CHRISTOPHER E. EARLS
Senior Director, Regulatory Affairs

1201 F Street, NW, Suite 1100
Washington, DC 20004
P: 202.739.8078
cee@nei.org
nei.org

NUCLEAR ENERGY INSTITUTE

December 12, 2017

Mr. Christopher G. Miller
Director, Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Recommendations for Improving the Emergency Preparedness Significance Determination Process

Reference: NEI letter, "Significance Determination Process Revisions," Earls to Miller, dated October 12, 2017

Project Number: 689

Dear Mr. Miller:

In the Reactor Oversight Process (ROP) public meeting in September 2017, the NRC staff invited industry feedback on the Significance Determination Process (SDP). We provided our initial and overall feedback on SDPs in our letter referenced above. As indicated there and in the November 16, 2017 ROP meeting, the Nuclear Energy Institute (NEI)[1] is hereby providing industry recommendations for improving the Emergency Preparedness (EP) SDP.[2] Our concerns with this SDP, relevant background information, and our proposed remedy are provided in the attachment to this letter.

To address our concerns, the industry respectfully recommends that the NRC revise IMC 0609, Appendix B, Attachment 2, *Failure to Comply Significance Logic*, and related instructions so that the loss of a risk significant planning standard (RSPS) would result in, at most, a White finding, not a Yellow finding, as presently shown. All other *Failure to Comply* findings (shown as *RSPS Degraded Function* or *Loss of PS Function* in Attachment 2) should be determined to be Green.

[1] The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.
[2] NRC Inspection Manual Chapter (IMC) 0609, Appendix B, *Emergency Preparedness Significance Determination Process*, September 22, 2015, ADAMS ML15128A462.

We look forward to discussing our recommendations with the staff, perhaps at a future ROP or other public meeting, and working with the NRC staff to achieve a more risk-informed EP SDP.

If you have any questions, please contact my lead staff member on this project, James Slider (jes@nei.org, 202-739-8015), or me.

Sincerely,

Christopher E. Earls

Attachment

c: Mr. Joseph G. Giitter, DRA/NRR, NRC
Mr. Michael L. Scott, NSIR/DPR, NRC
Mr. Robert E. Kahler, NSIR/DPR/POB, NRC

Attachment

Industry Recommendations for Improving the Emergency Preparedness Significance Determination Process

Introduction

As mentioned in the cover letter, the nuclear industry is following up on an invitation from the NRC staff to provide feedback for improving the Significance Determination Process (SDP). The SDP is comprised of approximately 20 procedures the NRC uses to determine the risk significance of inspection findings under the Reactor Oversight Process (ROP). The focus of this attachment is the Emergency Preparedness SDP, identified as NRC Inspection Manual Chapter (IMC) 0609, Appendix B, "Emergency Preparedness Significance Determination Process," dated September 22, 2015, ADAMS ML15128A462. The feedback provided in this attachment was promised in a related NEI letter sent on October 12, 2017.[3]

The industry's concern with the EP SDP is that it can generate Greater-than-Green (GTG) outcomes for performance deficiencies that appear to be less risk-significant than those that produce GTG outcomes in other SDPs. In this regard, the risk assessment aspect of the EP SDP is not aligned with that of other SDP's. In these cases, the EP SDP implies that EP functions are of greater relative importance for the protection of public health and safety than plant systems and procedures which assure safe operation and prevent triggering of the emergency plan in the first place. Thus, the issuance of a White finding in EP gives the public the erroneous impression that EP was more significantly degraded and the public exposed to greater risk than for comparable situations that yield Green outcomes in other cornerstones of the ROP.

The misalignment between the EP SDP and other SDPs in assessing issue risk and importance leads to a disproportionately high number of GTG findings in the EP Cornerstone[4]. A review of findings from 2014 through September 2017 indicates that EP-related White findings account for approximately 25% of all the White findings issued in the six ROP Cornerstones for which data is publicly available.[5] Within just the EP Cornerstone, White findings are approximately 10 percent of the total findings, a percentage significantly higher than that of the other cornerstones.

Although 10 percent may sound like a small number, the impact of every White finding is significant. With the issuance of an NRC press release for every White finding, the surrounding community is unnecessarily alarmed and the affected licensee is immediately exposed to media interest, negative publicity, and Wall Street inquiries about financial implications to the plant owners. When the White finding is for a risk-insignificant performance deficiency, the licensee is at pains to put the true risk significance in perspective for those outside stakeholders. In addition to potentially unduly alarming the public, White findings undermine confidence in the credibility and consistency of the Reactor Oversight Process.

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[3] Letter from Chris Earls (NEI) to Chris Miller (NRC), "Significance Determination Process Revisions", October 12, 2017.

[4] Per NUREG-1649, a cornerstone of the ROP is a functional area which supports safe operation of nuclear power plants. Emergency Preparedness is one of the seven cornerstones of the ROP. The other six are Initiating Events, Mitigating Systems, Barrier Integrity, Occupational Radiation Safety, Public Radiation Safety, and Physical Protection.

[5] Information available to the public on findings and SDP results for the seventh cornerstone, Security, is insufficient to aid in the review described here.

Background

The issue described above is principally due to a statement contained in the technical basis for the EP SDP that "the probability of a reactor accident requiring implementation of the licensee's emergency plan has no relevance in determining the significance of EP findings," and therefore it is assumed that "the event has occurred."[6] This assumption should be reconsidered within the broader context of the NRC's Defense-in-Depth (DID) philosophy. In addition to being a cornerstone, EP is one of several elements comprising DID. The online NRC glossary defines DID as,

> *An approach to designing and operating nuclear facilities that prevents and mitigates accidents that release radiation or hazardous materials. The key is creating multiple independent and redundant layers of defense to compensate for potential human and mechanical failures so that no single layer, no matter how robust, is exclusively relied upon. Defense in depth includes the use of access controls, physical barriers, redundant and diverse key safety functions, and emergency response measures.*

The body of NRC documents describing DID is extensive but, from a collective reading of these documents, the concept can be summarized as providing the following layers of protection for public health and safety:

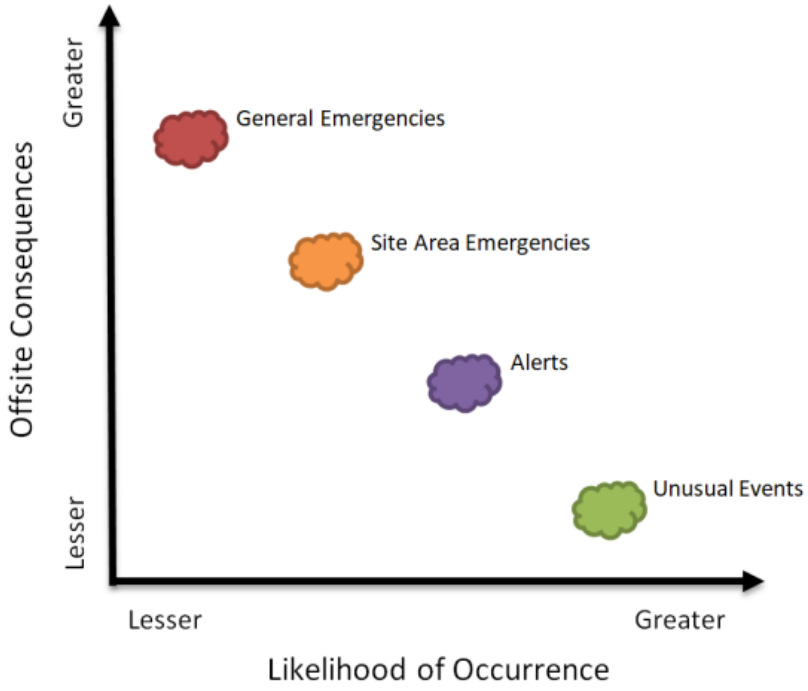
- Site facilities in low population areas.
- Ensure quality in the design, construction, testing, operation and maintenance of a facility so that it will perform during normal and abnormal conditions in a reliable and predictable manner.
- Prevent initiation of accidents (i.e., limit the frequency of accident initiating events).
- Install safety systems, including engineered safety features and containment, to detect, control and mitigate accidents (i.e., limit the probability of core damage given accident initiation).
- Maintain emergency response procedures for extreme events such as Extensive Damage Mitigation Guidelines (EDMGs) and Severe Accident Mitigation Guidelines (SAMGs) (e.g., limit radionuclide releases during core damage accidents).[7]
- Establish emergency plans and preparedness (e.g., limit public health effects caused by core damage accidents).

Thus, EP is generally recognized as the final layer of DID. Although enumerated last in the list above, EP is no less (or more) important than the other layers of DID. However, it is apparent that EP functions would not be employed unless the preceding layers were degraded or breached. Moreover, significant failures of the other DID layers would have to occur before protective actions for the public would become necessary. Contrary to these observations, the EP SDP's *Failure to Comply Significance Logic* assumes that implementation of a site emergency plan is the starting point for determining risk significance of an EP-

[6] NRC Inspection Manual Chapter 0308, Attachment 3, Appendix B, *Technical Basis for Emergency Preparedness Significance Determination Process*, December 19, 2012, ADAMS ML12284A512.
[7] Maintenance of EDMGs is a regulatory requirement while SAMGs are required by site-specific commitments to the NRC.

related performance deficiency. This assumption inflates the standing of the EP DID layer by essentially disregarding consideration of the other layers.

We believe that the EP SDP can and should be made more risk-informed to create better alignment between the actual increased risk to the public caused by an EP performance deficiency and the resulting finding significance. There are two elements of risk — the likelihood (or probability) of an accident and the seriousness of the resultant effects (or consequences). The figure below illustrates, in a qualitative manner, accident risk associated the four emergency classification levels established by the NRC.



The NRC Policy Statement, *Safety Goals for the Operations of Nuclear Power Plants*,[8] established two qualitative safety goals and two quantitative health objectives (QHOs). The two QHOs are a prompt fatality QHO and a latent cancer fatality QHO. For operating power reactors, a Large Early Release Frequency (LERF) guideline of 10^{-5} per reactor-year is used as a surrogate for the prompt fatality QHO and a core damage frequency (CDF) guideline of 10^{-4} per reactor year is used as a surrogate for the cancer fatality QHO. Since promulgation of the safety goal policy statement, substantial progress has been made in understanding severe accident behavior and the associated probabilities of occurrence. Recent analyses, such as NUREG-1935, *State-of-the-Art Reactor Consequence Analyses (SOARCA) Report*, show significantly lower consequences from severe accidents than earlier studies, with resulting increases in the margin to the QHOs.[9] These analyses, along with updated plant-specific evaluations of CDF and LERF, indicate that the likelihood of realizing the conditions that would require protective actions for the public, e.g., imminent or actual damage to irradiated fuel, is extremely low. Further, neither the SOARCA results nor the plant-

[8] 51 Fed. Reg. 28,044 (August 4, 1986) and 51 Fed. Reg. 30,028 (August 21, 1986).
[9] The SOARCA analyzed accident sequences selected for having the greatest risk and consequences, and identified CDFs in the range of 10^{-5}/yr to 10^{-8}/yr for representative PWR and BWR plants.

specific CDF and LERF values fully reflect the additional accident mitigation capabilities that each licensee has installed to meet post-Fukushima NRC Orders, including EA-12-049, *Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*.[10]

Industry Recommendation

In light of the preceding discussion, the EP SDP component driving our concern is the logic for determining the significance of a "Failure to Comply" performance deficiency as discussed in IMC 609, Appendix B. This logic is primarily focused on issue consequences and does not sufficiently consider the low likelihood that a given EP function or program element would require implementation, particularly for those performed during more consequential but less likely accidents, Site Area Emergencies and General Emergencies. Said differently, it does not take into account the coincident failures of the other layers of DID that would have to occur before protective actions for the public would become necessary. It is this unbalanced risk assessment that can produce an unwarranted White finding determination.

To address our concerns, the industry respectfully recommends that the NRC revise IMC 0609, Appendix B, Attachment 2, *Failure to Comply Significance Logic*, and related instructions so that the loss of a risk significant planning standard (RSPS) would result in a White finding, not a Yellow finding as presently shown. All other *Failure to Comply* findings (shown as *RSPS Degraded Function* or *Loss of PS Function* in Attachment 2) should be determined to be Green.

At this point, we believe other key features of the EP SDP can remain unchanged. Specifically:

- The current IMC 0609, Appendix B, Attachment 1, *Failure to Implement (Actual Event) Significance Logic*, and related instructions can remain. This logic appropriately determines the significance of a finding commensurate with the actual emergency classification level and failure to perform a required aspect of the site emergency plan.

- The current IMC 0609, Appendix B, Figure 5.14-1, *Significance Determination for CRITIQUE Findings*, and related instructions can remain. This logic uses appropriate factors and produces reasonable outcomes.

- The current IMC 0609, Appendix B, Figure 5.14-2, Attachment 2, *Significance Determination for Failure to Correct a WEAKNESS*, and related instructions can remain. This logic uses appropriate factors and produces reasonable outcomes.

We believe the proposed change to the *Failure to Comply Significance Logic* will improve the risk assessment aspect of the EP SDP through greater consideration of accident likelihood, and consequently lead to more appropriate finding significance levels. It also puts an emphasis on "what did happen" instead of "what could have happened." Should a performance deficiency be revealed during an emergency, the *Failure to Implement (Actual Event) Significance Logic* will appropriately determine the significance based on the actual impact.

[10] Also refer to SECY-16-0142, *Draft Final Rule – Mitigation of Beyond-Design-Basis Event (RIN 3150-AJ49)*, dated December 15, 2016.

We believe the proposed change is needed to maintain licensee and NRC focus on nuclear safety. When an EP White finding is issued (e.g., for a broad array of *Failure to Comply* performance deficiencies), licensee resources are diverted to investigate the issue and conduct a formal root cause analysis, then prepare for the supplemental inspection. This can cost more than $1 million and distract site management attention for weeks. While the costs of compliance are not the NRC's concern, the consumption of "management attention units" ought to be.

On the NRC side, agency resources are diverted to the conduct of a Significance and Enforcement Review Panel (SERP) and preparation for, conduct of, and follow-up to the supplemental inspection. If these White findings were recognized as not Greater-than-Green, as we believe they should be, the underlying issues could be dispositioned in a more timely and less burdensome, but no less effective, manner.[11]

[11] Because of the regulatory significance of a White finding, as well as the reputational risk (e.g., negative publicity and stigma among Wall Street analysts) associated with a White finding, licensees feel compelled to perform a formal root cause analysis to determine corrective actions. For Green findings, licensee procedures commonly allow the use of simpler, faster techniques that are sufficient to determine appropriate corrective actions.