

August 29, 2006

MEMORANDUM TO: Evangelos C. Marinos, Branch Chief,
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

FROM: Michael L. Scott, Chief **/RA/**
Safety Issue Resolution Branch
Division of Safety Systems
Office of Nuclear Reactor Regulation

SUBJECT: GENERIC LETTER 2004-02, "POTENTIAL IMPACT OF DEBRIS
BLOCKAGE ON EMERGENCY RECIRCULATION DURING DESIGN
BASIS ACCIDENTS AT PRESSURIZED WATER REACTORS"
EXTENSION REQUEST APPROVAL FOR VOGTLE UNIT NO. 1

The Safety Issue Resolution Branch (SSIB) has reviewed and evaluated the information provided in the Southern Nuclear Operating Company (SNC) letters dated June 22, 2006, and July 28, 2006, requesting an extension to the December 31, 2007, completion due date of Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation Design Basis Accidents at Pressurized Water Reactors," corrective actions for sump clogging issues at Vogtle Unit 1. SSIB has determined that it is acceptable to extend the completion due date for certain Vogtle permanent modifications until the Spring 2008 Vogtle Unit 1 refueling outage. Enclosed to this memorandum are the results of the SSIB evaluation of this matter. Please note the 30 day grace period for the Vogtle Unit 1 Spring 2008 outage commencement at the end of the attachment. If you have any questions, please contact Leon Whitney or Joe Golla. Please include Joe Golla and Leon Whitney on the distribution list.

Docket No: 50-424

Enclosure: As stated

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Vogtle Unit 1 GSI-191/GL 2004-02 Extension Request Approval

In a June 22, 2006, request for extension for completing corrective actions for Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors," Southern Nuclear Operating Company (SNC) provided updated information on its ongoing activities for resolution of the Generic Safety Issue (GSI)-191 containment sump clogging issue. SNC requested an extension beyond December 31, 2007 for completion of certain corrective actions for Vogtle Unit 1.

SNC stated that debris generation and transport calculations are complete, and that contracts are in place for the design, testing, delivery and installation of the new containment emergency sump screens.

SNC stated that Vogtle 1 has an NRC-approved leak-before-break reactor primary coolant loop, resulting in a substantial decrease in expected actual "loss-of-coolant accident (LOCA) zone of influence (ZOI) debris generation" and sump screen loading. [Based on a phone conversation with SNC personnel on August 16, 2006, it was clarified that SNC does not use leak-before-break credit for break selection/debris generation in their GSI-191 analyses, in accordance with Section 4.2.1 of the NRC safety evaluation on the NEI Guidance Report NEI 04-07 "Pressurized Water Reactor Sump Performance Evaluation Methodology" - NRC ADAMS Accession Number ML051460182.]

SNC stated that heavy debris particles are inhibited from reaching the sumps because the floor of containment slopes away from the sumps, and the new sump screens will be mounted approximately six inches above the containment floor.

SNC stated that it is currently assessing the impact of reducing the ZOI for qualified containment coatings, which would result in lower calculated particulate loading at the sump screens.

SNC stated that it had implemented the following Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-water Reactors," compensatory measures, and would keep them in effect until all plant modifications are complete:

- Training on integrated computer indications to ensure adequate Emergency Core Cooling System (ECCS) flow;
- New training materials and simulator scenarios addressing the need for long-term monitoring of the recirculation phase of LOCA recovery: training on sump blockage recognition;
- Training on actions to be taken if a sump blockage event occurs;
- Guidance to reduce depletion of the refueling water storage tank (RWST) and initiate makeup to the RWST from normal and alternative sources during efforts to restore ECCS flowpaths;

ENCLOSURE

- Sump screen and trash rack inspections for cleanliness, damage, corrosion and structural stability upon containment entry;
- Containment exit inspections with logged material accounting procedures, with comparable material controls for emergency entries into containment;
- End-of-outage emergency sump cleanliness and material control procedures to ensure the sumps are free of debris such as trash, rags, tools or protective clothing;
- Post-refueling and heat-up procedures to inspect that reactor cavity drains are properly restored with their blind flanges removed; and
- Inspections to ensure ECCS subsystem inlets are free of debris and show no evidence of abnormal corrosion or structural distress, and that the sump screens are correctly configured and securely bolted in place.

SNC submitted a July 28, 2006, response to a June 30, 2006, NRC teleconference request for amplifying information for the June 22, 2006, SNC GL 2004-02 corrective actions extension request. In the July 28, 2006 letter, SNC provided detailed information on ongoing GL 2004-02 resolution activities, clarification as to which corrective action issues resulted in submission of the extension request, listings of existing and future mitigative features, and an extensive throttle valve/flow orifice risk impact discussion for the requested extension period.

SNC stated that downstream effects evaluations have shown that current Vogtle ECCS pressure breakdown orifice positions leave these devices susceptible to debris plugging from particles which could be passed through the new sump screens. Therefore, SNC stated that it had determined that new ECCS flow orifices are required to be fabricated for shop testing, and that final design flow orifices would subsequently need to be procured for installation and system flow balancing.

SNC stated that three new flow-reducing pressure breakdown orifices (one in the Charging System, and two in the cold leg of the Safety Injection System) might not be ready for installation during the Vogtle Unit 1 Fall 2006 refueling outage, but that they could be ready for installation during the Vogtle Unit 1 Spring 2008 refueling outage. SNC stated that such a schedule would provide sufficient time to incorporate into the final orifice designs any lessons learned from the shop testing. SNC discussed the importance of comprehensively pre-testing ECCS components to avoid operational events, and cited Information Notice (IN) 97-76, "Degraded Throttle Valves in Emergency Core Cooling System Resulting from Cavitation-induced Erosion during a Loss-of-coolant Accident" in connection with this point. IN 97-76 discussed potential problems caused by under-designed ECCS throttle valves.

SNC stated that during the Fall 2006 Vogtle 1 refueling outage it would install new sump screens which would increase the available screen area from approximately 54 square feet to 765 square feet for each residual heat removal (RHR) screen, and from approximately 54 square feet to 590 square feet for each Containment Spray screen. SNC also stated that screen head loss tests have indicated that removal of "Min-K" insulation would substantially reduce the head loss across a debris loaded screen, and that SNC would actively pursue the removal of "Min-K" insulation during the Fall 2006 Vogtle 1 refueling outage. SNC stated that Vogtle chemical effects testing will be completed in Fall 2006. SNC stated that in conducting its

Fall 2006 chemical effects tests it would consider NRC requests for additional information (RAIs) on WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to support GSI-191." SNC stated that it anticipates an approximate 13.5 feet of head loss margin will exist to cope with calculated head losses expected to occur in the Fall 2006 chemical effects testing.

SNC stated that the following favorable conditions exist for Vogtle Unit 1:

- Containment foreign material exclusion (FME) controls (as discussed above) and improved loose debris surveillance in containment;
- Bulletin 2003-01 training and procedural guidance (as discussed above);
- Non-use of calcium silicate insulation in containment [as discussed in IN 2005-26 and IN 2005-26 Supplement 1];
- NRC staff approval of application of the leak-before-break principle for breaks in the reactor coolant loop piping, accumulator piping, and reactor coolant loop bypass piping, reducing expected actual debris generation from LOCA events (as discussed above);
- No credit taken for containment overpressure in the Vogtle Unit 1 net-positive suction head (NPSH) calculations for the containment spray and RHR pumps.

SNC stated that its plans for mitigative measures to be taken during the Fall 2006 refueling outage include:

- Installation of the significantly larger sump screens for each pump suction (as discussed above);
- Removal of "Min-K" insulation from the loss-of-coolant accident (LOCA) zone of influence (ZOI) in containment;
- A reduced screen mesh hole size (as discussed above); and
- Conservative sizing of the replacement strainers based on a 10D (10 pipe diameter) LOCA ZOI, although preliminary test data indicates that the ZOI could be substantially reduced.

SNC provided a detailed description of the various Vogtle 1 ECCS post-LOCA pump lineups. SNC also provided an extensive qualitative throttle valve/flow orifice risk impact discussion for small, medium and large LOCAs. SNC stated that it had concluded, for the multiple reasons stated in the qualitative risk impact discussion, that a few additional months of operation with the existing ECCS throttle valves in place would represent only a very small increase in incremental risk from transported debris plugging of the existing three orifices.

The NRC has confidence that SNC has a plan that will result in the installation of final GSI-191 modifications that provide acceptable strainer function with adequate margin for uncertainties. Further, the NRC has concluded that SNC has or will have put mitigation measures in place to adequately reduce risk for the requested short extension period, and it is therefore acceptable

to extend the completion date for the corrective actions for the issues discussed in Generic Letter 2004-02 (specifically the replacement of three new flow-reducing pressure breakdown orifices - one in the Charging System, and two in the cold leg of the Safety Injection System) until the completion of the Vogtle Unit 1 Spring 2008 refueling outage, currently scheduled to begin in March 2008. Should SNC elect to begin the Vogtle Unit 1 Spring 2008 refueling outage more than 30 days after March 31, 2008, SNC will need to provide the NRC additional justification for further delay in completing corrective actions for GL 2004-02.