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November 20, 1996
RC-96-0267

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

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
CHARGING PUMP TESTING RELIEF REQUEST
(NRR 960002)

South Carolina Electric and Gas Company (SCE&G) hereby submits the attached request for relief from performing a "substantial flow" Charging Pump Test at increased frequency per the acceptance criteria of ASME/ANSI Oma-1988, Part 6, Article 6.1. VCSNS charging pumps are tested at "substantial flow" pursuant to Generic Letter 89-04, Position 9 with acceptance limits established through the ASME Code, Section XI program. Vibration levels observed during the last "substantial flow" test placed Charging Pump 'A' in the "Alert" range of the acceptance criteria. Currently, the Code requires increased frequency testing without benefit of evaluation for maintaining normal test frequency.

This relief request is based upon a commitment to perform an alternative monitoring program in lieu of performing full flow testing at the nine month interval which is required by the Code acceptance criteria. This alternative monitoring program would consist of monthly vibration monitoring and data analysis under normal operating flow conditions. SCE&G judges that this alternative program is, at minimum, equivalent to the Code requirements. This judgment is based on the increased frequency of monitoring and the fact that the test is performed at flow conditions which would allow pump degradation to be detected. Compliance with all other Code test requirements will continue.

SCE&G is submitting the attached relief request in accordance with 10CFR50.55a(a)(3)(i). This relief request was discussed with NRR Staff (Mr. Joseph Colaccino and Mr. Al Johnson) in October,1996. NRC review and approval is requested by January 7, 1997.

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Should you have any questions, please call Mr. Jim Turkett at (803) 345-4047.

Very Truly Yours,

Gary J. Taylor

JT/GJT/nkk

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Request for Relief
from
Increased Frequency Testing of Charging/Safety Injection Pumps

Components: Charging/Safety Injection (SI) Pump A (XPP0043A)

Code Requirement:

ASME/ANSI Oma-1988, Part 6, Article 6.1 requires the following:

"If deviations fall within the alert range of Table 3, the frequency of testing specified in para. 5.1 shall be doubled until the cause of the deviation is determined and the condition corrected."

Alternate Test:

Perform monthly on-line vibration monitoring and analysis at normal plant operating conditions to verify pump performance and identify any pump degradation until the 10th Refueling Outage when full flow testing can be performed. Full flow testing during the next refueling outage will confirm the suspected cause and verify that maintenance actions performed during the cycle corrected the condition or will identify that further action is necessary. The test interval established by Generic Letter 89-04, Position 9 will be resumed when the cause is determined and corrected.

Basis for Relief:

The Charging/SI Pumps are tested in accordance with NRC Generic Letter 89-04, Position 9. This position allows the use of a non-instrumented minimum flow path for quarterly testing with a test performed at substantial flow conditions during cold shutdowns or refueling outages. Quarterly testing on minimum flow in conjunction with testing at substantial flow conditions during refueling outages provides adequate assurance that these pumps are capable of performing their design safety function upon demand.

This position is incorporated into the VCSNS Inservice Testing (IST) Program. Through the IST Program, the acceptance criteria applied to pump performance parameters is established through ASME/ANSI Oma-1988, Part 6. Part 6 is structured to address actions to be taken when performing quarterly tests for components within systems capable of demonstrating their design function performance during power operation.

The actions prescribed for components with parameters in the Alert range do not accommodate components relying on cold shutdown plant mode to demonstrate design performance parameters. During the Spring 1996 refueling outage, Charging Pump A indicated one vibration point (pump vertical outboard) to be in the Alert range. It was noted that the test frequency was impacted but that the pump was still recognized as operable to the Code acceptance criteria. VCSNS initiated an evaluation to determine the cause of the deviation and establish corrective actions.

The evaluation included a review of Charging Pump A data collected to determine a viable cause and establish corrective actions that could be pursued at power to improve the vibration condition.

Efforts to determine the cause included:

- Analysis of the vibration data spectrum
- Review of past maintenance history
- Review of trend data (in particular, vibration and motor bearing temperatures)

Based on a review of available data, it was determined that the vibration deviation most likely originated from a seal replacement activity performed in November 1995. Probable cause was concluded to be misalignment during pump restoration.

At power corrective actions performed to alleviate vibration and confirm cause included:

- Measured and recorded pump parameters while on mini-flow to establish comparison parameters prior to maintenance.
- Performed alignment check; discovered that gearbox and motor were both out of alignment and that both had a "soft-foot".
- Corrected "soft-foot" problems and performed laser alignment for pump, gearbox and motor.
- Measured and recorded post-maintenance pump parameters for evaluation.
- Monitored pump performance for two weeks following maintenance while in normal operation.

Review of testing performed (pre-maintenance and post-maintenance) and monitored data indicated that the temperature difference between motor inboard and outboard bearings had decreased significantly (~28°FΔT down to ~10°FΔT) and that the inboard bearing temperature had dropped (~165°F down to ~145°F) while the outboard bearing temperature had risen approximately 2°F (~133°F up to 135°F). This indicates that the two motor bearings are now more equally loaded and lessen any bearing contribution to the vibration condition.

There were no significant changes in vibration levels from pre-maintenance testing to post-maintenance testing (mini-flow). A correlation between miniflow test results and full flow conditions cannot be established. However, the review of monitored data did reveal that the affected parameter (pump vertical outboard vibration) was less for miniflow than the recorded value for full flow measured during the Spring 1996 outage. This condition was not as expected. The manufacturer was contacted and, upon considering the data and maintenance history for Charging Pump A, expressed the opinion that the high vibration during the full flow test was most likely attributed to misalignment. They also informed SCE&G that vibration has been observed, to be higher at full flow conditions than at recirculation flow or miniflow for pumps of this type and model.

The manufacturer concluded that the pump could perform its design function because the vibration recorded during full flow testing was not excessive. Further discussion provided recommended actions that will be performed at the next available opportunity including:

- Torque check the pump outboard fasteners for looseness
- Recheck alignment, if necessary, after torque check
- Measure and record vibration under full flow.

Furthermore, the data collected during the Spring 1996 outage for the full flow test of Charging Pump A indicated that the pump outboard vertical vibration was higher than other points on the pump by several orders of amplitude. The vibration was in the direction of highest stiffness with respect to mounting; indicating a potential resonance condition.

Natural frequency testing performed during normal plant operation following the Spring 1996 outage confirmed that the pump is operating in a natural frequency region of the casing. The data indicated that a wide natural frequency band exists from 20 to 200 hertz. Additionally, it was noted that the running pump speed falls to the left side of this region and that, at the point where the pump runs relative to the natural frequency, there is a steep decreasing slope in the area of the exciting force in the region of the natural frequency. A natural frequency in the area of the exciting force of running speed makes a resonance condition possible. The fact that the running speed of the pump falls to the left side, but within the natural frequency region, allows small speed changes to affect the resulting pump casing vibration levels.

A review of Charging Pump A speed shows that the pump runs at a slower speed during full load, full flow conditions compared to inservice testing (IST), miniflow testing. While operating in the natural frequency region, the result of a load changing variable, such as vibration due to misalignment, may produce a significant change as a result of resonance. Resonance is a condition affected by either mass or stiffness. Decreases in the stiffness of the machine may shift the natural frequency region to the left, increasing the possibility of a resonance condition. In this case only a small change in stiffness is required due to the left side position of the exciting force inside the natural frequency region. Stiffness changes may have occurred between full flow testing performed in November 1994 and the full flow testing performed in April 1996.

Summary:

SCE&G has determined that Charging Pump A is operating satisfactorily, is not susceptible to catastrophic failure, and can perform its design basis function. This conclusion is supported by the pump manufacturer. Therefore, the proposed alternative monthly on-line monitoring program is considered sufficient to assure that the pump continues to operate satisfactorily