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

March 30, 2007

NRC INFORMATION NOTICE 2007-14: LOSS OF OFFSITE POWER AND DUAL-UNIT TRIP AT CATAWBA NUCLEAR GENERATING STATION

ADDRESSEES

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of a loss-of-offsite-power (LOOP) and dual-unit trip event that occurred at the Catawba Nuclear Generating Station (Catawba) due to current transformer (CT) failures and improper switchyard bus differential relay settings. The NRC expects that addressees will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this IN are not NRC requirements; therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

On May 20, 2006, at 2:01 p.m., Catawba, Units 1 and 2 tripped automatically from 100 percent power following a LOOP event. The event began when a fault occurred internal to a CT associated with one of the 230-kV switchyard power circuit breakers (PCBs). [CTs are used in protective circuits to step down the line current to a value suitable for use by protective relays.] Within a fraction of a second, another CT associated with a different switchyard PCB failed. The differential protective relays tripped the appropriate PCBs to clear the faults. However, due to a low trip setting, one of the red bus differential relays inappropriately actuated and tripped additional PCBs. This red bus differential relay should not have actuated because the CT failures occurred outside of its zone of protection. This relay tripped most of the PCBs except those in the middle of the "breaker-and-a-half" switchyard bus arrangement. At this point, only two 230-kV transmission lines remained in service to carry the full power output from Catawba, Units 1 and 2. The PCBs for these transmission lines tripped on overload, separating the units from the grid. The emergency diesel generators (EDGs) on both units started automatically and supplied the required essential loads.

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The licensee at Catawba declared a Notice of Unusual Event (NOUE) due to the loss of alternating current electrical power from all offsite sources for more than 15 minutes. The licensee completed restoring power to the 6.9-kV buses at Unit 2 and then Unit 1 approximately 6.6 hours after the LOOP and restored offsite power to the vital buses several hours later. The licensee secured all four EDGs approximately 11.1 hours after the LOOP and terminated the NOUE shortly thereafter, once it restored offsite power to vital buses on both units.

The licensee's root cause analysis determined that certain switchyard relay tap settings, within the "breaker-and-a-half" switchyard configuration scheme, for the red and yellow buses were set at a value too low to handle the fault currents experienced during this transient. In 1979, prior to the commercial operation of either Catawba unit and establishment of site system engineering, the relay engineering department originally set the switchyard red and yellow bus differential relays using tap settings of 100 volts. This was the appropriate setting for the postulated fault current at the time. In 1981, the relay engineering department revised the differential relay calculations for a new tap setting of 250 volts. The revised calculations reflected the additional postulated fault current, as well as, the addition of transmission lines to the switchyard. However, the revised relay settings were not implemented at the Catawba switchyard. One relay setting card was erroneously marked as having made the change from 100 volts to 250 volts. The relay card was returned to the relay engineering department to update the engineering records. Another relay setting card was left reflecting the 100-volt tap setting and, thus, became the field reference for further maintenance work on the relays.

If the actual relay settings in the switchyard had been set adequately, only certain appropriate PCBs would have opened due to the CT failures, both units would have run back to 48 percent main generator electrical power, a sufficient number of transmission lines would have remained in service for this power level, and a LOOP would not have occurred.

The NRC dispatched an augmented inspection team to review the facts surrounding the event (NRC Inspection Report 05000413/2006-009 and 05000414/2006-009, dated June 29, 2006, Agencywide Documents Access and Management System (ADAMS) Accession Number ML061800329). NRC Inspection Report 05000413/2006-004 and 05000414/2006-004 dated October 26, 2006 (ADAMS Accession No. ML062990345), also discussed the Catawba LOOP event.

DISCUSSION

The Catawba LOOP event occurred as a result of incorrect switchyard protective relay tap settings. Inspection Report 05000413/2006-009 and 05000414/2006-009 concluded there were no requirements or standards that were not met and it was not reasonable for the licensee to have identified the lower-than-desired relay tap setting earlier. Notwithstanding, this event illustrates the importance of determining and implementing the appropriate relay tap settings so that no differential relay operation is obtained for faults outside the zone of protection.

CONTACT

This Information Notice does not contain any information collections and, therefore, is not subject to the requirements of the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). This IN requires no specific action or written response. Please direct any questions about this matter to the technical contacts listed below.

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Note: NRC generic communications may be found on the NRC public Web site, http://www.nrc.gov under Electronic Reading Room/Document Collections.

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