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REGULATORY GUIDE DISTRIBUTION LIST (DIVISION 1)

Regulatory Guide 1.137, "Fuel-Oil Systems for Standby Diesel Generators," transmitted herewith, describes a method acceptable to the NRC staff for complying with the Commission's regulations regarding fuel-oil systems for standby diesel generators and assurance of adequate fuel-oil quality.

In addition to the provisions of Section D, "Implementation," of the guide, the NRC intends to implement portions of this guide for all nuclear power plants in the following manner:

1. Regulatory Position C.1 will be evaluated, on a case-by-case basis, for application to all construction permit cases under review whose Safety Evaluation Report has not been issued as of the implementation date shown in the published guide.

2. Regulatory Position C.2 will be evaluated, on a case-by-case basis, for application to all operating reactors, operating license reviews, and construction permit cases under review whose Safety Evaluation Reports are completed as of the implementation date shown in the published guide (including Preliminary Design Authorizations).

3. Regulatory Position C.2 will be applied to all construction permit cases under review whose Safety Evaluation Report has not been issued as of the implementation date shown in the published guide.

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REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 1.137
FUEL-OIL SYSTEMS FOR STANDBY DIESEL GENERATORS

A. INTRODUCTION

General Design Criterion 17, "Electric Power Systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Licensing of Production and Utilization Facilities," requires that an onsite electric power system and an offsite electric power system be provided to permit functioning of structures, systems, and components important to safety. In addition, Criterion 17 contains requirements concerning system capacity, capability, independence, redundancy, availability, testability, and reliability. Appendix B, "Quality Assurance Criteria for Nuclear Power Plants," to 10 CFR Part 50 establishes overall quality assurance requirements for the design, construction, and operation of structures, systems, and components important to safety. This regulatory guide describes a method acceptable to the NRC staff for complying with the Commission's regulations regarding fuel-oil systems for standby diesel generators and assurance of adequate fuel-oil quality.

B. DISCUSSION

Working Group ANS 59.51 of Subcommittee ANS-50, Nuclear Power Plant Systems Engineering, of the American National Standards Committee N18, Nuclear Design Criteria, has prepared a standard that provides design requirements for the fuel-oil systems for standby diesel generators. This standard was approved by the American National Standards Committee N18 and its Secretariat, and it was subsequently approved and designated ANSI N195-1976 by the American National Standards Institute on April 12, 1976.

For proper operation of the standby diesel generators, it is necessary to ensure the proper quality of the fuel oil. Appendix B to ANSI N195-1976 addresses the recommended fuel-oil practices. Although not a mandatory part of the standard, the staff believes Appendix B can serve as an acceptable basis for a program to maintain the quality of fuel oil, as supplemented by Regulatory Position C.2 of this guide.

C. REGULATORY POSITION

1. The requirements for the design of fuel-oil systems for diesel generators that provide standby electrical power for a nuclear power plant that are included in ANSI N195-1976, "Fuel Oil Systems for Standby Diesel Generators,"[1] provide a method acceptable to the NRC staff for complying with the pertinent requirements of General Design Criterion 17 of Appendix A to 10 CFR Part 50, subject to the following:

a. Throughout ANSI N195-1976, other documents required to be included as part of the standard are either identified at the point of reference or described in Section 7.4, "Applicable Codes, Standards, and Regulations," or Section 11, "References," of the standard. The specific acceptability of these listed documents has been or will be addressed separately in other regulatory guides or in Commission regulations, where appropriate.

b. Section 1, "Scope," of ANSI N195-1976 states that the standard provides the design requirements for the fuel-oil system for standby diesel generators and that it sets forth other specific design requirements such as safety class, materials, physical arrangement, and applicable codes and regulations. The standard does not specifically address quality assurance, and

[1] Copies may be obtained from the American Nuclear Society, 555 North Kensington Avenue, La Grange Park, Illinois 60525.

in this regard ANSI N195-1976 should be used in conjunction with Regulatory Guide 1.28, "Quality Assurance Program Requirements (Design and Construction)," which endorses ANSI N45.2-1971, "Quality Assurance Program Requirements for Nuclear Power Plants," for the design, construction, and maintenance of the fuel-oil system.

c. Section 5.4, "Calculation of Fuel Oil Storage Requirements," of the standard sets forth two methods for the calculation of fuel-oil storage requirements. These two methods are (1) calculations based on assuming the diesel generator operates continuously for 7 days at its rate capacity, and (2) calculations based on the time-dependent loads of the diesel generator. For the time-dependent load method, the minimum required capacity should include the capacity to power the engineered safety features. Applications that use the time-dependent load method to calculate fuel-oil storage requirements will be reviewed on a case-by-case basis along with the calculations.

d. Section 7.3, "Physical Arrangement," of ANSI N195-1976 states that "the location of the day tanks of standby diesel generators shall be as required by the diesel-engine manufacturer." In addition to this requirement, the day tanks should be located at an elevation to ensure adequate net positive suction head at the engine fuel pumps at all times.

e. Section 7.3 of ANSI N195-1976 states that the arrangement of the fuel-oil system "shall provide for inservice inspection and testing in accordance with ASME Boiler and Pressure Vessel Code, Section XI, 'Rules for In-Service Inspection of Nuclear Power Plant Components.'"[2] Although Section XI of the ASME Boiler and Pressure Vessel Code does not specify whether its provisions apply to fuel-oil systems, they should be applied for the inservice inspection and testing program for those portions of the fuel-oil systems for standby diesel generators that are designed to Section III, Subsection ND of the Code.

f. Section 7.3 of ANSI N195-1976 states that adequate heating shall be provided for the fuel-oil system. Assurance should be provided that fuel oil can be supplied and ignited at all times under the most severe environmental conditions expected at the facility. This may be accomplished by use of an oil with a "Cloud Point" lower than the 3-hour minimum soak temperature (Ref. 1) expected at the site during the seasonal periods in which the oil is to be used, and/or by maintenance of the onsite fuel oil above the "Cloud Point" temperature.

g. Section 7.5, "Other Requirements," of the standard states that "protection against external and internal corrosion shall be provided" for the fuel-oil system. To amplify this requirement for buried supply tanks not located within a vault and other buried portions of the system, a waterproof protective coating and an impressed current type cathodic protection system should be provided in accordance with NACE Standard RP-01-69 (1972 Revision), "Recommended Practice—Control of External Corrosion on Underground or Submerged Metallic Piping Systems."[3] In addition, the impressed current type cathodic protection system should be designed to prevent the ignition of combustible vapors or fuel oil present in the fuel-oil systems for standby diesel generators.

h. Section 7.5 of the standard includes requirements for fire protection for the diesel-generator fuel-oil system. The requirements of Section 7.5 are not considered a part of this regulatory guide since this subject is addressed separately in more detail in other NRC documents. Thus a commitment to follow this regulatory guide does not imply a commitment to follow the requirements of Section 7.5 concerning fire protection.

2. Appendix B to ANSI N195-1976 should be used as a basis for a program to ensure the initial and continuing quality of fuel oil as supplemented by the following:

a. The oil stored in the fuel-oil supply tank, and the oil to be used for filling and refilling the supply tank, should meet the requirements of ASTM D975-74, "Standard Specification for Diesel Fuel Oils,"[4] or the requirements of the diesel-generator manufacturer, if they are more restrictive, as well as the fuel-oil total insolubles level specified in Appendix B of the standard and the "Cloud Point" requirements given in Regulatory Position C.2.b. Fuel oil contained in the supply tank not meeting these requirements should be replaced in a short period of time (about a week).

b. Prior to adding new fuel oil to the supply tanks, tests for the following properties should be conducted:

(1) Specific or API gravity
(2) Cloud Point
(3) Water and Sediment
(4) 90% Distillation Temperature

The fuel oil should meet the requirements of ASTM D975-74 for the latter two analyses. The "Cloud Point" should be less than or equal to the 3-hour minimum soak temperature, or the minimum temperature at which the fuel oil will be maintained during the period of time that it will be in storage. Analysis of the other properties of the fuel oil listed in ASTM D975-74 should be completed within 2 weeks of the transfer.

c. The periodic sampling procedure for the fuel oil

[2] Copies may be obtained from the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, N.Y. 10017.

[3] Copies may be obtained from the National Association of Corrosion Engineers, 2400 West Loop South, Houston, Texas 77027.

[4] Also designated ANSI Z11.205-1975. Copies may be obtained from the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

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should be in accordance with ASTM D270-1975, "Standard Method of Sampling Petroleum and Petroleum Products."[5]

d. Accumulated condensate should be removed from storage tanks on:

(1) a quarterly basis;

(2) a monthly basis when it is suspected or known that the ground-water table is equal to or higher than the bottom of buried storage tanks; and

(3) one day after the addition of new fuel.

e. Day tanks and integral tanks should be checked for water monthly, as a minimum, and after each operation of the diesel where the period of operation was 1 hour or longer. Any accumulated water should be removed immediately. If it is suspected that water has entered the suction piping from the day or integral tank, the entire fuel-oil system between the day or integral tank and the injectors should be flushed.

f. As a minimum, the fuel oil stored in the supply tanks should be removed, the accumulated sediment removed, and the tanks cleaned in order to perform the ASME Section XI, Article IWD-2000, "Examination Requirements," at the required 10-year intervals. To preclude the introduction of surfactants in the fuel system, this cleaning should be accomplished using sodium hypochlorite solutions or its equivalent rather than soap or detergents.

g. Assuming an unlikely event should occur that would require replenishment of fuel oil without the interruption of operation of the diesel generators, the method of adding additional fuel oil should be such as to minimize the creation of turbulence of the accumulated residual sediment in the bottom of the supply tank since stirring up this sediment during the addition of acceptable new incoming fuel has the potential of causing the overall quality of the fuel oil in the storage tank to become unacceptable.

h. Cathodic protection surveillance should be conducted according to the following procedures:

(1) At intervals not exceeding 12 months, tests should be conducted on each underground cathodic protection system to determine whether the protection is adequate.

(2) The test leads required for cathodic protection should be maintained in such a condition that electrical measurements can be obtained to ensure the system is adequately protected.

(3) At intervals not exceeding 2 months, each of the cathodic protection rectifiers should be inspected.

(4) Records of each inspection and test should be maintained over the life of the facility, to assist in evaluating the extent of degradation of the corrosion protection systems.

D. IMPLEMENTATION

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

Except in those cases in which the applicant proposes an acceptable alternative method for complying with specified portions of the Commission's regulations, the method described herein will be used in the evaluation of submittals for construction permit applications docketed after September 15, 1978, unless this guide is revised as a result of suggestions from the public or additional staff review.

If an applicant wishes to use this regulatory guide in developing submittals for applications docketed on or before September 15, 1978, the pertinent portions of the application will be evaluated on the basis of this guide.

REFERENCE

1. J.P. Doner, "A Predictive Study for Defining Limiting Temperatures and their Application in Petroleum Product Specifications," U.S. Army, Mobility Equipment Research and Development Center, Coating and Chemical Laboratory, Aberdeen Proving Ground, Maryland, CCL Report No. 316.

[5] Also designated ANSI Z11.33-1976. Copies may be obtained from the American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.

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