



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
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January 11, 2018

MEMORANDUM TO: Joseph Colaccino, Chief  
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Office of New Reactors

FROM: Barbara Hayes, Project Manager /RA/  
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SUBJECT: SUMMARY OF PUBLIC MEETING DISCUSSING FIRST PRINCIPLES  
FOR USE IN DEVELOPING DESIGN CERTIFICATION TIER 1  
INFORMATION AND INSPECTIONS, TESTS, ANALYSES AND  
ACCEPTANCE CRITERIA

On November 16, 2017, staff from the U.S. Nuclear Regulatory Commission (NRC) conducted a Category 2 public meeting with the Nuclear Energy Institute (NEI) and other stakeholders to discuss a NEI white paper. Meeting attendees are shown in Enclosure 1. Copies of presentation materials used by the NRC staff can be found in the Agencywide Documents Access and Management System (ADAMS) under Accession No. [ML17325A767](#). Prior to the public meeting, NEI provided an additional handout to support the public meeting which can be found under ADAMS Accession No. [ML17319A097](#).

**BACKGROUND**

The NEI letter dated June 14, 2017, transmitted to the NRC a white paper entitled "First Principles for Use in Developing Design Certification Tier 1 Information and Inspections, Tests, Analyses and Acceptance Criteria [ITAAC]" (ADAMS Accession No. [ML17235A591](#)). The first principles presented in the white paper were taken from draft NEI 15-02 entitled "Industry Guideline for the Development of Tier 1 and ITAAC under 10 CFR Part 52" (ADAMS Accession No. [ML15147A672](#)). The letter states that NEI plans to submit a revision of NEI 15-02 for NRC review and endorsement that reflects NRC feedback on the white paper as well as feedback on the standardized ITAAC provided in connection with the ongoing NuScale Power, LLC, (NuScale) design certification (DC) review.

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Tier 1 Information is defined in the 10 CFR Part 52 appendices under Section II.D as follows:

“Tier 1 means the portion of the design-related information contained in the generic DCD that is approved and certified by this appendix (Tier 1 information). The design descriptions, interface requirements, and site parameters are derived from Tier 2 information. Tier 1 information includes:

1. Definitions and general provisions;
2. Design descriptions;
3. Inspections, tests, analyses, and acceptance criteria (ITAAC);
4. Significant site parameters; and
5. Significant interface requirements.”

### **MEETING SUMMARY**

NEI provided opening remarks regarding the rationale and history behind the development of their proposed first principles. NEI stated that the work on first principles developed out of a recognition of inconsistencies in how the ITAAC were developed both in terms of scope and language across several DCs. The first principles, as developed, are tied to the need for standardization of ITAAC as well as the need for consolidated guidance on the use of Tier 1. NEI provided a general description of how they developed the first principles and reiterated their request for NRC feedback on the white paper.

The NRC stated that several technical branches reviewed the white paper and provided detailed comments which were then reviewed for potential inclusion in the public meeting discussion. As such, the comments have not been thoroughly vetted and should not be misconstrued as final. The comments are instead intended to support constructive dialogue at the public meeting.

Before discussing NRC’s high level comments, NEI asked whether staff can 1) affirm the statements in SECY-17-0075, “Planned Improvements In Design Certification Tiered Information Designations,” that improved guidance on definition of Tier 1 information needed and 2) discuss whether the white paper is the right vehicle for such guidance. The NRC affirmed the statements made in the paper and noted that NUREG 0800, the light-water reactor edition of the Standard Review Plan (SRP), Section 14.3 provides more detailed guidance than was presented in the NEI white paper. NRC staff inquired whether the intent of the white paper was to inform future revisions of the SRP.

NEI responded that its longer term vision would be to drive the discussion to conclusion via NEI guidance which may ultimately also inform future revisions to the SRP. NEI hoped that the discussion would support that long term vision and also provide insight in the near term for current applicants and licensees.

NRC noted that with the issuance of SECY-17-0075, attention to the definition of Tier 1 information has been elevated and that improved Tier 1 information definitions should inform ITAAC. NRC also stated that the discussion of the NEI white paper would contribute to

developing guidance related to Tier 1 information and that the details of what vehicle is appropriate should be decided later.

An individual representing NuScale commented that NRC staff's input was very valuable and provided some additional information on how industry approached the development of the Tier 1 first principles. He clarified that ITAAC are a derivative of a process that begins with high level design descriptions that inform associated design commitments which in turn inform ITAAC. The NEI 15-02 discussion of first principles represented a summary of extensive internal work and included examples. NEI believed that they had the range of appropriate first principals (FP) with the understanding that more clarity and some changes were expected.

The NRC staff discussed the outcome of its review of the white paper. The staff's comments consisted of five high-level comments, four additional comments and three questions. The NRC staff's comments on the white paper were acknowledged by NEI as being critical for potential future alignment. NEI shared critical context on their development efforts that were not included in the white paper. A summary of NRC's comments and questions along with feedback from NEI is included below:

#### **High Level NRC Comments:**

- Comment 1. Tier 1 Information other than design description & ITAAC: It is unclear how the first principles apply to Tier 1 information other than design description and ITAAC.

The NRC staff explained that the document title, cover letter and introduction imply that it addresses the full scope of Tier 1 information, including significant site parameters and interface requirements. However, the text only addresses design descriptions and ITAAC. The NRC staff asked why the other issues were not addressed as they are part of Tier 1 as the NRC considers all Tier 1 information to be of equal importance. The NRC staff suggested that NEI provide more complete guidance sufficient to support an organization who has no prior experience developing Tier 1 information.

NEI clarified that the white paper was a high level document which includes discussion of other Tier 1 information such as significant site parameters. The extraction may not have captured or translated a sufficient amount of context.

- Comment 2. Scope beyond light water reactors (LWR): It is unclear how the proposed first principles relate to advanced reactors.

The NRC staff asked whether the first principles are intended to be technology neutral. With advanced reactors (AR), the NRC technology approach may not have the Tier 1 and 2 system. The staff further clarified that a broader approach would be more appropriate given potential future DC applications.

NEI stated that when the concept of first principles was first created, no specific technology was assumed. NEI indicated that the seven first principles were high level and were technology neutral but that the examples were associated with LWRs.

The NRC staff discussed the sequencing of information and suggested that just as the first principles should precede and inform ITAAC, they should also precede and inform all forms of Tier 1 information such as interface requirements and design features. The white paper seems to mix and match ITAAC with design descriptions. The NRC staff questioned whether NEI would regard fuel as a design feature because a large portion of the safety case for AR is fuel design. The staff discussed examples of AR fuel design features for designs such as molten salt reactors and high temperature gas cooled reactors. It is not clear that the first principles, as proposed, would recognize these design features.

The NRC staff also noted that Tier 1 is a function of the licensing process and that Tier 1 and 2 distinctions were not developed to address 10 CFR 50.59 related change processes. Instead, Tier 1 information was designed to address the scope of the certification.

Comment 3. Regulatory Bases: The regulatory basis/source associated with each item listed as a first principle is unclear.

NRC staff noted that Appendix A of the white paper entitled "Tier 1 and ITAAC Related NRC Policy Papers" consisted of a list of NRC policy papers but that the direct references that would link the regulatory basis to individual first principles were not provided. The NRC staff suggested that this could be accomplished in a tabular format within Section 3 of the white paper and possibly linked to an itemized Appendix A of the white paper.

NEI agreed with NRC's comments. NEI further inquired whether there were first principles that were surprising. In response, staff used first principle number four (FP#4) regarding design descriptions as an example. This first principle limits Tier 1 to structures, systems, and components (SSC) for which construction or installation in the final location will be completed prior to fuel loading. This may be true for ITAAC but it is not true for all design descriptions. Another example discussed was a plant's licensed power level which will not be in place prior to fuel load but will be there for the life of the plant.

The NRC staff noted that it has accumulated experience with reviewing amendments to ITAAC for a plant under construction. A future operating plant may submit an amendment request that will affect a Tier 1 design description. Therefore, the first principles for design descriptions should be more clearly separated from ITAAC.

A representative from NuScale noted that the industry views the benefits of Tier 1 information differently from NRC staff. Where the NRC looks to Tier 1 for the benefits of standardization, which may have more of a nexus to operations, the industry views finality as the principle benefit. The applicant may want to put items into Tier 1 in order to get finality. Tier 2 finality was also discussed based on Section VI of the 10 CFR Part 52 appendices as well as restrictions on backfit.

Comment 4. Bases for First Principles: It is unclear how the proposed first principles would align the definition of Tier 1 and with topics important to essential safety performance criteria (e.g. reactivity control, decay heat removal, and retention of

radionuclides) and what other approaches to development of the first principles were considered.

The NRC staff stated that the document arguably does not provide a description of first order issues related to the proposed first principles in that it does not describe basic concepts that would be characteristic of Tier 1 content for any technology. SECY-90-341, "Staff Study on Source Term Update and Decoupling Siting from Design," states that "the top tier certified design would include essential safety performance criteria." However, it is not clear what criteria NEI considers to be essential or how NEI envisions applying those criteria to any new designs, both LWR and non-LWRs. The first principles NEI proposes appear to have an administrative rather than a safety focus. The NRC asked if there are other approaches that would generate a different set of first principles such as one tied to critical safety functions. Specifically, could a different approach result in first principles that would be more technology neutral?

A representative from NuScale indicated that several other approaches had been discussed during the development of the first principles with much deliberation over critical safety features. What appears in the white paper is based on the group's work after removing other alternative approaches. NEI acknowledged that these additional discussions are not reflected in the white paper. NEI indicated that moving specifically to an "essential safety performance criteria," would result in far less Tier 1 information. The use of Design Reliability Assurance Program (DRAP) procedures has resulted in ITAAC related to numerous systems that are not directly related to safety such as radiation protection and fire protection.

The potential use of a risk informed strategy was discussed at length. The discussion concluded with the observation that providing greater context regarding what other approaches had been considered would strengthen the white paper.

Comment 5. Practical Implementation: It is unclear how the proposed first principles would be applied in the development of a certified design.

The NRC staff explained that the white paper does not provide enough detail for practical use as an implementation guidance document. There is a need for better selection criteria for Tier 1, either using criteria associated with the current proposed principles or based on an alternative basis such as safety/risk significance (e.g. reactor coolant system, fuel, vessel, severe accident analysis). Would process flow diagrams be useful to implement the selection criteria and would they need to be developed for specific chapters in the SRP?

NEI inquired as to how implementation of guidance might occur. The NRC staff responded that the actual vehicle for implementation will likely need more thought and additional public interaction.

**Additional NRC Comments:**

1. First Principles as “stand alone” or “group”: The basis is unclear for the following statements: "These First Principles must be applied together..." and "selective application or reliance on a single criterion...could result in inappropriate information being included in Tier 1."

This appears overly restrictive, as it is possible that a single criterion would provide a sufficient basis for inclusion in Tier 1, such as a very safety-significant SSC.

2. Dimensions (FP#2): The discussion minimizes the importance of using dimensions and material identification in ITAAC for a variety of design issues such as spent fuel pool criticality analysis, shielding, seismic response, etc.

The staff agrees that there are times when dimensions and material choice are not the most important parameters, but the text seems to overstate the point. Without further discussion, the reader could easily miss other important systems which should have ITAACs which are focused on either dimensions, materials, or both. For example, the spent fuel pool criticality analysis is heavily dependent upon the geometry of the rack design in order to demonstrate compliance with 10 CFR 50.68 “critically accident requirements.” The text of the white paper provides a caveat by qualifying the statement as “general” and providing examples of some exceptions. However, the statement may be an overgeneralization that could lead to mistakes in interpretation. NEI stated that it may be an appropriate place to provide examples.

One of NEI’s concerns was the potential need to request amendments to address regulatory compliance and not a safety issue. NEI indicated that they will consider NRC’s comments and revise the associated text in the white paper.

3. Operations (FP#4): The discussion excludes design aspects that pertain to operation from Tier 1. This appears to be an overstatement.

NEI responded that, consistent with previous discussion, the write up does not fully capture NEI’s previous work on the issue. The white paper can be revised to clarify the important details related to NEI’s development of this statement.

4. Tier 1 limited to pre-10 CFR 52.103(g) finding and for lifetime of plant (FP#4): This appears to be overly restrictive when considering a number of issues (e.g., fuel system design, control rod, and core design).

The staff again found this statement overly broad. NEI responded that, consistent with previous discussion, the write up does not fully capture NEI’s previous work on the issue. The white paper can be revised to clarify the important details related to NEI’s development of this statement.

**NRC Questions:**

NRC presented the following three questions for NEI's consideration going forward:

- Design Acceptance Criteria (DAC): How does DAC factor into this document?
- Objective Criteria: In Section 3, what objective criteria does NEI envision to determine whether safety or risk significance is sufficiently high for inclusion in Tier 1? Similarly, in Section 3.2, NEI states that a graded approach is applied to determine the level of detail in Tier 1 design descriptions. What objective criteria does NEI propose be used to determine that level of detail?
- Priority & Timeline: NRC asked NEI what is the prioritization of the first principle white paper relative to other requests they recently sent to the agency. NEI responded that they will take this question under consideration as they consider next steps.

The meeting concluded with a brief discussion of next steps. Satisfaction of the original intent of the meeting to provide meaningful feedback on the white paper was generally acknowledged. NRC suggested that NEI revise the first principles white paper and NEI committed to communicate to the NRC how they will proceed.

The NRC staff inquired if there were any comments or questions from the general public but received no response, upon which, the meeting was adjourned.

Enclosure:

1. Meeting Attendees

cc w/encl: NEI New Reactors Mailing List

SUMMARY OF PUBLIC MEETING DISCUSSING FIRST PRINCIPLES FOR USE IN DEVELOPING DESIGN CERTIFICATION TIER 1 INFORMATION AND INSPECTIONS, TESTS, ANALYSES AND ACCEPTANCE CRITERIA DATED JANUARY 11, 2018

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**NEI White Paper “First Principal for Use in Developing Design Certification Tier 1  
Information and Inspections, Tests, Analyses and Acceptance Criteria  
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(Revised 11/17/2017)

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