UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

July 18, 1988

NRC INFORMATION NOTICE: NO. 88-50: EFFECT OF CIRCUIT BREAKER CAPACITANCE ON AVAILABILITY OF EMERGENCY POWER

Addressees:

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose:

This information notice is being provided to alert addressees to the potential for circuit breaker capacitance having an adverse effect on the operation of emergency power sources. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to preclude similar problems from occurring at their facilities. However, suggestions contained in this information notice do not constitute NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances:

As a result of projected increases in generation capacity, Duke Power Company was replacing the power circuit breakers (PCBs) in the 230-kilovolt transmission switchyard at the Oconee station with breakers having a higher interrupting capacity. With an increase in the interrupting capability of the PCBs, a higher capacitance is needed to prevent restrike across the breaker contacts following fault interruption.

The increased capacitance value used across the breaker contacts, when coupled with the electrical impedance characteristics of the Unit 2 startup transformer and its associated switchyard circuits, established a stable induced voltage in the startup transformer circuit. The circuit provided 4000 volts on the secondary of a 230-kilovolt to 4160-volt transformer when the primary and secondary breakers were open. Under these circumstances the unpowered 4160-volt bus would appear to be near rated voltage to the circuitry used to make actual emergency bus transfers during loss-of-power events. The possibility of such a resonance effect was not considered in the modification, and the post modification testing did not exactly duplicate all possible operating conditions of the switchyard.

Discussion:

The Oconee station has three units. Unit 3 was shutdown for steam generator repairs at the time this potential problem was identified. The PCBs for the Unit 2 startup transformer had been replaced with new breakers as part of a

modification to upgrade all the breakers in the switchyard to the larger capacity breakers.

Oconee is unique in that its onsite emergency power generation is provided to the emergency buses from the Keowee hydro plant via an above-ground transmission system that connects to each startup transformer via the 230-kilovolt switchyard and a 13.8-kilovolt underground transmission system with a 13.8/4.16-kilovolt transformer. Therefore, each emergency bus has three power sources; i.e., the main generator via the auxiliary transformer, the switchyard via the startup transformer, and the Keowee station via the underground transmission system. These sources are automatically controlled, primarily by the emergency power switching logic (EPSL), to ensure that emergency power is provided for various accident scenarios. Under normal circumstances a loss of the unit generator will cause a shift of the emergency bus feed to the startup transformer. If there is a loss of voltage sensed on the secondary of the startup transformer the system will shift to the underground source of emergency power.

The licensee was testing these new PCBs as they were installed. This consisted primarily of testing the breaker function and the various relays associated with the control circuits. The licensee did not test to determine if an induced voltage was occurring in the circuit because this was not considered a problem after discussions were held with the manufacturers.

On March 29, the utility identified a leakage voltage and current developing across the capacitors of the newly installed PCBs. The licensee concluded at this time that the resonance condition would not cause an operating problem. On April 26, 1988 after further review of this problem while trying to provide corrective action for this condition, the licensee determined that the induced voltage would be of sufficient magnitude to exceed the pickup setting of the EPSL. If the pickup setting is exceeded, the EPSL system will not automatically select the appropriate power supply for emergency power. The electrical system was immediately placed in a lineup to preclude this problem from affecting the operating units. The capacitors have subsequently been changed to ones with a different capacitance thus eliminating this problem.

No specific action or written response is required by this information notice. If you have any questions about this matter, please contact one of the technical contacts listed below or the Regional Administrator of the appropriate regional office.

Charles E. Rossi, Director
Division of Operational Events Assessment
Office of Nuclear Reactor Regulation

Technical Contacts: Raymond F. Scholl, NRR
(301) 492-1171

Thomas Peebles, Region II
(404) 331-4196

Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
88-49	Marking, Handling, Control, Storage and Destruction of Safeguards Information	7/18/88	All holders of OLs or CPs for nuclear power reactors and all other licensed activities involving a formula quantity of special nuclear material.
88-48	Licensee Report of Defective Refurbished Valves	7/12/88	All holders of OLs or CPs for nuclear power reactors.
88-47	Slower-Than-Expected Rod-Drop Times	7/14/88	All holders of OLs or CPs for PWRs.
88-46	Licensee Report of Defective Refurbished Circuit Breakers	7/8/88	All holders of OLs or CPs for nuclear power reactors.
88-45	Problems In Protective Relay and Circuit Breaker Coordination	7/7/88	All holders of OLs or CPs for nuclear power reactors.
88-44	Mechanical Binding of Spring Release Device in Westinghouse Type DS-416 Circuit Breakers	6/24/88	All holders of OLs or CPs for nuclear power reactors.
88-43	Solenoid Valve Problems	6/23/88	All holders of OLs or CPs for nuclear power reactors.
88-42	Circuit Breaker Failures Due to Loose Charging Spring Motor Mounting Bolts	6/23/88	All holders of OLs or CPs for nuclear power reactors.
88-41	Physical Protection Weaknesses Identified Through Regulatory Effectiveness Reviews (RERs)	6/22/88	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
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The licensee was testing these new PCBs as they were installed. This consisted primarily of testing the breaker function and the various relays associated with the control circuits. The licensee did not test to determine if an induced voltage was occurring in the circuit because this was not considered a problem after discussions were held with the manufacturers.

On March 29, the utility identified a leakage voltage and current developing across the capacitors of the newly installed PCBs. The licensee concluded at this time that the resonance condition would not cause an operating problem. On April 26, 1988 after further review of this problem while trying to provide corrective action for this condition, the licensee determined that the induced voltage would be of sufficient magnitude to exceed the pickup setting of the EPSL. If the pickup setting is exceeded, the EPSL system will not automatically select the appropriate power supply for emergency power. The electrical system was immediately placed in a lineup to preclude this problem from affecting the operating units. The capacitors have subsequently been changed to ones with a different capacitance thus eliminating this problem.

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RScholl:db	TPeebles	PBaranowsky	WLanning		LShao	AThadani
6/29/88	/ /88	6/13/88	6/17/88	5/18/88	6/9/88	6/29/88

C:GCB:NRR*	~~D:DOEA:NRR~~
CHBerlinger	~~CERossi~~
6/29/88	7//2/88

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