August 22, 2007

Mr. Adrian P. Heymer
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SUBJECT: RESPONSE TO NUCLEAR ENERGY INSTITUTE (NEI) LETTER DATED MAY 23, 2007 - RE: INDUSTY COMMENTS ON RECENT GUIDANCE DOCUMENTS

By letter dated May 23, 2007 (ADAMS Accession No. ML071590207), NEI submitted additional information on the industry concerns associated with recently published guidance documents. These guidance documents included four Regulatory Guides: RG 1.9, Rev. 4, *Application and Testing of Safety-Related Diesel Generators*; RG 1.209, Rev. 0, *Guidelines for Environmental Qualification of Safety-Related Computer-Based I&C*; RG 1.20, Rev. 3, *Comprehensive Vibration Assessment Program for Reactor Internals during Preoperational and Initial Startup Testing*; and RG 4.15, Rev. 2, *Quality Assurance for Radiological Monitoring Programs (Inception through Normal Operations to License Termination)—Effluent Streams and the Environment.*

A public meeting was held on August 8 & 9, 2007 to discuss these concerns. The enclosure provides the staff's response to concerns dealing with RG 1.9, RG 1.209, and RG 1.20. RG 4.15 will be discussed at a future periodic meeting with NEI. Issues other than these RGs will be addressed in separate memoranda.

If you have any questions regarding this matter please contact me at (301) 415-1323.

Sincerely,

/RA/

William Reckley, Chief
Rulemaking, Guidance, and Advanced
Reactors Branch
Division of New Reactor Licensing
Office of New Reactors

Enclosure: As Stated

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Staff Responses to NEI Comments on RG 1.9

The staff agrees that voltage overshoot during a load rejection test will be larger when the EDG is operating at a designed load power factor. However, this additional overshoot should not normally be a problem because the EDG and its connected components typically can tolerate quite high transient over-voltages. Further, the staff agrees that the Regulatory Position 2.2.8 does not specify the voltage requirement. This requirement is provided in the Standard Technical Specifications (For example, Section 3.8.1.10 of NUREG 1431, Volume 1 specifies "typical" voltage requirements not to exceed 20% for Westinghouse plants). Note that the "typical" voltage values must be substituted with plant specific values based on the operational requirements of the safety system equipment under design basis events. The staff agrees to include this clarification in the next revision of RG 1.9.

The power factor requirement was not included in RG 1.9 Revision 3 or IEEE Std 387-1995 because this was not a technical concern at the time of publication of these documents. IEEE Std 387-1995 is currently under revision and the staff expects that this would be addressed appropriately in its revision. The emergency core cooling loads are generally induction motor-driven pumps. Therefore, the combined power factor of these safety loads is usually 0.85 to 0.90. It is prudent that EDG demonstrates its operational capability at a power factor that would be seen during an actual emergency event to ensure that failures or incipient failures due to reactive loading will not go undetected. The operating experience has revealed that some EDGs experienced failures in the governor field circuitry when tested at the rated load power factor.

The staff agrees that in certain cases, the grid voltage conditions could require generators to produce its maximum voltage for reaching the required load power factor. The required voltage increase for testing could be managed to an acceptable level by choosing periods when the grid conditions are favorable, or changing transformer taps to regulate the bus voltage.

The staff agrees that the Table 1 should be revised to remove the "check marks" for Sections 7.2.1.1, 7.2.1.2 and 7.2.1.3.

The staff agrees that monthly availability tests are covered in Sections 7.5.1, 7.5.2 of IEEE Std 387-1995 and Regulatory Position 2.3.2.1. The staff agrees that the use of the words "simulate...environments" in Regulatory Position 1.5 is subject to different interpretations. The staff intended that the effects of environments (temperature and humidity) should be considered in establishing the rating of the diesel generator. The tests should confirm that the capacity margin provided in the design of the EDG is continued to be adequate for design basis event mitigation during worst case expected temperature and humidity condition for a given plant.

The staff agrees to include this clarification in the next revision of RG 1.9.

The staff intended that the 30 day mission time for EDG should be considered if an extended LOOP occurs. The "endurance and margin test" currently performed for 24 hours is adequate to demonstrate that the engine and the support systems are capable of operating for a long period if required. While the performance of the EDG is expected for greater than 24 hrs, the testing is not required for more than 24hrs.

No changes to the RG 1.9 are necessary.

Staff Responses to NEI Comments on RG 1.209

RG 1.209 captures the all the qualification requirements for safety-related computer-based I&C systems for service within nuclear power plants as explained in
Page 2 paragraph 3 of the RG as stated below:

"This regulatory guide describes a method that the NRC staff considers acceptable for determining the environmental qualification procedures for safety-related computer-based I&C systems for service within nuclear power plants. In so doing, this guide endorses certain practices in the current national standard, and it incorporates guidance to address specific issues posed by the application of microprocessor-based technology. Adherence to these qualification practices contributes to ensuring that a computer-based
I&C system can perform its safety-related function under all anticipated service conditions."

Clarifications on regulatory positions

Position 2 on Testing
The RG states "The qualification testing should be performed with the I&C system functioning, with software and diagnostics that are representative of those used in actual operation, while the system is subjected to the specified environmental service conditions, including abnormal operational occurrences. Testing should exercise all portions of the safety-related computer-based I&C systems necessary to accomplish the safety-related function or those portions whose operation or failure could impair the safety-related function. Qualification testing should confirm the response of digital interfaces and verify that the design accommodates the potential impact of environmental effects on the overall response of the system."

The scope of testing includes exercising all portions of the safety-related computer-based I&C systems necessary to accomplish the safety-related function or those portions whose operation or failure could impair the safety-related function.

In order to follow the guidance of IEEE 323-2003 Section 7.2 j), the details of the tested configuration, with its schematic, drawings etc., for hardware and software, test specifications, test results, etc., become a part of the qualification record to establish how the test sample is a representative of the qualified equipment in service.

Position 4 on Documentation
The RG states "The evidence of qualification in a mild environment should be consistent with the guidance given in Section 7.2 selectively based on actual environmental conditions, and the records should be retained at a facility in an auditable and readily accessible form for review and use as necessary."

IEEE 323- 2003 section 7.2 n) "Identification of design basis event tests" addresses the need to document design basis test records. The documentation for all the tests mentioned in RG Position 2 become a part of the records to be retained in readily accessible form at the facility. The documentation includes test records that demonstrate acceptable performance of the system during environmental tests and how the test sample is a representative of the qualified equipment in service.

The staff is requesting only the documentation that was needed to review the amendments for approving similar systems for existing plants. Unlike relays and switches, the computer-based control systems have several process functions that could impact many safety related

operations. Software revisions and hardware changes could influence the qualification. The requested information is essential in the design and licensing phase for confirming the appropriateness of the processor, affirming the accuracy during start-up testing, and modifying functions if necessary during operation.

The historic records on software and hardware tests, during the development of the earlier models, are not within the scope of this documentation unless those become a basis for qualifying the system to perform its functions.

These clarifications will be incorporated in a future revision of RG 1.209.

Staff Responses to NEI Comments on RG 1.20

At a public meeting on August 9, 2007, industry participants requested that the NRC staff clarify the intent of revising Regulatory Guide 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing," for vibration assessment of plant components beyond the reactor internals. In Revision 3 to RG 1.20, the NRC staff included lessons learned from the occurrence of adverse flow effects at operating nuclear power plants from acoustic resonance in steam lines (Quad Cities and Dresden nuclear power plants) and reactor coolant branch line (Palo Verde Unit 1 nuclear power plant). These acoustic resonance effects have damaged reactor internals (such as steam dryers), safety-related relief valve actuators, and plant piping and supports. New plants and those plants going through modifications to allow power uprates potentially have to address this operating experience to meet 10 CFR 50, Appendix A, General Design Criteria 1, 4, 14, and 15, which address dynamic testing and analyses to ensure structural and functional integrity of nuclear power plant structures, systems, and components.

NRC staff agrees that RG 1.20 (Revision 3) includes information beyond the title of reactor internals and startup testing. NRC staff recognized this during development of RG 1.20, but included the information in the guide at this time to alert new reactor applicants of this safety issue early in the development of their applications. In revising RG 1.20, the staff provided updated recommendations for vibration assessment of reactor internals and information on the consideration of potential adverse flow effects for other components that may need to be taken into account in new plant applications and amendments for operating plants to meet 10 CFR 50. RG 1.68 (Revision 3, March 2007), "Initial Test Programs for Water-Cooled Nuclear Power Plants," on initial test programs references RG 1.20 for vibration assessment of reactor internals and other components. In addition, the NRC Office of Nuclear Reactor Regulation (NRR) updated Standard Review Plan (SRP) Sections 3.9.2, "Dynamic Testing and Analysis of Systems, Structures, and Components," and 3.9.5, "Reactor Pressure Vessel Internals," to provide guidance for the staff review of applications for new plants and power uprates related to potential adverse flow effects. These SRP sections also reference RG 1.20.

In the Introduction to Revision 3 to RG 1.20, the NRC staff states, in addition to vibration assessment of reactor internals, the guide provides helpful information on methods for evaluating the potential adverse effects from pressure fluctuations and vibrations in piping systems for both boiling water reactor (BWR) and pressurized water reactor (PWR) nuclear power plants. The staff does not expect the same level of detail to be necessary in addressing potential adverse flow effects for both BWR and PWR plants in light of the more significant operating experience from these effects at BWR plants. RG 1.20 lays out options industry could use in addressing operating experience in the development of vibration monitoring and

test program. During the August 9, 2007, meeting, hold points were called out as a specific concern by industry. The guidance in the RG was intended to identify licensee hold points as a viable alternative as part of a program to test operating conditions, not to state that hold points for NRC are required. It is industry's responsibility to determine which of the options (either listed or otherwise), including when in the process tests should occur, would be most appropriate for their situation.

Since adverse flow effects in reactors caused by flow-excited acoustic and structural resonances are as-built specific and sensitive to minor changes in arrangement, design, size, and operating conditions, it is NRC staff's position that all applications will need to address the phenomena. Applicants have the option of addressing the phenomena by providing a description of the test programs or analyses used to address the phenomena or by providing a basis as to why their plant does not need to address the phenomena (for example, an analysis that shows that the level of standardization is such that the existing testing from another facility could be used).

NRC staff does not intend to withdraw Revision 3 of RG 1.20. The NRC staff considers that COL applicants for new nuclear power plants and current licensees applying for power uprates should use Revision 3 to RG 1.20 in the development of vibration assessment programs. Applicants are encouraged to discuss their plans for implementing RG 1.20 with respect to potential adverse flow effects with the staff early during the implementation process. In addition, applicants can propose an approach different from that discussed in RG 1.20 where improvements in addressing potential adverse flow effects are identified.

The NRC staff sent letters to the BWR and PWR Owners' Groups on July 18, 2007, regarding the staff's plan to prepare a Regulatory Issue Summary on potential adverse flow effects for new reactors and power uprates for operating reactors. The staff has been interacting with the nuclear industry on adverse flow effects since the occurrence of damage to the steam dryers at Quad Cities Units 1 and 2 several years ago. The staff is awaiting a response to its comments on the lessons learned document on extended power uprates prepared by the BWR Owners Group and on a steam dryer inspection guide prepared by the BWR Vessel Internals Program.

At the August 9 public meeting, industry participants provided several suggestions to clarify the guidance in RG 1.20 for new reactor applications. The staff will consider those suggestions along with knowledge gained in preparation of the Regulatory Issue Summary during the next revision to RG 1.20, such as separating the guidance for BWR and PWR plants. The staff will also consider expanding the scope of RG 1.20, or developing a new regulatory guide for vibration assessment of components outside of the reactor vessel.