U.S. NUCLEAR REGULATORY COMMISSION

Revision 3
April 1995

REGULATORY GUIDE

OFFICE OF NUCLEAR REGULATORY RESEARCH

REGULATORY GUIDE 1.118
(Draft was issued as DG-1028)

PERIODIC TESTING OF ELECTRIC POWER AND PROTECTION SYSTEMS

A. INTRODUCTION

Section 50.55a, "Codes and Standards," of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," requires in paragraph (h), "Protection Systems," that protection systems meet the requirements set forth in Institute of Electrical and Electronics Engineers Standard 279,[1] "Criteria for Protection Systems for Nuclear Power Generating Stations." Section 4.9 of IEEE Std. 279-1971 requires, in part, that means be provided for checking the operational availability of each protection system input sensor during reactor operation and includes examples of how this can be accomplished. Section 4.10 of IEEE Std. 279-1971 requires, in part, that capability be provided for testing and calibrating protection system equipment other than sensors and indicates when such equipment must be tested during reactor operation.

General Design Criterion 21, "Protection System Reliability and Testability," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 requires, in part, that the protection system be designed to permit its periodic testing during reactor operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred. General Design Criterion 18, "Inspection and Testing of Electric Power Systems," requires, in part, that electric power systems important to safety be designed to permit periodic testing, including periodic testing of the performance of the components of the system and the system as a whole. The testing should be carried out under conditions as close to design as practical and should involve the full operational sequence, including operation of portions of the protection system, as well as the transfer of power among the nuclear power unit, the offsite power system, and the onsite power system. Criterion XI, "Test Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50 requires, in part, that a test program be established to ensure that all testing, including operational testing required to demonstrate that systems and components will perform satisfactorily in service, is identified and performed in accordance with written test procedures.

This regulatory guide describes a method acceptable to the NRC staff for complying with the Commission's regulations with respect to the periodic testing of the electric power and protection systems.

The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

Any information collection activities mentioned in this regulatory guide are contained as requirements in 10 CFR Part 50, which provides the regulatory basis

[1]Copies may be purchased from the Institute of Electrical and Electronics Engineers, 345 East 47th Street, New York, NY 10017.

for this guide. The information collection requirements in 10 CFR Part 50 have been approved by the Office of Management and Budget, Approval No. 3150-0011.

B. DISCUSSION

IEEE Std. 338-1987,[1] "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems," was prepared by Working Group 3.0 of Subcommittee 3, "Operations, Surveillance and Testing," of the IEEE Nuclear Power Engineering Committee and was approved by the IEEE Standards Board on September 10, 1987 (reaffirmed in 1993). The standard provides design and operational criteria for the performance of periodic testing as part of the surveillance program of nuclear power plant safety systems. The periodic testing consists of functional tests and checks, calibration verification, and time response measurements, as required, to verify that the safety system performs to meet its defined safety functions. The system status, associated system documentation, test intervals, and test procedures during operation are also addressed.

C. REGULATORY POSITION

Conformance with the requirements of IEEE Std. 338-1987, "Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems," provides a method acceptable to the NRC staff for satisfying the Commission's regulations with respect to periodic testing of electric power and protection systems if the following exceptions are complied with:

1. The definitions of "safety systems," "safety function," and "safety group" in IEEE Std. 603-1991,[1] "Criteria for Safety Systems for Nuclear Power Generating Stations," are used instead of the definitions in IEEE Std. 338-1987.

2. Both Sections 5(15) and 6.4(5) of IEEE Std. 338-1987 are replaced by the following:

   Procedures for periodic tests shall not require makeshift test connections except as follows:

   (1) Temporary jumper wires may be used with safety systems that are provided with facilities specifically designed for the connection of portable test equipment. These facilities shall be considered part of the safety system and shall meet all the requirements of IEEE Std. 338-1987.

   (2) Removal of fuses or opening a breaker is permitted only if such action causes trip of the associated channel or actuation of the logic of the associated load group.

   (3) Test procedures or administrative controls shall provide for verifying the open circuit or verifying that temporary connections are restored after testing.

3. The description for a logic system functional test, as noted in Section 6.3.5 of IEEE Std. 338-1987, implies that the sensor is included. A logic system functional test is to be a test of all logic components (i.e., all relays and contacts, trip units, solid state logic elements, etc.) of a logic circuit, from as close to the sensor as practicable up to but not including the actuated device, to verify operability.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding the NRC staff's plans for using this guide.

Except in those cases in which an applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described in this guide will be used in the evaluation of submittals in connection with applications for construction permits and operating licenses. It will also be used to evaluate submittals from operating reactor licensees that propose system modifications voluntarily initiated by the licensee if there is a clear nexus between the proposed modifications and this guidance.

VALUE/IMPACT STATEMENT

A draft Value/Impact Statement was published with the draft of this guide when it was published for public comment (Task DG–1028, September 1994). No changes were necessary, so a separate value/impact statement for the final guide has not been prepared. A copy of the draft value/impact statement is available for inspection or copying for a fee in the Commission's Public Document Room at 2120 L Street NW., Washington, DC, under Task DG–1028.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

FIRST CLASS MAIL
POSTAGE AND FEES PAID
USNRC
PERMIT NO. G-67