

NUGEQ Comments on
DRAFT ISG 6, DIGITAL I&C LICENSING PROCESS

1. D.5 guidance on qualification only discusses testing and appears to ignore other acceptable methods of establishing qualification.

The D.5 guidance should be revised to make clear that, while testing is preferred, there are other acceptable methods of establishing qualification. The introductory paragraph in D5.1 appropriately states that *"The NRC staff will review the information provided to verify that the equipment has been demonstrated to be able to operate within the specified environment"*. However, it then states that: *"The equipment is tested with respect to a wide range of parameters, such as temperature, humidity, seismic, and electromagnetic, based on the environment in which the equipment is located."*

The NRC should clarify that testing is the preferred but not the only method of establishing qualification. In this regard, the existing guidance in RG1.209 can be used to clarify testing expectations.

Recommendation: Insert the following text derived from RG1.209 Regulatory Position 1 after the second sentence in the D.5.1 Scope of Review:

"For environmental qualification of safety-related computer-based I&C systems, type testing is the preferred method. The type tests may be manufacturer's tests that document performance to the applicable service conditions with due consideration for synergistic effects, if applicable."

2. D5.4 guidance on significant aging mechanism assessments and preaging is inconsistent with the guidance in RG1.209.

D5.4 second paragraph beginning – *"Prior to the performance of testing, the system shall be reviewed to identify significant aging mechanisms"* – requires such an aging assessment and age preconditioning prior to environmental testing if the mechanism is not accounted for by surveillances and maintenance. This position is in stark contrast to the guidance in Regulatory Guide 1.209 (RG1.209), "Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants," March 2007. For digital systems located in mild environments RG1.209 Regulatory Position 1 states, in part; *"The NRC does not consider the age conditioning in IEEE Std. 323-2003 Section 6.2.1.2 to be applicable because of the absence of significant aging mechanisms on microprocessor-based modules."*

Further, for mechanisms that can be accounted for by surveillances and maintenance this D5.4 paragraph also appears to require preconditioning to some quantifiable acceptance criteria and use of quantifiable measurements during periodic surveillance/maintenance. Unfortunately, not all aging mechanisms are amenable to simulation by accelerated preconditioning or meaningful quantitative periodic measurements.

Recommendation: Delete D5.4 second paragraph and replace with the following:

"For digital systems located in mild environments RG1.209 Regulatory Position 1 states that the NRC does not consider the age conditioning in IEEE Std. 323-2003 Section 6.2.1.2 to be applicable because of the absence of significant aging mechanisms. However, if significant aging mechanisms are identified, they shall be addressed in the qualification program. An aging mechanism is significant if in the normal or abnormal service environments it causes degradation during the installed life of the system that progressively and appreciably renders the equipment vulnerable to failure. Such mechanisms may be addressed by testing (e.g., preconditioning prior to testing), operating experience, or surveillance and maintenance. Where feasible the preconditioning and surveillance/maintenance assessments should be based on quantifiable acceptance criteria."

3. D.5.4.2 Radiation - fails to recognize that it is permissible to use one type of radiation during tests to simulate the effects of another type of radiation.

The third paragraph in D.5.4.2 states that: *"Because different types of radiation affect electronic components differently and are differently attenuated by shielding, the source or sources used to radiologically age the system should be representative of the actual in-plant source."*

However, it is a widely accepted practice to use one type of radiation (e.g., gamma) to simulate the effects of another type of radiation (e.g., beta).

Recommendation: Add the following to the third paragraph in D.5.4.2:

"If one type of radiation (e.g., gamma) is used to simulate the effects of another type of radiation (e.g., beta), then the basis for the equivalency shall be clearly established."

4. D.5.4.4 Sprays and Chemicals – suggests efforts that may extend beyond the environmental design basis of the equipment.

The equipment's environmental design basis should include, as appropriate, sprays and chemical effects within the design basis. If specified in the design basis, the equipment must be protected from or qualified to the effects of such sprays and chemicals. However, use of beyond design basis terminology such as *"if possible"* or *"potential"* considerations is not appropriate for defining the parameters of qualification.

Recommendation: Delete the existing text in D.5.4.4 and replace with the following:

"Digital I&C systems whose design basis includes exposure to sprays (e.g., fire sprinkler systems) or chemicals must be protected from or qualified to the effects of such sprays and chemicals. If such exposures occur during normal operation, including maintenance and surveillance, they should be treated as an aging mechanism."