UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

ACRSR-2067

March 17, 2004

The Honorable Nils J. Diaz
Chairman
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL APPLICATION FOR THE VIRGIL C. SUMMER NUCLEAR STATION

Dear Chairman Diaz:

During the 510th meeting of the Advisory Committee on Reactor Safeguards, March 3-6, 2004, we completed our review of the License Renewal Application (LRA) for the Virgil C. Summer Nuclear Station and the related Safety Evaluation Report (SER) prepared by the staff of the U. S. Nuclear Regulatory Commission (NRC). Our Plant License Renewal Subcommittee reviewed both the LRA and the staff's draft SER during a meeting on December 3, 2003. During these reviews, we had the benefit of discussions with the NRC staff and representatives of South Carolina Electric and Gas Company (SCE&G), the applicant. We also had the benefit of the documents referenced.

CONCLUSION AND RECOMMENDATION

1. The programs instituted and committed to by SCE&G to manage age-related degradation are appropriate and provide reasonable assurance that the Virgil C. Summer Nuclear Station can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public.

2. The SCE&G application for renewal of the operating license for Virgil C. Summer Nuclear Station should be approved.

BACKGROUND AND DISCUSSION

This report fulfills the requirements of 10 CFR 54.25, which states that the ACRS should review and report on all license renewal applications. SCE&G prepared its application in accordance with NUREG-1801, "The Generic Aging Lessons Learned (GALL) Report." In that LRA, SCE&G requested renewal of the operating license for the V.C. Summer Nuclear Station for a period of 20 years beyond the current license term, which expires on August 6, 2022. The plant is a single unit, Westinghouse-designed, three-loop, pressurized-water reactor rated at 2,900 megawatts-thermal (MWt) with replacement steam generators that were installed in 1994.

The staff's initial SER did not include any open or confirmatory items, so the staff was able to expedite issuance of the final SER. Consequently, to accommodate the staff's accelerated schedule, we advanced our final review of this matter by 2 months.

The final SER documents the results of the staff's review of the information submitted by the applicant and identified during onsite NRC inspections and audits. In particular, the staff reviewed the completeness of the applicant's identification of structures, systems, and components that are within the scope of license renewal, the integrated plant assessment process, the applicant's identification of the plausible aging mechanisms associated with passive long-lived components, the adequacy of the applicant's aging management programs (AMPs), and the identification and assessment of time limited aging analyses (TLAAs) that required review.

During our review, we also discussed the effectiveness of existing programs that the applicant has established to deal with significant equipment degradation issues identified by operating experience.

In 2001, for example, the applicant identified a through-wall crack in the "A" hot leg to vessel nozzle weld. The root cause of that crack was high residual stresses resulting from weld repairs performed during plant construction. To address the problem, the applicant installed a new spool piece to replace the segment containing the defective weld. The applicant also inspected the "B" and "C" hot leg to vessel nozzle welds using ultrasonic methods, supplemented by eddy current testing. A recordable indication was detected in the "B" nozzle weld. To address the problem, the applicant applied a mechanical stress improvement process to the "B" and the "C" hot leg nozzle welds. This process introduced compressive stresses on the inside of the pipe which has inhibited flaw propagation.

Since earlier ultrasonic testing failed to identify the "A" hot leg to vessel nozzle weld defect before it propagated completely through the pipe wall, we questioned the effectiveness of the applicant's Alloy 600 AMP for managing primary water stress corrosion cracking (PWSCC) in ASME Class 1 dissimilar welds (e.g., Alloy 82/182 welds). The applicant stated that it continues to take advantage of improvements in ultrasonic testing methods and is now using the latest ultrasonic technology. Furthermore, the applicant has committed to incorporate emerging regulatory requirements and industry recommendations into its Alloy 600 program prior to the period of extended operation. We found the applicant's commitment acceptable.

The applicant has also conducted inspections of the upper and lower reactor vessel heads in accordance with the current NRC Bulletins and Orders. These inspections have not revealed any visible indications of leakage on the upper head. The applicant plans to perform bare metal inspections during the upcoming refueling outage. The plant is ranked as a "low-susceptibility" plant with regard to vessel head penetration cracking phenomena and the applicant currently has no plans to replace the upper head. Inspections of the reactor vessel bottom head revealed traces of boron. The applicant believes that the source of this boron is the aforementioned leak in the "A" hot leg to vessel nozzle weld. Consequently, the applicant cleaned the lower head to establish a fresh surface baseline for future inspections.

The ultimate heat sink for the plant is a lake created by a series of safety grade dikes and dams which are included in the scope of license renewal. The Service Water Pump House, which takes suction from this lake, experienced major settlement at the time of original construction. However, recent data indicate that no further settlement is occurring. This structure is also within the scope of license renewal. The Service Water Structures Survey Monitoring Program monitors the pump house and the intake structure for movement, cracking, settlement, and structural degradation. We concur with the staff's assessment that the attributes of this plant-specific program are appropriate and sufficient.

The SER describes the groundwater at the plant site as mildly acidic, with a pH slightly below 5.5. Therefore, the groundwater is considered aggressive in the SER, even though measured chloride and sulfate concentrations are extremely low. Although recent analyses of the groundwater performed by the applicant at five new wells indicate that the groundwater pH may actually be above 5.8, the applicant has committed to enhance the existing plant programs and procedures that manage potential aging effects on concrete structures. Therefore, the staff has reasonable assurance that the applicant can effectively maintain the concrete plant structures throughout the period of extended operation. The applicant also asserted that the inspection of a nearby 70-year-old hydroelectric plant with similar concrete exposed to similar groundwater has revealed no signs of degradation.

During its review of the LRA, the staff evaluated 42 aging management programs which include 26 existing programs and 16 new programs. Several of the new programs are not yet developed. As with other applicants, we encouraged SCE&G to establish a schedule for the implementation of these commitments well ahead of the beginning of the license renewal period, so as not to place an unreasonable demand on applicant and NRC resources.

We concur with the staff's assessment that the applicant has appropriately evaluated the plant TLAAs. For metal fatigue, three limiting reactor coolant system components were identified that could potentially exceed the design basis fatigue cumulative usage factor during the period of extended operation. Specifically, those components are the normal and alternate charging nozzles and the pressurizer surge line nozzle. The applicant has committed to track thermal transients on these three nozzles and will perform additional evaluations of these components prior to the period of extended operation. Any component with a projected cumulative usage factor exceeding the established limits will be either re-evaluated or replaced prior to entering the license renewal period. Additional independent calculations performed by the staff have confirmed that the plant reactor vessel is qualified to operate until the end of the license renewal period without exceeding established reactor vessel neutron embrittlement limits.

On the basis of our review of the LRA, the final SER, and the NRC's inspection and audit reports, we agree that there are no issues specifically related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) which preclude renewal of the plant's operating license. The programs instituted and committed to by SCE&G to manage age-related degradation are appropriate and provide reasonable assurance that the plant can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The SCE&G application for renewal of the operating license for the V.C. Summer Nuclear Station should be approved.

Sincerely,

/RA/

Mario V. Bonaca
Chairman

References:

1. U. S. Nuclear Regulatory Commission, “Safety Evaluation Report Related to the License Renewal of the Virgil C. Summer Nuclear Power Station,” January 2004.
2. South Carolina Electric and Gas Company, “License Renewal Application for Virgil C. Summer Nuclear Power Station,” August 6, 2002.
3. U. S. Nuclear Regulatory Commission, “Draft Safety Evaluation Report Related to the License Renewal of the Virgil C. Summer Nuclear Power Station,” October 2003.
4. NRC Inspection Report 50-395/03-007, Scoping and Screening, June 13, 2003.
5. NRC Inspection Report 50-395/03-008, Aging Management Review, September 29, 2003.
6. U. S. Nuclear Regulatory Commission, “Aging Management Program Audit Report,” October 9, 2003.

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1. U. S. Nuclear Regulatory Commission, “Safety Evaluation Report Related to the License Renewal of the Virgil C. Summer Nuclear Power Station,” January 2004.
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6. U. S. Nuclear Regulatory Commission, “Aging Management Program Audit Report,” October 9, 2003.

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