SCE&G
A SCANA COMPANY

October 8, 1998
RC-98-0182

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

Attention: Mr. L. M. Padovan

Gentlemen:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
REQUEST FOR ADDITIONAL INFORMATION -
GENERIC LETTER 96-05, (TAC NO. M97106)
"PERIODIC VERIFICATION OF DESIGN-BASIS CAPABILITY
OF SAFETY-RELATED MOTOR-OPERATED VALVES"

Reference: Stephen A. Byrne letter RC-98-0070 to the Document Control Desk dated April 2, 1998; "Response to Safety Evaluation for the Joint Group Program on Periodic Verification of Motor Operated Valves"

Pursuant to your request for additional information, South Carolina Electric & Gas Company (SCE&G) is submitting the attached documentation under oath of affirmation.

Should you have any questions, please call Mr.Jeffrey W. Pease, at (803) 345-4124, at your convenience.

Very truly yours,

BC Williams
for
Gary J. Taylor

JWP/GJT/dr
Attachment

c: see Page Two

Gary J. Taylor
Vice President
Nuclear Operations

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

803.345.4344
803.345.5209
www.scana.com

1/1

A073

c: J. L. Skolds
W. F. Conway
R. R. Mahan (w/o Attachment)
R. J. White
L. A. Reyes
L. M. Padovan
NRC Resident Inspector
J. B. Knotts, Jr.
NSRC
RTS (LTR 960005)
File (815.14)
DMS (RC-98-0182)

STATE OF SOUTH CAROLINA :
: **TO WIT** :
COUNTY OF FAIRFIELD :

I hereby certify that on the 8th day of October 1998, before me, the subscriber, a Notary Public of the State of South Carolina personally appeared Bruce C. Williams, being duly sworn, and states that he has signature authority for the Vice President, Nuclear Operations of the South Carolina Electric & Gas Company, a corporation of the State of South Carolina, that he provides the foregoing response for the purposes therein set forth, that the statements made are true and correct to the best of his knowledge, information, and belief, and that he was authorized to provide the response on behalf of said Corporation.

WITNESS my Hand and Notarial Seal

Notary Public

My Commission Expires

July 13, 2005
Date

Per your Request for Additional Information on Generic Letter 96-05, dated August 6, 1998, VCSNS submits the following response. The questions are restated below followed by the VCSNS response.

As background to the specific responses provided, the following information should be noted. SCE&G has an established plant specific MOV periodic verification (PV) program as described in our response to GL 96-05 (Reference letter RC-97-0052, dated March 13, 1997). SCE&G considers plant-specific data to be the best source of information for our long-term PV Program. SCE&G is participating in the Joint Owners Group (JOG) PV Program to enhance our own program and make our test data available to the industry. SCE&G is supporting the JOG initiative by providing information on safety-related MOV performance from our site specific periodic verification program. SCE&G was the first utility to complete both the first and second dynamic test for our two assigned JOG valves and the third and final JOG dynamic test is scheduled for RF 12 (Fall 2000). As stated in our letter RC-98-0070, dated 4/2/98. SCE&G will review the data received from the JOG MOV PV Program and will incorporate the data into our plant specific program as applicable. The SCE&G PV program requirements are consistent with the JOG PV Program requirements as identified in MPR-1807, 'Joint BWR, Westinghouse and Combustion Engineering Owners' Group Program on Motor-Operated Valve (MOV) Periodic Verification', Revision 2, dated July 1997 and the Westinghouse Risk Ranking Methodology as identified in W report V-EC-1658-A, Revision 2. The SCE&G PV program is a living program and will be modified, as necessary, based on plant specific and applicable industry information.

Question 1

Your March 13, 1997, letter states that the scope of the motor-operated valve (MOV) program at the V. C. Summer Nuclear Station in response to Generic Letter (GL) 96-05 is the same as your station program in response to GL 89-10, Safety-Related Motor-Operated Valve Testing and Surveillance. Your MOV periodic verification program should cover all GL 89-10 MOVs. In addition, GL 96-05 indicated you should also consider safety-related MOVs assumed to be capable of returning to their safety position when placed in a position that prevents their safety system (or train) from performing its safety function. This applies if you do not declare the system (or train) inoperable when the MOVs are in their non-safety position. Describe how you considered any such MOVs with respect to your GL 96-05 program at V. C. Summer.

Response 1

VCSNS has 18 Safety-Related MOVs that are not within the GL 89-10 scope. Review of the non-GL 89-10 MOVs indicates that none of the valves are placed in a position that would prevent their safety system (or train) from performing its safety function within the design basis of the plant without declaring the associated system (or train) inoperable. VCSNS reconvened the MOV Expert Panel to review the SR MOVs outside the GL 89-10 scope to determine if any additional valves needed to be added due to GL 96-05 requirements. GL 96-05 states that "The program should include Safety-Related MOVs that are assumed to be capable of returning to their safety position when placed in a position that prevents their safety system (or train) from performing its safety function" within the current licensing basis of the plant. The Expert Panel provided the interdisciplinary input necessary to ensure that all valves required to be within the GL 96-05 scope are identified and properly included in the GL 89-10/96-05 scope. VCSNS has made licensing commitments that take credit for the Reactor Vessel Head Vent Valves (NUREG-0578). The Expert Panel concluded that the Reactor Vessel Head Vent Valves were the only additional valves that should be included in the GL 89-10/96-05 program based on the GL 96-05 requirements. The Reactor Vessel Head Vent valves have been added to the GL 89-10/96-05 scope due to GL 96-05 requirements only.

Question 2

You state in your letter that six valves will undergo two additional dynamic tests by July 27, 2005. Describe the evaluation performed to confirm that information from tests of these six valves is sufficient to determine the degradation rate for the potential increase in thrust (torque) requirements for all GL 96-05 MOVs at V. C. Summer.

Response 2

VCSNS considers plant-specific test data to be the best source of information for our long-term Periodic Verification (PV) program. The six valves were selected for additional dynamic testing based on risk significance, testability, and applicability to other GL 89-10/96-05 MOVs. The most risk significant valves (category 1) were then ranked for testing based on a quantitative estimate of the overall benefit of periodic dynamic testing. The six valves include butterfly and gate valves, and represent a cross-section of the three major valve suppliers for VCSNS. The six valves have also been evaluated for valve age degradation grouping based on

general similarities in valve design, materials, and application of the valves (especially the fluid environment). VCSNS is participating in the JOG PV program (Reference Letter #RC-98-0070, dated April 2, 1998) and will utilize the results of the JOG PV program for specific applications/material pairs which are not fully represented by the valves being tested at VCSNS.

Question 3

In your letter, you do not discuss actuator output under dynamic conditions. Describe your method for ensuring adequate actuator output, considering recent Limitorque guidance in Technical Update 98-01, and its Supplement 1. Also, describe your method for determining the degradation rate associated with aging effects that could result in a potential decrease in actuator output.

Response 3

VCSNS has revised the design basis capabilities of all the station's GL 89-10/96-05 MOV actuators using information made available and documented in Commonwealth Edison White Paper 125. Implementing the Commonwealth Edison methodology in its entirety ensures adequate actuator output, considering the recent Limitorque guidance in Technical Update 98-01, and its Supplement 1. Five of the six valves slated for additional dynamic testing are rising stem flexible wedge gate valves. The stem-stem nut material pair is stainless steel-brass which is the same for all the station's GL 89-10/96-05 rising stem gate valves. The station's GL 89-10/96-05 MOVs use the same stem lubricant and have established lubrication frequencies. The sixth valve is a butterfly valve with a Limitorque actuator and a HBC gear box which is typical of all the station's GL 89-10/96-05 butterfly valves. VCSNS has established a trending program to trend load sensitive behavior (LSB), open/close stem friction coefficients and valve factor capability/margin under dynamic conditions. The periodic dynamic testing at VCSNS to date does not indicate any appreciable actuator degradation.

Question 4

Your letter indicated that you will perform periodic static diagnostic testing on your GL 96-05 MOVs. Describe the basis for your periodic test method to identify age-related degradation affecting thrust (torque) operating requirements and actuator output for all GL 96-05 MOVs.

Response 4

All the station's GL 89-10/96-05 MOVs will be diagnostically tested under static conditions at least once every 10 years. The static diagnostic testing is designed to provide information on the thrust and torque output of the motor-actuator and any changes to the motor-actuator as a result of aging effects such as increased stem friction coefficients or reduced thrust at Control Switch Trip (CST). VCSNS has established a trending program to trend motor power/current, open/close stem friction coefficients, valve operating torque, running load/packing load, seating thrust and unseating thrust and valve factor capability/ margin. The data used to trend MOV performance includes MOV failure and deficiency data, diagnostic test results, and industry data. The periodic reverification of MOV performance is intended to provide objective evidence of actuator capability and performance over time.

Question 5

Justify any MOV grouping to share test information or minimize testing.

Response 5

Valves in the GL 89-10/96-05 program are grouped by similarity of valve, actuator and application. Valves are grouped for age degradation based on similarities in valve design, materials and application of the valve (especially the fluid environment). MOV equivalency is established consistent with the JOG periodic verification program (Reference MPR-1807 'Joint BWR, Westinghouse and Combustion Engineering Owners' Group Program on Motor-Operated Valve Periodic Verification', Revision 2 dated July 1997, and JOG Position Paper PP-03, 'Scope of MOVs Covered by the JOG Program and Valve Grouping', Rev.0). Actuator age degradation grouping is established with respect to actuator type, control configuration and stem-stem nut material pair. The station's rising stem MOVs are represented by two types of actuators (Limitorque and Rotork). The stem-stem nut material pair for all the station's rising stem MOVs is stainless steel-brass and the same stem lubricant is used on all valves. Periodic lubrication frequencies have been established for the actuator gearboxes and stem/stem nuts. The station's GL 89-10/96-05 quarter turn MOVs are all Henry Pratt butterfly valves with Limitorque actuators and HBC gear boxes.

Question 6

You state in your letter that you will place each MOV in the GL 96-05 program in a Probabilistic Risk Assessment (PRA) Group of high, medium or low risk. Describe the MOV risk-ranking methodology applied at V. C. Summer.

Response 6

VCSNS performed MOV risk ranking by a method similar to the WOG MOV risk ranking methodology. The VCSNS MOV risk ranking was performed in July 1995, one year before revision 0 of the Westinghouse report V-EC-1658 was issued, and three years before the final revision was issued. The primary difference is the threshold for the different risk levels as described below. Both methods use the at-power PRA model supplemented by Expert Panel judgment for shutdown risk, external events, initiating events and containment performance. VCSNS is in the process of performing a data update to the PRA model. When this task is complete the MOV risk ranking may be revised. Consideration will be given at that time to adopting the WOG methodology for consistency with the industry.

The VCSNS MOV risk ranking methodology (for MOVs modeled in the PRA) is based on Risk Achievement Worth (RAW) and Risk Reduction Worth (RRW). A and B train valves were grouped together and then a group importance value was obtained based on Core Damage Frequency. The valves were then grouped in Risk Significance Categories of 1, 2, and 3, similar to the High, Medium, and Low of the WOG methodology. The table below shows that the VCSNS thresholds for the various levels are more conservative than that shown for the WOG methodology. While RRW was also calculated, it was found to be a subset of the RAW levels; i.e. the RAW would escalate an MOV to a higher level before the RRW.

Westinghouse Category	VCS Category	WOG Criteria	VCSNS Criteria
H	1	RAW>10	RAW>1.99
M	2	10>RAW>2	1.99>RAW>1
L	3	RAW<2	RAW=1.0

The Expert Panel reviewed MOVs categorized by the above criteria and then revised the levels accordingly. For example, the Containment Spray System MOVs were category 3 based on CDF but were increased to level 2 based on their importance to containment performance. The Expert Panel also reviewed valves that were not modeled in the at-power PRA, but were important from the standpoint of shutdown, external events, or offsite dose.

VCSNS has also performed a review of Table A.1 of V-EC-1658-A, Revision 2 which confirms that the VCSNS methodology is conservative in the ranking of MOVs when compared to other plants.

Question 7

You indicated in your letter that you will periodically test some MOVs at intervals longer than 5 years or three refueling outages. Describe your criteria for evaluating test data to justify these long test intervals.

Response 7

Each GL 89-10/96-05 MOV has been baseline static tested and most have been dynamically tested once and statically tested at least twice. To minimize the effects of diagnostic equipment error, direct stem thrust and torque measurements are taken wherever practicable. The static test results traces of each MOV are reviewed by MOV Component Engineers to ensure that the MOV is set up adequately and to validate the various design basis parameters. Each valve is setup above the minimum required values and below the maximum allowable values with diagnostic errors taken in the conservative direction. The new values are compared to the old values (LSB, stem friction coefficients, thrust at CST, operating torque, running load, etc.) and the data is inputted into the GL 89-10 MOV setup, test, and performance validation summary report (TR01520-001) and MOV trend program. After each valve is setup and tested (statically or dynamically) an assessment of the capability of the actuator and existing setup is made. The assessment of capability is based on the minimum required thrust including margin allowances and is expressed as the "valve factor capability". The valve factor capability displays how sensitive the setup of a given valve is with respect to changes in valve performance. Any indication of degradation/anomalies that could affect the performance of the valve is evaluated for the individual valve as well as similar valves, as appropriate, and corrective actions are taken as necessary. The static testing intervals may be changed by the MOV Component Engineers based upon evaluation of the trending information, equipment performance, functional significance and operability concerns. Testing at VCSNS to date indicates that the station's MOV degradation rates are minimal.

Question 8

Your letter states that your GL 96-05 program will provide reasonable assurance that your GL 96-05 MOVs will remain operable until the next scheduled test. Describe your method for ensuring that your periodic test interval (maximum of 10 years) provides continued design-basis capability of your GL 96-05 MOVs until the next scheduled test.

Response 8

The station's GL 89-10/96-05 periodic test intervals are based on the risk significance and safety function thrust capability margin of the specific MOV. All MOVs in PRA group 1 (high risk), as well as those MOVs in PRA group 2 (medium risk) with less than 100% safety function thrust capability margin, are statically tested once per five years or three refueling outages, whichever is longer. Those MOVs in PRA group 2 (medium risk) with safety function thrust capability margin equal to or greater than 100%, as well as all PRA group 3 (lower risk) MOVs, will be subject to static testing once per ten years or six refueling outages, whichever is longer. Butterfly MOVs which are not in PRA group 1 (high risk) will be subjected to static testing once per ten years or six refueling outages, whichever is longer. All MOVs are administratively required to have a 10% safety function thrust (torque for butterfly valves) capability margin to allow for potential age related degradation. Any valve without at least a 10% safety function thrust capability margin will be evaluated for acceptability and will be tested at least every 5 five years or three refueling outages, whichever is longer. MOV Component Engineers may change the testing intervals based upon evaluation of the trend data. Performance of both static and dynamic testing of similar MOVs yields objective evidence that similar valves will remain operable until the next scheduled test. The station performs additional motor power testing on each GL 89-10/96-05 on a frequency of approximately every 18 months. The motor power data is then trended with the rest of the MOV diagnostic, equipment performance and industry data.

A number of other different processes and activities in the plant provide evidence of valve performance. Normal plant operations periodically exercise a significant portion of the GL 89-10/96-05 valves. Periodic surveillance testing also gives information on valve operability along with valves which are part of the ASME Section XI Program. Any negative performance indicators discovered during the course of the above events or other events which could provide operational information would serve to alert the plant to a potential operational problem with the subject valve and the necessary corrective actions would be taken. The plant

preventive maintenance activities also support the continued operability of the valves.

Question 9

In NRC Inspection Report 50-395/97-01 (dated April 17, 1997), we closed our V. C. Summer GL 89-10 program review based on your actions to verify safety-related MOV design-basis capability. In the inspection report, we noted certain long-term actions that you were taking to address weaknesses in your MOV program. For example, we noted weaknesses in your assumptions for valve factor, load sensitive behavior, and stem friction coefficient in your MOV calculations. Describe the actions taken to resolve these weaknesses, the results of those actions, and any future actions.

Response 9

The Inspector Follow-up Items dealing with weaknesses in our assumptions for valve factors were closed by the NRC in NRC Integrated Inspection Report No. 50-395/98-06, dated August 24, 1998 (after issuance of this RAI). Station procedures are being revised to ensure the stem factor is stable during the seating portion of the dynamic test when determining the LSB values. The margins added to the minimum required thrust calculations remain in place and the LSB values are being monitored/ trended per the station's GL 89-10/96-05 MOV PV program. The margin added to the open direction minimum required thrust calculations remains in place and the stem friction coefficients are being monitored/ trended per the station's GL 89-10/96-05 MOV PV program.