NUCLEAR UTILITY GROUP

ON EQUIPMENT QUALIFICATION

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Washington, D.C., 20555 - 0001

Subj: Comments of The Nuclear Utility Group On Equipment Qualification on NRC Draft Questions And Answers Regarding Unresolved Issues In DBA EQ Program Inspections

Reference: Letter of the NUGEQ, dated October 8, 2017, "Comments of the Nuclear Utility Group on Equipment Qualification Regarding Design Basis Assurance EQ Program Inspection Procedure"

Mssrs. Miller, Miller and Isom:

Enclosed are comments of the Nuclear Utility Group on Equipment Qualification ("NUGEQ" or "Group")[1] concerning certain questions and topics raised by the NRC Staff ("staff") in the context of the ongoing NRC Design Basis Assurance EQ Program inspections. The Group appreciates the opportunity to discuss

[1] The Nuclear Utility Group on Equipment Qualification is a group of utilities owning and operating nuclear power reactors in the United States and Canada. The Group membership includes utilities currently operating over 90 plants in the United States, and an additional 18 plants in Canada. The Group was founded in 1981, as the NRC staff was evaluating and planning the ultimate promulgation of 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants." Since its inception the Group has been actively involved in the development and implementation of licensee EQ programs in accordance NRC requirements and guidance, as well as NRC inspection and enforcement and additional regulatory initiatives which impact the EQ arena.

these topics with the NRC as they present a number of issues related to the proper interpretation of EQ requirements, as well as established and accepted practices in meeting those requirements.

We also set out recommendations related to supplemental training, licensing treatment of current unresolved issues, incorporation into the resolution process of additional unresolved issues identified in recent inspections, and treatment going forward of such issues (including, as a result of recent actions, the possibility of holding in abeyance the inspections pending clarification of the path forward).

OVERVIEW

By way of background, in response to the comments provided in the referenced NUGEQ letter, the staff elected to set certain inspection questions aside for further analysis, delineating those questions as Unresolved Items ("URIs") in the ongoing inspections. They are questions/topics which appear to be premised on regulatory interpretations that conflict with the EQ licensing and design bases, or proper analytical practices, and in most instances involve generic topics and issues. The Group has been supportive of this effort.

To facilitate public discussion of the topics, those URIs were then captured in general (non-plant specific) Q&A format by the staff. That sorting was done in late 2017. The Q&As were released in May, 2018, and a public meeting was held on May 31, 2018, for the Group to provide initial reactions to the Q&A.

This approach is also intended to allow consideration of these topics on a generic basis, as they had generic implications, in an efficient manner. The practice up to that point had been to attempt resolution of those broad generic issues in individual inspections, which resulted in significant burdens on licensees and the staff. In the licensee context, our Group members have indicated that such resolution efforts for these topics involved resources, and extended inspections processes (during and long after the on-site inspection activities), many-fold compared to the entire rest of the inspection. As a result, many of the inspections result in inspection hours that far exceed the NRC estimated hours for such inspections.

In view of the questions, concerns and issues from Group members, the Group felt the process underway was appropriate to address such issues. It is in fact aligned with the NRC recommendations in the resolution of the EQ-Task Action Plan and GSI-168, where on May 10, 2002, the Director of the Office of Research, Michael Mayfield, transmitted the "EQ Programmatic Review Report: Inter-Agency Team's Report," where the Response to the Recommendation 3 (establish a functional interface between the NRC and industry on EQ issues and concerns) of that effort stated:

> The team agreed with this recommendation. Over the past several years, the staff has interacted with the nuclear industry on a regular basis. The staff regularly participates in industry meetings with groups such as NUGEQ, NUS, NEI, EPRI, ASME, IEEE, to exchange technical information concerning EQ issues and to discuss the status of the NRC Research Program.[2]

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[2] Memorandum from Michael E. Mayfield, Director, Division of Engineering Technology, Office of Nuclear Regulatory Research, to Charles A. Casto, Acting Director, Division of Engineering, Office of Nuclear Reactor Regulation, "EQ Programmatic Review Report: Inter-Agency Team's Report," May 10, 2002 (ML021790551).

The NUGEQ and the NRC have maintained those communications over the years, and we consider the interaction with the industry on these issues to represent a further example of such interaction and we fully appreciate the efforts by the staff in this context.

To further this discussion, this letter provides follow-up, more detailed comments on those Q&A. To facilitate a common understanding of our comments on the Q&As, we provide in the attachment to this letter an overview of (1) the history and development of EQ licensing basis and its ongoing evolution, (2) the application of the backfit rule to that licensing basis (plant-specific and generic), followed by (3) focused comments on the Q&As, and (4) a list of issues/topics from the Q&As and the inspection URIs that present regulatory issues (e.g., misinterpretations of requirements, misapplication/ mischaracterization of guidance and/or accepted practices, and/or direct conflicts with plant EQ licensing bases).

SUMMARY OF ATTACHMENT

EQ Licensing Basis: We begin with a discussion of the historical EQ licensing and design bases. This history apparently was not understood or recognized by the staff until recently in the DBA EQ Program inspections. That history is extensive. It involved detailed examinations of licensee conformance to different EQ standards through numerous reviews and inspections over a decade, including express approval by the NRC staff of the bases on which such conformance was judged. Later, the NRC undertook an effort that provided reaffirmation of many of the most important principles on which the original bases were premised.

Backfit Rule Application: In light of that extensive EQ licensing bases, it is important to consider the application of the backfit rule in that context. The application of that rule in this context is not limited to plant-specific findings, but also the generic principles and NRC approval of the bases for those approvals which apply generically. Both elements are crucial in that the nature of EQ programs involve, first and foremost, determinations of generic equipment-level design, material suitability, application of qualification standards, before plant-specific applications. An example would be the review and acceptance of a test report for application to specific material or equipment, that is used throughout the industry. Certain NRC positions in the DBA EQ Program inspections, although made at one plant, fundamentally are challenges to the generic equipment determinations employed at multiple plants. Thus, the consequences of those new interpretations can be significant.

Further, using the URI process, supplemented by the Q&As, has been a valuable mechanism for discussion. Accordingly, as these issues have been designated for further evaluation before formal findings are made, there have not been specific, formal backfitting claims as there has been no imposition of those positions in inspection findings. However, there are issues that need to be addressed.

Comments on Staff Draft Q&A: Ultimately, our discussion focusses on comments on the NRC draft Q&As. As noted, to facilitate further discussion of these topics generally, rather than on a plant-specific basis, the NRC staff gathered the questions involved into this Q&A format. The comments provided herein address topics which are presented by the Q&As, including purpose, regulatory, and technical positions.

Examples of Misapplication of Regulations, Guidance, or Accepted Practices: The final discussion seeks to capture principle examples of concerns related to the application of EQ requirements. We have sought to capture many of those from the Q&A comments, as well as some plant-specific URIs, though it is not necessarily complete, and we welcome further discussion on these topics.

In the May 31, 2018, public meeting, the Group had the opportunity to make very initial comments on the Q&A which had just become available. We appreciate that opportunity, and the ongoing discussion process. We are hopeful that we can establish a common ground on which to resolve these issues.

GROUP RECOMMENDATIONS

In view of the above, the Group recommends that **(1)** dialogue continues with respect to the findings considered to be challenges to the original licensing bases, **(2)** that the Q&A list be supplemented to include the URIs that have been identified since the initial effort in capturing the first set of URIs, **(3)** that NRC staff training that has been conducted with respect to EQ Programs, and with respect to backfitting, be promptly supplemented for all personnel involved in these inspections to allow for consideration of the material herein, and **(4)** the NRC not finalize as "violations" or "performance deficiencies" plant findings related to URIs until determinations are made as to the validity and applicability of those findings in light of the overall EQ licensing basis.

With respect to recommendation (4), the Group became aware during the preparation of this material that issues which had been reasonably identified as URI's in the Brunswick NRC Design Basis Assurance EQ inspection were re-categorized as findings, on the apparent staff interpretation that the specific URIs at Brunswick were not part of the ongoing Q&A issues and therefore could be treated outside of that process, and violations were cited.

The Group believes, however, that the underlying interpretation issues were in fact included within the scope of one or more of the issues in the other URIs, if not the same factual context. Also, we felt that the intent was that in that case they would be considered with the ongoing Q&A process. And even if not within that group, they are of the nature that treatment as a URI and inclusion in the Q&A process, would be reasonable and consistent. They certainly, in both instances, involved interpretations concerning generic positions, such as licensees' ability to conduct re-analyses of EQ topics, as well as the application of the correct EQ standards.

Accordingly, the Group makes a recommendation **(5)**. We recommend that the inspections be held in abeyance until this fundamental element of the process is resolved. Going back into the burdensome process on which the initial Q&A process was intended to alleviate will serve no purpose but to cause additional, unnecessary burden to the licensee. Indeed, once such issues have been categorized as violations, they must be included in the licensee's corrective action program and be addressed in the corrective action process or expose the licensee to escalated enforcement. Yet, in addition, there has been no indication that any of these issues

present immediate or long term significant safety issues (the new Brunswick "findings" were categorized as green, for instance). However, the topics involved are fundamental to the EQ process and are best addressed on a more generic posture.

We look forward to further discussions with the NRC on these matters.

Respectfully submitted,

William A. Horin

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Counsel to the Nuclear Utility
Group on Equipment Qualification

Attachment: "Comments Of The Nuclear Utility Group On Equipment Qualification On NRC Draft Questions And Answers Regarding Unresolved Issues In DBA EQ Program Inspections"

CC: Shana R. Helton (NRC)
Thomas R. Hipschman (NRC)
Michael F. King (NRC)

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COMMENTS OF THE NUCLEAR UTILITY GROUP ON EQUIPMENT QUALIFICATION ON NRC DRAFT QUESTIONS AND ANSWERS REGARDING UNRESOLVED ISSUES IN DBA EQ PROGRAM INSPECTIONS
June 29, 2018
Attachment A

OVERVIEW OF NUGEQ COMMENTS

The Nuclear Utility Group on Equipment Qualification("Group" or "NUGEQ") provides the following comments on the generic issues identified in the EQ Design Basis Assurance Program Inspections conducted by the NRC. These comments focus on a number of attributes related to those inspections which have broad generic implications for EQ Programs. Given that several topics were raised as questions in that context, the Group presented initial comments in a letter to NRC, dated October 8, 2017.[1] That letter set out a number of concerns with the inspections, as well as pointing out apparent positions that had been raised that were in conflict with prior generic standards and approaches to the EQ licensing process.

In response to that letter, the NRC sought to identify those issues and categorize them as unresolved issues (URIs) in the ongoing inspections. The NRC met with the industry in November and December, 2017, to discuss their plans to consider the issues. In summary, the NRC intended to review the unresolved issues through a process of capturing the issues presented in a set of Questions, and to develop responses to those Questions. These are the Draft Q&A on which these comments are focused.

In that light, we have divided the comments into 4 sections, each building on the one before to illustrate the concerns with the particular findings involved:

I. Licensing Bases for EQ Programs – an examination of the historical AND evolutionary licensing bases (plant-specific and generic) for implementation of EQ programs.

II. Backfitting - an evaluation of the application of important elements of the backfit rule that would apply in this context, potentially producing (if the positions were applied) in either plant-specific or generic backfits.

III. Specific Comments on Draft Q&A – presentation of the Group's comments on the draft Q&A (expanding on the comments presented at the May 31, 2018, public meeting).

IV. Examples of Misapplication of EQ Standards – this is a combined list, of material in the comments or other input from plant URIs, which the Group believes, if applied as NRC requirements resulting in formal findings would conflict with existing requirements and processes, producing potential backfits.

The Group appreciates and welcomes the opportunity to discuss these issues.

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[1] By that point in time, the NRC was well into its first (of three years) of these program inspections, which are intended to cover (including the initial "pilot inspections") all plants by the end of the three year period. As of today, the inspections are half-way through the second year of non-pilot inspections.

I. LICENSING BASES FOR EQ PROGRAMS

It is fundamental that in conducting inspections such as the DBA EQ Program inspections, that the inspectors understand the full scope of the EQ licensing and design bases for each plant. We discuss the history of the NRC review of the EQ programs below. The intent in doing so is not simply to set forth the sources for information to help determine the licensing and design bases, but also to assure the record is clear as to the extent and depth of the reviews of the EQ programs. Those efforts were conducted over more than a decade initially, and over another decade in confirmation efforts to provide additional assurance for future plant operation of the adequacy of the protection of public health and safety provided by EQ processes and programs. In all instances, these reviews, whether site specific or generic issues, involved highly qualified and experienced engineers, in roles of licensee program managers, consultants for licensees and the NRC, and the NRC staff. This review path was extensive, deep, and well-informed. Reliance on the determinations made in those contexts is fully justified.

Initial EQ reviews - Overview

The NRC regulatory history with respect to licensee compliance with EQ requirements is extensive. With the filing of the Union of Concerned Scientists' petition in November 1977,[1] the effort by the Commission,[2] the NRC staff,[3] and licensees,[4] to demonstrate that appropriate measures had been taken to provide assurance of equipment performance in an accident environment significantly broadened and accelerated. The effort expanded into one of the most comprehensive industry and NRC efforts related to a specific equipment performance expectation in the history of the NRC.

The definition of EQ technical and program standards, and the assurance of implementation of those standards at individual plants, were all confirmed by the NRC on a plant level and generically for those elements that applied across the plants. Those efforts produced an extensive EQ licensing and design basis for each plant ***and on a generic basis***. Specifically, within those bases were demonstrations of satisfaction of expectations on the **plant-specific** equipment and programs and NRC approval (or findings) in each case. Significantly, much of the analyses and particular technical assurances of equipment capabilities were provided through **generic** analyses and evaluations (e.g., test report reviews and analyses for each specific type of equipment which are used in multiple plants across the country.

Accordingly, many of the issues raised in the current inspection context and which have been placed in the URI category, are issues for which the original plant reviews included generic determinations that were used in all plant reviews, **and were expressly accepted by the NRC**. Thus, an understanding of the original NRC review process and the NRC acceptance of positions therein apply not simply as plant-specific determinations, but also as generic determinations.

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1 "Petition for Emergency and Remedial Relief" was filed with the Commission on November 4, 1977.

2 See Memorandum and Order, CLI-80-21, 11 NRC 707 (1980)

3 These efforts included both the development and application of more detailed reference standards of DOR, NUREG-0588, 10 CFR Section 50.49, and the inspections summarized herein.

4 As summarized herein.

Derivation of Plant-Specific and Generic Licensing Bases

There were a multitude of confirmation efforts undertaken by the NRC, and licensees, to assure adherence to appropriate standards related to post-accident electrical equipment performance. There are many places where this history is reflected. It is important to appreciate the broad extent of these efforts, from a regulatory assurance perspective both for individual plants and generically.[5]

And although we summarize the principal inspection efforts below, the effort was more extensive than we can capture in this letter. Therefore, we have attached the summary of these extensive efforts, as described in the Franklin TER for Surry.[6]

IE Bulletin 79-01B Inspections

For the operating plants, as noted, the NRC process for assuring evidence of the qualification of equipment in those plants evolved rapidly during the late 1970s.[7] Among the first detailed inspections to obtain further assurances of demonstrating qualification was the inspections used to consider the licensees' response, and program status, in the context of IE Bulletin 79-01B. The NRC approach at this stage involved two reviews. An initial review with preliminary review results concerning the licensee's demonstration of equipment qualification in response to IE Bulletin 79-01B,[8] and then a follow-up inspection regarding the adequacy of licensee's response to the preliminary results.[9]

Franklin Inspections-NRC SERs

Franklin Research Center was tasked in May, 1981, to conduct additional reviews related to 71 operating plants. Those reviews entailed not only the review of generic materials to be used by licensees in demonstrating qualification, e.g., test reports, but also the adequacy of the licensee's application of those materials, and also the licensee's implementation of the overall EQ program.

The importance of these materials cannot be underestimated in understanding not just the expectations (i.e., licensing and design bases) related to a licensee's conformance to the applicable EQ standards, but the depth and degree of the reviews that were also performed with respect to the generic material employed to demonstrate qualification of specific pieces of equipment, such as test reports. A large team of engineers and EQ experts were gathered for the reviews resulting in the Franklin Reports, and similarly for the NRC evaluation of those Reports with respect to each facility.

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5 It is also important to appreciate that few people from among the EQ experts in the field today, including licensees and regulators, were part of the original efforts. This absence of historical knowledge of the extensiveness of the original efforts we believe has been a factor in the DBA EQ Program inspection process in raising and resolving questions related to topics examined in the past.

6 A detailed summary of this review process is contained in the Franklin TERs issued in each inspection, in Section 1.3 thereof. See, e.g., Surry TER, (8212290349). (Enclosure A.) It should be noted that inspections were conducted both with respect to the older plants, in the Systematic Evaluation Process (SEP), and subsequently for the remaining operating plants, as discussed below.

7 NRC IE Bulletin, 79-01B, "Environmental Qualification of Class IE Equipment," January 14, 1980, and supplements.

8 See, e.g., NRC Letter to Virginia Electric and Power Company, March 26, 1981 (8104020188).

9 See, e.g., NRC Letter to Virginia Electric and Power Company, May 21, 1981 (8106010768).

Significantly, after each review, the NRC issued an SER in which it examined the Franklin Reports. Then, given their involvement throughout the process, including ongoing interactions with Franklin in the context of these reviews conducted for the NRC Division of Engineering, as part of the NRR Technical Assistance Program, the NRC took a step in the SERs on the Franklin TERs that demonstrates agency acceptance of the overall work of the Franklin reviews, where the NRC states:

> "We have reviewed the evaluation performed by our consultant contained in the enclosed Technical Evaluation Report (TER) and concur **with its bases and findings**."[10]

That language in the SERs reflects the NRC's acceptance of the approach, the evaluation, the standards and criteria, and findings, all making up the bases for the reports both generically, and on a plant-specific[11] basis. Thus, an individual plant's licensing and design bases includes the findings and conclusions reached in the SERs and TERs. The NUGEQ also believes that the reviews of **generic**[12] material that were conducted in the Franklin review context, and which the NRC itself reviewed and accepted, and which were used where applicable in each of the over 70 Franklin plant reviews, are part of the generic EQ licensing basis. (For instance, the determination a particular activation energy for a particular material.) The reasonableness of such approvals is appropriate in this context, given the massive review effort by Franklin, under NRC oversight and participation, to provide reasonable assurance of the protection of the public health and safety through the application of appropriate standards and conduct of reviews for equipment environmental qualification.

Franklin/NRC Implementation Guidance

We note also that evidence of the integral cooperation between the NRC and Franklin is further provided by the "Implementation Guidance for New and Corrective Equipment Environmental Qualification," a Franklin TER itself, dated April 22, 1983. That document is signed by EQ experts working with Franklin and by the NRC Lead Engineer, and was developed internally over the course of the Franklin Reviews and NRC examination of the applicable EQ standards.

NUGEQ Freedom of Information Act Request

The NUGEQ requested materials related to the Franklin Research effort in the context of the original EQ evaluations in 2 FOIA requests in 2018.[13] These FOIA requests provided the Franklin/NRC Guidelines, and most (we believe) of the TERs and related SERs. We note that in ongoing discussions with the NRC in connection with the EQ inspections, it appeared that these materials had not been considered in the NRC DBA EQ Program inspection awareness or discussions. We believe that the

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10 See e.g., NRC SERs on Surry's (Units 1 and 2) TER, issued January 26, 1983, at page 3 of the SERs for both Surry units (8301310396). (Emphasis added.) (Enclosure B.) Other SERs use substantively the same ("and the basis") language for the other plants subject to the Franklin Reviews.

11 To illustrate, Enclosure C is a plant-specific (blank) checklist for the Franklin Review of a qualification file or documentation for a piece of equipment.

12 The same forms, we understand, as in Enclosure C, were used to conduct reviews of specific test reports, and those completed forms were then used in each inspection where the subject test report was relied upon.

13 See FOIA-NRC-2018-000308 and FOIA-NRC-2018-000438.

ongoing Surry EQ inspection review is the first instance where the NRC specifically requested the plant-specific SERs.

NRC Franklin TER Closeouts and NRC Followup and Confirmatory Inspections

In addition to the initial Franklin reviews, and NRC SERs on those reviews, the NRC subsequently reviewed the licensee responses to findings and open items and closed out the Franklin TER/NRC SER reviews.[14] The NRC also conducted additional examinations of licensee program implementation and licensee compliance with the EQ rule, in further follow-up inspections and even additional confirmatory inspections.[15] While some variation undoubtedly occurred, this Surry process is an example of the scope and breadth of that process.

All told, for the plants examined through the Franklin review process, there were a minimum of 4 levels of NRC review over the course of assuring compliance with EQ requirements, stretching over time from 1981/82 to 1987/88.

Non-Franklin, New Plant Reviews

Subsequent to the plant reviews in the Franklin process, the NRC conducted inspections of what were considered the newer plants, including those which were going through the initial operating licensing process. In that context, the NRC used a combination of inspections and licensing reviews to provide reasonable assurance of licensee conformance to EQ requirements. In particular, the NRC used its own inspection staff, supported by Idaho National Engineering Labs (INEL), for these reviews. As a result, the NRC issued either or both inspection reports (setting forth an SER with respect to the INEL/NRC reviews) and/or supplements to plant licensing SERs.[16] In this context also, the NRC approved the INEL findings and their bases either expressly or by reference[17] and often adopting virtually verbatim the INEL findings in the plant SERs.[18]

NRC Enforcement

As part of the review process for EQ, the NRC also looked at the enforcement potential for identified violations. In some cases, the NRC found that the licensee had not satisfied specific EQ requirements and had not made corrections in a timely manner to assure qualification. In those

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[14] See, e.g., Virginia Electric and Power Company, and NRC, letters dated January 11, 1985 and March 12, 1985. (8501170133, 8504020403)

[15] See, e.g., NRC letters to Virginia Electric and Power, dated November 3, 1986, and August 2, 1988. (8611120175, 8808170203)

[16] See, e.g., Watts Bar Supplemental Safety Evaluation Report 15, Section 3.11. (ML072060488).

[17] Id., in that the NRC incorporated the entire INEL report in the SSER. See also, NRC's characterization of the audit as including both NRC and INEL personnel, and crediting portions of the audit specifically to INEL.

[18] See e.g., INEL TER/Audits of Vogtle (8704300015), Seabrook (8612110424) and Beaver Valley (8706080033); and the corresponding acceptances in Vogtle (SSER 3, 8609180229, and Inspection Report 8806210023), Seabrook (SSER,5, 8608180067, and Inspection Report 9002230181), and Beaver Valley (SSER 5, 8706120079, and Inspection Report 8807290179).

instances the NRC issued civil penalties associated with the licensee performance, involving hundreds of thousands of dollars.[19] The NRC even issued a separate enforcement policy for EQ violations.[20]

Initial Inspections Summary

All told, each licensee and each plant went through multiple reviews, inspections, audits and evaluations, as well as potential enforcement actions, to provide assurance that the EQ Programs across the industry provided reasonable assurance of the protection of the public health and safety. This massive effort produced a record of NRC and licensee positions on EQ practices, both plant-specific and generic determinations. It is critical that this entire regulatory history be recognized and understood when conducting the DBA EQ Program nspections.

Ongoing EQ Assessments and Guidance for Improvements Through Generic Communications

EQ programs have not relied solely on the licensing and inspection processes to maintain their level of assurance of protecting the public health and safety.

From the beginning of the comprehensive implementation process, and now into the active maintenance of those programs, both with respect to the technical and programmatic elements of the programs, the NRC has issued numerous Generic Communications related to the EQ arena, dating back to 1978, including Generic Letters, IE Bulletins, IE Circulars, Information Notices, and Regulatory Issue Summaries. And the industry has separately issued numerous Part 21 reports, as findings directly related to or potentially related to EQ issues have been identified. The Group has maintained lists of all such communications, and licensees maintain operating experience (OE) processes, all of which are aimed at providing assurance of the application of information useful to licensees in implementing their programs. The total of such communications over this period, to date, is in the several hundreds.

Subsequent EQ Process and Issue Reverification – EQ Task Action Plan, GSI-168, License Renewal

In addition to the above, the NRC undertook an additional decade long detailed technical review of potential EQ issues, through a program titled EQ Task Action Plan, which then evolved into a separate generic safety issue, GSI-168. The history of that effort is also important to assure and understanding of the depth and breadth of the NRC efforts that have gone into fulfilling their tasks to assure the EQ requirements provide reasonable assurance of the protection of the public health and safety.

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19 See e.g., Baltimore Gas and Electric, Calvert Cliffs, Notice of Violation and Proposed Imposition of Civil Penalty, April 28, 1988 (Proposed $300,000)(8805110227); see also Order Imposing Civil Penalty, August 21, 1990, Alabama Power Company (Farley)(Imposed $450,000)(see 55 Fed.Reg. 35,203(1991)).

20 The Calvert and Farley violations were the bookends (the first one, and the last one) notices of violation under the revised EQ Enforcement Guidance, set forth in a Modified Enforcement Policy on EQ, Generic Letter 88-07, April 7, 1988. A number of plants were reviewed under that policy. Later enforcement continued under the normal NRC enforcement policy.

NRC EQ Task Action Plan

In 1993, as part of the NRC staff's efforts to define expectations in anticipated license renewal actions, the staff recommended to the Commission that certain generic areas related to EQ that may need to be reassessed and potentially backfits would be required even for existing plants which were not reviewing their licenses.[21] As a result, the NRC staff submitted an EQ task action plan (EQ-TAP) as enclosure 3 to its third quarterly report on fire protection issues, on July 1, 1993.[22] The purpose of the EQ-TAP was to "evaluate and resolve existing environmental qualification concerns and to identify and resolve other EQ concerns."[23]

Rather than attempt a summary of the actions taken in response to the EQ-TAP, we quote here the statement of the Director of Research, Ashok Thadani, in the June 28, 2002, technical assessment of GSI-168:

> "The EQ-TAP involved reviewing EQ-related information and conducting EQ-related research to enable the staff to (1) assess existing differences in the EQ requirements for older and newer plants, (2) assess the adequacy of accelerated aging practices for demonstrating equipment qualification, and (3) identify and resolve any other EQ issues. The plan included meetings with the industry, an EQ program review, data collection and analysis, a refined PRA, research on aging and condition monitoring, and options for resolving EQ concerns. These activities were modified as more information became available through research and a review of industry operating experience."[24]

In addition, in 1996, the NRC issued a voluminous, two-volume technical report of the expert team working on the EQ-TAP. The report identified 7 major issues, sub-divided into 43 sub-issues, of which 19 were considered unresolved and warranted additional research.[25] During this period, public meetings and workshops were held. Ultimately, the staff elected to conduct additional testing in six areas.

> These issues are (1) the acceptability of using the Arrhenius methodology to simulate natural aging of cables, (2) the acceptability of activation energy estimates used in past qualification tests, (3) whether multi-conductor cables have any unique failure mechanisms compared to single conductor cables, and whether these failure mechanisms are adequately addressed in EQ practices, (4) whether bonded-jacket cables have any unique failure mechanisms compared to non-bonded jacket cables and whether these failure mechanisms are adequately addressed in EQ practices, (5) whether condition- monitoring

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21 SECY-93-049, "Implementation of 10 CFR Part 54 Requirements for Renewal of Operating Licenses for Nuclear Power Plants," March 1, 1993. (ML031480169)

22 Third Quarterly Report Regarding Fire Protection, July 1, 1993, and Enclosure 3, EQ Task Action Plan. (9308120145)

23 As cited in the June 28, 2002, "Technical Assessment of Generic Safety Issue (GSI) 168, "Environmental Qualification of Low-Voltage Instrumentation and Control (I&C) Cables", Assessment at 2. (ML021790551)

24 Id.

25 Id.

> methods exist that could be used to monitor the condition of cables in situ, and (6) whether condition monitoring could be used to predict the accident survivability of cables.[26]

Generic Safety Issue (GSI) 168, Environmental Qualification of Low-Voltage Instrumentation and Control Cables

With the resolution of most of the issues in the EQ-TAP being resolved by the reviews of EQ literature or were being addressed in the cable research program, the NRC closed the EQ-TAP and transferred the long-term research activities to Generic Safety Issue 168, "Environmental Qualification of Low-Voltage instrumentation and Control Cables." The scope of the issues addressed through research and testing focused on certain remaining issues of potential concern, including addressing both the issue of "accelerated aging techniques used in original qualification compare[d to] the properties of naturally aged cable..., " as well as "the limitations in using an estimated value of the activation energy to predict the chemical degradation during thermal aging."[27] We mention these issues in particular because of the current inspection refocus on that very topic, without any apparent knowledge of the prior work done by the NRC.

The results of this testing were carefully evaluated by the NRC. The NRC examined the significance, performed risk evaluations, considered the uncertainties, and reached ultimate conclusions related to the cables and issues involved.[28] The NRC's ultimate conclusions, captured in the Technical Assessment, and also published in Regulatory Issue Summary 2003-09, "Environmental Qualification of Low-Voltage Instrumentation and Control Cables," concluded that for both the existing 40 year license period and for the license renewal period, current cable aging approaches were acceptable, including the use of the Arrhenius methodology in extending cable life.[29] Specifically, the NRC concluded:

> For license renewal, a reanalysis (based on the Arrhenius methodology) to extend the life of the cables by using the available margin based on a knowledge of the actual operating environment compared to the qualification environment, coupled with observations of the condition of the cables during walkdowns, was found to be an acceptable approach.[30]

That recommendation is based on the broad finding in the Technical Assessment cited above, stating:

> 1. The Arrhenius methodology has been shown to be a valid means of modeling temperature effects and for evaluating thermal degradation of polymers, with some limitations. These limitations include: (i) Arrhenius methodology is acceptable when the thermal degradation of the polymer involved is dominated by a single reaction within the temperature range of interest, and (ii) Arrhenius methodology can be used to evaluate the effects of varying temperature

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26 Id at 2-3.

27 Id. At 6.

28 Id. at pp. 3-44

29 Regulatory Issue Summary 2003-09, "Environmental Qualification of Low-Voltage Instrumentation and Control Cables," May 2, 2003.

30 Id at 4.

> conditions provided it is based on the principle of cumulative damage to the polymers involved.
>
> 2. In the opinion of the EQ experts, adequate technical basis exists to justify the application of Arrhenius methodology for integrated time-temperature equivalent analysis.[31]

License Renewal

In addition to the efforts described above which resulted in additional evidence of assurance of the adequacy of the EQ regulatory scheme, virtually all plants have now gone through plant-specific evaluations for extending the qualified lives of equipment, or defining a point for replacement of components, in the license renewal context.[32] Each of those reviews, in accordance with one or more of the methods for assuring adequacy of performance during the license renewal period, involved assessments related to each licensee's evaluations to assure equipment readiness in the EQ arena to perform its safety function in the post-accident environment. The NRC reviews in this context applied review criteria specific to the license renewal period.[33] In that context, the NRC notes:

> *Analytical Methods:* The analytical models used in the reanalysis of an aging evaluation are the same as those previously applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose).[34]

These analyses, applying the Arrhenius methodology, and allowing for reanalysis of aging using Arrhenius, are part and parcel of accepted and permitted EQ evaluations.

Conclusion

The above discussion demonstrates that EQ is not an arena which has gone un-reviewed for years. It has been an arena of extensive, in-depth, virtually continuous review since before the issuance of the rule. And that review continues.

It is the Group's view that certain questions presented in this arena have been premised on a lack of understanding of the breadth of these broad reviews over time, the prior acceptance of evaluations and re-evaluations, the applicability of various materials as guidance or requirements, or the plant's EQ licensing basis.[35] We believe that this absence of background

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31 Technical Assessment at 45-46

32 See, e.g., 10 CFR 54.21(c).

33 NUREG-1801, Generic Aging Lessons Learned Report, which includes several sections specifically applicable to EQ evaluations (e.g., Section XI.E1, "Environmental Qualification of Electrical Components"),

34 NUREG-1801, Rev. 2, p. X E1-2, December 2010

35 The Group readily acknowledges that the licensee has an obligation as well to present the licensing basis for the licensee's facility. But, the staff when citing a provision or position based on a particular standard, for

in these areas has created a misunderstanding of issues and the licensing bases and has resulted in positions that are inconsistent with the licensing bases, the historical interpretation of the licensing bases, and perhaps an unwillingness to reasonably consider the licensing status of a licensee position.

As a final note, and to reiterate a recommendation in the cover letter, a review of the training for the NRC staff on this background, and discussions in our public meetings, both evidence a lack of knowledge of many aspects of the EQ regulatory history. The training slides with respect to EQ background (from 2015) were limited primarily to the different EQ standards with only a brief mention of GSI-168 (mostly in the context of condition monitoring), and no mention of the early reviews/licensing inspections and Franklin reviews or the EQ Task Action Plan.[36] Finally, regarding the incorporation of the EQ Licensing Basis in the context of these inspections, the Group recommends that the NRC training be supplemented to assure that there is a full understanding of the overall EQ licensing basis going forward.

example, and the licensee does not recognize that as part of its licensing basis and so informs the staff, it becomes the staff's obligation to show the licensee how that particular standard is part of their licensing basis. A licensee cannot be placed in a position of proving the negative for an inspector.

[36] These materials were provided to the Group in response to FOIA/PA-00573.

II. BACKFITTING

A number of the NRC inspection findings, or potential findings in that they remain in the URI category, relate to issues and topics which previously have been reviewed and addressed by the NRC and the industry. Yet, the current positions are new or different from the original understanding of either or both the specific topic or the approach to address a specific topic. For instance, there are conclusions and analytical assumptions and approaches proposed today by the NRC as "requirements," that are premised on material that in fact does not constitute a requirement or on a misinterpretation of the material. Further, several instances of new interpretations or positions simply involve non-specific, non-definitive standards. The NUGEQ believes that those current staff conclusions reflect at most different engineering judgments with respect to the topics involved, compared to the judgments made by experienced, knowledgeable engineers in the past. For each of these circumstances, the Group believes the positions reflect potential backfits.

In the following discussion we examine some of the fundamental principles regarding backfitting that we consider applicable to several potential inspection findings. In this regard, we also reference as a comprehensive NRC evaluation of the application of the backfit rule, the Byron/Braidwood backfit appeal and the NRC review panel findings thereon.

NRC Backfit Rule and Compliance

The NRC's backfit rule, 10 CFR 50.109, applies to the NRC and imposes certain expectations related to NRC efforts to change previously approved licensing positions.[1] In particular, the backfit rule states that in order to impose a backfit, the NRC:

> "shall require the backfitting of a facility only when it determines, based on the analysis [described in the rule] that there is a substantial increase in the overall protection of the public health and safety."
>
> [10 CFR 50.109(a)(3)(emphasis added).

Although the NRC staff has not yet considered the backfit question with respect to its positions in the EQ inspections, we would anticipate that in the backfit context, if such a discussion were

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1 10 CFR 50.109(a)(1) provides:

> "Backfitting is defined as the modification of or addition to systems, structures, components, or design of a facility; or the design approval or manufacturing license for a facility; or the procedures or organization required to design, construct or operate a facility; any of which may result from a new or amended provision in the Commission's regulations or the imposition of a regulatory staff position interpreting the Commission's regulations that is either new or different from a previously applicable staff position..."

to occur, it would be premised on the 'compliance exception' of the rule. That exception indicates that the NRC need not perform that analysis, if the backfit involves:

> "a modification [that] is necessary to bring a facility into compliance with a license or the rules and orders of the Commission, or into conformance with written commitments by the licensee;..."
>
> [10 CFR 50.109(a)(4)(i).]

Thus, to be able to impose the changed positions without conducting the analysis dictated in Section 50.109(a)(3), the NRC would need to demonstrate that the particular finding is required to bring the plant(s) involved into compliance with a NRC requirement or licensee commitment.

Understanding the Commission's intent with respect to that compliance principal is crucial. Demonstrating whether there is a requirement or commitment involves careful examination of the overall questions and standards. Fortunately, direction was provided in this regard in the backfit rulemaking where, in the accompanying statements of consideration, the Commission pointed out the following:

> "The compliance exception is intended to address situations in which the licensee has failed to meet known and established standards of the Commission because of omission or mistake of fact. It should be noted that new or modified interpretations of what constitutes compliance would not fall within the exception and would require a backfit analysis and application of the standard."[2]

The interpretation of this element of the backfit rule is significant to the issues here. For further examination of these considerations, we also can look at the guidance provided in the Byron/Braidwood decision.

Exelon Byron/Braidwood Backfit Decision

> *"The Backfit Rule creates a structured process for changes to previous NRC staff positions - in effect, placing the burden of proof on the NRC staff [in changing such a position]...."*[3]

That quote was brought to the fore at the beginning of the Byron/Braidwood backfit decision. It is relevant here for putting into context the staff's EQ inspection interpretations. It is also particularly on point from another perspective as well, in that the NRC staff has in the course of these

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2 50 Fed. Reg. 38097, 38103 (September 20, 1985)(emphasis added).

3 Byron/Braidwood Backfit Appeal Review Panel Report ("Panel Report"), August 23, 2016, at p. 3 (itallics added).

inspections also sought to fundamentally shift the burden of proof related to their interpretations on to the licensees and, in effect, to reverse the burden application of the backfit rule itself.[4]

In addition, the Backfit Panel concisely captured the nature of staff interpretations that can fall under the backfit rule. Specifically, the Panel noted that it

> "...understands the term 'new or modified interpretations' to include situations where the NRC staff has, in effect, 'changed its mind' on how to interpret the language of a requirement or on how much assurance is necessary to conclude that the requirement is met. Levels of assurance might be established in terms such as acceptable probabilities or consequences, conservative assumptions, or sufficient margin."[5]

Thus, new interpretations that go to the level of expecting more assurance to satisfy a particular standard than in the past are within the scope of the changing position/new or modified interpretation scope.

Further, the Backfit Panel analysis also provides insights with respect to the importance of distinguishing between decisions made based on "reasonable and well-informed staff engineering judgment,"[6] in the absence of "specific standards,"[7] and decisions involving an omission or mistake of fact with respect to "known and established Commission standards."[8] A new position in the case of the former where specific standards are not established and a position arises from a new staff judgment is subject to backfit requirements, while a new position in the latter scenario where someone fails to comply with some clear standard is not within the backfit requirements and would satisfy the compliance exception.

We believe many of the potential backfit positions would fall into this first category. It is the NUGEQ view that many positions taken by the NRC staff that are of concern reflect new interpretations of language in guidance or requirements, where there are no explicit requirements. Thus, falling into the first example above. In that context the NRC reviewers appear to have applied their own engineering judgments in the determination of their opinion of compliance and/or how much assurance was needed to demonstrate compliance. Yet when those judgments go beyond reasonable prior engineering judgments, the new positions that such existing determinations are inadequate or require more assurance would in fact be backfits subject to the protections of the backfit rule.

NRC Backfit Training

The Group recognizes that the NRC has undertaken significant measures to improve the understanding of the backfit rule within all levels of the staff. That effort is to be commended. The Group addressed this topic in our prior comments (see Reference). Unfortunately, as we also

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4 This reversal of burden construct is addressed below in the examples where it arises in the discussions in Sections III and IV, of these comments. .

5 Panel Report at 6.

6 See, e.g., Panel Report at 8, 21, 23, and 24.

7 Id at 8, 21 ("specific standards"), 22, ("single accepted approach")

8 Id. at 8-9.

recognized in the Group's letter, the complete backfit training with respect to those serving as inspectors may not have occurred until 2018, and in fact relatively recently. Thus, we have had at least 2 and a half years of Pilot and actual EQ inspections by inspectors who had not received the backfit training. Therefore, we believe it is even more imperative to look closely at the positions taken over that time to consider whether backfitting considerations were brought into the decision-making on these issues.

As we indicate in our cover letter, we recommend that with respect to backfit training that the NRC confirm that all inspectors involved in these inspections have had that training, and we suggest supplementing that training in the context of EQ issues specifically by recognizing the considerations related to EQ licensing bases and proper consideration of applicable requirements as discussed in these comments.

III. SPECIFIC COMMENTS ON DRAFT Q&A

Overview and General Comments

The following comments are provided on the Questions and Answers (Q&A) regarding Environmental Qualification of Electric Equipment with the perspective that the responses will be used to formulate the resolution of certain URIs as well as to capture the NRC's positions for future inspections or knowledge transfer. The currently proposed responses to several of the questions do not appear to answer or completely address the questions in a clear and concise way. For example, it is not clear whether the responses to Questions 1, 2, 4, and 8 provide sufficient clarification to allow a consistent understanding of the issue or application of the stated positions. It would also be helpful if the questions were phrased in such a way to eliminate the overlap between questions (i.e., define the questions more precisely) and the resulting need to have a response refer to one or more responses to another question.

As a general matter, while backfitting is mentioned in a couple of questions, backfitting considerations apply to all questions. Thus, specific reference to backfitting may be avoided and simply include the caution that the Backfit Rule applies in all instances if the staff takes a position contrary to the previously accepted position. (See previous discussion in Section II. Backfitting, for additional information.)

It is also suggested that the final version of these Q&As have an introduction that provides an overview of the intended purpose and use of these questions and answers. This introduction is meant to assist the NRC inspectors and other users of this information. An element of that introduction would be that the guidance herein is intended to assist in understanding several EQ questions raised during the inspection process. As discussed at the May 31, 2018 public meeting, the responses to these questions are not intended to suggest any approach that could be viewed as changing the applicable requirements. The responses are intended to promote understanding, in a relatively brief fashion, what the licensing expectations are related to the issues.

As a general observation, the responses in the draft Q&As should remove any wording related to specific guidance to inspectors on how these EQ inspections "should" be performed, or expanding upon their "responsibilities" during these inspections unless they are specifically covered by the current inspection procedure. The inclusion of any new expectations or expansion of responsibilities has the potential to result in interpretation of regulatory requirements for compliance by the end users of these Q&As. Including this type of opinion or interpretation on how to perform these inspections is not supported by the inspection procedure or processes, and could adversely and inadvertently change the scope and focus of the ongoing and future inspections. If additional guidance regarding the direction and responsibilities of the inspectors is needed, it should be incorporated into inspection procedure IP 71111.21N

Question 1 - Application of Arrhenius

1) The question should be restated to the effect of "What is the proper application of the Arrhenius methodology to extend the thermal life of an EQ component in the evaluation to extend its original qualification or qualified life?"

   Basis: The response appears to focus more on the application of the Arrhenius methodology as opposed to the specific form of the Arrhenius equation. Also, this question and the response appears to equate the Arrhenius equation to qualified life. It is actually related to thermal life (which is commonly the limiting consideration for qualified life, but not always). Suggest rewording to clarify that Arrhenius results in establishing the thermal life or thermal qualified life.

2) The response contains a statement that "(Generally, conservatism existed in the initial assumption of the actual operating temperature.)" This response is incomplete in that it doesn't recognize other conservatisms, some of which are subsequently mentioned in the discussion section. Other conservative bases, such as extremely conservative activation energy values, can also exist in the original analysis. There is nothing in the regulatory basis that limits the reduction of any conservatisms identified in the original aging analysis and the response should not be structured to suggest such a limitation. The response should be reworded to clarify that service temperature is not the only example of conservatism.

   Basis: This could be interpreted as being the only conservatism, yet other excessive conservatisms can exist, such as overly conservative activation energies that is mentioned in X.E1 of the GALL (NUREG-1801).

3) In a few Unresolved Items issued to operating units, the NRC has used the following or similar words: "*The licensee did not find the original qualification activation energy to be in error or non-conservative. The licensee chose to develop an activation energy from less limiting log life plots, which was non-conservative. In addition, without actual data for the log life plots, the licensee was unable to demonstrate acceptable margins for uncertainty*[1]."

   There is also one violation in a recently issued inspection report [2] where the inspection report contains a similar statement of "The activation energies were changed from 1.0eV to 1.32eV, without verifiable test data to demonstrate that the original ASCO mathematical model was unrealistic or invalid."

   There are two specific items of concern that are relevant to this response.

   First, the NRC words from the inspection report appear to indicate that the inspectors required an analysis of some sort that rendered the original values invalid as a

[1] ML18094A162
[2] ML18176A352

prerequisite for permitting reanalysis of the value. We were unable to find any NRC requirement that dictates such a requirement or expectation. Imposing such a conditionrepresents a new and different interpretation of existing regulation and as such a backfit.

Second, with respect to uncertainty analysis, the NRC has published in a report entitled "NRR/RES Team Report Disposition of EQ Programmatic Review Recommendations[3]" the following position:

"Response:

The team disagreed, in part, with this recommendation. Additional EQ programmatic requirements are not considered necessary at this time to assure qualification. We believe that current practice (primarily EQ based on type test and analysis), which is one of the options permitted by the EQ rule, provides reasonable assurance of qualification. Test margin and built in conservatism of EQ based on type test compensate for the various limitations and uncertainties that may exist relative to equipment qualification, and provide assurance of continued qualification over time."

This appears to contradict the inspector's interpretation of the need for demonstration of acceptable additional margins for uncertainty for these reanalyses. The NRC published guidance does not contain a requirement for uncertainty analysis in the qualification process and furthermore, the NRC Intra-Agency Task Force set to determine the necessity of this question made a clear finding that uncertainties were adequately addressed by the inherent margins in the equipment qualification process.

Basis: The statement made by the NRC in the Intra-Agency report was not bounded and spoke of conservatisms in the type test and analysis methods that obviated the need for uncertainty analysis.

4) The response needs to clarify that the use of the Arrhenius model is valid if based on a single dominant reaction in the temperature range of interest. The draft response currently includes a statement that the Arrhenius equation is valid only if the data represents a single "discreet" chemical reaction and that the activation energy of that single reaction is within the temperature limits of the data. This statement should be reworded and clarified. For example, use the term "single dominant" in place of "single discreet" in order to avoid misinterpretation that there can only be one chemical reaction for the Arrhenius methodology to be valid.

Basis: Current wording could be misinterpreted to mean that Arrhenius is not valid if there is more than one chemical reaction or aging mechanism occurring over the temperature range of interest.

[3] ML003708304 (See discussion of the report in Section I. Licensing Bases For EQ Programs.)

5) The response to broad based question like Q1 needs to be framed in a manner that addresses the variations in requirements between NUREG-0588 Cat I, NUREG-0588 Cat 2, and the DOR Guidelines. Inspector use of EQ guidance for all requirements that is in fact only applicable to 0588 Category I has been a consistent area of feedback from the industry. As an example, the draft response to Q1 includes excerpts from Section 4 of NUREG-0588. It should be noted that reference to paragraphs 6, 9, and 10 are specifically limited to NUREG-0588 Category I applications and is not applicable to DOR or NUREG-0588 Category II qualification. This response is incomplete and should be updated to include a discussion or additional guidance that is relevant to NUREG-0588 Category II and DOR Guidelines.

Basis: NUREG-1800, Section 4.4.1.1 and 4.4.1.2 clearly reflect the continuation of the original qualification basis. Limiting the response to questions to just NUREG-0588 Category I plants is inconsistent with this EQ regulatory approach.

6) The response should cover what the staff's criteria is for judging the adequacy of justification related to the selection of an activation energy. Based on some of the violations and URI's issued to date, it should be clarified that such justifications should be evaluated on a case-by-case basis since they can take many forms. For example, the justification can be included within (or otherwise based on) documentation provided from an Approved 10 CFR 50 Appendix B vendor or test lab that has been reviewed and accepted by the licensee or developed by the licensee.

7) The response needs to reflect the concept that the aging analysis focuses on significant aging mechanisms that could result in common cause failures under harsh accident conditions. The response should be updated to reflect that the proper application of the Arrhenius methodology starts with applying the methodology for these significant aging mechanisms. Section 3.4.5 of TER-C5257-532 provides criteria for what constitutes a significant aging mechanism that are based on IEEE 627-1980. The response should include other relevant references such as NUREG-1800, Section 4.4.1.

Basis. This is a fundamental concept of aging analysis that appears to be either misunderstood or disregarded in the inspection process. In the various URI's and some findings, the NRC has relegated their examination to underlying assumptions in the process (e.g., the licensee did not disprove the original activation energy value used) rather than apply the concept of significant aging mechanisms to ensure that the potential for environmentally induced common cause failures under accident conditions is adequately addressed. In addition, the specific example of expecting licensees to disprove any value that they are reanalyzing before they conduct such reanalysis creates a false barrier to consideration of reasonable alternatives, fundamentally creating a new obligation that is not premised on any requirement, i.e., a backfit.

Question 2 - Revalidation of Activation Energy In Commercial Grade Dedication

1) The question attempts to address the issue for both vendors and licensees. Vendors are only responsible for dedications they perform under their Appendix B QA programs (e.g. they are not involved in Licensee dedication programs). The question should be rephrased so that the distinction is clear and the question isn't addressing whether a vendor needs to justify the activation energy of replacement EQ parts through the licensee's commercial grade dedication process.

   Basis: The response incorrectly states that vendors and licensees need to justify activation energy of replacement EQ parts qualified through the licensee's commercial grade dedication process.

2) The response needs additional clarification to correctly distinguish the differences between dedication of an in-kind or "like-for-like" replacement item vs. replacements that involve a design or configuration change (i.e., a change in design, material or manufacturing process). Further, in the context of "like-for-like" replacements, this response is in conflict with GL 91-05 which states "...that if the licensee can demonstrate that the replacement item is identical, the licensee need not identify the safety function or review and verify the design requirements and critical characteristics." In contrast, non-identical replacements would inherently involve the design change process which would include the establishment of the qualification basis (which could include defining, documenting and justifying the activation energy of any material changes that are critical to qualification).

   The distinction between "like-for-like" and "non-identical" replacement of equipment items is also essential to validly address the provisions in RG 1.89 Rev 1 Sections C.6.a and C.6.b related to the replacement of identical components.

   Basis: The response needs to be consistent with GL 91-05 as well as the endorsement of EPRI 3002002982 in RG 1.164, which makes a specific distinction between dedication (an activity performed under Appendix B Criterion VII) and environmental qualification (a design verification activity performed under Appendix B Criterion III).

3) The response states that the inspectors should verify the licensee's justification of any changes to material activation energy values as part of a reanalysis. This is incorrectly introducing an expectation for the inspectors that is related to reanalysis (e.g. changes to TLAA) that is not specifically related to dedication. Reanalysis can occur outside of the dedication process and consistent with GL 91-05, there is no need to verify activation energies for in-kind replacements.

4) The response indicates, as an apparent result of failing to distinguish the Like-for-Like and Non-Identical scenarios, an apparently new expectation that 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. In the first instance, this consideration is not applicable for a Like-for-Like dedications as described in GL 91-05.

Second, the term similarity analysis has specific meaning in the context of EQ and is related to the comparison of the installed and tested items to validate that the demonstrated performance during the test is representative of the performance of the installed plant equipment under simulated harsh accident conditions. Justification for the activation energy value being used can take many forms and should not be arbitrarily limited to the licensee adhering to a heretofore unheard expectation that a similarity analysis is required for reassessing the activation energy.

5) Similar to the comment on Q1, the response to Q2 also contains wording related to a "single discreet chemical reaction." As previously stated, the wording is overly restrictive if it is interpreted as suggesting that the Arrhenius methodology is acceptable when there is only one chemical reaction or aging mechanism involved.

6) The discussion mentions RIS 2002-11 for an example that discusses requalification of Okonite control cable for 40 years and 60 years. This Regulatory Issue Summary discusses the requalification of a cable with a bonded jacket and states that Okonite developed a specific activation energy value. The discussion related to RIS 2002-11 should be removed from the response to Q2 since the purpose of the investigation of the activation energies at Okonite was related to unknown degradation related to a bonded cable jacket insulation system that was identified during the EQ TAP studies documented in NUREG/CR-6704.

Basis: It is not understood how this example has any bearing whatsoever on the discussion on the validation of activation energies as part of commercial grade dedication.

7) The response refers to IEEE 323-1974 for "additional information." Please provide citations to specific sections being referenced for additional information. There should be other references included as well which deal with the dedication process, such as EPRI 3002002982 (Revision 1 to NP-5652 and TR-102260), RG 1.164, GL 91-05, IP 43004, IP 38703, IN 2011-01, etc.

8) In the discussion, there is a statement that "....commercial grade dedication <u>might not</u> be the same as environmental qualification." This is incorrect and should be stricken as they <u>are not</u> the same (see EPRI 3002002982 as endorsed by RG 1.164.).

Basis: Appendix I of EPRI 3002002982 specifically states that dedication is not qualification and states "Qualification is an activity undertaken to verify that a component's design is suitable for the intended nuclear power plant application. The suitability of design must be established prior to initiating procurement of an item. In other words, the technical evaluation and acceptance activities involved in dedication are not substitutes for design; they cannot be used to change the design of a given item, nor are they a means to verify the suitability of a given design."

9) In the discussion, there is a statement that "A commercial grade item can be deemed equivalent to an Appendix B item provided that the critical characteristics are identified

and verified by tests." This is fundamentally incorrect and misleading. Equivalency is established through a technical evaluation that is different and separate from the verification of critical characteristics. The objective of commercial grade dedication is to accept an item as a basic component, which is not the same as showing equivalency to an Appendix B item. Also the inference that the only method to verify a critical characteristic is by test conflicts with the fact that there are multiple acceptance methods (inspection, source verification, commercial grade survey, etc.) outlined in EPRI 3002002982.

Question 3 - Is upgrading of DOR qualification required upon entry into License Renewal

1) The question is specific to plants subject to the qualification requirements in the DOR Guidelines. For completeness, the question should be expanded to also include NUREG-0588 Category II qualification.

2) The question be reworded to remove the statement that the "DOR Guidelines are regulatory requirements **are much less stringent** than the 10 CFR 50.49 regulation." Suggest that the wording of "....requirements much less stringent than the 10 CFR 50.49 regulation..." be changed to something along the lines of "...requirements grandfathered under the 10 CFR 50.49 regulation..."

   Basis: That statement conflicts with the Commission determination, since reconfirmed in the EQ-TAP, that all standards provide reasonable assurance of protection the public health and safety. The staff has affirmed multiple times that there is no justification or demonstrable improvement in plant/public safety from backfitting NUREG-0588 Cat I/50.49 requirements onto DOR or NUREG-0588 Category II plants. In fact, the use of DOR Guidelines and NUREG-0588 Category II are specifically allowed under 50.49(k).

3) The response should specifically reaffirm that the need to upgrade the qualification requirements is specifically tied to replacement of an item unless there are sound reasons to the contrary. As such, there is no specific requirement to change the qualification basis when a plant enters the period of extended operation.

   Basis: 10 CFR 50.49 (l) states that "Replacement equipment must be qualified in accordance with the provisions of this section unless there are sound reasons to the contrary."

4) At the end of the discussion, there is a reference to Position 6 of RG 1.89 Rev. 1 for additional guidance regarding sound reasons to the contrary. It is recommended that this also refer to GL 82-09, which also includes examples of sound reasons which are not included within RG 1.89. The point being that the response should specifically reflect that sound reasons to the contrary which are not specifically identified in RG 1.89 C.6 may also be found to be acceptable.

Question 4 - Assurance of Accuracy and Applicability of Activation Energies Supplied by Appendix B Suppliers

1) General observation-Question 4 is very similar to Question 2 except that it doesn't involve dedication of commercial grade items. Suggest that questions be framed such that there is clarity as to the discrete issues being addressed in each context.

2) The question is specific to ensuring that activation energies supplied by 10 CFR 50 Appendix B vendors are accurate and applicable to the specific material composition and service conditions. The draft response does not address the assurance of accuracy that is an inherent element of the vendor's Appendix B QA program. If the intent of the question has other elements, they should be clearly stated. In the current form, the response is simply reiterating the guidance from RG 1.89 C.5.c to have a defined, documented and justified basis for the activation energy and points back to Q2 for additional details. As a minimum, the response related to assurance of accuracy should be based in part on the review of the vendor's QA program by the licensee as well as inspections performed by the Vendor Inspection Branch.

3) Within the discussion there is wording related to the use of the most limiting (lowest) activation energy of the components for conservatism. This discussion should be expanded to ensure consistent application of the NRC position described in the response to Question 86 to NUREG-0588 which is cited in the Q&A discussion. In particular, it should be clarified that the response to Question 86 was not intended to mean that a licensee must use the lowest possible activation energy that can be found for a particular material. Rather, it is intended to indicate the use of the lowest of the activation energies selected (e.g. those that are defined, documented and justified) for the various materials of construction that are critical to qualification and thus should be evaluated in determining qualified life. Materials which don't provide a safety function and whose failure is not detrimental to accident mitigation could have lower activation energies than what is used to establish the thermal life.

Question 5 - Are Licensees required to use same standards as original qualification when EQ components are replaced?

No specific comments

Question 6 - Application of 0588 Cat II standards to EQ components qualified under DOR Guidelines

1) The response is a modification of the wording in the Introduction section of NUREG-0588, which specifically states that in cases where the DOR guidelines do not provide "sufficient" detail but NUREG-0588 Category II does, NUREG-0588 will be used. Note that this wording is not limited to aging. It is not clear what the regulatory basis is for the position in the response that NUREG-0588 Cat II applies to DOR equipment, but only for aging as specified in 10 CFR 50.49(e)(5). This is an apparent change in regulatory position.

2) The response should clearly indicate that the application of NUREG-0588 Category II requirements is applicable only when the DOR guidelines do not provide sufficient detail but NUREG-0588 Category II does. As currently worded, the response also is based on the incorrect presumption that the guidance in the DOR Guidelines related to aging lacks sufficient detail without providing any specific examples or justification for this conclusion. In addition, the test is "sufficient" detail, not less detail. Thus, application of this direction does not mean that a word count or some other test of more or less detail would apply.

3) In the last paragraph of the discussion, there is wording that is different from what is actually in GL 82-09 which could be viewed as a change in regulatory position. The discussion in the draft Q&A response states that "In GL 82-09, the NRC noted that the acceptable method for addressing in-service degradation....." while the generic letter actually states "**an** acceptable method" as opposed to "**the** acceptable method" provided in the response. This should be reworded to correctly set forth the quote from GL 82-09 such that it is clear that licensees are not limited by a single method for addressing in-service degradation.

Question 7 - Requirement to use IEEE standards used in initial license term to extend qualified life into license renewal?

1) The response should be clarified to simply state that the methodology used to establish qualification in accordance with the EQ Licensing Basis may continue to be used during the period of extended operation. While there is a good discussion on the requirements related to evaluating TLAA under 10 CFR 54.21(c), the methods allowed under 54.21(c)(i), (ii), or (iii) would not necessarily involve a change to the methodology or standards were used to establish qualification under the original licensing basis for EQ.

Question 8 - Acceptable "level of decision making" in selecting activation energy.

1) The response to Question 8 does not provide an adequate answer to the question as to what is the "acceptable level of decision making" for determining the correct activation energy. The response essentially points back to Q2, which doesn't provide any specific guidance related to this question. This question also seems to overlap with Q4. It also sets up another undefined standard that is being used as a requirement when the term cannot be defined.

2) The question needs to be clarified or reworded to focus on attributes of what is considered acceptable approach for defining, documenting and justifying an activation energy rather that asking about a level of decision making. However, as previously noted, such justification is a case and fact-specific exercise of judgment. Thus, seeking to define and require specific activities may be educational, it would not be definitive.

3) Although RG 1.89 C.5.c does have guidance to define, justify and document the basis for the activation energy used, it is not clear where the regulatory requirement or expectation

comes from to dictate that it is necessary to justify operating or service temperatures beyond the licensee's design process to verify/justify the operating or service temperatures. As currently written, the draft response implies that there are new expectations to justify (as opposed to verifying the accuracy and applicability of normal service conditions) differently from how accident service conditions or other fundamental inputs are treated in establishing an auditable qualification basis under the licensees' quality assurance program.

4) There is a typo in the discussion related to the reference to IEEE 323-1794 (should be 1974) as well as IEEE 101-1072 (should be 1972).

5) The discussion contains an example related to considerations in determining the validity of predicted aging effects. The wording in the example states that "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." This example appears to be a misinterpretation of the guidance in IEEE 98. Section 11 is specific to limiting the extrapolation of the thermal endurance curves for the purpose of establishing the temperature index. For this purpose, IEEE 98 recommends that the extrapolation from the thermal endurance to the temperature index should be limited to no more than 25°C from the lowest exposure temperature. Extrapolation of thermal endurance curves to establish the temperature index of a material or insulating system is not the same as the extrapolation for the thermal aging point to the service temperature for the purpose of establishing a thermal life. The approach in the draft response would effectively prevent the use of actual service temperatures for materials with relatively high thermal indexes (e.g. 90°C, 130°C, 150°C, 180°C, 200°C, etc.). As a result, this interpretation would be a new regulatory position and its application would effectively eliminate the practical application of the Arrhenius methodology for establishing or reanalyzing the thermal qualified life for many components.

Question 9 - Is information in EQ Files (e.g., activation energy) part of licensing basis?

1) Q9 is specifically asking if specific information in the licensee's EQ files, such as activation energy, should be considered part of their licensing basis. The response is provided in terms of design basis and lacks sufficient detail for practical application. The response should address or otherwise cover situations where the NRC (or its contractors) have formally reviewed qualification test reports used to establish qualification as well as the associated EQ documentation. Such reviews were conducted by FRC and INEL and these reviews included reviews of test reports and aging analyses that were also approved by the NRC staff (also see the discussion in Section I. Licensing Bases for EQ Programs) Information in the EQ files, such as activation energies, can be part of the EQ licensing basis provided that the licensee has not changed this information subsequent to the NRC's review.

The discussion section also states "It should be noted that the NRC safety evaluations reviewed in the formulation of this response that evaluated licensees' methodologies for compliance with 10 CFR50.49 requirements have not made any explicit endorsements of any such values as activation energy or appropriateness of any specific values that were used for calculating qualified life." That statement is incorrect. Refer to the discussion of the licensing basis for EQ and the history of reviews and NRC approvals. The following statement is also incorrect and incomplete; "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....." This position is incorrect and must be corrected. The actual EQ licensing basis includes findings and determinations, both plant-specific and generic, which can exist outside of UFSAR Section 3.11. The draft response to Q9 needs to be corrected so that it is consistent with the discussion in Section I. Licensing Bases for EQ Programs.

Basis: This was one of the key points made during the NRC public meeting on May 31, 2018. The EQ licensing basis needs to be viewed in its totality and not limited to any one document or source.

2) The discussion section states that plant specific licensing basis for EQ is typically described in Section 3.11 of the UFSAR. As described above, that position is incorrect or at most, incomplete. Other typical sources include EQ related TERs, EQ SERs, NRC inspection reports, and docketed correspondence. The discussion also includes a statement of "....certain replacement EQ equipment where a sound reason to the contrary is found to be not applicable is a potential source of confusion." The EQ licensing basis does not change upon equipment replacement since the need to upgrade qualification exists within 10 CFR 50.49 unless there are sound reasons to the contrary. So it is not clear why this specific element of 50.49 is being called out separately.

IV. EXAMPLES OF MISAPPLICATION OF EQ STANDARDS

The following is a list of the particular areas where generic issues raised by the NRC inspections appear to conflict with EQ requirements and guidance (with respect to applicability and/or application), EQ licensing bases (plant-specific and generic positions), or other NRC requirements or guidance. We present this list here to provide an easy reference to the topics at issue. Many of these are presented in current EQ DBA Inspection Unresolved Issues captured in the NRC Q&A and draft responses thereto. In fact, several of these examples were discussed during the NRC Public meeting on May 31, 2018. Some may be resolved as a result of the comments presented herein (see Section III.). Others appear to remain as issues in terms of inspector practices and interpretations. Some may be drawn from URIs from facilities with URIs that were raised subsequent to the gathering of URIs into the Q&As.

In any event, regardless of the status, the imposition of current interpretations would represent backfits in the context of virtually all plants if the underlying finding was imposed as a violation. We have not, nor has the NRC, suggested that any of these issues present current safety-significant questions. Rather, they reflect views related to the application of EQ requirements, or other NRC requirements that impact EQ equipment, that conflict with current and historical treatment.

EXAMPLES:

1. In the Draft Q&A's provided to the Group by the NRC, the NRC stated that:
   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:

   This discussion in the Q&A fails to acknowledge that these paragraphs in NUREG-0588 apply ONLY to Category I equipment. Application of these requirements to Category II or DOR guideline equipment represents a clear attempt to backfit requirements that the commission specifically excluded in 10 CFR 50.49 (k).

2. There are a couple of URI examples as well as in one NCV where it was stated that the licensee did not establish that the original activation energy was in error or non-conservative as part of justifying the change in activation energy. This infers that there is a new expectation or regulatory requirement for some sort of analysis that renders the original values invalid.
   [NCV 1 IR 05000325/2018011 and 05000324/2018011]
   [URI 050000395/2018010-04 and 050000395/2018010-06]

3. In one NRC Inspection report Finding, the NRC cited as its bases IEEE-98-1972, Section 11 related to application of aging temperatures (extrapolation) being limited to 25°C. The citation actually comes from IEEE 98-1972 Section 11. Section 11 of IEEE 98-1972 states:
   *"In order to determine the **temperature index** of an insulating material it is necessary to extrapolate the thermal endurance curve. Some precautions should be observed:*

   (1) The extent to which thermal endurance curves are extrapolated should be limited. It is recommended that the extrapolation from the lowest exposure temperature be no greater than 25 °C."

Emphasis has been added to the words 'temperature index' in the first sentence of IEEE 98-1972 Section 11. IEEE 117-1974 (also cited by the NRC in the same finding) states in Annex A, Footnote 7:

> *"Temperature Index of materials as defined and explained in IEEE 1-1969 Section 1.21 is, 'Temperature index is related to the temperature at which the material will provide a specified life as determined by test or as estimated by service experience.'*

Annex A also describes the following for Class H insulation:

> *"A Class H system is described as a system utilizing materials having a preferred* ***temperature index*** *of 180 [sic °C]."*

In the referenced citation, the NRC inspectors have taken the limitations of extrapolation described in IEEE 98-1972 and applied it to the extrapolation of thermal aging data to the plant's ambient temperature as opposed to the IEEE defined application to development of the thermal endurance curves used to defining the thermal index of an insulation system. This constitutes a misapplication of the IEEE standard. Further, IEEE 98-1972, IEEE 117-1974 and IEEE 101-1972, all referenced as applicable in the NRC finding are mentioned in IEEE 334-1971. This IEEE standard was endorsed by the NRC in Regulatory Guide 1.40, Revision 0. Regulatory Guide 1.40, Revision 0, Regulatory position C.2 states:

> *"Section 6, 'References' of IEEE 334-1971 lists additional applicable IEEE standards. The specific applicability or acceptability of these referenced standards will be covered separately in other regulatory guides, where appropriate."*

None of these referenced IEEE standards were endorsed by other available regulatory instruments and identification of a performance deficiency on the basis of not meeting these referenced standards constitutes a new and different interpretation of the existing regulations without basis.

4. The description in URI 2018011-03 states that the licensee did not document an independent failure modes and effects analysis to justify the activation energy they used. There is no known regulatory requirement that specifies that a licensee must perform an independent FMEA in addition to what was done by the manufacturer or test organization as part of designing the test program.
[IR 05000325/2018011 and 05000324/2018011 and URI]

5. The draft responses to the Q&As contain new undefined terms as if they are regulatory requirements. Examples from Question 2 include "industry consensus standards," "quality databases," "similarity analysis" and "good fit." Example from Question 8 includes "state of the art technology."

6. The draft response to Question 2 indicates that vendors and licensees need to justify the activation energy of replacement EQ parts that are qualified through the licensee's commercial grade dedication program. This response has multiple examples of new requirements or expectations, such as:

a) Replacement EQ parts are qualified through the commercial grade dedication process. Qualification is separate and distinct from dedication as described in Appendix I of EPRI 3002002982, which is endorsed by RG 1.164.
b) Vendors and Licensees need to justify the activation energy of replacement EQ parts qualified through the licensee's commercial grade dedication process. Vendors are only responsible for dedications they perform under their Appendix B QA programs (e.g. they are not involved in Licensee dedication programs).

7. The draft response to Question 2 also fails to differentiate the difference between dedication of the in-kind replacement item versus dedication of the non-equivalent replacement item. As a result, the response has other examples of a change in regulatory position or guidance. For example:

   a. The response is contrary to the NRC position in GL 91-05 which specifically states "...if the licensee can demonstrate that the replacement item is identical, the licensee need not identify the safety function or review and verify the design requirements and critical characteristics."
   b. The response indicates that the licensee's justification for an activation energy should include a similarity analysis that shows that the selected activation energy is suitable and/or applicable to replace the existing value. The stated expectation of a similarity analysis, as part of establishing an activation energy value, is a new regulatory expectation. The basis for which a licensee or vendor can define, document and justify an activation energy can take many forms.

8. The NRC has referenced in multiple inspection reports positions based upon the Questions and Answers contained within NUREG-0588, Revision 1. The questions and answer section of Part II of NUREG-0588, revision 1 was specifically separated and is discussed by the NRC as resolution of comments on the document. These resolutions are responses to comments made by the public and are not identified, nor are they stated to be NRC positions on Equipment Qualification. Unless Part I of NUREG-0588 was specifically revised to incorporate the resolution of the comment, this information is guidance or discussions only and are not meant to establish regulatory requirements as indicated in the inspection reports.

9. In one Inspection Report, there is a URI which contains the following statements :

   "AQS-21678/TR does not appear to meet Category 1 requirements, yet its' accelerated aging rate was used to replace the Category 1 qualification-aging rate in AQR-67368."

   "The inspector noted that the test program specified in AQS-21678/TR used IEEE 382-1972, which did not meet Category 1 qualification requirements. The test program in AQR-67368 used IEEE 382-1980, which did meet Category 1 requirements."

   Saying that the test program does not meet Category I requirements because it does not reference a later, unendorsed version of IEEE 382 constitutes a clear backfit. The NRC position is clear that any test program that meets the requirements of IEEE 323-1974 and the amplifying positions in RG 1.89, rev 1 are Category I equipment.
   [URI 05000327/2017008-05, 05000328/2017008-05]

10. During a recent EQ DBA inspection, three URIs were issued which specifically challenge the original qualification basis for Brand-Rex Cables and Barton Transmitters. For each of these URI, there are specific elements where the inspection is challenging the original licensing basis or is contrary to previous NRC position for the component in question. Specific examples are provided below:

    a. Activation Energy of Brand-Rex Cable and Qualified Life

    The methodology for Activation Energy Derivation of Brand-Rex cable (and other cable types) was reviewed by Idaho National Engineering Laboratory (INEL), as the technical reviewer for NRR and was found to be acceptable. After the initial review of the licensee's compliance to 10 CFR 50.49, the NRC issued a request for additional information (RAI), which noted the review of activation energies for insulation on power cable, which includes the Brand-Rex Activation Energy value in question, that were much higher than typically expected, and requested that the licensee "identify both the source and the method used to determine the activation energy used in your calculation of qualified life." The licensee's response to this RAI was subsequently accepted by NRR in SER, Supplement 15. The licensee has not changed the activation energy for the Brand-Rex cables since original licensing and this value is now being challenged.

    [URI 05000390, 391/2017007-03]

    b. EQ Qualification of Barton O-rings procured via Commercial Grade Dedication

    This URI is blending commercial grade dedication with qualification and failed to recognize that the challenge to verify the activation energy as a critical characteristic is not required per Generic Letter 91-05 for in-kind/identical replacement items. In this particular instance, the licensee procured the O-rings used on Barton transmitters through an approved 10 CFR 50 Appendix B supplier which performed the dedication activities. This dedication activities verified that the supplied item was a like-for-like replacement (e.g., same dimensions, material verification and comparison to a known EQ certified O-ring, and durometer verification).

    [URI 05000390, 391/2017007-04]

    c. Environmental Qualification of Barton 764 Transmitters

    This URI challenges the use of an activation energy value of 0.78eV for Barton transmitters. The review of the qualification basis by Idaho National Engineering Laboratory (INEL), as the technical reviewer for NRR, was performed as part of original licensing. Supplement 15 to the SER documents INEL's review and the NRC's acceptance of the methodology used by the licensee for extrapolating test data, using Arrhenius methodology and establishing a qualified life, as was used to document the qualified life of the Barton differential pressure transmitters supplied by Westinghouse. This documentation reflects NRC acceptance of the 0.78eV value used for Barton transmitters and of the general methodology used to qualify these transmitters with appropriate conservatism. The conclusions of the NRC/INEL during original licensing

related to the qualification of Barton 764 transmitters were based on the same information provided to the NRC team during the EQ DBA inspection. The licensee has not changed the activation energy for the Barton transmitters since original licensing and this value is now being challenged.

[URI 05000390, 391/2017007-05]

Enclosure A

Franklin TER for Surry Power Station, December 22, 1982, Section 1.3, Generic Issue Background

Nuclear Utility Group on Equipment Qualification Comments on NRC Draft Questions and Answers Regarding Unresolved Issues in EQ DBA Program Inspections, June 29, 2018

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TECHNICAL EVALUATION REPORT

REVIEW OF LICENSEES' RESOLUTION OF OUTSTANDING ISSUES FROM NRC EQUIPMENT ENVIRONMENTAL QUALIFICATION SAFETY EVALUATION REPORTS (F-11 and B-60)

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNIT 2

VOL. 1 OF 2

NRC DOCKET NO 50-281
NRC TAC NO 42469
NRC CONTRACT NO NRC-03-79-118

FRC PROJECT C5257
FRC ASSIGNMENT 13
FRC TASK 483

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With respect to TMI Action Plan Implementation, the scope of this report is limited to those sections of NUREG-07. :3] applicable to equipment having an installation implementation date of January 1, 1981. Where applicable, a review is to be performed on installed equipment with implementation dates after January 1, 1981 as adequately identified by the Licensee.

The NRC has determined that the evaluation of environmental qualification of equipment items (1) located in plant areas whose environment is not adversely effected by the design basis event (DBE) (e.g., equipment located in "mild" environments) or (2) required to achieve and maintain cold shutdown, is not to be included within the scope of this report. However, where the Licensee has identified these equipment items in the EEQ submittals to the NRC, these items have been listed in NRC evaluation Category III.b in this report (see Section 3 of this report for definition of NRC evaluation categories).

Qualification aspects not included within the scope of this evaluation are:

- o seismic and dynamic qualification
- o equipment protection against natural phenomena
- o equipment operational service conditions (e.g., vibration, voltage, and frequency deviations)
- o equipment located where it is subjected to the outdoor environment
- o equipment protection against fire hazards
- o equipment protection against missiles
- o equipment located in plant areas whose environment is not adversely effected by the design basis event
- o equipment required to achieve and maintain cold shutdown.

1.3 GENERIC ISSUE BACKGROUND

Safety-related electrical equipment must be capable of performing design safety functions under all normal, abnormal, and accident conditions. The purpose of equipment qualification is to provide tangible evidence that equipment will operate on demand and to verify design performance, thereby establishing assurance that the potential for common-mode failure is minimized.

Of particular concern is the assurance that equipment will remain operable during and following exposure to the harsh environmental conditions (i.e., temperature, pressure, humidity [steam], chemical sprays, radiation, and submergence) imposed as a result of a design basis accident. These harsh environments are generally defined by the limiting conditions resulting from the complete spectrum of postulated break sizes, break locations, and single failures consequent to a LOCA, main steam line break (MSLB) inside the reactor containment, or a HELB outside the reactor containment (such as a main steam or feedwater line break). In addition, depending on specific plant design features, other postulated HELB locations may be associated with:

- o the chemical and volume control system (CVCS) letdown line
- o the steam supply piping to
  - the auxiliary feedwater (AFW) pump turbine
  - the reactor core isolation cooling (RCIC) pump turbine
  - the high pressure core injection (HPCI) pump turbine
  - the isolation condenser
- o steam generator blowdown.

The NRC criteria for reviewing the safety of nuclear power generating stations include the requirement that the qualification of safety-related electrical equipment be substantiated by auditable documentation of the program that establishes the ability of the equipment to function as specified in the station design. This report is restricted to a technical evaluation of the equipment's ability to function in harsh environments resulting from DBEs.

Qualification criteria applied during the licensing of the older nuclear power plants have been modified over the years, and specific industry standards concerning qualification have been revised as the design of reactor systems has changed and as regulatory and operating experience has accumulated. Examples of such standards are IEEE Standards 279-71, 323-74, 383-74, 317-76, 334-80, 381-77, 382-80, 535-79, 627-80, 649-80, and 650-79. NRC NUREG documents 0413 and 0588 have been developed to address this topic. In particular, NUREG-0588 (published for comment in December 1979 and reissued as Revision 1 in July 1981) formally presented the NRC staff positions regarding selected areas of environmental qualification of safety-related electrical equipment in the resolution of General Technical Activity A-24,

"Qualification of Class IE Safety Related Equipment." The positions documented therein are applicable to plants that are or will be in the construction permit or operating license review process.

Although qualification standards and regulatory requirements have undergone considerable development, all of the currently operating nuclear power plants are required to comply with 10CFR50, Appendix A, General Design Criteria for Nuclear Power Plants, Section I, Criterion 4. This criterion states in part that "structures, systems and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents, including loss-of-coolant accidents."

Qualification requirements are also embodied in (1) 10CFR50 Appendix A, General Design Criteria 1, 2, and 23 and (2) 10CFR50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Criteria III, "Design Control," and XI, "Test Control." These requirements are applicable to safety-related equipment located outside as well as inside containment.

The NRC staff has evaluated the licensees' equipment qualification programs by reviewing the qualification documentation of selected safety-related equipment as part of the operating license review for each plant. The NRC staff has also used a variety of methods to assure that these general requirements are met for electrical safety-related equipment. In the oldest plants, qualification was based on the fact that electrical components were of high industrial quality. After 1971, qualification was judged on the basis of IEEE Std 323-71; however, no regulatory guide was issued adopting this standard. For plants whose SERs were issued after July 1, 1974, the Commission issued Regulatory Guide 1.89, which in most respects adopted the most recent standard, IEEE Std 323-74.

In November 1977, the Union of Concerned Scientists petitioned the NRC Commissioners to upgrade current standards for the environmental qualification of safety-related electrical equipment in operating plants. Subsequently, the NRC staff instituted the Systematic Evaluation Program (SEP) to determine the degree to which the older operating nuclear power plants deviated from current

licensing criteria. The subject of electrical equipment environmental qualification (SEP Topic III-12) was selected for accelerated evaluation as part of this program. Seismic qualification of equipment was to be addressed as a separate SEP topic. In December 1977, the NRC issued a generic letter to all SEP plant licensees requesting that they initiate reviews to determine the adequacy of existing equipment qualification documentation.

Preliminary NRC review of licensee responses led to the preparation of NUREG-0458, an interim NRC assessment of the environmental qualification of electrical equipment. This document concluded that "no significant safety deficiencies requiring immediate remedial actions were identified." However, it was recommended that additional effort should be devoted to examining the installation and environmental qualification documentation of specific electrical equipment in all operating reactors.

On May 31, 1978, the NRC Office of Inspection and Enforcement issued IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," which required all licensees of operating plants (except those included in the SEP) to examine their installed safety-related electrical equipment and ensure appropriate qualification documentation for equipment function under postulated accident conditions. Subsequently, on February 8, 1979, the NRC Office of Inspection and Enforcement issued IE Bulletin 79-01, which was intended to raise the threshold of IE Circular 78-08 to the level of Bulletin, i.e., action requiring a licensee response. This Bulletin required a complete re-review of the environmental qualification of safety-related electrical equipment as described in IE Circular 78-08.

The review of the licensees' responses indicated certain deficiencies within the scope of equipment addressed, definition of harsh environments, and adequacy of support documentation. It became apparent that generic criteria were needed for evaluating the electrical equipment environmental qualification for both SEP and non-SEP operating plants. Therefore, during the second half of 1979, the Division of Operating Reactors (DOR) of the NRC issued internally a document entitled "Guidelines for Evaluating Environmental Qualification of Class IE Electrical Equipment in Operating Reactors" [5]. (The document is hereafter

referred to as the "DOR Guidelines.") The document was prepared as a screening standard for reviewing all operating plants, including SEP plants. It was originally intended that the licensees evaluate their qualification documentation in accordance with the DOR Guidelines. However, initial NRC review of this documentation, which was compiled to support licensee submittals, revealed the need for obtaining independent evaluations and for accelerating the qualification review program.

In October 1979, the NRC awarded Franklin Research Center a contract to provide assistance in the "Review and Evaluation of Licensing Actions for Operating Reactors," which included an assignment for review of equipment environmental qualification documentation under SEP Topic III-12. The assignment was to review equipment environmental qualification documentation and to present the results in the form of a Technical Evaluation Report for the 11 oldest plants (included in the SEP review). The plants included within the assignment were the Palisades, Oyster Creek, Ginna, Haddam Neck, Yankee Rowe, LaCrosse, and Big Rock Point plants and Zion Station Units 1 and 2, Indian Point Units 2 and 3, Millstone Unit 1, Dresden Unit 2, and San Onofre Unit 1. (This assignment was completed in April 1981.)

On January 14, 1980, the NRC Office of Inspection and Enforcement issued the DOR Guidelines and IE Bulletin 79-01B, which expanded the scope of IE Bulletin 79-01 and requested additional information on environmental qualification of safety-related electrical equipment at operating facilities, excluding the 11 facilities undergoing the SEP review. This Bulletin cited the DOR Guidelines as the criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification. The scope of the review was expanded to include HELBs (inside and outside containment) in addition to equipment aging and submergence. The NRC advised the licensees that the criteria contained in the DOR Guidelines would be used in its review of licensee submittals, NUREG 0588 would be used as a guide in cases where the DOR Guidelines do not provide sufficient detail.

In early February 1980, the NRC decided that Indian Point Units 2 and 3 and Zion Station Units 1 and 2 should be included within SEP Topic III-12 for the purpose of equipment environmental qualification review.

On February 21, 1980, the NRC and representatives of the SEP Plant Owners Group held an open meeting at NRC headquarters to discuss an accelerated review program in accordance with the DOR Guidelines. Representatives of the Indian Point Units and Zion Station also attended this meeting. The NRC formally issued to all licensees represented at the meeting the DOR Guidelines document which included a second document, "Guidelines for Identification of That Safety Equipment of SEP Operating Reactors for Which Environmental Qualification Is To Be Addressed" [5], together with the request that the licensees review their plant systems and provide additional equipment environmental qualification information to the NRC on an accelerated schedule.

For non-SEP plants, the NRC Office of Inspection and Enforcement formed a task force including a principal reviewer in each region and a task leader from headquarters. The regional members were assigned responsibility for the technical review of the licensees' responses to IE Bulletin 79-01B, and the task leader was assigned responsibility for the overall coordination of the review effort with NRC staff to assure overall consistency. The regional reviewers held meetings with the licensees in their respective regions, which resulted in staff positions being issued in a supplement to IE Bulletin 79-01B dated February 29, 1980.

In April 1980, the NRC organizational structure was modified and the Equipment Qualification Branch was formed within the new Division of Engineering. Responsibility for reviewing the status of equipment qualification for all plants was assigned to this branch.

On May 23, 1980, the NRC issued Memorandum and Order CLI-80-21 [10], specifying that licensees and applicants must meet the requirements set forth in the DOR Guidelines and NUREG-0588 regarding environmental qualification of safety-related electrical equipment in order to satisfy 10CFR50, Appendix A, General Design Criteria, Section I, Criterion 4. This Order also established that the SERs on this subject, to be prepared by the NRC staff, must be issued on February 1, 1981 and that all subsequent actions to be taken by licensees to achieve full compliance with the DOR Guidelines or NUREG-0588 must be completed no later than June 30, 1982. The Memorandum and Order established the DOR Guidelines and NUREG-0588 as acceptable interpretations of the General

Design Criteria for an interim period. Rulemaking was proposed for the purpose of establishing a permanent interpretation of the General Design Criteria.

The staff held regional meetings with the licensees and interested parties during the week of July 13, 1980. The staff issued a second supplement to IE Bulletin 79-01B, a response to significant questions raised durin· a public meetings, and two Orders. The Order dated May 30, 1980 required the licensees to comply with the previously issued Commission Memorandum and Order of May 27, 1980 (CLI-80-21). The above orders required the licensees to complete the tasks identified in IE Bulletin 79-01B no later than November 1, 1980 to allow the staff to comply with the February 1, 1981 date imposed by the Commission Order. The responses to the questions were issued on February 29, 1980; and the second and third supplements to IE Bulletin 79-01B, highlighting the staff positions affecting the licensees' responses, were issued on September 29 and October 24, 1980, respectively.

In October 1980, EG&G Idaho, Inc., awarded Franklin Research Center a contract to provide assistance in the equipment environmental qualification review for 13 of the plants whose licensees responded to IE Bulletin 79-01B. The assignment was to evaluate the licensees' equipment environmental qualification submittals and to present the results in the form of a Technical Evaluation Report for each plant. The objective of this Technical Evaluation Report was to review the licensees' submittals to determine if safety-related electrical equipment was reviewed for environmental qualification in accordance with the DOR Guidelines and NUREG-0588 as required by IE Bulletin 79-01B. The NRC was to perform an audit of the qualification documentation references as part of its Safety Evaluation Program. If discrepancies were found, the audit was to be extended. The plants included within this assignment were Nine Mile Point Unit 1, Millstone Unit 2, Salem Unit 1, Browns Ferry Units 1, 2, and 3, Brunswick Units 1 and 2, Hatch Units 1 and 2, Dresden Unit 3, and Quad Cities Units 1 and 2. (This assignment was completed in June 1981.)

In mid-1981, the NRC issued SERs on environmental qualification of safety-related electrical equipment to licensees of all operating plants.

Where additional qualification information was required, the licensees were directed to respond to the NRC within 90 days of receipt of the SER.

In May 1981, under the licensing action assistance contract, NRC authorized Franklin Research Center to proceed with the review and evaluation of the environmental qualification of safety-related electrical equipment located in harsh environments, required for TMI Lessons Learned Implementation on 71 operating plants.

In July 1981, the NRC conducted extensive meetings with the nuclear industry to address concerns and questions regarding qualification of safety-related equipment. In addition, the NRC provided licensees with detailed information with respect to the format and expected content of the licensees' 90-day responses to the NRC SERs. Draft outlines of the following proposed programs were also presented to the industry: environmental qualification of equipment located in "mild" environments, seismic and dynamic qualification, and environmental qualification of mechanical equipment.

In October 1981, the NRC authorized Franklin Research Center to include within the scope of the existing EEQ assignment (TMI Lessons Learned Implementation Equipment) the evaluation of licensees' resolutions of outstanding issues related to equipment environmental qualification discussed in the NRC SERs in accordance with NRC criteria. The assignment was to review the qualification documentation and to present the results in the form of a Technical Evaluation Report for 71 operating plants. (This report was developed within the scope of this assignment.)

On January 7, 1982, the NRC Commissioners approved the issuance of the proposed rule, "Environmental Qualification of Electric Equipment for Nuclear Power Plants," for public comment. The proposed rule was published in the Federal Register (Volume 47, No. 13) dated January 20, 1982.

In February 1982, Proposed Revision 1 to Regulatory Guide 1.89, "Environmental Qualification of Electric Equipment for Nuclear Power Plants," was issued for public comment. This regulatory guide was issued to (1) reflect current NRC positions on equipment qualification and (2) provide guidelines for meeting the NRC Commissioners proposed rule on equipment qualification.

On April 20, 1982, the NRC staff issued Generic Letter No. 82-09 [11] to all licensees, presenting the NRC's position and clarification of certain aspects of the environmental qualification requirements.

1.4 SPECIFIC ISSUE BACKGROUND

On May 31, 1978, the NRC Office of Inspection and Enforcement issued IE Circular 78-08, "Environmental Qualification of Safety-Related Electrical Equipment at Nuclear Power Plants," which required all licensees of operating plants to examine their installed safety-related electrical equipment and ensure appropriate qualification documentation for equipment function under postulated accident conditions. Subsequently, on February 8, 1979, the NRC Office of Inspection and Enforcement issued IE Bulletin 79-01, which was intended to raise the threshold of IE Circular 78-08 to the level of Bulletin, i.e., action requiring a licensee response. This Bulletin required a complete re-review of the environmental qualification of safety-related electrical equipment as described in IE Circular 78-08.

On January 14, 1980, the NRC Office of Inspection and Enforcement issued the DOR Guidelines and IE Bulletin 79-01B, which expanded the scope of IE Bulletin 79-01 and requested additional information on environmental qualification of safety-related electrical equipment at operating facilities. This Bulletin cited the DOR Guidelines as the criteria to be used in evaluating the adequacy of the safety-related electrical equipment qualification.

The NRC staff held regional meetings with the licensees and interested parties during the week of July 13, 1980. The staff issued a second supplement to IE Bulletin 79-01B, a response to significant questions raised during the public meetings, and two Orders. The Order dated May 30, 1980 required the licensees to comply with the previously issued Commission Memorandum and Order of May 27, 1980 (CLI-80-21). The above orders required the licensees to complete the tasks identified in IE Bulletin 79-01B no later than November 1, 1980 to allow the staff to comply with the February 1, 1981 date imposed by the Commission Order. The responses to the questions were issued on February 29, 1980; and the second and third supplements to IE

Bulletin 79-01B, highlighting the staff positions affecting the licensees' responses, were issued on September 29 and October 24, 1980, respectively.

The NRC SER [17] stated the following:

> "The NRC Office of Inspection and Enforcement performed (1) a preliminary evaluation of the licensee's response, documented in technical evaluation reports (TERs) and (2) onsite verification inspections (reports dated May 2, 1980) of selected safety-related electrical equipment. Some components of the inside recirculation spray and the feedwater systems were inspected at both Units 1 and 2. The inspections at both units verified proper installation of equipment, overall interface integrity, and manufacturers' nameplate data. The manufacturer's name and model number from the nameplate data were compared to information given in the Component Evaluation Work Sheets (CES) of the licensee's report. The site inspections are documented for Units 1 and 2 in reports IE 50-280/80-14 and 281/80-15, respectively. Prior to the inspection, the licensee had not determined the model numbers of several components listed on the CES. Consequently, licensee and inspector model numbers could not be compared. The licensee agreed to provide the model numbers during the present outage of the Surry steam generator."

On October 1, 1980 [1], Virginia Electric and Power Company (VEPCO) provided the NRC with an equipment environmental qualification submittal in response to IE Bulletin 79-01B for Surry Power Station Unit 2.

On December 1, 1980 [2], VEPCO submitted to the NRC further equipment environmental qualification information [3, 4] in response to IE Bulletin 79-01B.

On January 30, 1981 [14], VEPCO submitted to the NRC Revision 3 to the previous response to IE Bulletin 79-01B.

The NRC issued a Safety Evaluation Report (SER) to VEPCO on May 21, 1981 [17].

By letter dated August 24, 1981 [18], VEPCO transmitted to the NRC a response to the SER.

Requests for information [102, 103, 104] were transmitted to the NRC by FRC to obtain qualification documentation referenced by the Licensee in its submittals, TMI Action Plan information, and correlations to NUREG-0737 [13].

In References 23, 26, and 27, VEPCO responded to the FRC requests for additional information.

Enclosure B

NRC SER for Surry Station
NRC Concurrence with Basis for
Franklin TER Equipment Qualification Review Report

Nuclear Utility Group on Equipment Qualification Comments on NRC Draft Questions and Answers Regarding Unresolved Issues in EQ DBA Program Inspections, June 29, 2018

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Docket Nos. 50-280
and 50-281

Mr. W. L. Stewart
Vice President - Nuclear Operations
Virginia Electric and Power Company
Post Office Box 26666
Richmond, Virginia 23261

Dear Mr. Stewart:

This letter transmits the Safety Evaluation Report for the Environmental Qualification of Safety-Related Electrical Equipment at Surry Power Station, Unit Nos. 1 and 2. This evaluation is based on your responses to our previous Safety Evaluation Report, issued on May 21, 1981. This Safety Evaluation Report presents the results of the Environmental Qualification Review for safety-related electrical equipment, exposed to a harsh environment, in accordance with NRC requirements. We request that you provide your plans for qualification or replacement of the equipment in NRC categories I.B, II.A and II.B (presented in the Technical Evaluation Report) and the schedule for accomplishing your proposed corrective actions to us within ninety (90) days of the receipt of this letter.

As indicated in the conclusion section of the Safety Evaluation Report, we request that you reaffirm the justification for continued operation and within thirty (30) days of receipt of this letter, submit information for items in NRC categories I.B, II.A and II.B (presented in the enclosed Technical Evaluation Report) for which justification for continued operation was not previously submitted to the NRC. We suggest that the clarification set forth in Item 8 of Generic Letter No. 82-09, "Clarification Questions and Answers of Environmental Qualification Requirements," should be considered in your justification for contined operation.

The Technical Evaluation Report contains certain identified information which you have previously claimed to be proprietary. We request that you inform us as indicated in the proprietary section of the Safety Evaluation Report whether any portions of the identified pages still require proprietary protection.

At your option, the staff will be available to discuss the findings in the Safety Evaluation Report as augmented by the Technical Evaluation Report. Questions regarding this letter should be directed through the NRC Project Manager for your plant.

Please Send Copy of XA to PDR

OFFICE							
SURNAME							
DATE							

Attachment To Be Withheld From Public Disclosure

The reporting and/or recordkeeping requirements contained in this letter affect fewer than ten respondents; therefore, OMB clearance is not required under P.L. 96-511.

Sincerely,

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Enclosures:
1. Safety Evaluation Report
2. Technical Evaluation Report

cc w/o TER:
See next page

Attachment To Be Withheld From Public Disclosure

SAFETY EVALUATION REPORT BY THE
OFFICE OF NUCLEAR REACTOR REGULATION
EQUIPMENT QUALIFICATION BRANCH
FOR VIRGINIA ELECTRIC AND POWER COMPANY
SURRY 1
DOCKET NO. 50-280

ENVIRONMENTAL QUALIFICATION OF SAFETY-RELATED ELECTRIC EQUIPMENT

INTRODUCTION

General Design Criteria 1 and 4 specify that safety-related electrical equipment in nuclear facilities must be capable of performing its safety-related function under environmental conditions associated with all normal, abnormal, and accident plant operation. In order to ensure compliance with the criteria, the NRC staff required all licensees of operating reactors to submit a re-evaluation of the qualification of safety-related electrical equipment which may be exposed to a haran environment.

BACKGROUND

On February 8, 1979, the NRC Office of Inspection and Enforcement (IE) issued to all licensees of operating plants (except those included in the systematic evaluation program (SEP)) IE Bulletin (IEB) 79-01, "Environmental Qualification o. Class IE Equipment." This Bulletin, together with IE Circular 78-08 (issued on May 31, 1978), required the licensees to perform reviews to assess the adequacy of their environmental qualification programs.

On January 14, 1980, NRC issued IE Bulletin 79-01B which included the DOR guidelines and NUREG-0588 as attachments 4 and 5, respectively. Subsequently, on May 23, 1980, Commission Memorandum and Order CLI-80-21 was issued and stated the DOR guidelines and portions of NUREG-0588 form the requirements that licensees must meet regarding environmental

EVALUATION

The acceptability of the licensee's equipment environmental qualification program was resolved for the Division of Engineering by the Franklin Research Center (FRC) as part of the NRR Technical Assistance Program in support of NRC operating reactor licensing actions. The consultant's review is documented in the report "Review of Licensees' Resolutions of Outstanding Issues from NRC Equipment Environmental Qualification Safety Evaluation Reports," which is attached.

We have reviewed the evaluation performed by our consultant contained in the enclosed Technical Evaluation Report (TER) and concur with its bases and findings.

The staff has also reviewed the licensee's justification for continued operation regarding each item of safety-related electrical equipment identified by the licensee as not being capable of meeting environmental qualification requirements for the service conditions intended.

CONCLUSIONS

Based on the staff's review of the enclosed Technical Evaluation Report and the licensee's justification for continued operation, the following conclusions are made regarding the qualification of safety-related electrical equipment.

Enclosure C

Franklin TER Blank Copy of Equipment Qualification Checklist

Nuclear Utility Group on Equipment Qualification Comments on NRC Draft Questions and Answers Regarding Unresolved Issues in EQ DBA Program Inspections, June 29, 2018

DETAILED ENVIRONMENTAL QUALIFICATION DOCUMENTATION EVALUATION CHECKSHEET

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

Criteria: DOR Guidelines ___; NUREG-0588, Cat. I___; NUREG-0588, Cat. II ___; 10CFR50.49_____

REQUIREMENTS SECTION REFERENCE (DOR/0588-I/0588-II/50.49)	APPLICATION SPECIFICATION	QUALIFICATION DOCUMENTATION	SAT.	UNSAT.
EQUIPMENT DESCRIPTION				
Equipment Type				
Manufacturer's Name (5.2.2/-/-/J)				
Model Number (5.2.2/-/-/J)				
Serial Number				
Features/Mounting (5.2.6/-/-/-)				
Connections/Interfaces (5.2.6/-/-/J)				
Location/Elevation				
Equipment ID No.				
QUALIFICATION REPORT (8.0/5.0/5.0/J)				
Report ID Number				
Report Date				
Issued by				
Prepared for				
Referenced Reports				
Qualification Method (5.1, 5.3/2.1, 2.4/2.1, 2.4/f)				
QUALIFICATION TEST PROGRAM				
Functional Test Description (5.2.5/2.2.9/2.2.9/d.1)				
Operating Conditions (-/2.2.10/2.2.10/d.2) Load/Cycles/Voltage/ Current/Freq.				

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

REQUIREMENTS SECTION REFERENCE (DOR/0588-I/0588-II/50.49)	APPLICATION SPECIFICATION	QUALIFICATION DOCUMENTATION	SAT.	UNSAT.
Acceptance Criteria (5.2.5/2.2.1/2.2.1/-)				
Accuracy (5.2.5/-/-/-)				
Number of Specimens				
Test Instruments Calibrated				
Safety Function (Active/ Passive) (-/2.1.3/2.1.3/-)				
Test Duration (5.2.1/-/-/-)				
Accident Duration (Envir. Above Normal) (5.2.1/-/-/-)				
Required Function Time				
Test Sequence (General/-) (5.2.3/2.3.1/2.3.1/-)				
Test Sequence (NUREG-0588, Cat. I, 10CFR50.49) (-/2.3.1/-/-)				
Note: The sequence may be be varied with appropriate justification				
1. Representative Sample				
2. Baseline Data				
3. Performance Extremes				
4. Thermal Aging				
5. Radiation Aging				
6. Wear Aging				
7. Vibration/Seismic				
8. DBE Exposure				
9. Post-DBE Exposure				
10. Inspection				
Aging (5.2.4, 7.0/4.0/4.0/e.5) Thermal Aging/Basis				
Material Aging Evaluation (7.0/-/-/-)				

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

REQUIREMENTS SECTION REFERENCE (DOR/0588-I/0588-II/50.49)	APPLICATION SPECIFICATION	QUALIFICATION DOCUMENTATION	SAT.	UNSAT.
Materials Susceptible (Thermal) (5.2.4, 7.0/-/-/-)				
Radiation Aging, Type				
Radiation Aging, Dose (rd)				
Radiation Aging, Dose Rate				
Materials Susceptible (Radiation) (5.2.4, 7.0/-/-)				
Operational Aging (-/4.2/-/e.5)				
Other Age Conditioning (-/4.2/-/e.5)				
Qualified Life Claimed/ Established (5.2.4/4.10/-/e.5)				
Normal Ambient Temperature				
Normal Ambient Radiation				
Normal Ambient Humidity				
On-Going Surveillance and Preventive Maintenance (7.0/-/-/-)				
On-Going Analysis of Failures and Degradation (7.0/-/-/-)				
Margin (General) (6.0/3.0/3.0/e.8)				
Margin (NUREG-0588, Cat. I, 10CFR 50.49) (-/3.2/-/e.8)				
1. Temperature (+15°F)				
2. Pressure (+10%, 10 psig max)				
3. Radiation (accident)				
4. Time (+10%, (1 hour + function time minimum))				

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

REQUIREMENTS SECTION REFERENCE (DOR/0588-I/0588-II/50.49)	APPLICATION SPECIFICATION	QUALIFICATION DOCUMENTATION	SAT.	UNSAT.
ACCIDENT CONDITIONS				
LOCA/MSLB/HELB/Uncontrolled (4.1, 4.2, 4.3.1, 4.3.3/ 1.1, 1.2, 1.5/1.1, 1.2, 1.5/ e.1)				
Radiation Type				
Radiation Dose (rd) (4.1.2/1.4/1.4/e.4)				
Radiation Dose Rate (rd/hr)				
Radiation Qual. Method (5.3.1/-/-/e.4)				
Proximity to Concentrated Radiation (4.1.2/1.4.6/1.4.6/e.4)				
Equipment Susceptible to Beta Radiation (4.1.2/-/-/ e.4)				
Radiation Dose (Normal + Accident) (4.1.2/-/-/-)				
Plateout Dose Considered (-/1.48/1.48/-)				
Gamma + Beta Dose (rd) (4.1.2/1.4.7/1.4.7/-)				

EQUIPMENT ENVIRONMENTAL QUALIFICATION REVIEW

REQUIREMENTS SECTION REFERENCE (DOR/0588-I/0588-II/50.49)	APPLICATION SPECIFICATION	QUALIFICATION DOCUMENTATION	SAT.	UNSAT.
ENVIRONMENTAL PROFILE OF ACCIDENT CONDITIONS				
Rate of Temp./Press. Increase				
Peak: °F/psig/RH/Time				
Decrease To: °F/psig/RH/Time				
Decrease To: °F/psig/RH/Time				
Decrease To: °F/psig/RH/Time				
Equipment Surface Temperature (MSLB) (-/1.2.5.C, 2.2.6/1.2.5.C, 2.2.6/-)				
Spray Qualification Method (5.3.2/1.3, 2.2.8/1.3, 2.2.8/e.3)				
Spray Composition (4.1.4/1.3, 2.2.8/1.3, 2.2.8/e.3)				
Spray Density (gpm/ft^2)				
Spray Duration				
Submergence Duration (4.1.3/2.2.5/2.2.5/e.6)				
In-Leakage Considered (5.2.6, 5.3.2/-/-/-)				
Time to Submergence				
Dust Environment (-/2.2.11/2.2.11/-)				

NOTES: