

## Enclosure 2

Equipment Qualification Branch  
Input for Safety Evaluation Report  
Beaver Valley Power Station, Unit 2

### 3.10 Seismic and Dynamic Qualification of Seismic Category I Mechanical and Electrical Equipment

#### 3.10.1 Seismic and Dynamic Qualification

Our evaluation of the adequacy of the applicant's program for qualification of electrical and mechanical equipment important to safety for seismic and dynamic loads consists of (1) a determination of the acceptability of the procedures used, standards followed, and the completeness of the program in general, and (2) an on-site audit of selected equipment items to develop the basis for the staff judgement on the completeness and adequacy of the implementation of the entire seismic and dynamic qualification program.

The Seismic Qualification Review Team (SQRT) has reviewed the methodology and procedures of the seismic and dynamic qualification program contained in the pertinent FSAR Sections 3.9.2, 3.9.3 and 3.10. The SQRT has concluded that the information provided in the FSAR meets the intent of the staff acceptance criteria as specified in the Standard Review Plan (NUREG-0800) Section 3.10 and provide adequate assurance that such equipment will function properly under all imposed design and service loads including the loadings imposed by the safe shutdown earthquake, postulated accidents, and loss-of-coolant accidents, with the exception of the following:

1. The applicant should identify the in-plant dynamic loads which may be induced during the operation of Beaver Valley 2 plant, and address their effects on the seismic and dynamic qualification of safety related equipment.
2. The applicant should commit to establish a maintenance and surveillance program to maintain equipment in a qualified status throughout the life of the plant.
3. The applicant should commit to establish a central filing system capable of retrieving qualification documentation, in an auditable manner, before the plant operation.
4. The applicant should commit to update the equipment lists and pertinent qualification information contained in the tables in FSAR Sections 3.9 and 3.10.
5. For any BOP equipment, and NSSS equipment not covered under the Westinghouse generic qualification program as approved by the staff and for which single axis and/or single frequency testing methods were used, justification should be provided for the validity of the methodology in light of the current staff licensing criteria as specified in SRP 3.10.

The applicant should submit FSAR amendments to resolve the identified FSAR deficiencies. In addition, the SQRT will follow the applicant's effort closely, and will confirm its implementation during the on-site audit. During the plant site audit the staff will review in detail the applicant's implementation of the qualification program to confirm that all applicable loads and combinations of loads have been defined, operability has been verified through appropriate tests and analyses, assemblies rather than individual components have been verified operable, and that for all safety-related equipment operability can be assured through the plant life. A substantial portion (85%-90%) of the equipment must be qualified, documented in an auditable manner, and installed on-site before an on-site audit by the SQRT can be performed. Whenever the applicant indicates that his work is substantially complete, the SQRT will then conduct an on-site audit shortly thereafter. We shall report the results of our audit and the followup and resolution of our concerns described above in a future supplement to the SER.

### 3.10.2 Pump and Valve Operability Assurance

Our evaluation of the adequacy of the applicant's pump and valve operability assurance program consists of (1) a determination of the acceptability of the procedure used, standards followed, and the completeness of the program in general, and (2) an on-site audit of selected equipment items to develop the basis for the staff judgement on the completeness and adequacy of the implementation of the entire pump and valve operability assurance program. The staff has reviewed the methodology and procedures of the pump and valve operability assurance program contained in the pertinent FSAR Section 3.9.3.2. The staff has concluded that, except for the areas discussed below, the information provided in the FSAR does meet the intent of the staff acceptance criteria as specified in the Standard Review Plan (NUREG-0800) Section 3.10 which requires applicant's qualification program to meet the requirements and recommendations of IEEE 323-1974, the regulatory positions of regulatory guide 1.148 and the draft standards ANSI/ASME N551.1, N551.2, N551.2, N551.4, and ANSI B.16.41 and N41.6 and provide adequate assurance that such equipment will function properly under all imposed design and service loads including the loadings imposed by the safe shutdown earthquake, postulated accidents, and loss-of-coolant accidents.

#### Areas Which Need Further Clarification or Resolution

1. There should be a list of equipment types which clearly shows the methods used for qualification. This list should also address which standards are met, in particular those cited in SRP 3.10.
2. Clarification of how aging was incorporated in the qualification process should be contained in the FSAR. In addition, the applicant should commit to establish a maintenance and surveillance program to maintain equipment in a qualified status throughout the life of the plant. The criteria for the maintenance and surveillance program should be contained in the FSAR.
3. SRP 3.10, Paragraph II.1.a(2) indicates that equipment should be tested in the operational condition, that is, normal plant loadings should be superimposed on seismic and dynamic loads, including thermal, flow induced loads and degraded flow conditions. The FSAR should clearly indicate how this requirement is met. In addition, the FSAR should clearly show the loads and conditions considered in the qualification of safety related pumps and valves.

4. The extent to which draft standards ANSI/ASME QNPE-1 (N551.1), QNPE-2 (N551.2) QNPE-3 (N551.3), QNPE-4 (N555.4) and N41.6 and issued standard ANSI/ASME B.16.41 are used needs to be clearly stated in the FSAR. In addition, the applicant's position with respect to Regulatory Guide 1.148 must also be indicated in the FSAR and the extent to which the applicant follows the requirements and recommendations of IEEE 344-1975.
5. The FSAR should show the extent to which operational testing is being used to meet the requirements of SRP Section 3.10. The extent to which operational testing is performed at full flow and temperature conditions should be shown.

The applicant should submit FSAR Amendments to resolve the identified FSAR deficiencies. In addition, the Pump and Valve Operability Review Team (PVORT) which consists of the staff from the Equipment Qualification Branch (EQB) and consultants from Idaho National Engineering Laboratory (INEL) will follow the applicants effort closely, and will confirm its implementation during the on-site audit. During the plant site audit the staff will review in detail the applicant's implementation of the qualification program to confirm that all applicable loads and combinations of loads have been defined, operability has been verified through appropriate tests and analyses, assemblies rather than individual components have been verified operable, and that for all safety-related equipment operability can be assured through the plant life. A substantial portion (85%-90%) of the equipment must be qualified, documented in an auditable manner, and installed on-site before an on-site audit by the PVORT can be performed. Whenever the applicant indicates that his work is substantially complete, the PVORT will then conduct an on-site audit shortly thereafter. We shall report the results of our audit and the followup and resolution of our concerns described above in a future supplement to our SER.

### 3.11 Environmental Qualification of Electric Equipment Important to Safety and Safety-Related Mechanical Equipment

#### 3.11.1 Introduction

Equipment that is used to perform a necessary safety function must be demonstrated to be capable of maintaining functional operability under all service conditions postulated to occur during its installed life for the time it is required to operate. This requirement, which is embodied in GDC 1 and 4 and in Sections III, XI, and XVII of Appendix B to 10 CFR 50, is applicable to equipment located inside as well as outside containment. More detailed requirements and guidance relating to the methods and procedures for demonstrating this capability for electrical equipment have been set forth in 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," and NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment." NUREG-0588 supplements IEEE Standard 323 and various NRC Regulatory Guides and industry standards.

#### 3.11.2 Background

NUREG-0588 was issued in December 1979 to promote a more orderly and systematic implementation of electrical equipment qualification programs by industry and to provide guidance to the NRC staff for use in ongoing licensing reviews. The positions contained in this document provide guidance on (1) how to establish environmental service conditions, (2) how to select methods that are considered appropriate for qualifying equipment in different areas of the plant, and (3) other factors such as margin, aging, and documentation. In February 1980, the NRC requested certain near term operating license (OL) applicants to review and evaluate the environmental qualification documentation for each item of safety-related electric equipment which could be exposed to a harsh environment and to identify the degree to which their qualification program complies with the staff positions described in NUREG-0588.

IE Bulletin 79-01B, "Environmental Qualification of Class IE Equipment," issued January 14, 1980, and its supplements dated February 29, September 30, and October 14, 1980, established environmental qualification requirements for operating reactors. This bulletin and its supplements were provided to OL applicants for consideration in their reviews.

A final rule on environmental qualification of electric equipment important to safety for nuclear power plants became effective on February 22, 1983. This rule, Section 50.49 of 10 CFR 50, specifies the requirements to be met for demonstrating the environmental qualification of electrical equipment important to safety located in a harsh environment. In accordance with this rule, equipment for Beaver Valley Unit 2 may be qualified to the criteria specified in Category II of NUREG-0588.

The qualification requirements for mechanical equipment are principally contained in Appendices A and B of 10 CFR 50. The qualification methods defined in NUREG-0588 can also be applied to mechanical equipment.

The applicant has provided some equipment qualification information in Section 3.11 of the FSAR.

### 3.11.3 Completeness of the Environmental Qualification Program

The staff has reviewed the information submitted by the applicant in Section 3.11 of the Beaver Valley Unit 2 FSAR. However, prior to the completion of our review of your license application, it is necessary that we establish that you comply with the Commission's requirements applicable to environmental qualification contained in 10 CFR 50.49 for electrical equipment important to safety; GDC 4, Appendix A, 10 CFR 50; and Appendix B, 10 CFR 50, Sections III, XI, XVII.

As a result of the issuance of Section 50.49 of 10 CFR Part 50, some of the information requested in SRP 3.11 and R.G. 1.70, Section 3.11, is no longer required for staff review. Other new information is required, however, and is defined in this guidance. By utilizing these guidelines to demonstrate compliance with the Commission's regulations, applicants can significantly reduce the need for requests for additional information from the NRC staff. The information required may be submitted in Section 3.11 of the FSAR or in a separate submittal. If the latter approach is chosen, Section 3.11 should reference the information in the environmental qualification program submittal. The following guidelines summarize the information to be furnished to the staff:

- a. The applicable criteria should be identified and shown to have been incorporated into the environmental qualification program.
- b. The systems and components selected for harsh environment qualification should be identified and demonstrated to be complete. Correlation with Table 3.2.1 of the FSAR should be provided for identification of safety-related equipment. Safety-related equipment exempted from harsh environment qualification requirements should be justified.

The scope of safety-related electrical equipment that should be identified is defined in 50.49 (b) (1).

To demonstrate compliance with 50.49 (b) (2) concerning nonsafety-related electrical equipment whose failure could prevent the satisfactory accomplishment of safety functions, and 50.49 (b) (3), post-accident monitoring equipment, the following information should be provided:

- (1) a list of all nonsafety-related electrical equipment, located in a harsh environment, whose failure under postulated environmental conditions could prevent the satisfactory accomplishment of safety functions by the safety-related equipment. A description of the method used to identify this equipment must also be included. The nonsafety-related equipment identified must be included in the environmental qualification program.
  - (2) a list of all post-accident monitoring equipment currently installed, or that will be installed before plant operation, that is specified as Category 1 and 2 in Revision 2 of R. G. 1.97 and is located in a harsh environment. The equipment identified must be included in the environmental qualification program. In addition, any TMI Action Plan equipment previously committed to installation prior to fuel load should be identified and qualified in accordance with the applicable criteria.
- c. The normal, abnormal, and accident environments should be provided for each plant zone. References should be made to other FSAR sections, where appropriate, for methodologies used to determine accident environments. The requirement for calculation of the radiation doses to equipment in close proximity to recirculating fluid systems inside and outside containment for LOCA events in which the primary system does not depressurize should be incorporated into the program (II.B.2 of TMI Action Plan, NUREG-0737). The time dependent environments should be defined for accident conditions.
- d. The qualification methodology should be summarized by reference to appropriate criteria (Reg. Guides, industry standards, etc.) and should address the following areas:
- (1) Margin
  - (2) Aging
  - (3) Dose rate and synergistic effects

- (4) Use of analysis for qualification
  - (5) The maintenance/surveillance program, in particular its conformance with R.G. 1.33 and the industry standard it endorses, and its use in the aging program for equipment qualification.
- e. All equipment located in a harsh environment should be identified by its tag number, and its location and operability time provided. Mild environment equipment need not be included in this list. For electrical equipment, the information requested in Appendix E of NUREG-0588, and SRP 3.11 concerning test results should be submitted. An acceptable format for this information was provided with IE Bulletin 79-01B in the form of "SCEW sheets." Other formats providing the same information may be submitted however.

The information requested in item 4 of Appendix E, NUREG-0588 need not be submitted but should be available for audit by the staff.

- f. For mechanical equipment, the staff review will concentrate on materials which are sensitive to environmental effects, for example, seals, gaskets, lubricants, fluids for hydraulic systems, diaphragms, etc. A review and evaluation should be performed by the applicant that includes the following:
- (1) Identification of safety-related mechanical equipment located in harsh environment areas, included required operating time.
  - (2) Identification of non-metallic subcomponents of this equipment.
  - (3) Identification of the environmental conditions this equipment must be qualified for. The environments defined in the electrical equipment program are also applicable to mechanical equipment.
  - (4) Identification of non-metallic material capabilities.
  - (5) Evaluation of environmental effects.

The list of equipment identified should be submitted. From this list the staff will select approximately three items of mechanical equipment for which documentation of their environmental qualification should be provided for review. Also, the results of the review should be provided for all mechanical equipment in harsh environment areas and corrective actions identified. Justification for interim operation must be submitted prior to fuel load for any mechanical equipment whose qualification cannot be established.



Upon receipt of the above information, we will review your environmental qualification program for compliance with 10 CFR 50.49, and Appendix B, 10 CFR 50, and request any additional information needed to establish its acceptability. We will then perform an audit review of your electrical equipment environmental qualification files and associated installed equipment. Following this audit, an SER supplement will be prepared documenting the results of our review and evaluation. Prior to granting of an operating license, we must be able to conclude that you are in compliance with 10 CFR 50.49 and Appendix B, 10 CFR 50.