Frequently Asked Questions Regarding Environmental Qualification of Electric Equipment

Q1. What is the proper application of Arrhenius equations to extend the life of an EQ component beyond their original 40-year qualification or qualified life?

Response: The proper application of Arrhenius equations to extend the life of an EQ component beyond its original 40-year qualification or qualified life is by utilizing excess conservatism incorporated in the original qualification bases. (Generally conservatism existed in the initial assumption of the actual operating temperature.) For example, the reanalysis could replace the assumed ambient temperature in the original Arrhenius equation that was used to derive the qualified life. If the component was actually operating in a lower ambient temperature, the reanalysis could justify increasing the qualified life. (The converse is true for higher actual ambient temperatures.)

Discussion:

The NRC endorsed the Arrhenius equation for pre-conditioning equipment for operational aging (i.e., for bringing the equipment to the "end of life" condition) before subjecting it to loss of coolant accident (LOCA), or main steam line break (MSLB) or high energy line break (HELB) profiles to establish the qualified life of electric equipment in a harsh environment. This is the method used for establishing EQ in accordance with NRC guidance. It should be recognized that the Arrhenius equation is valid only if the data represents a single discreet chemical reaction and the activation energy of that single reaction is within the temperature limits of the data.

While the agency position with regard to the Arrhenius methodology did not discuss in full detail the application of that methodology, the Agency had expressed staffs' expectations in NUREG-0588. Specifically, Section 4, paragraphs 6, 9, and 10 stated the following:

> (6) The aging acceleration rate used during qualification testing and the basis upon which the rate was established should be described and justified.
> (9) The qualified life of the equipment (and/or component as applicable) and the basis for its selection should be defined.
> (10) Qualified life should be established on the basis of the severity of the testing performed, the conservatisms employed in the extrapolation of data, the operating history, and in other methods that may be reasonably assumed, coupled with good engineering judgment.

To extend the life of an EQ component beyond its original 40-year qualification, concerning EQ component reanalysis attributes, Section X.E1 "Environmental Qualification (EQ) of Electric Components" of NUREG-1801, Rev. 2 states

> The reanalysis of an aging evaluation is normally performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of an EQ program. While a component life limiting condition may be due to thermal, radiation, or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component

(de-energized versus energized). The reanalysis of an aging evaluation is documented according to the station's quality assurance program requirements, which requires the verification of assumptions and conclusions.

Regulatory Guide 1.89 (RG) “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants,” Rev. 1, July 1984, describes a method acceptable to the NRC Staff for complying with 10 CFR 50.49 with regard to qualification of electric equipment important to safety for service in nuclear power plants to ensure that the equipment can perform its safety function during and after a design basis accident. Per RG 1.89, section C.5.c. “Section 6.3.3, [‘] Aging, [‘] of IEEE Std 323-1974 and paragraph 50.49(e)(5) should be supplemented with the following: ... c. The aging acceleration rate and activation energies used during qualification testing and the basis upon which the rate and activation energy were established should be defined, justified, and documented.” Reanalysis of an aging evaluation to extend the qualification of a component is performed in accordance with the requirements pursuant to 10 CFR 50.49(e).

Also, see response to Q3 below.

References used: DOR guidelines, NUREG-0588, Rev. 1; IEEE 323-1974, Regulatory Guide 1.89; RIS 2003-009, NUREG 1800-Section 4.4, and Section X.E1 “Environmental Qualification (EQ) of Electric Components” of NUREG-1801, Rev. 2.(GALL Report)

Q2. Do vendors and licensees need to validate the activation energy (lower activation energy results in reduced longevity of an EQ component) of replacement EQ parts qualified through the licensee’s commercial grade dedication process?

Response: The vendors and licensees need to justify the activation energy of replacement EQ parts qualified through the licensee’s commercial grade dedication process. As part of the inspection procedure, it’s the NRC staff’s responsibility to verify that licensees have defined, justified, and documented activation energies they have used. The inspectors should verify the licensee’s justification of any changes to material activation energy values as part of a reanalysis. Licensees may rely on industry consensus standards and quality databases to obtain a new activation energy value for a specific material; however, the selected value must be supported by auditable background information that indicates the organization responsible for its creation and how the activation energy was developed (i.e., methodology and results from testing). The licensee’s justification should include a similarity analysis that shows that the selected activation energy is suitable and/or applicable to replace the existing value (e.g., material equivalency or similarity, similar failure parameter or degradation mechanism as demonstrated by test, similar temperature range supported by test data). Additionally, the selected data should be used in the same ranges, as can be demonstrated by test, to ensure the data continue to represent a single discreet chemical reaction. If similarity can be shown and the selected data exhibits a good fit to the Arrhenius relationship, then the licensee has demonstrated a reasonable technical basis to use the revised value. However, if NRC has previously approved as part of the plant’s licensing basis a specific methodology or values for EQ and staff is now finding it insufficient, the staff would not use the inspection process but would enter a site-specific backfit process.

Refer to IEEE 323-1974 for additional information.

Discussion:

Equipment qualification is governed by 10 CFR Part 50, Appendix B and the regulation for environmental qualification of electrical equipment important to safety is 10 CFR 50.49. The purpose of the commercial grade dedication acceptance process is to provide reasonable assurance that the commercial item intended to be used as a basic component will perform its intended safety function for safety-related applications. It is important to note that commercial grade dedication might not be the same as environmental qualification. A commercial grade item can be deemed equivalent to an Appendix B item provided that the critical characteristics are identified and verified by tests, inspection, or analyses. 10 CFR 50, Appendix B, Criterion III, “Design Control,” requires that licensees verify or check the adequacy of the design. Commercial grade items could be environmentally qualified, provided that there is a documented and acceptable material verification to ensure the replacement items are identical to those originally qualified items and the original qualification tests and analysis remain valid. Qualification should be established based on qualification methods specified in 10 CFR 50.49(f) (e.g. environmental qualification via analysis with partial type test data or similarity to gain confidence that the component can perform its function in the required harsh environment). 10 CFR 50.49 requires each holder of, or applicant for, an operating license holder to establish a program for qualifying electric equipment specified in 10 CFR 50.49(b). Per 10 CFR 50.49(f), each item of electrical equipment important to safety must be qualified by testing, analyses and/or experience, as applicable. 10 CFR 50.49(k) Applicants for and holders of operating licenses are not required to requalify electric equipment important to safety in accordance with the provisions of this section if the Commission has previously required qualification of that equipment in accordance with "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," November 1979 (DOR Guidelines), or NUREG-0588 (For Comment version), "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment.". Further guidance was provided in Regulatory Guide 1.89, Rev 1, issued in June 1984. Per RG 1.89, section C.5. “Section 6.3.3, [‘] Aging, [‘] of IEEE Std 323-1974 and paragraph 50.49(e) (5) should be supplemented with the following: Section 4(c) which states:

> The aging acceleration rate and activation energies used during qualification testing and the basis upon which the rate and activation energy were established should be defined, justified, and documented.

RG 1.89 states that activation energies should be defined, justified, and documented by the licensee. See RIS-02-11 for an example that discusses requalification of Okonite control cable for 40-years and 60-years for additional information. In addition, in response to Comment No. 91 in NUREG-0588 Rev. 1, the staff stated “It is incumbent on the applicant to have the necessary documentation to justify the adequacy of using data from similar or equivalent equipment.” The inspection process verifies if there is adequate supporting data to establish qualification. This adequacy needs to be examined because these EQ components are critical to accident mitigation and are non-serviceable after the beginning of a design basis accident.

Q3. Do licensees need to upgrade the qualification requirements for components initially licensed under DOR Guidelines, which are regulatory requirements much less stringent than the 10 CFR 50.49 regulation, as they transition into the extended period of operation?

Response: No. Licensees do not automatically have to upgrade the qualification requirements for components initially licensed under DOR Guidelines, which are regulatory requirements that provide reasonable assurance that the components will perform their safety function as they transition into the extended period of operation.

Discussion:

Per 10 CFR 54.21(c), each application for a renewed operating license must contain an evaluation of time-limited aging analyses (TLAA) as defined in 10 CFR 54.3 (stating in part that TLAA are those licensee calculations and analyses that consider the effects of aging, involve time-limited assumptions defined by the current operating term (e.g., 40 years)). Per 10 CFR 50.21(c)(1), the applicant shall demonstrate that (i) the analyses remain valid for the period of extended operation; (ii) the analyses have been projected to the end of the period of extended operation; or (iii) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. Section VI B of NUREG-1801, Rev. 2, address equipment subject to 10 CFR 50.49 EQ requirements. As noted on page VI B-2, EQ is a TLAA to be evaluated for the period of extended operation, and Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," provides acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). Where the application uses 50.21(c)(1)(iii), Chapter X.E1, "Environmental Qualification (EQ) of Electric Components," of NUREG-1801, Rev. 2, provides an acceptable method for meeting the requirements of 10 CFR 54.21(c)(1)(iii). Meeting 54.21(c)(1)(i)-(iii) is the licensee's burden, but the licensee can select which method(s) to use. The licensee would have to examine each analysis made under the DOR Guidelines and whether to meet 54.21(c)(1)(i), (ii), or (iii). A licensee could state in its application that an existing analysis under the DOR Guidelines meets 54.21(c)(1)(i) because the analyses remain valid for the period of extended operation. The statement would be subject to review by the staff as part of the review of the license renewal application, and associated records would be subject to inspection after the licensing action was complete.

In addition to the above, 10 CFR 50.49(k) states: "Applicants for and holders of operating licenses are not required to requalify electric equipment important to safety in accordance with the provisions of this section if the Commission has previously required qualification of that equipment in accordance with 'Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors,' November 1979 (DOR Guidelines), or NUREG-0588 (For Comment version), 'Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment.'" However, if a licensee replaces an EQ component in its facility that was qualified in accordance with the DOR Guidelines or NUREG-0588 Category II, then the EQ of the new component should be upgraded to meet the NUREG-0588 Category I requirements unless the licensee demonstrates a sound reason to the contrary in accordance with 10 CFR 50.49 (l). 10 CFR 50.49(l) states "Replacement equipment must be qualified in accordance with the provisions of this section unless there are sound reasons to the contrary."

See Regulatory Guide 1.89, Revision 1, Regulatory Position 6 for additional guidance regarding sound reasons for the use of replacement equipment.

Q4. How do we ensure that the activation energies supplied by Appendix B vendors are accurate and applicable to the specific component material composition and service conditions experienced during normal (service) conditions?

Response: In order to ensure continued accident mitigation capability of electric equipment located in harsh environment, the NRC inspection on a sampling basis should ensure that licensees have defined, justified, and documented the activation energies they have selected. See the response to Q2 for additional details.

Discussion:

As stated in response to Q1 above, the NRC endorsed the Arrhenius equation for pre-conditioning the equipment for operational aging (i.e., for bringing the equipment to the "end of life" condition) before subjecting it to LOCA, MSLB, or HELB profiles to establish qualified life of electric equipment in a harsh environment. In NUREG-0588, in response to comment No. 86 from the public concerning endorsement of the Arrhenius methodology, the NRC staff stated that for cases where equipment is composed of different material components having different activation energies, and testing each component separately is not practical, the testing of the equipment should be conducted using the most limiting (lowest) activation energy of the components for conservatism. The activation energy values are derived from different tests by vendors and that forms the bases for accelerated operational aging. Any reanalysis that involves a change in activation energy value should have supporting bases. The range of actual test values available for materials provide a reference to assess the appropriateness of the value used for establishing qualified life. Inspectors should verify that licensees utilized the activation energy for the most limiting material (sub-component) in the EQ equipment that is being qualified. RG 1.89 regulatory position 5.c states "the aging acceleration rate and activation energies used during qualification testing and the basis upon which the rate and activation energy were established should be defined, justified, and documented." In addition, NUREG-0588 regarding aging (page 16) states that "Other aging methods that can be supported by type tests will be evaluated on a case-by-case basis."

In summary, inspectors should verify that the licensee has defined, justified, and documented the activation energy used in establishing qualified life of the equipment. However, if NRC has previously approved a specific methodology or values for EQ and is part of the plant's licensing basis and staff is now finding it insufficient, the staff would not use the inspection process but would enter a site-specific backfit process.

Also, see response to Q8 and Q9.

Q5. Do licensees have to adhere to the same standard that was used by the original qualifying body (laboratory, etc.) for EQ components that the licensee has replaced or will be replacing?

Response: No. The licensees do not have to adhere to the same standards if they are not part of the plant-specific EQ licensing basis.

Discussion:

10 CFR 50.49(k) recognized that the Commission had previously required qualification of that equipment in accordance with "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," November 1979 (DOR Guidelines),

or NUREG-0588 (For Comment version), "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," and 10 CFR 50.49(k) states that requalification under 10 CFR 50.49 is not required in those circumstances. However, per 10 CFR 50.49(l), replacement equipment must be qualified to 10 CFR 50.49 requirements unless there are sound reasons to the contrary.

Q6. Should inspectors apply NUREG-0588 CAT II requirements to EQ components licensed under DOR Guidelines?

Response: Yes, but only for aging as specified in 10 CFR 50.49 (e)(5). The inspectors use NUREG-0588 CAT II requirements where the DOR Guidelines do not provide sufficient detail but NUREG-0588 Category II does.

Discussion:

As used in NUREG-0588, Rev. 1, Category I positions apply to equipment qualified in compliance with IEEE Std. 323-1974 "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations" and Category II positions apply to equipment qualified in compliance with IEEE Std. 323-1971 “IEEE Std. 323-1971, "IEEE Trial Use Standard: General Guide for Qualifying Class 1E Equipment for Nuclear Power Generating Stations."

10 CFR 50.49(k) states that

> Applicants for and holders of operating licenses are not required to requalify electric equipment important to safety in accordance with the provisions of this section if the Commission has previously required qualification of that equipment in accordance with "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," November 1979 (DOR Guidelines), or NUREG-0588 (For Comment version), "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment."

Furthermore, the Commission’s memorandum and order (CLI 80-21) discusses criteria for environmental qualification of safety-related equipment and states, in part, that “the Commission endorses the staff's actions to use the DOR Guidelines to review operating plants and NUREG-0588 to review plants under licensing review as well as those pieces of equipment in operating plants which do not meet the DOR Guidelines.”

NUREG-0588 provides additional clarification that only the aging aspects can be applied to plants licensed under the DOR guidelines. Inspectors should only apply NUREG-0588 CAT II requirements (4) and (2) for aging requirements for EQ components licensed under the DOR Guidelines. Specifically, NUREG-0588 (pages ix and x) states, “All reactors with Operating Licenses as of May 23, 1980 will be evaluated by the staff against the DOR guidelines (Division of Operating Reactors – ‘Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors,’ dated November 13, 1979). In cases where the DOR guidelines do not provide sufficient detail but NUREG-0588 Category II does, NUREG-0588 will be used.”

The NRC further clarified this position in Generic Letter (GL) No. 82-09 dated April 20, 1982. In GL 82-09, the NRC noted that the acceptable method for addressing in-service degradation is through a preventive maintenance/surveillance program with equipment and

component refurbishment and/or replacement based on known susceptibility to aging degradation, the results of inspections, or manufacturer's recommendations.

Q7. Do licensees have to apply the methodology described in IEEE standards used to qualify EQ components during their initial licensing period for extending the qualified life of EQ components past 40 years?

Response: It depends on the licensing basis and on the licensee's license renewal application. For example, if the FSAR refers to certain IEEE standards to comply with 10 CFR 50.49 requirements, then the answer would probably be "Yes." However, Per 10 CFR 54.21(c), each application for a renewed operating license must contain an evaluation of TLAA as defined in 10 CFR 54.3 (stating in part that TLAA are those licensee calculations and analyses that consider the effects of aging, involve time-limited assumptions defined by the current operating term (e.g., 40 years)). Per 10 CFR 50.21(c)(1), the applicant shall demonstrate that (i) the analyses remain valid for the period of extended operation; (ii) the analyses have been projected to the end of the period of extended operation; or (iii) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. Section VI B of NUREG-1801, Rev. 2, address equipment subject to 10 CFR 50.49 EQ requirements. As noted on page VI B-2, EQ is a TLAA to be evaluated for the period of extended operation, and Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," provides acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). Where the application uses 50.21(c)(1)(iii), Chapter X.E1, "Environmental Qualification (EQ) of Electric Components," of NUREG-1801, Rev. 2, provides an acceptable method for meeting the requirements of 10 CFR 54.21(c)(1)(iii). Meeting 54.21(c)(1)(i)-(iii) is the licensee's burden, but the licensee can select which method(s) to use. The licensee would have to examine each analysis and decide whether to meet 54.21(c)(1)(i), (ii), or (iii). The application would be subject to review by the staff as part of the review of the license renewal application, and associated records would be subject to inspection after the licensing action was complete

Also, see response to Q8 below.

Q8. Qualification test reports have shown various levels of rigor in establishing activation energies. The results of incorrect activation energies can have significant impacts on qualified life. What is the acceptable level of decision making involved in determining the correct activation energy?

Response: Staff agrees that the selection of incorrect activation energies can have significant impacts on qualified life calculations. See response to Q2 for additional information regarding acceptable level of decision making involved in determining the correct activation energy. Also, see the following discussion.

Discussion:

The objective of this EQ inspection is for inspectors to verify that electric equipment important-to-safety and located in harsh environment meets the requirements of 10 CFR 50.49. It is the NRC inspectors' responsibility to verify that input parameters such as the operating or service temperature and activation energy used for determining qualified life using the Arrhenius methodology is defined, justified, and documented.

Section C.5.b. of RG 1.89 states that Section 6.3.3, “Aging,” of IEEE Std. 323-1794 and paragraph 50.49(e)(5) should be supplemented with the following: ..“The expected operating temperature of the equipment under service conditions should be accounted for in thermal aging. The Arrhenius methodology is considered an acceptable method of addressing accelerated thermal aging within the limitation of state-of-the-art technology. Other aging methods will be evaluated on a case-by-case basis.”

It should be noted that current state-of-the-art aging technology for performing aging analysis via the Arrhenius methodology are provided in various IEEE consensus standards such as IEEE Standard 98, “IEEE Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials,” IEEE Standard 99, “IEEE Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electrical Equipment,” IEEE Standard 101, “IEEE Guide for the Statistical Analysis of Thermal Life Test Data,” IEEE Standard 117, “IEEE Standard Test Procedure for Thermal Evaluation of Systems of Insulating Materials for Random-Wound AC Electric Machinery,” IEEE Standard 382, “IEEE Standard for Qualification of Safety-Related Actuators for Nuclear Power Generating Stations,” IEEE Standard 383, “IEEE Standard for Qualifying Electric Cables and Splices for Nuclear Facilities,” and IEEE Standard 334, “IEEE Standard for Qualifying Continuous Duty Class 1E Motors for Nuclear Power Generating Stations.” In addition, in the comment and resolution section of NUREG-0588, Resolution to Comment No.84, the staff noted that it expected licensees to use the current state-of-the-art as outlined in industry consensus standards.

As shown on page II-46 of NUREG-0588, Rev. 1, Public Comment No. 84 to the “For Comment” version of NUREG-0588 dated December 1979 states: “Paragraph 4(4) on page 16 speaks of [‘]The Arrhenius methodology[‘] regarding aging. It is suggested that a reference be given with a source of information on this methodology.” The staff’s resolution to this comment states “Numerous references can be found in qualification publications. The reports identified in Comment No. 80 or the IEEE Standard 101-1072 referenced in Comment No. 83 also provide information on this methodology.”

With regard to the specific language “current state-of-the-art” mentioned above, several SERs for licensees’ responses to Bulletin 79-01B and Order CLI-80-21 submittals states the following: “The licensee identified a number of equipment items for which a specified qualified life was established (for example, 5 years, 15 years, or 40 years). In its assessment of these submittals, the staff did not review the adequacy of the methodology nor the basis used to arrive at these values; the staff has assumed that the established values are based on state-of-the-art technology and are acceptable.” (ADAMS Legacy Library Accession Nos. 8106260368 and 8106260370). To make a specific determination for a licensee, it would be necessary to review the NRC’s SER for that licensee’s responses and commitments to the Bulletin and the Order.

The staff accepted the following positions on satisfying the aging requirements of NUREG-0588 and DOR Guidelines, which are also in agreement with the industry consensus standards mentioned above:

> As a minimum, the following should be considered in determining the validity of predicted aging effects:

1. It may be necessary to extrapolate model results to stress levels significantly beyond the established range of the model, thereby introducing large statistical uncertainties in any aging prediction.

2. Models and associated data typically address a single aging mechanism over a limited higher stress range; changes in stress level (e.g., from test level stress used for data generation to a lower level stress associated with actual service) can result in the dominance of another competing aging mechanism. For example, Arrhenius models should not be used to quantitatively predict aging at temperatures 20° to 30°C below the lowest temperature used in establishing the Arrhenius equation parameters, unless there is empirical evidence (e.g. Operating experience) that the aging mechanism is the same.

3. The physical property used to establish the model may not be easily correlated with the aging mechanism and equipment application. For example, aging data may be available only for tensile properties of a material; however, if the actual application of the material is as a seal or gasket, then compressive set is the more appropriate parameter of interest.

4. Specimens used to establish the aging model may not be sufficiently similar to the equipment under consideration. For example, cyclic failure data used in developing some accelerated aging models tend to be device-specific with little applicability to other equipment. Similarly, aging studies conducted with slabs of insulating material may not be adequately correlated to the aging of that material in its application (e.g., as conductor insulation).

5. Minor differences between the material studied and the material used in an application (e.g., difference in type or amount of filler) may cause significant differences in aging rates and even aging modes.

(Reference: TER-C5257-532)

In addition, in a memorandum dated November 25, 1997, NRR requested RES to perform appropriate research and provide independent confirmation of the applicability of Arrhenius methodology to meet the environmental qualification (EQ) requirements for LOCA and post-LOCA environments. The Research findings and recommendations are available in ADAMS Accession No. ML003701987.

Also, see responses to Q1, Q2, and Q4 above.

Q9. Should the information contained in the licensee's EQ files be considered part of their licensing bases (e.g., activation energy)?

Response: EQ files themselves are required by the regulation. EQ files that contain design basis specific values or information such as equipment data, operating parameters, LOCA profile, procurement information, test parameters; a detailed explanation of test procedures and the results thereof which establish the basis for qualified life of an equipment are considered part of design basis information, to the extent that this information meets the definition for design bases provided in 10 CFR 50.2.

Discussion:

10 CFR 50.49(d), (f), and (j), respectively, require, in part, that (1) a list of electric equipment important to safety be prepared, and information concerning performance specifications, electrical characteristics and postulated environmental conditions for this equipment be maintained in a qualification file; (2) each item of electric equipment important to safety shall be qualified by testing and/or analysis of identical or similar equipment, and the qualification based on similarity shall include a supporting analysis to show that the equipment to be qualified is acceptable; and (3) a record of the qualification shall be maintained in an auditable form to permit verification that each item of electrical equipment important to safety is qualified and that the equipment meets the specified performance requirements under postulated environmental conditions. Importantly, per 10 CFR 50.49(d), the "applicant or licensee shall keep the list and information in the file current and retain the file in auditable form for the entire period during which the covered item is installed in the nuclear power plant or is stored for future use."

Plant-specific licensing basis for EQ is typically described in Section 3.11 of UFSAR. The licensing basis for EQ is dependent on the issuance date of a nuclear power facility's Construction Permit, other regulatory commitments, and certain replacement EQ equipment where a sound reason to the contrary is found to be not applicable.

It should be noted that the NRC safety evaluations reviewed in the formulation of this response that evaluated licensees' methodologies for compliance with 10 CFR 50.49 requirements have not made any explicit endorsements of any values such as activation energy or appropriateness of any specific values that were used for calculating the qualified life. Therefore, specific values used by a licensee are not part of the licensing basis unless explicitly described in UFSAR section 3.11 (typical) or docketed as regulatory commitment or license condition and shall remain auditable in accordance with 10 CFR 50.49 (d) and (j) for the entire period of plant operation.

See NRC Inspection Manual Chapter 0326, "Operability Determinations and Functionality Assessments for Conditions Adverse to Quality or Safety," and LIC-100, "Control of Licensing Bases for Operating Reactors," Revision 1 for more information what constitutes licensing basis or current licensing basis for operating reactors under the provisions of 10 CFR Part 50.