



January 1974

U.S. ATOMIC ENERGY COMMISSION

# REGULATORY GUIDE

DIRECTORATE OF REGULATORY STANDARDS

## REGULATORY GUIDE 1.73

### QUALIFICATION TESTS OF ELECTRIC VALVE OPERATORS INSTALLED INSIDE THE CONTAINMENT OF NUCLEAR POWER PLANTS

#### A. INTRODUCTION

Section III, "Design Control," of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that, where a test program is used to verify the adequacy of a specific design feature, it include suitable qualification testing of a prototype unit under the most adverse design conditions. This regulatory guide describes a method acceptable to the Regulatory staff for complying with the Commission's regulations with regard to qualification testing of Class I electric valve operators for service within the containment of light-water-cooled and gas-cooled nuclear power plants to assure that the valve operator design will meet its performance requirements. The Advisory Committee on Reactor Safeguards has been consulted concerning this guide and has concurred in the regulatory position.

#### B. DISCUSSION

IEEE Std 382-1972, "IEEE Trial-Use Guide for Type Test<sup>1</sup> of Class I Electric Valve Operators for Nuclear Power Generating Stations," dated April 10, 1973,<sup>2</sup> (also designated ANSI N41.6) was prepared by Subcommittee<sup>2</sup>, Equipment Qualification, of the IEEE Joint Committee on Nuclear Power Standards of the Institute of Electrical and Electronics Engineers, Inc. (IEEE) and subsequently was approved by the IEEE Standards Committee on September 20, 1972. The standard delineates specific procedures for the qualification testing of Class I electric valve operators to

<sup>1</sup>As used in this regulatory guide, the term "qualification test" and the term "type test" as defined in IEEE Std 382-1972 are synonymous.

<sup>2</sup>This regulatory guide applies only to the version of IEEE Std 382-1972 dated April 10, 1973.

demonstrate design adequacy for service within the containment of a nuclear power plant. The procedure provides for testing under conditions simulating (1) those that would be imposed during and after a design basis loss-of-coolant accident and (2) those occurring during normal operating conditions.

The standard specifies procedures for accomplishing accelerated aging of components to simulate the effects of long-term operation under normal operating conditions. These effects include exposure to nuclear radiation, temperature, pressure, humidity, and chemical sprays. The standard also includes procedures for accomplishing accelerated aging due to wear under rated load conditions for the estimated number of operating cycles over a 40-year period or for 500 operating cycles, whichever is larger.

#### C. REGULATORY POSITION

The procedures specified by IEEE Std 382-1972, "IEEE Trial-Use Guide for Type Test of Class I Electric Valve Operators for Nuclear Power Generating Stations,"<sup>3</sup> dated April 10, 1973, for conducting qualification tests of electric valve operators for service inside the containment vessel of water-cooled and gas-cooled nuclear power plants are generally acceptable and provide an adequate basis for complying with the qualification testing requirements of Section III of Appendix B to 10 CFR Part 50 to verify adequacy of design for service under design basis event conditions, subject to the following:

1. To the extent practicable, auxiliary equipment (e.g., limit switches) that is not integral with the valve

<sup>3</sup>Copies may be obtained from the Institute of Electrical and Electronics Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017.

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operator mechanism but will be part of the installed valve operator assembly should be tested in accordance with the subject standard.

2. The test sequence described in Section 4.5.2 of the standard should be used unless the anticipated actual service operating sequence for the valve operator is expected to create a more severe operating condition than described in Section 4.5.2. In such case, the actual service sequence should be used in the test.

3. To assure that the valve operator is tested under an environment of sufficient severity, the magnitude of the environmental conditions (e.g., temperature, pressure, radiation, humidity) that simulate the conditions to which the valve operator is expected to be exposed during and following a design basis accident (Section 4.4, second paragraph) should be based on conservative calculations.

4. The radiological source term for qualification tests in a nuclear radiation environment should be based on the same source term used in Regulatory Guide 1.7 (Safety Guide 7), "Control of Combustible Gas

Concentrations in Containment Following a Loss of Coolant Accident," for BWRs and PWRs. An equivalent source term (i.e., 100% of the noble gases, 50% of the halogens, and 1% of the remaining solids developed from maximum full-power operation of the core) should be used for HTGRs. The containment size should be taken into account in each case. For exposed organic materials, calculations should take into account both beta and gamma radiation.

5. Qualification testing for gas-cooled reactor (HTGR) components should follow the written description in Section 4 of IEEE Std 382-1972 through at least two environmental transients of the temperature profiles depicted in Figures 2 and 3 of IEEE Std 382-1972.

6. Part I, Section 6, "Standard References," of IEEE Std 382-1972, dated April 10, 1972, lists additional applicable IEEE Standards. The specific applicability or acceptability of these referenced standards has been or will be covered separately in other regulatory guides, where appropriate.