



November 13, 2000
RC-00-0353

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

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
RELIEF REQUEST FOR USE OF ALLOY 690 WELDING FILLER
MATERIALS PER CODE CASES 2142-1 AND 2143-1
IN CLASS 1 PIPE REPAIR
NRR 00-0266

South Carolina Electric & Gas Company (SCE&G) is requesting approval of the use of Alloy 690 welding filler materials and associated ASME Boiler and Pressure Vessel Code, Section II, Cases 2142-1 and 2143-1 (Code Cases) at VCSNS. The Code Cases would be applied as an alternative to the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition, (no addenda), the In-service Inspection Code of Record (Code of Record) for VCSNS.

Preparation activities are currently underway at VCSNS to address the replacement of the "A" loop hot leg nozzle weld. Approval is requested for the use of the Code Cases to allow the application of Alloy 690 type weld material (Inconel 52 / 152) in the repair of ASME Class 1 piping on the reactor coolant system (RCS) at VCSNS. Industry studies show that Alloy 690 welding filler materials possess a high resistance to primary water corrosion. In addition, SCE&G determined that the proposed welding filler materials provide an acceptable level of quality and safety, when compared to the materials allowed by the Code of Record because of their superior corrosion resistant properties.

Note that the NRC staff approved (via safety evaluation report) the use of Inconel 52 / 152 for tubing and components in the fabrication and installation of replacement steam generators in response to ASME Code relief requests by licensees on at least two previous occasions. In particular, SCE&G received approval in July 1993 to apply Alloy 690 (and associated Code Cases) to the replacement steam generators at VCSNS (TAC NO. M86293).

NUCLEAR EXCELLENCE - A SUMMER TRADITION!

A047

Stephen A. Byrne
Vice President
Nuclear Operations
803.345.4622

South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station
P. O. Box 88
Jenkinsville, South Carolina
29065

803.345.5209
803.635.1461

Document Control Desk
NRR 00-0266
RC-00-0353
Page 2 of 2

The descriptions of Alloy 690 welding filler materials and the Code Cases, including justification for their application, are included as an attachment to this letter. SCE&G requests NRC staff review and approval of this request by November 20, 2000, so that VCSNS can complete the weld repair of the "A" loop hot leg crack and return the RCS to operable status. VCSNS is currently shutdown for its 12th refueling outage and will not restart the plant until the RCS code compliance is restored.

SCE&G is submitting the attached relief requests in accordance with 10CFR50.55a(a)(3)(i).

Should you have any questions, please call Mr. Phil Rose at (803) 345-4052.

Very truly yours,



Stephen A. Byrne

PAR/SAB/dr
Attachment

c: N. O. Lorick
N. S. Cams
T. G. Eppink (w/o Attachment)
R. J. White
L. A. Reyes
K. R. Cotton
NRC Resident Inspector
J. B. Knotts, Jr.
T. B. Franchuk
RTS (NRR 00-0266)
File (810.19-2, 810.58)
DMS (RC-00-0353)

**South Carolina Electric & Gas Co. (SCE&G)
Virgil C. Summer Nuclear Station (VCSNS)
Relief Request**

Subject:

Corrective action for the "A" loop hot leg nozzle weld involves removal of the subject weld (along with a small portion of pipe) and replacement with a spool piece and its associated welds. This request provides for the alternative use of Alloy 690 (Inconel 52 / 152) as the butter and weld-filler metals, essentially taking advantage of the improved resistance of these materials to primary water corrosion mechanisms. Use of Code Cases 2142 and 2143 would eliminate the burden of requiring qualification of separate welding procedures for each weld metal, as is the case for non-Code welding materials.

Based on preliminary study of plant records, the current field configuration at the "A" loop hot leg nozzle weld includes Inconel 182 buttering on the nozzle base metal, and Inconel 82 / 182 filler in the joining nozzle to pipe weld. Planned destructive examination of the weld (and its associated flaw), as part of the root-cause evaluation, will provide a better understanding of the weld composition.

Components:

ASME Class-1 weld joints associated with the repair of the "A" loop hot leg nozzle weld, specifically:

1. Inconel 52 - buttering on the nozzle base metal
2. Inconel 52 - buttering on the spool piece (nozzle side)
3. Inconel 52 - nozzle to piping weld
4. Inconel 152 - any necessary weld / weld repair

Current Code Requirement:

The current Code of Record at VCSNS for In-service Inspection (Code of Record) is the ASME Boiler and Pressure Vessel Code, Section XI, 1989 Edition, (no addenda). The Code of Record allows for the use of Alloy 600 (Inconel 82 / 182) welding filler materials, but does not include Alloy 690 (Inconel 52 / 152) welding filler materials.

Alternative Requirement:

Approval is requested for the utilization of Inconel 52 / 152 weld metals, as substitutes for Inconel 82 /182, in the repair / replacement of the "A" loop hot leg nozzle weld at VCSNS. The Code Cases, which invoke Sections III and XI, have been approved by the ASME (6/5/95), and have been included in the 1998 Edition 1999 Addenda of Section II. Currently, neither Code Case has been incorporated by reference into the Code of Federal Regulations (i.e., 10 CFR 50.5a). The CFR, by reference, permits the appropriate use of Editions and Addenda prior to and including 1995 and 1996, respectively, of Section III and XI. In addition, neither Regulatory Guide 1.147, 1.84 nor 1.85 includes NRC staff review and endorsement of the Code Cases. The essential provisions of the Code Cases are stated below:

Code Case 2142-1

"It is the opinion of the Committee that UNS N06052 Ni-Cr-Fe welding filler metal meeting the [specified] chemical requirements ... but otherwise conforming to AWS 5.14 may be considered as F-No. 43 for both procedure and performance qualification purposes. Further, this material shall be identified as UNS N06052 in the Welding Procedure Specification, Procedure Qualification Record, and Performance Qualification Records."

Code Case 2143-1

"It is the opinion of the Committee that UNS W86152 Ni-Cr-Fe welding electrodes meeting the [specified] chemical and mechanical properties ... but otherwise conforming to AWS 5.11 may be considered as F-No. 43 for both procedure and performance qualification purposes. Further, this material shall be identified as UNS W86152 in the Welding Procedure Specification, Procedure Qualification Record and Performance Qualification Records."

This relief request, therefore, incorporates two issues:

1. The use of Alloy 690 (Inconel 52 / 152) welding filler materials in Code Class 1 weld repair, in lieu of Alloy 600 (Inconel 82 /182) welding filler materials, and
2. The use of two ASME Code cases that group the new welding filler materials in the same welding categories as other commonly employed nickel base weld metals. This allows the use of appropriate existing welding procedures and performance qualifications with the new weld metals.

SCE&G will maintain detailed weld records to document the location and extent of the welds utilizing Inconel 52 / 152 as butter and weld filler material.

Basis for Request:

The following was extracted from the NRC Safety Evaluation Report (SER) dated July 2, 1993, provided in response to a relief request for application of Alloy 690, (and associated Code Cases), to replacement steam generators at VCSNS. A portion of the SER (with minor editing) is included in this relief request:

"Alloy 600 was used in the fabrication of many of the steam generators (SG) in service in the industry today. Due to the many instances of intergranular stress corrosion cracking (IGSCC) of Alloy 600 components occurring in these generators, the industry sought a new material from which to fabricate various SG components. The current base metal of choice is Alloy 690. This metal was chosen because laboratory tests indicate that it is resistant to both IGSCC and general corrosion in a simulated reactor environment. Use of Alloy 690 as a base metal has already been approved by the staff; the licensee is now seeking approval to use the new compatible weld metals."

"Results of the principal corrosion study examining the susceptibility of weld metals to IGSCC are found in the Electric Power Research Institute (EPRI) report NP-5882M, "Stress Corrosion Cracking Resistance of Alloys 600 and 690 and Compatible Weld Metals in BWRs." Two Alloy 690 weld metals (designated as Inco 52 and Inco 152) were tested. They were tested under the same conditions as the base metals, thus allowing direct comparison of results. Results showed that both of the Alloy 690 weld metals are resistant to IGSCC, as well as general corrosion, in pure water environments. However, since these were laboratory simulations of a boiling water reactor (BWR) environment, the results are only an indicator of the weld metals' performance in a pressurized water reactor (PWR) environment."

"A series of tests conducted by the Inco Research and Development Center, the laboratory that developed both Alloys 600 and 690, showed that Alloy 690 weld metal was highly resistant to both general corrosion and IGSCC in a simulated SG environment. Additional testing also demonstrated a high resistance to stress corrosion cracking. The results of this study are documented in "Corrosion Testing of Inconel Alloy 690 for PWR Steam Generators," J. R. Crum and R. C. Scarberry, Journal of Materials for Energy Systems, Vol. 4, No. 3, Dec. 1982."

"Not considered in either study is the effect, if any, of heat to heat variations in the weld metal compositions. Such variations were found to have a substantial role in the IGSCC susceptibility of Alloy 600. The strong performance of Alloy 690 suggests there would be minimal effect."

Document Control Desk
Attachment
NRR 00-0266
RC-00-0353
Page 4 of 4

In accordance with 10 CFR 50.55a(a)(3)(i), timely NRC staff approval is requested based on the proposed use of Alloy 690 welding filler materials, and associated Code Cases, providing an acceptable level of quality and safety.

Implementation Schedule:

This relief will be implemented in the second inspection interval, during the preparations for the weld repair on the "A" loop hot leg. The weld repair is scheduled to begin on or about November 23, 2000. The expected date for completing the weld repair is December 15, 2000.