

Standardization of ITAAC for SMRs

NRC Public Meeting

March 28, 2014

Meeting Goals

1. Consensus on standardization approach using ITAAC types
 1. ITAAC first principles
 2. ITAAC types and process to identify individual ITAAC
 3. Examples of standardized ITAAC language
2. Propose next actions and path forward

Goals of Standardizing ITAAC for DCAs

- Enhance consistency and safety focus of ITAAC scope
- Provide predictability/efficiency of ITAAC development
- Enhance effectiveness and efficiency of NRC review
- Enhance effectiveness and efficiency of ITAAC closure
- Maximize standardization of ITAAC (target 90%)

TIER 1 AND ITAAC FIRST PRINCIPLES

ITAAC Requirement for DCA

10 CFR 52.47(b)(1):

The proposed inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations;

First Principles – Tier 1 Scope (1/2)

1. Tier 1 is derived solely from Tier 2 design information
2. Tier 1 is not relied upon for the NRC safety determination
3. Tier 1 information is limited to the top-level design and performance characteristics

First Principles – Tier 1 Scope (2/2)

4. Principles for determining the top-level design and performance characteristics are based on whether the SSC
- a) performs a safety-related function;
 - b) performs a risk-significant function as determined by the results of a PRA;
 - c) provides a function necessary or important to severe accident mitigation;
 - d) is associated with key assumptions or performance characteristics as determined in the various accident analyses specific to the design; or
 - e) is otherwise necessary to comply with NRC regulations (e.g. EP)

First Principles – Tier 1 Level of Detail

1. Amount of detail in Tier 1 is proportional to the safety significance
2. Tier 1 include only details that are important to the safety functions
3. Tier 1 does not need to include every safety-related component for a system, but instead should only include components that are important to accomplishing the safety function of the system
4. Tier 1 does not contain a level of detail (e.g., minor dimensional details) that would restrict a licensee from making changes that do not affect a safety function
5. To the extent that Tier 1 includes quantitative information, the numbers should be identified as bounding numbers or should include ranges
6. In general, Tier 1 does not include references to Tier 2 or to codes, standards, or guidance, with a few exceptions (e.g., ASME Code)
7. In general, Tier 1 should not include references to particular vendors of components, and should allow for the use of a range of vendors for a particular component

First Principles – ITAAC Scope (1/2)

1. ITAAC are created to verify, and therefore limited to, the design functions as they are described in Tier 1
2. ITAAC are not relied upon for the NRC safety determination provided in an SER. The NRC safety determination is based solely on the Tier 2 design information
3. Not all Tier 1 design descriptions require an ITAAC
4. ITAAC verify the top-level design and performance characteristics of SSCs

First Principles – ITAAC Scope (2/2)

5. ITAAC address the design at a system or structure functional performance level of detail. Numeric acceptance criterion values are specified only when failure to meet the stated acceptance criteria would clearly indicate a failure to properly implement the design
6. ITAAC is an important part of the construction verification program, but does not verify every design and construction attribute included in the certified design. ITAAC are not meant to be a one-for-one check of detailed design and construction attributes that are verified in the quality programs already in place
7. ITAAC design commitments are consistent with the Tier 1 design descriptions
8. ITAAC are not necessary if the top-level design or performance characteristic is already verified by another ITAAC

STANDARDIZED ITAAC TYPES

Standard ITAAC types

(see separate handout for industry's initial thoughts on a set of standardized ITAAC types)

- ITAAC Types
 - Groups of ITAAC that share similar design commitments, closure methods and acceptance criteria
 - Can be written generically with bracketed information for SSC/design specific information
- ITAAC Categories (columns)
 - Broad groupings of ITAAC types arranged based upon closure method
- Top-level design requirements (rows)
 - Design functions that generally have design descriptions in Tier 1
 - May contain one or more ITAAC types to satisfy first principles for that design requirement
- Cells (intersection of columns and rows)
 - Contain the unique ITAAC types
 - Not all cells require ITAAC types to meet first principles
 - Some cells may contain more than one ITAAC type

Application of First Principles

- Initial screening of ITAAC with first principles suggest the following ITAAC types are not necessary
 - Functional arrangement ITAAC
 - ITAAC that reference other ITAAC
 - ITAAC for First Plant and First Three Plant-only tests
 - Class 1E equipment labeling
 - Electrical equipment grounding

Process to identify individual ITAAC

- Review Tier 1 design descriptions to determine if an ITAAC type is applicable to the SSC
- Some ITAAC type may not apply to a DCA
 - SSC is not safety related for the design and thus not in Tier 1
- ITAAC Type can generate numerous individual ITAAC for a DCA
 - Each type is a model for numerous ITAAC in a DCA
 - Multiple units with the same ITAAC
 - Multiple SSCs within same unit with the same ITAAC

STANDARDIZED ITAAC LANGUAGE

Standardized ITAAC language

- Each ITAAC type will have standardized language
- Maintain three (3) column format
- Based upon lessons learned from previous DCAs
- Bracketed text for design specific information

Example #1 - Electrical

Design Commitment	ITA	Acceptance Criteria
Class 1E [XXX system] equipment listed in [Table x.x.x-x] is powered from the Class 1E division listed in [Table x.x.x-x].	A test will be performed to demonstrate that Class 1E [XXX system] equipment is powered from Class 1E divisions.	Class 1E [XXX system] equipment listed in [Table x.x.x-x] is powered from the Class 1E division listed in [Table x.x.x-x].

- ITAAC Type: Class 1E Electrical Divisional Power Verification
 - Category = Preoperational Test
 - High Level Design Requirement = Class 1E AC and DC Electrical Power Supply Independence Between Redundant Divisional Power Supplies
 - Currently SRP Section 14.3.6
- Systems that will contain ITAAC (e.g. RCS, ECCS, and HVAC)
- Table is as described in design specific DCA Tier 1

Example #2 - Structural

Design Commitment	ITA	Acceptance Criteria
Physical separation exists between the [XXX structure] and the [YYY structure] [dimension description or as shown on Figure x.x.x-x] to preclude interaction between the [XXX structure] and the [YYY structure].	An inspection will be performed to verify the physical separation distance between the as-built [XXX structure] and the as-built [YYY structure].	The [XXX structure] is located at least [### ft] from the [YYY structure].

- ITAAC Type: Non-seismic Category I SSC Failure – Impairment of

Safety-Related SSCs

- Category = As-Built Inspection
- High Level Design Requirement = Protection from non-seismic Category I SSC Impairment of Seismic Category I Structures
- Currently SRP Section 14.3.2

- Flexibility to use figure if description of key dimension is complex

PATH FORWARD

Other improvements that need to be addressed before submittal of DCAs

- Standard Tier 1 Chapter 1
 - Definitions may need to be updated
- Tier 1 standardized formatting and content
 - Eliminate ITP discussion and “no entry” ITAAC
 - Figures, component numbers and acronyms
- Potential need for administrative change process
- Processes to close factory ITAAC and shared ITAAC

Next Steps and Future Actions

- Proposed agendas for monthly NRC public meetings
 - April 29th – Discuss standardized ITAAC language for Piping, and Structural
 - May 20th – Discuss standardized ITAAC language for Electrical, I&C, and HFE
 - June 19th – Discuss standardized ITAAC language for Reactor, Plant and Containment systems, and others
 - July – Discuss standardized ITAAC language for EP, and Physical Security
- July – Industry submit proposed standard ITAAC language for NRC endorsement

BACK-UP SLIDES

System Functional Arrangement ITAAC

- Tier 1 system design descriptions include tables and figures, as needed. The design descriptions serve as requirements for the lifetime of a facility to control departures from the certified design.
- A comprehensive system walkdown is performed as a prerequisite to turnover for preoperational testing.
- The comprehensive walkdown will encompass structural, mechanical, I&C, and electrical SSCs of the system.
- The system Functional Arrangement ITAAC covers only the significant SSCs identified in Tier 1.
- Other ITAAC (including preoperational testing) will validate the functionality of the system.
- The system Functional Arrangement ITAAC provides little to no value for assuring that the system is built to the design requirements, and this assurance is provided by other means.
- Therefore, system functional arrangement will not be an ITAAC but a design description will be retained to assure that the certified design is controlled.