

November 7, 2016

MEMORANDUM TO: Kevin Hsueh, Chief  
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Division of Policy and Rulemaking  
Office of Nuclear Reactor Regulation

FROM: Joseph J. Holonich, Senior Project Manager /RA/  
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SUBJECT: SUMMARY OF JULY 11, 2016, MEETING TO DISCUSS THE  
U.S. NUCLEAR REGULATORY COMMISSION STAFF EFFORT TO  
REVIEW ITS POSITION AND REGULATIONS ON COMMON CAUSE  
FAILURE

On July 11, 2016, U.S. Nuclear Regulatory Commission (NRC) staff met with representatives from the Nuclear Energy Institute (NEI), industry, and stakeholders. The purpose of the meeting was to discuss the ongoing NRC staff review of regulatory considerations related to the treatment of common cause failures (CCF) in digital instrumentation and control (I&C) systems. The meeting was a Category 3 workshop with open participation available to all attendees. The meeting was conducted as a tabletop exercise that evaluated a scenario developed by the NEI.

Information related to the meeting, including presentations and the attendees list, can be found in the Agencywide Documents Access and Management System (ADAMS) package accession number ML16174A045. In its opening remarks, the NRC staff provided some clarification points regarding expectation, goals, and objectives for the tabletop exercise. In particular, the staff emphasized that the primary objective of the tabletop exercise was for stakeholders to present and discuss the challenges/concerns that they encounter when using the current NRC position and guidance on CCF in digital I&C. The NRC staff also discussed our second objective, which was to discuss, demonstrate, and explain key technical approaches that could be used to address CCF. Before the meeting, the NRC staff sent a document summarizing these clarification points. A copy of this document is included in the enclosure to this summary.

The representatives from NEI, Electric Power Research Institute (EPRI) and industry developed and presented a hypothetical modification involving replacement of safety related control room HVAC chiller controls for use in this exercise.

In the first presentation, the EPRI briefly presented a re-cap of the concepts and definitions describing defensive measures that may be applied to the design of new digital I&C equipment and coping analysis, as presented in its new technical guide No. 3002005326, "Methods for Assuring Safety and Dependability when Applying Digital Instrumentation and Control Systems." This guide was issued on June 30, 2016, and it is now publicly available. The information provided in this presentation was later used to analyze the upgrade of the chiller controls.

The second presentation, "NEI CCF Tabletop Part 1," provided technical information concerning the chiller controls, as well as a brief identification of the problems and challenges with the

digital upgrade of the chiller controls under existing NRC policy and guidance. During this presentation, stakeholders stated that one of the challenges is the uncertainty of the applicability of BTP 7-19 to auxiliary systems. In particular, Revision 6 of BTP 7-19 requires a diversity and defense in depth (D3) analysis for auxiliary systems. Stakeholders see this as an unnecessary barrier with no value added that prevents industry from achieving the safety increases possible through implementation of digital modifications of auxiliary systems. In addition, BTP 7-19 identifies only two methods to eliminate the consideration of software CCF (diversity and simplicity), and stakeholders believe that other methods should be considered (e.g., defensive measures). Stakeholders also stated that for this example, they did not have a problem with the current NRC policy as defined in SRM-SECY 93-087, but rather on how it is implemented and interpreted. Based on this, at the end of this presentation, NEI stated the need for a short term solution, consisting of a modification of BTP 7-19, and a long term solution, consisting on clarifying the policy in SRM-SECY-93-087.

In the third presentation, "EPRI CCF Guide Chiller Controls Example," the NEI representatives described how an applicant might implement the example modification using the methodology described in EPRI 3002005326. The NEI representatives suggested that this approach would permit the applicant to implement the modification without facing the challenges posed by BTP 7-19. In this case, an applicant would perform coping analyses to demonstrate vulnerabilities to CCF have been adequately addressed. At the end of this presentation, participants stated that for this example (using coping analysis) they did not see a problem with the current NRC policy (defined in SRM-SECY 93-087) and guidance in BTP 7-19.

The fourth presentation, "Overview of Methods for Assessing CCF Issues under NEI 16-XX," describes the technical method being proposed by NEI for addressing CCF. This was the first introduction of this methodology that NEI has presented to the staff. The NEI representative explained that after performing a CCF susceptibility analysis, applicants can determine the level of susceptibility, and depending on such level determine the amount of bounding or coping analysis necessary to address CCF. The NEI representatives stated that susceptibility would be classified into one of three levels, similar to the levels three levels identified in EPRI 3002005326, but that NEI 16-XX provides additional details for the determination of the different susceptibility levels by eliminating ambiguities and flexibilities in the EPRI guide. At the end of this presentation, the NEI representatives stated they would request NRC review of this technical guidance when completed, but a date was not identified. The NRC staff asked NEI to describe in a future meeting the purpose and extent of NEI 16-XX. This was identified as an action item.

In the final presentation, "Chiller Example Part 3 CCF Methodology Illustration Alternative," NEI used the chiller controls example to illustrate how NEI believes that its method could be used to augment current NRC guidance to allow rationale beyond "diversity and simplicity" to reach a conclusion that a CCF need not be further considered within D3 conservative or best-estimate, bounding or coping, analysis. In this case, the configuration of the chiller controls was modified from the case analyzed in the third presentation. Using this example, the NEI representatives illustrated how defensive measures could be used. During this presentation, the NRC staff expressed concerns associated with the timing considerations for concurrent failures in different trains (e.g., the validity of the assumption that a concurrent or sequential trigger in both trains is unlikely). The industry representatives agreed that this is an area that requires further investigation.

At the end of this presentation, industry representatives stated that this example is consistent with current NRC policy (defined in SRM-SECY 93-087), but there are challenges associated with BTP 7-19. Specifically, the limitation on BTP 7-19 to eliminate CCF consideration only through simplicity or design diversity. Therefore, the industry representatives requested the NRC staff to evaluate other methods for eliminating CCF from consideration.

The meeting attendees agreed that the meeting achieved part of the stated goals but that additional tabletop exercises would be needed (e.g., a more complex example such as a digital I&C upgrade on a safety system) to clearly, completely, and unambiguously identify the specific challenges associated with the application of the current NRC policy and BTP 7-19. Participants agreed to hold another tabletop exercise meeting on August 22, 2016. The NRC staff requested that the next example clearly identify the challenges with current NRC policy and guidance. This was identified as an action item.

At the end of the meeting, the NRC staff and industry agreed to concentrate on addressing any concerns associated with the implementation aspects of the NRC position on CCF and subsequently assess how those implementation aspects should surface to the policy level.

### **Public Comments**

No public comments were provided throughout the meeting.

### **Action Items**

The following action items were identified at the meeting:

- 1) NEI to provide additional information, as well as a schedule for issuing a draft of NEI 16-XX for NRC consideration.
- 2) Schedule the next tabletop exercise for August 22, 2016.
- 3) The next example for the tabletop exercise should clearly identify the challenges/problems when using current NRC policy and guidance.

Enclosure:  
As stated

Project No. 689

## Tabletop Meeting with Industry on Common-Cause Failure

July 11, 2016

### **Purpose**

Perform a tabletop exercise to:

- 1) Discuss, demonstrate, and explain the challenges and concerns when applying or utilizing the current U.S. Nuclear Regulatory Commission (NRC) diversity, defense-in-depth (D3) assessment policy (SRM to SECY-93-087, Item II.Q) during the table-top exercise.
- 2) Discuss, demonstrate, and explain key technical approaches that could be used to address common-cause failure (CCF).

This meeting will allow its attendees to discuss any specific challenges and concerns associated with the current NRC policy on CCF so that they may be addressed accordingly through the development of the CCF working group's technical basis and subsequent policy and guidance considerations.

### **Scope**

Industry will provide an example that:

- 1) Demonstrate and explain challenges to implement current digital modifications.
- 2) Discuss and demonstrate key technical approaches that could be utilized to address CCF.

### **First tabletop exercise (Date: July 11, 2016)**

- Provide an example that explains and demonstrates the barriers to performing a digital software based modification under the current D3 assessment/analysis policy.
- Provide an example that demonstrates how the consequences of failure of a digital system due to CCF is already bounded (using an existing analysis). The analysis should show that even if that function cannot be performed by the analyzed components, the acceptance criteria will be met.
- Provide an example that demonstrates how defensive measures are used or incorporated to address CCF considerations. This would include demonstration of the method, discussion of the repeatability and measurability of the effectiveness of the defensive measures and the documentation to support providing credit for them in the analysis.

Enclosure

### Expectations

1. This tabletop exercise should provide insights on specific technical concepts and related policy issues for addressing CCF. This information would be analyzed and discussed by the NRC SCCF rulemaking group activities.
2. NEI will provide a realistic example of modifications that are under consideration in operating plants. The example should be the types that “the US nuclear industry has been slow to adopt, despite the need to replace obsolete analog and early digital components with modern technology” and which “one of the primary barriers is the NRC policy toward on mitigating software (SW) common-cause failure (CCF) in I&C designs” as discussed in the NEI comment letter on April 22, 2016.
3. The realistic example should be provided to NRC approximately 5 days prior to the workshop.
4. The table top should not delve into the specific question of how specific 50.59 criteria are met or interpreted or be a direct test of draft Appendix D. While there may be commonalities with the proposed concepts in draft Appendix D, this is not a table top exercise to test that guidance but instead the science for addressing CCF.
5. During this demonstration, the NRC staff will ask questions of how relevant technical issues within each approach would be considered/addressed /analyzed.
6. NEI should also articulate any specific CCF-related policy issues/questions that need to be reaffirmed or modified by NRC to address barriers with in using the potential technical approaches.

### Outcome of Table Top

The results of the demonstration of CCF technical issues (application, scoping, analysis, grading, or defensive measures) will be discussed and analyzed by the SCCF rulemaking group. In addition, identification of limitations/challenges with the application of the current D3 policy position will also be considered and discussed.

At the end of this presentation, industry representatives stated that this example is consistent with current NRC policy (defined in SRM-SECY 93-087), but there are challenges associated with BTP 7-19. Specifically, the limitation on BTP 7-19 to eliminate CCF consideration only through simplicity or design diversity. Therefore, the industry representatives requested the NRC staff to evaluate other methods for eliminating CCF from consideration.

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Enclosure:  
As stated

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