UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
OFFICE OF NEW REACTORS
WASHINGTON, DC 20555-0001

DRAFT

NRC REGULATORY ISSUE SUMMARY 2008-05, REVISION 1, LESSONS LEARNED TO IMPROVE INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA SUBMITTAL

ADDRESSEES

All holders of or applicants for a power reactor early site permit (ESP), combined license (COL), standard design certification (DC), standard design approval, or manufacturing license under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

INTENT

The U.S. Nuclear Regulatory Commission (NRC) is issuing this regulatory issue summary (RIS) to communicate good practices associated with the quality, clarity, and inspectability of inspections, tests, analyses, and acceptance criteria (ITAAC) submitted as part of applications for ESPs, standard DCs, or COLs. This RIS also recommends that applicants, vendors, and the NRC maintain complete and consistent ITAAC lists. Addressees should consider incorporating these practices into their applications to provide for a more efficient inspection and ITAAC closure process. No specific action or written response is required.

RIS 2008-05, Revision 1, expands on issues that were identified in RIS 2008-05, "Lessons Learned to Improve Inspections, Tests, Analyses, and Acceptance Criteria," dated February 27, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML073190162), and incorporates several new issues. Additional information appears in Regulatory Guide (RG) 1.215, "Guidance for ITAAC Closure under 10 CFR Part 52" (ADAMS Accession No. ML091480076), which endorses the methodologies described in the industry guidance document Nuclear Energy Institute (NEI) 08-01, "Industry Guideline for the ITAAC Closure Process under 10 CFR Part 52," Revision 3, issued January 2009 (ADAMS Accession No. ML090270415).

BACKGROUND

As required by 10 CFR Part 52, applicants for ESPs, standard DCs, or COLs must submit, among other information, the proposed ITAAC that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses (ITA) are performed and the acceptance criteria are met, the facility has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act of 1954, as amended, and the Commission's rules and regulations. Following issuance of a COL, a licensee completes the

ITAAC in the license during construction and submits notification letters to the NRC in accordance with 10 CFR 52.99, "Inspection during Construction." The NRC verifies closure of all ITAAC through direct inspection or other methods, such as oversight of the licensee's ITAAC completion, closure, and approval processes.

SUMMARY OF ISSUES

On the basis of a review of recent ITAAC submittals to the NRC, the staff has identified five general categories in which ITAAC submittals could be improved: (1) ITAAC format and content, (2) ITAAC nomenclature and language, (3) ITAAC focus, logic, and practicality, (4) ITAAC standardization and consistency, and (5) ITAAC scope.

ITAAC FORMAT AND CONTENT

- Applicants should consider using a consistent system to identify and number individual ITAAC within their applications. Although past submittals have typically used an alphanumeric system, some submittals used dashes or separate paragraphs with no labels in the body of the text to specify separate ITAAC requirements. In other submittals, the alphanumeric designations were not consistently aligned for the applicable ITAAC tables. Use of a standard and consistent ITAAC identification system will facilitate ITAAC closure activities.

- Applicants should consider a standard methodology for identifying and organizing the structures, systems, and components (SSCs) associated with an ITAAC to enable a more efficient inspection and ITAAC closure process. For example, if an applicant chooses to organize SSCs in a tabular format (as opposed to system drawings), it could group instrumentation-related components (e.g., sensors) separately from mechanical components. The applicant could also list mechanical components, or a group of components that are likely to be close together, in similar categories (e.g., pumps, valves).

- Applicants should avoid the integration of several different engineering or construction areas into a single ITAAC. For example, one applicant put all of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements and the pipe break analyses for all of the plant's piping into only two ITAAC. In another instance, an applicant's definition for a system's "basic configuration" included five separate engineering and construction processes, the applicability of which had to be interpreted to determine the required ITAAC for each. In both cases, the ITAAC were ill-defined and unwieldy.

- COL applicants should consider aggregating into one complete ITAAC list all of the ITAAC contained in both the certified design and the COL. Because this complete ITAAC list would include all ITAAC applicable to a specific COL, it would function as a master list that could be referenced by both the NRC and the applicant (or licensee) throughout construction until the Commission makes a 10 CFR 52.103(g) finding.

- As a complementary measure to the development of a consistent ITAAC identification system and an ITAAC master list, both DC and COL applicants should consider establishing a logical process for handling, identifying, and referencing ITAAC revisions. If a design control document (DCD) revision or COL change adds to or renumbers the existing ITAAC, the applicant should link all new ITAAC to the existing ITAAC they originated from through their alphanumeric designations. This renumbering protocol would facilitate the closure of any new ITAAC by correlating available information with the planned inspection activities for the ITAAC already approved. Both licensee and NRC inspection processes would then be able to efficiently coordinate existing inspection results and conclusions with the revised ITAAC.

ITAAC NOMENCLATURE AND LANGUAGE

- Applicants should clearly define all terms used in an ITAAC. The following are examples of confusion caused by undefined terms:

  – It was unclear whether an applicant using the terms “design reports” and “reports” in an ITAAC involving ASME Code piping and welding intended the ASME Code definition for “design report” and “data report” or its own definition for these terms.

  – An applicant frequently used the term “as-installed” but did not define it. The applicant was using this term as a substitute for “as-built,” which it did define. Substitution of undefined but similar terms for “as-built” is not recommended.

- Even when the applicable DCD defines ITAAC terms and phrases, applicants should ensure that such ITAAC word usage is consistent with industry-accepted guidance. For example, Section 8.6 of NEI 08-01, “Guidance for Inspections, Tests or Analyses Performed at Other Than Final Installed Location,” as endorsed by NRC RG 1.215, discusses several examples of the already defined term, “as-built,” in the context of how an “as-built” condition can be correctly interpreted in various ITAAC applications. Applicants should specifically consider this guidance (not only in Section 8.6, but also elsewhere in NEI 08-01) when developing ITAAC to submit for approval.

- If applicants use such terms as “interfacing systems,” “control room features,” “minimum set,” “seismic structure,” “equipment qualification,” “physical separation,” “fast-closing” valves, and “rapid” depressurization, they should clearly define them—or at least quantify the adjectives used—for inspection purposes. For example, the term “equipment qualification,” if not clearly defined, could be associated with the specific requirements for environmental qualification (EQ) given in 10 CFR 50.49, “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants.”

- Use of the conjunction “and/or” is never appropriate.

- If applicants use the phrase “a report exists and concludes that...” they should specify the scope, the type of report and how report generation is controlled. For example, the

applicant should explain whether the scope of the report includes the design, the as-built construction (as reconciled with the design), or any other information. This is not necessary for reports generated in accordance with the ASME Code, as the Code itself governs the creation of such reports.

- Applicants should use specific technical terms consistently. For example, the terms "pressure test" and "hydrostatic pressure test" are often inappropriately interchanged; similarly, "internal pressure" and "design pressure" are used synonymously in the same ITAAC to mean the same thing. Applicants should also take care not to confuse the "preoperational conditions" with the applicable "operation modes" in situations involving testing.

- Applicants should avoid subjective terms, such as "inclined sufficiently," "acceptable level," and "adequate thickness." These terms call for interpretation to understand the ITAAC.

ITAAC INSPECTION FOCUS, LOGIC, AND PRACTICALITY

- Applicants should avoid applying a single ITAAC to a large area of construction or to activities that are likely to be widely separated in time. Large-scoped ITAAC create problems with verification activities and with the timing of construction and other requisite inspections.

- Applicants should consider breaking ITAAC with a large number of SSCs into areas of construction. For example, if a single ITAAC includes construction from the basemat to the top of containment and applies to several different buildings, the large area and scope create difficulties, not only in tracking the applicable SSCs, but also in connecting the interdependent nature (e.g., seismic) of the applicable structures. Breaking a large single ITAAC into several simpler ITAAC will make the ITAAC closure process more efficient.

- Applicants that envision using modular construction should consider the impact of these activities in developing their ITAAC. For example, the inspection of as-built SSCs implies that "as-built" refers to the completion of construction at the final location at the plant site. However, if a module is fabricated at a remote location (e.g., a shipyard), it may be possible to justify inspection or testing at the remote location. It may also be possible for applicants to develop ITA that can be performed at the remote location. (The industry guidance document, NEI 08-01, discusses modular construction, as well as a consistent approach to the use of as-built terminology.)

- Applicants should consider the timing and sequence of construction activities in the development of related ITAAC. Breaking an ITAAC into pieces that can be completed in the early and mid-stages of construction would help alleviate the surge in ITAAC closure activities at the end of the process.

- Applicants should develop ITAAC that require direct inspection of construction as it occurs, rather than review of postconstruction records. For example, a design

commitment that indicates certain buildings are constructed of reinforced concrete or are prestressed is inconsistent with an ITA that specifies an inspection of the construction records. The ITA should be an inspection of the actual construction to ensure the use of reinforced concrete or prestressing as required. ITAAC inspections are intended to physically confirm the attribute being checked. An inspection of documentation is actually a record check, not a physical verification of the SSC attributes of concern.

- Applicants should ensure that design commitments and ITAAC are consistent. It is important for the language and details of the ITAAC to comport with the language of the design commitment. In one example, the design commitment indicated that the piping was designed and constructed in accordance with the ASME Code, but the acceptance criteria only required the existence of "design reports" (which would not normally encompass construction quality) for as-built piping. In another example, the design commitment indicated that each standby diesel generator was sized to accommodate expected loads, but the acceptance criteria only required the generator to provide power at generator terminal rated voltage and frequency when at rated load. To validate the design commitment, the applicant would first need to determine the electrical loads presented by equipment credited in the safety analysis (e.g., by analyses or testing) and then conduct a test to verify that the procured diesel generator could adequately supply these loads.

- Applicants should ensure that the ITA match the associated acceptance criteria. The NRC staff has observed instances in which the ITA was inappropriate for determining that the acceptance criteria had been satisfied. In one example, the ITA required an inspection of a makeup water system. Although three separate acceptance criteria were associated with this one ITA inspection, only two of the criteria were actually inspections; the third criterion specified a flow rate, which is a test result and not an inspection criterion. Below are three additional examples illustrating mismatches between ITA and acceptance criteria.

  – Example 1

Design Commitment	Inspection, Tests, Analyses	Acceptance Criteria
The XYZ system has an available volume…sized to contain approximately 400 percent of the full-core debris.	Inspections of the as-built system will be conducted.	The as-built XYZ system is sized to contain 350–450 percent of the full-core debris.

The inspection is appropriate for determining the volume of the XYZ system. However, an inspection alone is not capable of determining whether the measured volume can contain 350–450 percent of full-core debris, because this amount of material has either not been determined or is not defined for the inspection.

– Example 2

Design Commitment	Inspection, Tests, Analyses	Acceptance Criteria
All low-pressure coolant injection piping and components…are designed to withstand full reactor pressure.	Inspection of the as-built low-pressure coolant injection piping…will be performed.	The as-built low-pressure coolant injection piping and components…are designed to withstand full reactor pressure.

The inspection of piping and components can determine whether they were installed in accordance with design. In addition to the inspection, an analyses or test would be needed to determine whether the as-built piping and components meet the approved design. Additionally, the applicant needs to quantify the term "full reactor pressure" in the acceptance criteria.

– Example 3

Design Commitment	Inspection, Tests, Analyses	Acceptance Criteria
Level instruments with adequate operating ranges are provided for the spent fuel pool.	Inspections of the ABC System will be conducted to verify that level instruments with adequate operating ranges are provided for the spent fuel pool.	The as-built ABC System provides spent fuel pool level instrumentation with adequate operating ranges. Pool instruments accurately indicate pool level over ranges.

Although an inspection is capable of checking the proper pool level range, an inspection alone cannot determine the accuracy of the specified instrumentation. Some form of testing or analyses is likely required to validate the pool instrument accuracy noted in the acceptance criteria.

ITAAC STANDARDIZATION AND CONSISTENCY

- Applicants should ensure consistency in ITAAC designations within their applications. For example, a count of the ITA designations identified 33 ITAAC, but a count of the acceptance criteria designations identified 38 ITAAC. Such an inconsistent ITAAC count could result in problems not only during verification and inspection activities, but also when the ITAAC are closed and the notification letters are submitted in accordance with 10 CFR 52.99.

- Applicants should ensure that ITAAC references exist and provide appropriate information. For example, a design commitment and acceptance criteria indicated that controls exist in the main control room, but did not specify nor provide enough information about what actual controls must exist. Either a list of controls or a reference

to a list would have provided the necessary information. Applicants should ensure that the ITAAC verify the design commitment. If the existence and the functionality of the controls are to be validated, the ITAAC should clearly state that requirement. (However, functionality can only be verified by a test.)

- Applicants should ensure that ITAAC agree with Tier 1 information. For example, the Tier 1 definition of an EQ required "type tests, or type tests and analyses," but the associated ITA for EQ required "type tests, analyses, or a combination of type tests and analyses." This would appear to inappropriately allow analyses alone to validate the EQ.

- Applicants should ensure that ITAAC agree with Tier 2 information. For example, the acceptance criteria for one ITAAC specified that a certain valve will open within 0.89 seconds, but the Tier 2 design parameter for this valve identified a maximum of 0.7 seconds.

ITAAC SCOPE

- Applicants should ensure that ITAAC are written in a clear and objective manner. In some cases, applicants have expanded the scope of individual ITAAC in a way that diminished the ITAAC's objectivity and promoted a lack of clarity about what the ITAAC required. Some examples follow that illustrate the generic problem of expanding the scope of an ITAAC's objectivity beyond what was intended.

  – An applicant attempted to expand the ITAAC for functional arrangement of a system beyond the definition of functional arrangement as a physical arrangement of SSCs to include several testing, qualification, and analytical attributes. In this case, an ITAAC intended to be verified by an objective inspection of the as-built system was inappropriately transformed into a catch-all for a diverse set of technical attributes. In some cases, these separate attributes (e.g., separate tests, physical measurements, analytical results) justified their own unique ITAAC. This was a case where the objectivity of a simple ITAAC was lost because its scope was inappropriately expanded.

  – Other ITAAC have used terminology that the applicant defined differently than the NRC, thus expanding the scope of the defined term. For example, the applicant defined the word "exists" using part of the definition presented in Standard Review Plan Section 14.3, "Inspections, Tests, Analyses, and Acceptance Criteria," issued March 2007, of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," which states, "the term "exists," when used in the acceptance criteria, means that the term is present and meets the design description." Unfortunately, the second part of the section is not quoted by the applicant, which states that, "detailed supporting information on what should be present …is contained in the…standard safety analysis report." This clarifying sentence implies that "what should be present" is something that can be seen to be inspected. Several criteria described in the design description (e.g., EQ, seismic qualification, design attributes, and, most importantly, functionality) cannot be seen. Therefore, the

scope of any ITAAC using the term "exists" might be inappropriately expected to include attributes (like functionality in accordance with the design) that cannot be validated by only an inspection that something exists. This is another case in which an objective ITAAC may be improperly expanded to include the scope of attributes that cannot be verified by the inspection. Below is an example of an ITAAC that illustrates improper use of the term “exist.”

Design Commitment	Inspection, Tests, Analyses	Acceptance Criteria
Controls exist in the Main Control Room.	Tests will be performed for the existence of control signals from the Main Control Room.	Controls exist in the Main Control Room.

The ITAAC should have enough detail to describe what is being verified. Although the necessary information may be included in the DCD, it is neither provided in the ITAAC nor provided by reference to any other detailed information or tables that would adequately support licensee inspection or NRC verification.

- Applicants should ensure that revisions to ITAAC are thoroughly reviewed and the extent-of-condition fully evaluated and resolved. Applicants should check revisions to ITAAC for applicability to all related system ITAAC and also for the impact of referenced SSC table revisions. ITAAC reviews should include verification checks for extent-of-condition applicability, especially in situations involving ITAAC revisions or ITA activities that generically apply to similar systems or components.

  – For example, the ITAAC for one system refer to tests of motor-operated valve (MOV) functions and squib valve functions. The ITAAC references a table identifying the related valves and their respective functions. However, an ITAAC for a similar safety-related system that also employs MOVs and squib valves with active functions refers only to MOV tests and inappropriately neglects the squib valve tests.

  – In the previous example, the applicant later revised the referenced table to change the active function of the MOV to “none.” However, the ITAAC written to test the operation of the MOV was never deleted. This entire ITAAC was no longer applicable because there was no active function for the MOVs associated with this ITAAC.

BACKFIT DISCUSSION

This revised RIS provides addressees information to aid in the submittal of ITAAC as part of their applications for ESPs, standard DCs, or COLs and does not represent a new or different NRC staff position on the implementation of 10 CFR Part 52. It does not create or impose any

new or different applicable NRC staff positions inconsistent with 10 CFR Part 52. It requires no action or written response beyond what is required in 10 CFR Part 52.

This RIS requires no action or written response and is, therefore, not a backfit under 10 CFR 50.109, "Backfitting." Consequently, the NRC staff did not perform a backfit analysis.

FEDERAL REGISTER NOTIFICATION

A notice of opportunity for public comment was not published in the *Federal Register* because this RIS is informational and does not represent a departure from current regulatory requirements. However, the NRC posted this RIS on the NRC Public Web site for comment 30 days. These comments will be considered before the issuance of this RIS.

CONGRESSIONAL REVIEW ACT

This RIS is not a rule as designated by the Congressional Review Act (5 U.S.C. 801–808) and, therefore, is not subject to the Act.

PAPERWORK REDUCTION ACT STATEMENT

This RIS contains existing information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). Existing requirements were approved by the Office of Management and Budget, approval number 3150-00151.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid Office of Management and Budget control number.

CONTACT

This RIS requires no specific action or written response. Please direct any questions about this matter to the technical contact listed below.

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