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Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants

Comment On: NRC-2020-0245-0001

Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants

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Submitter Information

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General Comment

Attached are my preliminary comments on the DG-1361. If the comment period is extended, I would gladly look into more detail and provide any additional comments that I might have to offer.

Attachments

RG 1-89 R2 VPB Comments

Vincent P. Bacanskas

USNRC Docket Number 2020-0245
DG-1361 Comments

Gentlemen:

I am forwarding comments as a member of the public on DG-1361. Prior to my retirement in 2020, I had spent over 40 years in the nuclear industry with work on equipment qualification (EQ) as a primary responsibility for many of those years. My experience has included developing a qualification program for a plant under construction during the formulation of 10CFR50.49, review of IEB 79-01B submittals for the Office of Nuclear Reactor Regulation (NRR), Equipment Qualification Branch (EQB), equipment qualification and aging research for the NRC Office of Research (RES), and EQ inspections at licensee and vendor facilities conducted with the Office of Inspection and Enforcement (OIE). I also held primary responsibility for an EQ test laboratory during this time and conducted several qualification test programs. I subsequently worked at a few operating plants and a short consulting stint over the balance of my career. I retired as Chief Engineer for a utility operating multiple nuclear units.

I also was a member of the Institute of Electrical and Electronic Engineers, Nuclear Power Engineering Committee, and Subcommittee 3 on Maintenance Good Practices, Subcommittee 2 on Equipment Qualification, IEEE-323 working group and a short time as Chair of Subcommittee 2 until employment duties gave rise to my leaving SC-2 and NPEC.

I offer these comments to provide clarity and perspective from an individual who has worked with EQ for approximately 40 years, or as they say, until the end of my qualified life. My comments are on the pages that follow. These are initial comments and I hope to provide additional comments as the comment period may be extended. Thank you for including me in the Regulatory Process. There are those on the staff who know how to obtain my contact information should the need arise, but I offer no contact information for open publication. Thank you in advance for allowing me to provide comments to improve the staff's performance.

Sincerely,

Vincent P. Bacanskas

CC: Ron Wise
William Horin

Comments on DG-1361

1. Current NRC licensees have gone through a rigorous process of qualification over the past 43 years (1978-2021). Licensees were subject to a review of all qualification documentation in the early 1980's with subsequent staff meetings for corrective actions, follow up inspections on those corrective actions and in the past 5 years, re-inspection to validate the continuation of the program. Many licensees have gone through re-examination of their files for methodology to support extension of their operating licenses. The existing licensing bases are firmly established for operating reactors and reactors currently under construction. Review of the dual logo standard shows no promise of burden reduction on existing licensees, and the wording within DG-1361 quotes existing regulations out of context and creates the potential for backlit/forward fit in many instances. There appears to be NO incentive for an operating reactor to change commitments or licensing bases to incorporate either this revision of the IEEE standard or DG-1361 as written. DG-1361 should thus be revised to indicate that it does NOT apply to existing licensees unless a change in a licensing commitment is made.
2. DG-1361 fails to recognize the incorporation of 10CFR50.69 since the publication of 50.49, and where 50.49 is quoted for equipment under its scope in the DG. 50.69 specifically excludes EQ for RISC-3 components and the Commission even states that files such as those required for 50.49 are NOT required for RISC-3 components. (69 FR 68008). EQ (50.49) is identified as a special treatment requirement which is not required to 'provide reasonable confidence' of a component's capability to provide a low safety significant design function. While 50.69 was published after 50.49, and 50.49 was not revised to address RISC-3 equipment, it should be identified in the Applicable Regulations section of DG-1361. Footnotes should be added to Staff Regulatory Guidance Section C.1.b indicating that RISC-3 components are not included within this position. This footnote should be repeated whenever the staff's regulatory position includes similar wording. It might be most simply addressed in the Introductory Discussion in the DG so that it is understood before looking at staff guidance in the document.
3. Under Applicable Regulations, the statement related to Criterion 3 of 10CFR50, Appendix B is written in a matter that could be misleading. These criteria should be listed and described separately so that it does not read that 'testing' is only associated with Criterion III Design Control. Criterion III lists several methods of design verification and all are acceptable to meet Criterion III.
4. Under "Related Guidance", the NRC staff states: "RG 1.40...describes a method that the staff of the NRC considers acceptable to implement regulatory requirements with regard to the design, inspection, and testing of normal atmospheric cleanup systems for controlling releases of airborne..." This is the first example of a perceived BACKFIT contained within this document. A review of the latest RG 1.40 reveals that there is no language within the Regulatory Guide related to 'normal atmospheric cleanup systems'.

It appears that the staff is trying to add equipment qualification requirements to another sub-class of systems that do not perform one of the essential functions outlined in 10CFR50.49. This wording should be removed as it is inconsistent with current regulation.

5. In Regulatory Guidance C.1, the staff throws in guidance related to 'service life', installed life, and qualified life'. The staff guidance should only be to not use those definitions in the dual logo standard. These terms have definitions in IEEE STD 323-1971, IEEE STD 323-1974, DOR guidelines, NUREG-0588, and RG 1.89 R0 and R1 which may NOT be consistent with the current language presented. As said in Comment 1 above, licensing bases for plants with operating licenses are relatively fixed and departure to new definitions may not only confuse inspectors, but potentially represent a threat of backfit if interpreted incorrectly from the initial licensing basis.
6. Section C.1.f, the staff states in part: *"...If used, these methodologies must ensure [emphasis added] that equipment important to safety will perform under the conditions specified in 10CFR50.49."* This appears to be another potential for a BACKFIT. The standards of qualification are, and have been, that we are required to provide reasonable assurance that equipment is capable of performing its intended safety function when called upon. Substituting the wording above [ensure] changes the base requirements. 10CFR50, Appendix A (General Design Criteria) make this abundantly clear in its introduction: *"Under the provisions of § 50.34, an application for a construction permit must include the principal design criteria for a proposed facility. Under the provisions of 10 CFR 52.47, 52.79, 52.137, and 52.157, an application for a design certification, combined license, design approval, or manufacturing license, respectively, must include the principal design criteria for a proposed facility. The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance [emphasis added] that the facility can be operated without undue risk to the health and safety of the public."*
7. Regulatory Guidance C.1.h discusses establishing the radiation qualification dose but clearly does not include the additional guidance provided in RG 1.89 R1. As this is the only document that it appears in, deleting the guidance would represent a backfit. Specifically, RG 1.89, Regulatory Position C.1.c(6) states: *"Shielded components need be qualified only to the gamma radiation environment provided that it can be demonstrated that the sensitive portions of the component or equipment are not exposed to significant beta radiation dose rates including heating and secondary radiation, have no deleterious effects on component performance. If, after considering appropriate shielding factors, the total beta radiation dose contribution to which the equipment or component is calculated to be less than 10% of the total gamma radiation dose to which the*

equipment has been qualified, the equipment or component is considered qualified for the beta and radiation environment." Considering the number of times that this provision was used to justify TID doses, removing this consideration would be a significant backfit for existing licensees. Also, RES performed research related to the actual radiation types, etc., that would be seen while exposed to a Cobalt-60 source. This was published in NUREG/CR-5231, Cobalt 60 Simulation of LOCA Radiation Effects. Perhaps review of this document would provide the appropriate insights to be included in the draft RG.

8. Staff Regulatory Guidance C.1.j(1) – 10CFR50.49(e)(7) states: *"Synergistic effects must be considered when these effects are believed to have a significant effect on equipment performance."* NUREG-0588, Part 1 refers one to NUREG/CR-0276 and NUREG/CR-0401 for synergistic effects. NUREG/CR-0276 says that there were no cable failures during this particular research program and that no significant functional or mechanical synergisms exist (Test Summary Sec. 2.2.4). NUREG/CR-0401 contains essentially the same paragraph from NUREG/CR-0276 and includes a section on ethylene propylene insulation with PVC jacket from Savannah River where they indicate degradation occurred and they expect synergistic effects contributed. The entire focus on this seems without value as little to no additional research was published on this. Furthermore, to state in RG 1.89 R1 that the test sequence of IEEE 323-1974 shall be followed; then there is a staff expectation that radiation followed by thermal aging is the preferred sequence. This once again, raises regulatory confusion. In essence, the entire staff position on synergism appears to have little scientific basis. While Sandia did document that some materials degraded at different rates with varying radiation dose rates, using the Merriam-Webster online dictionary, this is not a synergistic effect. The presence of this dose rate phenomena is clearly proven and must be a consideration in radiation aging. It would benefit the industry and the NRC staff to remove the position with regard to synergism, state as was included in NUREG-0588 that a simple literature search is sufficient and instead provide a regulatory position on dose rate effects as part of DG-1361. This would be of great benefit to EQ programs everywhere and there is nothing in the present research that even implies safety could be deleteriously affected by synergistic effects in EQ testing.
9. Section C.1.j(3) discusses the use of an Activation Energy and imposes specific requirements that are absent from any Regulatory Document. Specifically, Regulatory Guide 1.89, R1 states in C.5.(c): *"The aging acceleration rate and activation energies used during qualification testing and the basis upon which the rate and activation energy were established should be defined, justified, and documented."* The section in DG-1361 not only adds additional requirements [Backfit] but in some instances is technically incorrect.

Many of the currently used activation energy values were developed by insulation system material research laboratories (non-nuclear) in the 1960's and 1970's. AIEE Guide for the Statistical Analysis of Test Data was published in 1968 and remained in effect until the publication of IEEE 101-1972 IEEE Guide for the Statistical Analysis of Thermal Life Test Data. This IEEE document was published by the IEEE Standards Coordinating Committee on Thermal Rating as a NON-NUCLEAR standard. IEEE 101, while referenced in IEEE 323-1974, was never endorsed by the NRC. IEEE 101-1972 states in part: *"Procedures for estimating the thermal life of electrical insulation systems and materials call for life tests at several temperatures, USUALLY WELL ABOVE THE EXPECTED NORMAL OPERATING TEMPERATURE. [emphasis added] By the selection of high temperatures for the tests, life of the insulation samples will be terminated, according to some selected failure criterion or criteria, within relatively short times-typically one week to one year."* The additional criteria added in the DG contradicts the standards used for the very testing it wishes to backfit. The paragraphs in IEEE 101-1972 go further to describe the appropriate methods to develop an activation energy. Furthermore, many activation energies were provided to licensees by manufacturers or equipment qualification test laboratories in full qualification reports or studies. The bases documents for the activation energies are referenced in the equipment qualification reports. These test reports were furnished to the licensee (in most cases) under an approved Appendix B program and the wording by the staff is attempting to transfer that responsibility to the licensees. Please also refer to 48 FR 2732 regarding the need for a 'central file' and the appropriateness of test laboratory files.

10. While the DG provides a statement in the Staff Regulatory Guidance section on applicability to equipment located in a Mild Environment, there should be a more definitive statement as position C.1 that 50.49 explicitly excludes equipment in a Mild Environment and paragraphs associated with this equipment are excluded from this DG.