

March 2, 2000

Mr. Ralph Beedle  
Senior Vice President and Chief Nuclear Officer  
Nuclear Energy Institute  
1776 I Street, N.W., Suite 400  
Washington, D.C. 20006-3708

Dear Mr. Beedle:

A U.S. nuclear power plant (Callaway) reported an August 12, 1999 occurrence that, although not safety significant due to the actual plant conditions at the time, highlighted potential vulnerabilities of a generic nature that we would like your assistance in addressing. (See enclosed Licensee Event Report.)

The licensee for Callaway reported that with the plant in hot standby following a plant trip, the plant switchyard voltage was observed to decrease below the minimum operability limit established in the station procedures. This low voltage was attributed to the service territory loading that was near peak levels and to the magnitude of power being transported across the grid that had not been previously observed and was far in excess of typical levels. The licensee stated that the deregulated wholesale power market contributes to conditions in which higher grid power flows are likely to occur.

The licensee indicated that two days earlier, before the plant trip, similar grid loading conditions were present, but the low switchyard voltages were not observed at that time since Callaway generation was locally supporting grid voltage. As a result, the true capability of the offsite source could not be verified through direct readings when the unit was in operation.

The low switchyard voltages observed at Callaway did not result in insufficient safety bus voltages due to the electrical bus loading conditions at the time. However, had a larger complement of safety loads been required (such as those credited for mitigating a loss-of-coolant accident), safety bus voltages from the offsite power system may have been less than adequate to power those loads. This would result in actuation of the safety bus degraded voltage protection, separation from offsite power, and restarting of the safety loads onto the onsite diesel generators.

Other licensees have also identified situations in which a plant could be operating in a region that would result in insufficient offsite system voltages to safety equipment following a plant trip associated with a design basis event. The post-trip voltages cannot be directly monitored before the event because they are the result of the plant trip and various automatic switching actions

that take place at the time of the event. These switching actions include the starting of safety loads responding to the event, the transfer of nonsafety loads to the same source (transformer) that is feeding the safety loads, and the separation of the plant generator from the switchyard when it is providing voltage support to the yard. Because the post-trip voltages cannot be read directly before a plant trip, they must be derived from the plant and grid conditions that exist during operation of the plant.

In this regard, NRC Information Notice 95-37, September 7, 1995, addressed the potential that a failure to periodically update a plant's voltage analysis as the result of changing offsite grid or plant conditions could result in unintentional operation outside regulatory requirements. NRC Information Notice 98-07, February 27, 1998, addressed a potential concern relating to electric power industry deregulation that could adversely affect the reliability of the offsite power sources. It reiterated the need to ensure that the design bases with respect to the reliability and stability of the offsite power sources do not degrade during the life of the nuclear facility. We are also currently in the process of issuing an Information Notice and Inspection Report on the issues surrounding the Callaway event.

Our staff found from its work (ORNL/NRC/LTR/98-12, August 1998) on utility industry deregulation that there is significant variation between control areas, and utilities within control areas, regarding the amount of attention paid to this subject. The safety consequences that would result if an event, albeit unlikely, occurred during a period of degraded grid voltage are difficult to assess because most licensees have not analyzed all of their systems for the double-starting and degraded-voltage operation they might undergo in such a scenario. Maintaining adequate offsite power is a requirement of General Design Criterion (GDC) 17 and plant technical specifications.

We would like to better understand the risk implications of electrical system designs under degraded voltage conditions, including information on plant-specific risks of degraded-voltage and double-starting scenarios. Because of the variable nature of this scenario's initiating frequency and effect on safety equipment, a wide range of risk across the population of nuclear plants appears possible. We have found from our work (NUREG/CR-6538, July 1997) on this subject that these scenarios have not been evaluated in the majority of plant-specific probabilistic risk assessments.

We believe that our licensees are in the best position to assess this situation, understand the risks, and decide what, if any, actions need to be taken to assure continued compliance with GDC 17. Therefore, we propose that this subject be addressed as a voluntary industry initiative. Your help on these matters would be appreciated. We would like to schedule a public meeting

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in the near future to discuss this issue and an approach for interaction with the industry. Please contact José A. Calvo of my staff at (301) 415-2774.

Sincerely,

**(/RA by S. J. Collins)**

Samuel J. Collins, Director  
Office of Nuclear Reactor Regulation

Enclosure: Licensee Event Report dated September 13, 1999

cc w/enc: See attached lists

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*(/RA by S. J. Collins)*

Samuel J. Collins, Director  
Office of Nuclear Reactor Regulation

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cc w/enc: See attached lists

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