UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

November 25, 2002

NRC INFORMATION NOTICE 2002-34: FAILURE OF SAFETY-RELATED CIRCUIT BREAKER EXTERNAL AUXILIARY SWITCHES AT COLUMBIA GENERATING STATION

Addressees

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

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees of failures of circuit breaker external auxiliary switches because of inadequate maintenance of the associated switchgear. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On February 14, 2002, at the Columbia Generating Station, the licensee initiated a required plant shutdown because of a mechanical problem in an emergency diesel generator (EDG) output circuit breaker. Although the breaker was capable of closing and connecting the EDG to its safety bus, its cubicle-mounted auxiliary contacts, called mechanism-operated cell (MOC) switches, failed to change state as designed. The licensee determined that the MOC switch failures associated with this breaker and other breakers of this type resulted in failure of various electrical distribution system control functions, including some non-safety loads not being removed from the EDG bus following an accident signal.

On June 29, 2001, during a refueling outage at the same plant, after breaker replacement, a standby service water pump breaker MOC switch failed to reposition during breaker closure. This failure recurred on November 19, 2001. A MOC switch contact prevented the pump discharge valve from opening after a pump start, rendering the service water system and supported systems, such as EDGs, inoperable.

Discussion

The licensee believes the failure was caused by excessive resistance in the linkage between the breaker and the MOC switches. The licensee had not performed periodic maintenance on this linkage in the breaker cell housing. Over time, dirt and dust accumulated and grease hardened to increase the resistance in the linkage mechanism.

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During the preceding refueling outage, ending in July 2001, the licensee replaced 22 safety-related 4160-volt circuit breakers, exchanging older design Westinghouse Type DHP-350 (air-magnetic) breakers with newer design, Westinghouse-dedicated, Cutler Hammer Type DHP-VR (vacuum replacement) breakers using Sure-Close™ mechanisms to operate the MOC switches.

In the DHP-VR, the Sure-Close™ mechanism operates the MOC switches independently of the breaker's main contacts so that the MOC switches can be operated at a slower speed to avoid excessive kinetic energy and wear. In addition, the external MOC switch linkage drag won't stall the main contacts, even if the linkage is poorly maintained. However, because the design of the Sure-Close™ mechanism intentionally limits the force on the linkage, it does not have sufficient force margin to overcome the excessive drag of poorly maintained MOC switch linkages (for an explanation of Sure-Close™ operation, see "DHP -VR SURE CLOSE Mechanism: A Kinematic System Solution for Medium Voltage Circuit Breaker MOC Auxiliaries Operation," U. S. Patent 5,856,643, Ronald E. Vaill, available from Cutler-Hammer Nuclear Programs).

The Columbia Generating Station experience illustrates that the newer design breakers with the Sure-Close™ mechanisms operating the MOC switches depend more heavily on the state of maintenance of the linkage than do the older design breakers coupled directly to the MOC switches. Older design breakers will eventually cause damage to poorly maintained MOC switches and linkages. In severe cases, poorly maintained MOC switches and linkages could stall the older design breaker main contacts with potentially serious results.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate project manager from the NRC's Office of Nuclear Reactor Regulation (NRR).

/RA/
William D. Beckner, Program Director
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Office of Nuclear Reactor Regulation

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LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
2002-33	Notification of Permanent Injunction Against Neutron Products Incorporated of Dickerson, Maryland	11/21/2002	All teletherapy and radiation processing licensees.
2002-29 (Errata)	Recent Design Problems in Safety Functions of Pneumatic Systems	11/06/2002	All holders of operating licenses or construction permits for nuclear power reactors.
2002-32	Electromigration on Semiconductor Integrated Circuits	10/31/2002	All holders of operating licenses for nuclear power reactors except those who have ceased operations and have certified that fuel has been permanently removed from the reactor vessel.
2002-31	Potentially Defective UF_6 Cylinder Valves (1-inch)	10/31/2002	All licensees authorized to possess and use source material and/or special nuclear material for the heating, emptying, filling, or shipping of uranium hexafluoride (UF_6) in 30- and 48-inch cylinders.
2002-30	Control and Surveillance of Portable Gauges During Field Operations	10/30/2002	All NRC licensees authorized to possess, use, transport, and store portable gauges.
2002-29	Recent Design Problems in Safety Functions of Pneumatic Systems	10/15/2002	All holders of operating licenses or construction permits for nuclear power reactors.
2002-28	Appointment of Radiation Safety Officers and Authorized Users Under 10 CFR Part 35	09/27/2002	All medical licensees.

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OL = Operating License
CP = Construction Permit