September 6, 2005

Mr. Jeffery Archie
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88
Jenkinsville, South Carolina 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION - RESPONSE TO NRC BULLETIN 2003-01, "POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS (TAC NO. MB9617)

Dear Mr. Archie:

This letter acknowledges receipt of the South Carolina Electric & Gas (SCE&G) response dated August 6, 2003, to Nuclear Regulatory Commission (NRC) Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated June 9, 2003. The NRC issued Bulletin 2003-01 to all pressurized-water reactor (PWR) licensees requesting that they provide a response, within 60 days of the date of Bulletin 2003-01, that contains either the information requested in the following Option 1 or Option 2 stated in Bulletin 2003-01:

Option 1: State that the ECCS [emergency core cooling system] and CSS [containment spray system] recirculation functions have been analyzed with respect to the potentially adverse post-accident debris blockage effects identified in . . . the Discussion section, and are in compliance with all existing applicable regulatory requirements.

Option 2: Describe any interim compensatory measures that have been implemented or that will be implemented to reduce the risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete. If any of the interim compensatory measures listed in the Discussion section will not be implemented, provide a justification. Additionally, for any planned interim measures that will not be in place prior to your response to this bulletin, submit an implementation schedule and provide the basis for concluding that their implementation is not practical until a later date.

SCE&G's letter provided an Option 2 response.

Bulletin 2003-01 discussed six categories of interim compensatory measures (ICMs):

(1) operator training on indications of and responses to sump clogging; (2) procedural modifications if appropriate, that would delay the switchover to containment sump recirculation (e.g., shutting down redundant pumps that are not necessary to provide required flows to cool the containment and reactor core, and operating the CSS intermittently); (3) ensuring that alternative water sources are available to refill the RWST [refueling water storage tank] or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere; (4) more aggressive containment cleaning and increased foreign material controls; (5) ensuring containment drainage paths are unblocked; (6) ensuring sump screens are free of adverse gaps and breaches.

You stated in your bulletin response of August 6, 2003, that you had implemented the following interim compensatory measures:

(1) operators are instructed on switchover from injection to recirculation in EOP [Emergency Operating Procedure]-2.2, step 11 of which specifically directs them to monitor the residual heat removal (RHR) pumps for signs of sump blockage and take appropriate actions to throttle RHR pump flow or, in the event of severe degradation or loss of recirculation flow, enter EOP-2.4 for loss of recirculation - ICM category #1;

(2) training on switchover to emergency sump recirculation and loss of recirculation flow is included in baseline curriculum and schedules for Reactor Operators and Senior Reactor Operators, and taught every 2 years in the Licensed Operator Requalification Program, including simulator scenarios - ICM category #1;

(3) EOP-2.0, Loss of Reactor or Secondary Coolant contains symptom-based steps to either terminate safety injection, cooldown and depressurize the reactor coolant system (RCS) to reduce break flow, or sequentially stop safety injection pumps based on core cooling criteria to reduce RWST outflow, or (in the case of smaller loss-of-coolant accident (LOCA) conditions), cooldown and depressurize the RCS to cold shutdown before the RWST is drained to the switchover level (so that emergency sump recirculation is not required and sump blockage is not an issue) - ICM category #2;

(4) EOP-2.4 provides actions to reduce RWST outflow once it has been determined that a loss of recirculation sump capability exists (while ensuring that adequate core cooling flow and containment heat removal are maintained), and directs operators to refill the RWST in response to a loss of recirculation cooling - ICM category #3;

(5) the V. C. Summer Nuclear Station (Summer) Foreign Material and Debris Control (FME) Program is covered in procedure SAP-363, and associated FME training covers responsibilities, types of foreign materials and operating experience, and reactor building at power entries are controlled under procedure OAP-108.1 - ICM category #4;

(6) operator sump blockage prevention training includes information on the design of RHR and containment spray sumps, and thereby provides the operators with the knowledge to form a basis for reactor building cleaning and closeout/QC walkdown inspections of the FME program - ICM category #4;

(7) by design, floor drains are provided on each of the operating levels inside the reactor building and, should these drains become plugged for any reason, the water is free to flow down stairwells to the lower elevations until finally reaching the reactor building recirculation

sump, and existing mesh gates are outside the bio-shield wall and would not be subject to the results of local debris generation, thus resulting in little potential for debris-induced blockage between compartments - ICM Category #5;

(8) reactor building recirculation sumps are inspected during each refueling outage or every 18 months, checking for structural distress, corrosion, blockage and gaps, and this activity is preceded by prejob briefs on industry operating experience - ICM Category #6.

You also stated in your response that you would be implementing the following plant-specific measures not discussed in Bulletin 2003-01:

(1) during a LOCA, containment spray is considered for termination if safety injection cannot be terminated early in the event (enhanced by the presence of two safety-related reactor building cooling units), thereby decreasing washdown of latent debris and reducing debris transport (noting that Summer largely uses nonfibrous reflective metallic insulation (RMI)) - ICM category 1; and

(2) stainless steel enclosures exist on Kaowool and M-board fire barriers inside the reactor building - ICM category 4.

You further stated in your response that you would be implementing the following interim compensatory measures between the time of your response and the next refueling outage:

(1) an update to Plant Support Engineering Guideline PSEG-08 for Technical Support Center personnel to include response to sump clogging - ICM Category #1;

(2) new walkdowns to confirm the location of fibrous insulation, identify latent debris, and evaluate transport paths - ICM Category #4;

(3) a degraded coatings remediation program to identify and repair degraded and failed coatings inside the reactor building - ICM Category #4;

(4) implementation of a new permanent storage location for scaffolding and lead blankets inside the reactor building outside of the bio-shield wall - ICM Category #4.

Finally, you stated in your response, with justifications, that the following measure would not be implemented: shutting down one train of ECCS and /or reactor building spray early in an event due to apparent adverse risks and apparent violations of Summer licensing commitments, tabling this measure until appropriate industry review had been completed.

In an October 21, 2004, response to a September 9, 2004, NRC request for additional information you elaborated on the purpose and content of a change to PSEG-8 on sump clogging for Technical Support personnel, emphasizing the rationales and conditions for terminating spray flows, and describing the symptoms of sump clogging - ICM Category #1.

You also stated in that response that Summer had completed its evaluation of the Westinghouse Owners Group (WOG) report WCAP-16204, Revision 1, “Evaluation of Potential ERG [Emergency Response Guideline] and EPG [Emergency Procedure Guideline] Changes to Address NRC Bulletin 2003-01 Recommendations (PA-SEE- 0085), Revision 1" and that the Summer conclusion regarding the WOG Candidate Operator Actions (COAs) was that for:

(1) COA A1a, “Secure One Spray Pump Prior to Recirculation,” this COA was “not recommended” for Summer. Concluding that for a large break LOCA there would be little RWST depletion benefit, and that for a medium or small break LOCA (6" diameter or less), although there is potential for extending settling time, there would be little resultant benefit due to extensive use of RMI at Summer, limited amount of fibrous insulation, and no micro-porous insulation, such as calcium silicate, Min-K, etc;

(2) COA A1b, “Secure Both Spray Pumps Prior to Recirculation,” the WOG did not recommend this COA for plants with a Spray Additive Tank as exists at Summer;

(3) COA A2, “Manually Establish One Train of Recirculation Prior to Automatic Actuation,” concluding that this measure is not appropriate for Summer since the plant has limited RWST makeup rate of flow, and therefore the WOG identified advantages for its analysis reference plant would not be applicable to Summer;

(4) COA A3, “Terminate One Train of SI After Recirculation,” the rational for not implementing this COA was the same as for COA A1a above. Concluding that there is a risk-positive consideration related to multiple sump strainers, and a risk-negative consideration of potential interruption of core cooling should the remaining RHR pump have an active or passive failure, resulting in an assessed risk-neutral situation at Summer. In response, Summer is developing a risk-positive procedural alternative of throttling RHR flow when both trains are operating. This would reduce material transport, strainer head loss, and required net-positive suction head. The resultant maximization of strainer surface area will limit the potential for thin bed formation, especially for 6-inch diameter and smaller breaks. Potential over-throttling of RHR pumps would be countered by operator direction to monitor core exit thermocouples, containment pressure and containment temperature - ICM category #1.

During an August 15, 2005, phone call with the NRC staff, Summer staff stated that the flow rate calculation for the COA A3-related modification to EOP-2.2, Cold Leg Recirculation, would be completed by August 31, 2005, and that revision to EOP-2.2 would be completed by October 17, 2005;

(5) COA A4, “Early Termination of One RHR Pump Before Recirculation,” the WOG recommended that this COA not be implemented;

(6) COA A5 “Refill RWST,” Summer will change EOP 2.2 to refill the RWST upon switchover to recirculation - ICM category #3;

(7) COA A6, “Inject More Than One RWST Volume,” the decision to inject more than one volume would be plant- and event-specific (but possible given the postrecirculation RWST refill decision of COA A5 above) - ICM category #3;

(8) OA A7, “Provide More Aggressive Cooldown and Depressurization,” (as stated in your original Bulletin response of August 6, 2003) EOP 1.2 provides actions to cooldown and depressurize the RCS to reduce the break flow, thereby reducing the injection flow necessary to maintain RCS sub-cooling and inventory - ICM category #2;

(9) COA A8, “Provide Guidance on Symptoms and Identification of Sump Clogging,” concluding that this guidance is currently implemented in procedures (EOP 2.2 and EOP 2.4)

and training at Summer, and that as additional improvements to training, procedures, equipment and instrumentation are identified, those items will be evaluated and implemented as appropriate - ICM category #1;

(10) COA A9, "Develop Contingency Plan for Loss of Suction," Summer will develop a new (out of EOP network) plant-specific Sump Blockage Control Room Guideline by October 17, 2005, with training conducted in conjunction with the training for the other major changes to EOP 2.2-ICM category #1;

(11) COA A10, "Early Termination of One Charging Pump Before Recirculation," the WOG provided significant negative rationale in WCAP-16204 and this COA would not be implemented because the rationale applied to Summer; and

(12) COA A11, "Prevent or Delay Containment Spray for Small Break LOCAs (<1.0 Inch Diameter) in Ice Condenser Plants," this COA is not applicable because Summer is not an ice condenser plant.

During an August 15, 2005, phone call with the NRC staff, Summer staff stated that the flow rate calculation for the COA A3-related modification to EOP-2.2, Cold Leg Recirculation, would be completed by August 31, 2005, and that the revision to EOP 2.2 would be completed by October 17, 2005.

The NRC staff has considered your Option 2 response for compensatory measures that were, or were to have been, implemented to reduce the interim risk associated with potentially degraded or nonconforming ECCS and CSS recirculation functions. Based on your response, the NRC staff considers your actions to be responsive to and meet the intent of, Bulletin 2003-01.

Please retain any records of your actions in response to Bulletin 2003-01, as the NRC staff may conduct subsequent inspection activities regarding this issue.

Should you have any questions, please contact me at 301-415-1493 or the lead Project Manager for this issue, Alan Wang at 301-415-1445.

Sincerely,

/RA/

Robert E. Martin, Senior Project Manager, Section 1
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-395

cc: See next page

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(12) COA A11, "Prevent or Delay Containment Spray for Small Break LOCAs (<1.0 Inch Diameter) in Ice Condenser Plants," this COA is not applicable because Summer is not an ice condenser plant.

During an August 15, 2005, phone call with the NRC staff, Summer staff stated that the flow rate calculation for the COA A3-related modification to EOP-2.2, Cold Log Recirculation, would be completed by August 31, 2005, and that revision to EOP 2.2 would be completed by October 17, 2005.

The NRC staff has considered your Option 2 response for compensatory measures that were, or were to have been, implemented to reduce the interim risk associated with potentially degraded or nonconforming ECCS and CSS recirculation functions. Based on your response, the NRC staff considers your actions to be responsive to and meet the intent of, Bulletin 2003-01.

Please retain any records of your actions in response to Bulletin 2003-01, as the NRC staff may conduct subsequent inspection activities regarding this issue.

Should you have any questions, please contact me at 301-415-1493 or the lead Project Manager for this issue, Alan Wang at 301-415-1445.

Sincerely,
/RA/
Robert E. Martin, Senior Project Manager, Section 1
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