordable Indications ~90.38% Estimated Coverage | | |
| Surge CGE-1-4500A-1DM | Nozzle-to safe end weld | 4/20/96 | Surface PT- No Recordable Indications | BMV-No Evidence of Boric Acid Leakage | BMV-No Evidence of Boric Acid Leakage |
| | | 4/20/96 | UT-No Recordable Indications 100% Coverage | | |
| Safety 8010A CGE-1-4501-12DM | Nozzle-to safe end weld | 9/23/94 | Surface PT- No Recordable Indications | BMV-No Evidence of Boric Acid Leakage | BMV-No Evidence of Boric Acid Leakage |
| | | 9/28/94 & 10/1/94 | UT-No Recordable Indications 100% Coverage | | |
| Safety 8010B CGE-1-4501-1DM | Nozzle-to safe end weld | 9/23/94 | Surface PT- No Recordable Indications | BMV-No Evidence of Boric Acid Leakage | BMV-No Evidence of Boric Acid Leakage |
| | | 9/28/94 & 10/1/94 | UT-No Recordable Indications 100% Coverage | | |
| Safety 8010C CGE-1-4501-23DM | Nozzle-to safe end weld | 9/23/94 | Surface PT- No Recordable Indications | BMV-No Evidence of Boric Acid Leakage | BMV-No Evidence of Boric Acid Leakage |
| | | 9/28/94 & 10/1/94 | UT-No Recordable Indications 100% Coverage | | |
| Relief PORVs CGE-1-4502-1DM | Nozzle-to safe end weld | 9/23/94 | Surface PT- No Recordable Indications | BMV-No Evidence of Boric Acid Leakage | BMV-No Evidence of Boric Acid Leakage |
| | | 9/28/94 & 10/1/94 | UT-No Recordable Indications 100% Coverage | | |

**List of Commitments
Alloy 82/182 Program Enhancements**

| No. | COMMITMENT | COMMITTED DATE OR "OUTAGE" | COMMITMENT TYPE | |
|-----|---|----------------------------|--------------------------|------------------------------|
| | | | ONE-TIME ACTION (Yes/No) | PROGRAMMATIC ACTION (Yes/No) |
| 1. | Inspection and Mitigation activities at VCSNS will be completed during the next refueling outage (RF17) currently scheduled for April 2008. | April 30, 2008 | Yes | No |
| 2. | Future inspections of pressurizer dissimilar metal (DM) butt welds at VCSNS will be performed in accordance with industry guidance (MRP-139). | As required by MRP-139 | No | Yes |
| 3. | Perform an assessment of original fabrication welds documentation to identify welds that may have been reworked and provide results to NRC. | March 31, 2007 | Yes | No |
| 4. | If VCSNS should shutdown due to excessive primary system unidentified leakage and if the leakage cannot be confirmed to originate from a source other than the pressurizer, a bare metal visual examination of the dissimilar metal butt weld locations on the pressurizer will be performed to determine if the leakage originated from those locations. | Upon Occurrence | Yes | No |
| 5. | SCE&G is evaluating PWR Owners Group documents with respect to enhanced leak detection processes and methods of calculating RCS leakage. Results will be provided to the NRC. | March 31, 2007 | Yes | No |
| 6. | SCE&G is assessing the feasibility of on-line monitoring equipment for the VCSNS pressurizer to provide diverse leakage detection capabilities. The details of these actions will be provided to the NRC. | May 31, 2007 | Yes | No |