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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. NPF12
RESPONSE TO NOTICE OF DEVIATION
NRC INSPECTION REPORT 93-16 (IE 931601)

Attached is the South Carolina Electric & Gas Company (SCE&G) response to the Notice of Deviation delineated in Nuclear Regulatory Commission Inspection Report No. 50/395/93-16.

In this response, SCE&G would like to clarify its commitment regarding backup protection for electrical penetrations. We will also address the issue of safety significance as it applies to the current regions not covered by the backup protective device.

Should you have any questions, please call at your convenience.

Very truly yours,

John L. Skolds

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Attachment

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RESPONSE TO NOTICE OF DEVIATION
DEVIATION NUMBER 50-395/93-16-01

I. RESTATEMENT OF NRC DEVIATION

For approximately 45 electric penetrations at V. C. Summer Nuclear Station (VCSNS) only one protection (primary) was provided for the full range of possible fault currents and times that would exceed the penetration damage ratings. A second (backup) protection was included which protected against the maximum fault current; however, it did not provide protection in the overload or low level fault region. The approximately 45 penetrations lacking two (dual) full protections include the penetrations for containment loads such as Reactor Building Cooling Units and Pressurizer Heaters.

1. In the FSAR, the licensee indicated that the recommendations included in Regulatory Guide (RG) 1.63, Rev. 1, were satisfied in the VCSNS design. RG 1.63 indicates that the electric penetration assemblies should be designed to withstand, without loss of mechanical integrity, the maximum short-circuit given random failures of circuit overload protective devices. IEEE Std. 308-1971, which the FSAR indicates is also applicable to the VCSNS licensing basis, requires that protective devices shall be provided to isolate failed equipment automatically. Given the above, the protection of containment over-current protective devices should extend over the full range of fault currents and overload currents the devices could be exposed to based on the system configuration. As described in NRC inspection report 395/92-04, NRC inspectors found that this degree of protection was not provided for the subject 45 penetrations at VCSNS.

2. In response to the NRC's FSAR Question 040.72 D, "No single failure shall cause excessive currents in the penetration conductors which shall degrade the penetration seals," the licensee indicated that no single failure would cause excessive currents in the penetration conductors which would degrade the seals. The licensee did not meet the above commitment since the backup breaker will not provide protection for permanent overloads and low-level faults.

3. The licensee indicated in the FSAR, Appendix 3A, that the penetration conductors have short-time overload and short circuit ratings consistent with the characteristics of the backup protective device, assuming the failure of the primary protective device. However, based on the above finding, the NRC concludes that the penetration conductors do not have short-time overload ratings consistent with the characteristics of the backup protective device when the main incoming breaker is used as the backup protective device.

4. In the Safety Evaluation Report the NRC accepted the licensee's approach of using the main incoming (bus) breaker as the backup protective device for electric penetration overcurrent protection, provided it would be coordinated with the primary feeder breakers. Based on the findings stated above, the NRC concludes that the licensee did not provide properly coordinated breakers (primary and backup) for the penetration conductor protection.

II. RESPONSE TO NOTICE OF DEVIATION

In response to the Notice of Deviation, SCE&G will address each item noted above as well as clarify our commitment regarding backup protection for the electrical penetrations. SCE&G will also address the issue of safety significance as it applies to the current regions not covered by the backup protective device.

The concerns outlined in Deviation 93-16-01 are addressed as follows:

1. SCE&G agrees that the protection of our backup overcurrent protective devices does not extend over the full range of high impedance fault currents and overload currents. However, we do not believe that our commitment to Regulatory Guide 1.63 required such protection to be provided.

   VCS commitment regarding backup protection for electrical penetrations is provided in Appendix 3A of the FSAR. RG 1.63, Rev. 1, is identified, with clarification which specifies the details of our commitment.

   RG 1.63 addresses "maximum possible fault current vs. time conditions (which could occur because of single random failures of circuit overload protection devices)..." FSAR Appendix 3A clarifies our position on this RG by stating that "The penetration conductors have short-time overload and short circuit ratings consistent with the characteristics of the backup protective device, assuming the failure of the primary protective device." As a result, short-time overloads and short circuits that could potentially cause damage to the mechanical integrity of the penetration would be interrupted by the backup protective device. The original design method in response to RG 1.63 considered an initiating event to be a high current, short-time fault (short circuit) condition (not a long-time overload). Additional bases for this position are provided in Item 2 below.

   The NRC's Safety Evaluation Report (SER) recognized VCS commitment in Section 8.4.1 which states that "The containment electrical penetration assemblies for the facility are designed to withstand, without loss of mechanical integrity, the maximum available fault current for a period of time

sufficiently long to allow backup circuit protection to operate assuming a failure of the primary protective device."

The NRC's SER also states: "We have reviewed the above information and conclude that we find this acceptable."

VCS commitment has been clearly stated in the FSAR and in the SER and has been accepted by the NRC in both cases.

NOTE: In reading and understanding this issue, it is necessary to be aware of the connotations of the electrical terms. In particular, note that "fault current," "short circuit current," and " short-time overload" have different meanings from "high impedance fault" or "overload." The first terms are associated with conditions of maximum or near maximum) available current, usually from a fault or short circuit condition; whereas "overload current" or the qualified term "high impedance fault" imply a current elevated above normal equipment running level, but much lower than "fault" or "short circuit" levels. It is normal for an electrical overload or high impedance fault to quickly develop into a short circuit or fault current condition, as heat and ionization increases. FSAR Appendix 3A states that backup protection is provided for short-time duration. Short-time duration is defined as "brief, not extended in time."

2. Although the backup breaker will not necessarily actuate in the event of an overload or low-level fault, SCE&G believes that the protection provided by the backup breaker will protect the penetration conductors from any single failure that would cause excessive currents that would in turn cause penetration seal degradation. Permanent overloads and permanent low-level faults are not expected failures for which backup protection is required. Neither are they considered to be faults required to be addressed in single failure analyses. Any "permanent overload" which could be sustained by the load device for an extended period of time would be within the continuous current capabilities of the penetration. Any overload condition more severe than this would develop into a fault due to the degradation of the insulation in the load device. A "permanent low-level fault" would undoubtedly develop into a fault which would actuate the backup breaker prior to any damage to the integrity of the penetration seal.

   Permanent overloads and permanent low-level faults have not been considered as logical design requirements in penetration automatic backup protection. This is evidenced by the commitment clarification discussed in item one above. Technical reasons for this position include the following:

   A. Typical behavior of electrical insulation during failure is to develop into a fault condition. Therefore, a

"permanent low-level fault" is highly unlikely. This condition would quickly develop into a fault (short circuit).

B. Penetration conductors are generally larger and less exposed to potential damage than the field cables. The conductors are more capable of dissipating the I^2t energy generated, making overload damage more likely to occur in field cables where a fault condition would quickly develop. In this case, the backup breaker would actuate prior to the occurrence of damage to the penetration. It should be noted that since the penetration conductors are bare copper, their maximum allowable heat rise is not limited by the damage threshold of insulation, but by the properties of the glass seal.

C. The provided overload protection devices are reliable, are regularly tested to verify function, and have a great margin of safety in their settings. (In fact, research of maintenance testing history indicates that none of these devices has failed in a manner detrimental to this safety function).

3. Short-time overload and short circuit capabilities are consistent with the characteristics of the backup protective device since no damage will occur as a result of a short-time overload or short circuit with the main incoming breaker used as the backup protective device. The penetration is designed to handle short-time overload and short circuit conditions without resulting in damage to the mechanical integrity of the penetration. If a fault condition occurs that would potentially cause damage to the penetration, the backup breaker is designed to actuate and protect the penetration.

   The intent of the subject statement in the FSAR was to further clarify the VCS position. The NRC's SER recognized and similarly stated: ...."the containment electrical penetration assemblies for the facility are designed to withstand, without loss of mechanical integrity, the maximum available fault current for a period of time sufficiently long to allow backup circuit protection to operate assuming a failure of the primary protective device." The design of the electrical penetration circuitry does meet this commitment.

4. SCE&G has reviewed and concluded that the primary and backup devices are properly coordinated. Incoming bus breakers are coordinated with primary feeder breakers as required and have settings which provide the proper range of protection in accordance with the commitment of FSAR/Appendix 3A. The backup breaker protects against short time overload/short circuit conditions. Breaker coordination is designed such that it will preclude damage to the mechanical integrity of the electrical penetration in accordance with our commitment.

III. CONCLUSION

The notice of deviation addresses the topic as "a safety significant deviation from a written commitment." VCSNS does not consider the alleged deviation to be safety significant. The range of protection not encompassed by the backup protection (the overload or low level fault region) does not pose a safety concern due to the fact that the typical behavior of electrical insulation during a failure (low-level fault) is to develop into a fault condition (short circuit) for which the backup breaker is designed to protect against. Devices providing primary and backup penetration protection are appropriately tested, to assure proper function, and historical investigation has found no device that has failed testing in a manner detrimental to penetration protection.

The licensing basis required automatic backup protection of penetrations against short circuit current in Regulatory Guide 1.63, Rev. 1, as clarified in FSAR App. 3A, and as evaluated in the 1981 SER.

Based upon the above, VCSNS respectfully concludes that it is in compliance with its licensing basis with regard to electrical penetration assembly protection and that safety is not significantly affected.