AUDIT REPORT

Audit of NRC's Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Process

OIG-12-A-16 July 12, 2012

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

OFFICE OF THE
INSPECTOR GENERAL

July 12, 2012

MEMORANDUM TO: R. William Borchardt
Executive Director for Operations

FROM: Stephen D. Dingbaum **/RA/**
Assistant Inspector General for Audits

SUBJECT: AUDIT OF NRC'S INSPECTIONS, TESTS, ANALYSES, AND ACCEPTANCE CRITERIA (ITAAC) PROCESS (OIG-12-A-16)

Attached is the Office of the Inspector General's (OIG) audit report titled, *Audit of NRC's Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Process.* The audit objective was to assess NRC's regulatory approach, through the ITAAC review process, to ensure that new nuclear power plants have been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

OIG met with NRC management officials and staff on May 22, 2012, at which time the agency provided informal comments to the draft report. OIG subsequently met with agency management and staff during a May 31, 2012, exit conference to discuss agency informal comments that OIG incorporated into the draft report as appropriate. NRC management and staff reviewed the revised draft report and generally agreed with the recommendations in this report. Furthermore, the agency opted not to provide formal comments for inclusion in this report.

OIG identified opportunities to improve the agency's ITAAC process to include strengthening guidance, enhancing training procedures, improving oversight of construction tracking systems, developing a strategy for inspections at modular assembly facilities, and improving change management and communication/coordination practices between headquarters and Region II. The report contains recommendations intended to improve NRC's ITAAC process.

If you have any questions, please contact me, at 415-5915 or RK Wild, Team Leader, at 415-5948.

Attachments: As stated

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EXECUTIVE SUMMARY

BACKGROUND

The next generation of nuclear power plants will be built under combined construction permit and operating licenses (COL) that reference designs that are certified by the Nuclear Regulatory Commission (NRC). The Office of New Reactors (NRO) is the lead organization for licensing new reactors and overseeing their construction.

A COL is issued under Title 10, Code of Federal Regulations (10 CFR), Part 52, a process that combines the construction permit and operating license. NRC, in conjunction with industry, designed the Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) process to verify conformance with the COL as construction proceeds. ITAAC are a design-specific, pre-approved set of performance standards, grouped into families, which the licensee must meet to NRC's satisfaction. Families are composed of ITAAC that are related through similar construction processes, resulting products, and general inspection attributes.

NRC conducts performance-based inspections throughout the construction period on a sample of ITAAC completed by the licensee to verify that they have been appropriately completed. Once the licensee determines that the acceptance criteria have been met for a particular ITAAC, it informs NRC by submitting an ITAAC closure notification to NRC for review. Not less than 180 days before the scheduled date for initial fuel load, the Commission will publish a Federal Register Notice of intended operation, which provides a 60-day period for the public to request a hearing on whether the facility as constructed complies, or on completion will comply, with the acceptance criteria in the COL. Pending no outstanding issues, the Commission is then expected to make an affirmative finding in accordance with 10 CFR 52.103(g) that the acceptance criteria in the COL are met to allow the new reactor to begin operating.

ITAAC inspections are performed primarily by the Center for Construction Inspection in Region II. Other Region II construction inspectors and NRC headquarters technical staff will participate in the inspection and oversight activities to better ensure that the facility conforms to the conditions of the COL.
NRC vendor inspections are also performed as part of the ITAAC inspection process, in particular because a key characteristic of the current approach to new reactor construction is the use of modular assemblies, which are constructed offsite

and shipped to the construction site for installation. Interdependence between the ITAAC and vendor inspection programs is an important aspect of NRC's role in assuring that components destined for modular assemblies that will go into new reactors are manufactured to appropriate safety and regulatory standards. ITAAC inspection results will be recorded in an NRC-created and maintained electronic database referred to as the Construction Inspection Program Information Management System (CIPIMS).

OBJECTIVE

The audit objective was to assess NRC's regulatory approach, through the ITAAC review process, to ensure that new nuclear power plants have been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

RESULTS IN BRIEF

The agency established NRO in 2006 to oversee the regulatory activities associated with new reactor licensing under 10 CFR Part 52. To date, NRO staff have taken significant steps to employ a formalized approach for reviewing new reactor construction, such as implementing the ITAAC closure process. Staff have continued to strengthen the ITAAC closure process by developing and revising guidance and inspection procedures, creating a database tracking system, and working to identify and remedy issues associated with the ITAAC process. The Office of the Inspector General (OIG) identified opportunities to further improve aspects of the ITAAC process. The ITAAC process could benefit by NRC taking the following actions:

- Strengthening guidance would enhance staff understanding of ITAAC requirements.
- Designing ITAAC training programs through formalized training needs assessments would ensure the staff is receiving appropriate and useful training.
- Increasing oversight of CIPIMS development would help ensure:
  - Development costs are tracked.
  - Efficient development and implementation of future iterations of the system.

- Formalizing a strategy for inspection of components at modular assembly facilities would strengthen the ITAAC inspection program.
- Improving change management and communication/coordination practices between headquarters and Region II.

RECOMMENDATIONS

This report makes recommendations to improve the agency's ITAAC process. A consolidated list of these recommendations appears in Section IV of this report.

AGENCY COMMENTS

On May 9, 2012, OIG issued the discussion draft of this report to the Executive Director for Operations. OIG met with NRC management officials and staff on May 22, 2012, at which time the agency provided informal comments to the draft report. OIG subsequently met with agency management and staff during a May 30, 2012, exit conference to discuss agency informal comments that OIG incorporated into the draft report as appropriate. NRC management and staff reviewed the revised draft report and generally agreed with the recommendations in this report. Furthermore, the agency opted not to provide formal comments for inclusion in this report.

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ABBREVIATIONS AND ACRONYMS

ASME	American Society of Mechanical Engineers
CFR	Code of Federal Regulations
CIPIMS	Construction Inspection Program Information Management System
COL	Combined Construction Permit and Operating License
ITAAC	Inspections, Tests, Analyses, and Acceptance Criteria
NRC	Nuclear Regulatory Commission
NRO	Office of New Reactors
OIG	Office of the Inspector General
OIS	Office of Information Services
OPM	Office of Personnel Management

I. BACKGROUND

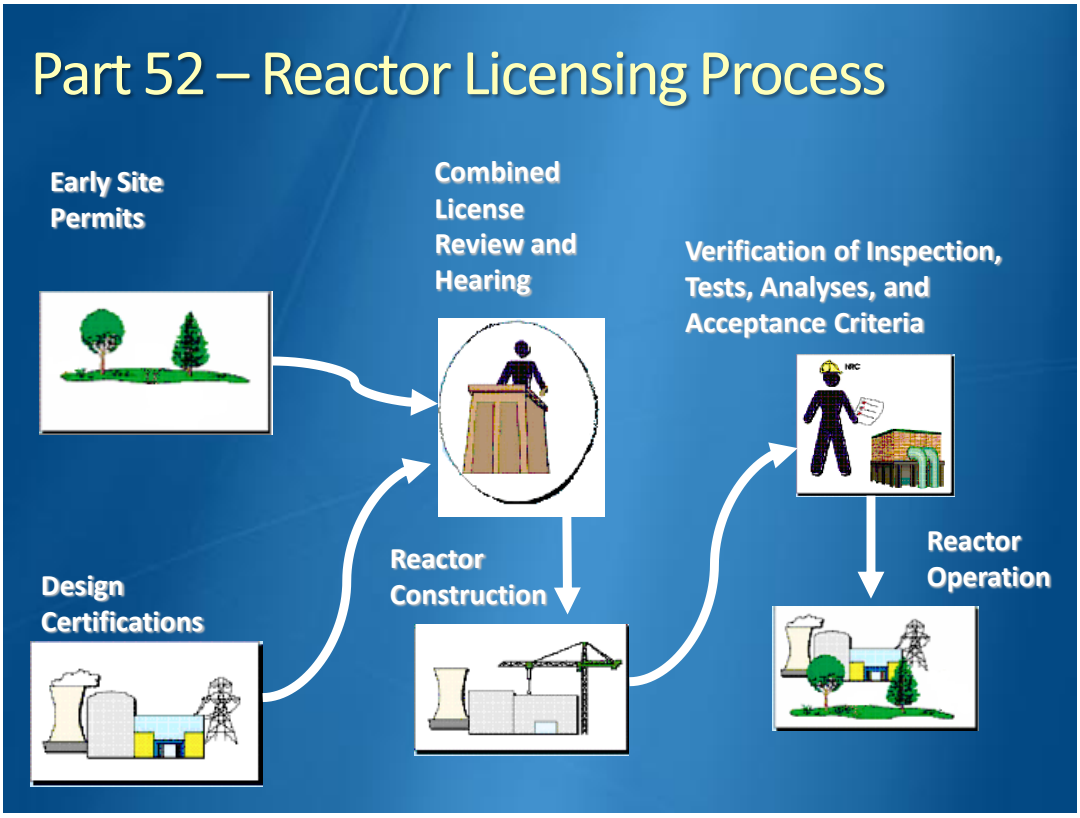
The next generation of nuclear power plants will be built under combined construction permit and operating licenses (COL) that reference designs that are certified by the Nuclear Regulatory Commission (NRC). The Office of New Reactors (NRO) is the lead organization for licensing new reactors and overseeing their construction. In fiscal year 2012, NRC allocated 924 full-time equivalents to new reactor activities and expenditures totaling $265.4 million.

In contrast to past licensing procedures under Title 10, *Code of Federal Regulations* (10 CFR) Part 50,[1] a COL is issued under 10 CFR Part 52. With Part 52, NRC established a process of combining the construction permit and operating license in order to eliminate unnecessary construction or startup delays caused by preoperational licensing or litigation. 10 CFR Part 52 requires resolution of design and siting issues before the start of construction under a COL and continued NRC and licensee attention to assuring compliance with the COL during construction. The intent behind Part 52 is to provide a more efficient and systematic approach to construction and NRC oversight (see Figure 1).

To achieve this purpose, NRC, in conjunction with industry, designed the Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) process to verify conformance with the COL as construction proceeds.

[1] Under 10 CFR Part 50, new reactor licensing is a two-stage process. Under this process, NRC would issue a prospective licensee with a construction permit, allowing them to begin construction immediately. During construction, NRC would inspect construction activities and determine whether or not to approve an operating license when the reactor was completed.

Figure 1: 10 CFR Part 52 Reactor Licensing Schematic



Source: NRC

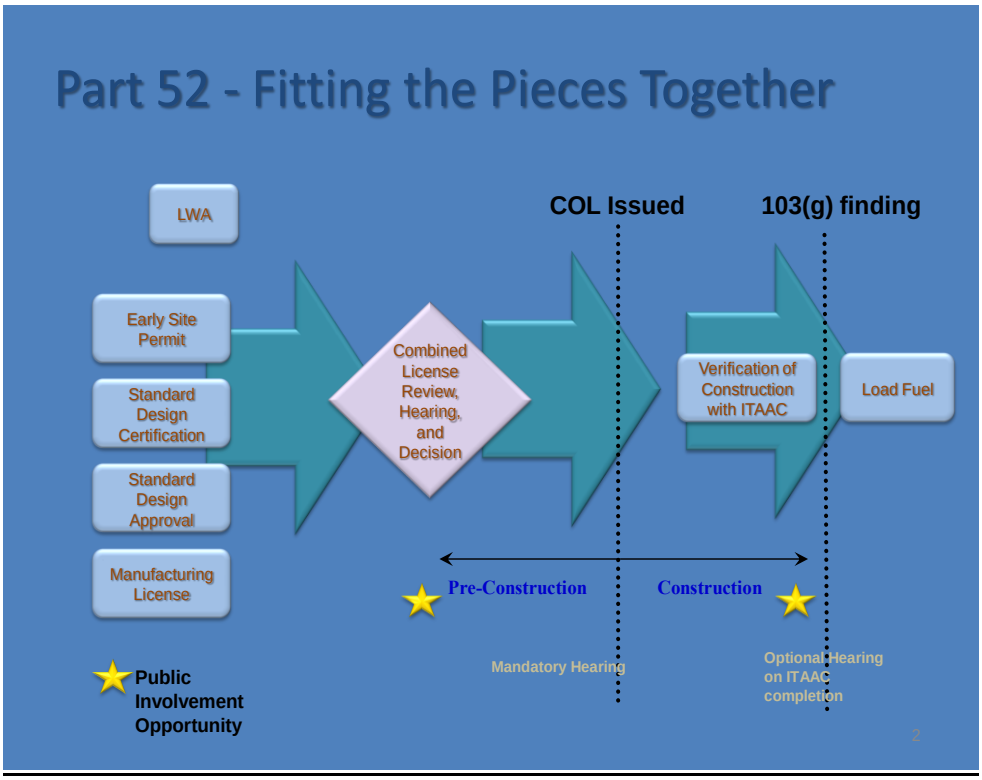
Inspections, Tests, Analyses, and Acceptance Criteria

ITAAC are a design-specific, pre-approved set of performance standards that the licensee must meet to NRC's satisfaction.[2] Through direct inspections and other methods, NRC must confirm that the licensee has met these performance standards, as set forth in the COL, before allowing the licensee to begin initial plant startup and operation. A typical new reactor design, such as the AP1000, has approximately 700 to 1,500 ITAAC that are grouped into families that are prepared and performed by the licensee during and after the construction process. The families are composed of ITAAC that are related through similar construction processes, resulting products, and general inspection attributes. NRC conducts performance-based inspections throughout the construction period on a sample of ITAAC conducted by the licensee to verify that they have been appropriately completed. Once the licensee determines that the acceptance criteria have been met for a particular ITAAC, it informs NRC

[2] That is, demonstrate that a plant has been constructed as-designed and licensed.

by submitting an ITAAC closure notification for review. Not less than 180 days before the scheduled date for initial fuel load, the Commission will publish a Federal Register Notice of intended operation, which provides a 60-day period for the public to request a hearing on whether the facility as constructed complies, or on completion will comply, with the acceptance criteria in the COL. Pending no outstanding issues, the Commission is expected to make an affirmative finding in accordance with 10 CFR 52.103(g) that the acceptance criteria in the COL are met to allow the new reactor to begin operating.[3] The overall licensing/construction process under 10 CFR Part 52 is depicted in Figure 2.

Figure 2: 10 CFR Part 52 Process Flow



Note: LWA is the abbreviation for Limited Work Authorization.
Source: NRC

[3] A 10 CFR 52.103(g) finding is made by the Commission after the licensee closes all ITAAC, and the staff determines that all acceptance criteria are met. An affirmative finding by the Commission is required to authorize fuel load by the licensee. After an affirmative 52.103(g) finding, ITAAC cease to have regulatory standing and technical specifications take over.

Construction Inspection Program

ITAAC inspections are performed under the construction inspection program in accordance with Inspection Manual Chapters 2503, *Construction Inspection Program: Inspections of Inspections, Tests, Analyses, and Acceptance Criteria*, and 2504, *Construction Inspection Program—Inspection of Construction and Operational Programs*, as well as other internal guidance documents, including those referred to by NRC staff as Strategy Documents. The construction inspection program was developed by the Division of Construction Inspection and Operational Programs in NRO and is being implemented primarily by the Center for Construction Inspection in Region II. The Region II construction resident inspectors are assigned to a new reactor site during the period prior to COL issuance to oversee the daily activities of the licensee and its contractors. Other Region II construction inspectors and NRC headquarters technical staff will participate in the inspection and oversight activities to better ensure that the facility conforms to the conditions of the COL.

Vendor Inspection Program

The NRC vendor inspection program consists of vendor quality assurance inspections to ensure that products and services provided by manufacturers for United States-based reactors meet regulatory requirements. This is particularly important considering that a key characteristic of the current approach to new reactor construction is the use of modular assemblies, which are constructed offsite and shipped to the construction site for installation. Thus, the ITAAC process is not limited to onsite inspections of construction, but can include NRC inspections at vendor locations in foreign countries as well as at modular assembly facilities. Consequently, the interdependence between the ITAAC and vendor inspection programs is an important aspect of NRC's role in assuring that components destined for modular assemblies that will go into new reactors are manufactured to appropriate safety and regulatory standards.[4]

[4] For more on the activities of the vendor inspection program, see OIG-10-A-20, *Audit of NRC's Vendor Inspection Program,* September 28, 2010.

Construction Inspection Program Information Management System

ITAAC inspection results will be recorded in an NRC-created and maintained electronic database referred to as the Construction Inspection Program Information Management System (CIPIMS). During the previous period of nuclear power plant construction, there were a number of problems with NRC oversight.[5] NRC conducted evaluations subsequent to the first generation of nuclear power plant construction which identified the need to strengthen NRC oversight of the construction process—in particular, the need to enhance construction inspection oversight programs. To that end, CIPIMS is intended to help plan inspections, and organize, manage, and generate inspection reports on information pertaining to (1) the ITAAC description, status, and closeout process; (2) inspection observation and tracking; (3) inspection report generation; and (4) assessment information. Information contained in CIPIMS will be used by headquarters in the review of ITAAC closure notices as well as by the Center for Construction Inspection to determine inspection completion.

[5] During the 1970s and 1980s, NRC and its predecessor, the Atomic Energy Commission, oversaw the industry's construction of the first generation of U.S. nuclear plants. Several of the construction projects experienced significant problems related to design and construction quality resulting in the cancellation of several plants in various stages of construction. See OIG-09-A-17, *Audit of NRC's Oversight of Construction at New Nuclear Facilities,* September 29, 2009.

II. OBJECTIVE

The audit objective was to assess NRC's regulatory approach, through the ITAAC review process, to ensure that new nuclear power plants have been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations. Appendix C of this report contains information on the audit scope and methodology.

III. FINDINGS

The agency established NRO in 2006 to oversee the regulatory activities associated with new reactor licensing under 10 CFR Part 52. To date, NRO staff have taken significant steps to employ a formalized approach for reviewing new reactor construction, such as implementing the ITAAC closure process. Staff have continued to strengthen the ITAAC closure process by developing and revising guidance and inspection procedures, creating a database tracking system, and working to identify and remedy issues associated with the ITAAC process.

However, OIG has identified opportunities to further improve aspects of the ITAAC process. The ITAAC process could benefit by NRC taking the following actions:

- Strengthening guidance would enhance staff understanding of ITAAC requirements.
- Designing ITAAC training programs through formalized training needs assessments would ensure the staff is receiving appropriate and useful training.
- Increasing oversight of CIPIMS development would help ensure:
  - Development costs are tracked.
  - Efficient development and implementation of future iterations of the system.

- Formalizing a strategy for inspection of components at modular assembly facilities would strengthen the ITAAC inspection program.
- Improving change management and communication/coordination practices between headquarters and Region II.

A. STRENGTHENING GUIDANCE WOULD ENHANCE STAFF UNDERSTANDING OF ITAAC REQUIREMENTS

NRC staff have an inconsistent understanding of existing ITAAC guidance and procedures. This has occurred because current programmatic guidance and procedures lack clarity, and training is improvised. Consequently, NRC may not be able to ensure that new nuclear power plants have been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

Importance of Clear Understanding of Guidance

NRC's strategic guidance and procedures emphasize the importance of regulatory consistency and staff understanding of processes and procedures. NRC's current Strategic Plan, for example, emphasizes regulatory consistency. Regulatory consistency includes the use of guidance and procedures to guide implementation of a new program, such as ITAAC. Consistent staff understanding of programmatic guidance and procedures is important for program success.

Staff Have an Inconsistent Understanding of ITAAC Guidance and Procedures

NRC staff do not uniformly understand how they should apply select guidance documents and procedures that describe the ITAAC inspection and closure process. This guidance includes the Strategy Documents[6] and relevant inspection guidance documents to help focus resources and identify ITAAC attributes for inspection. NRO also has a draft Office Instruction to assist staff during the ITAAC closure review process. Among

[6] For a brief description of Strategy Documents, see the text box entitled "The ITAAC Strategy Documents" in the next section of this report.

other things, the draft Office Instruction includes identification of the relevant program offices as well as a checklist to guide reviewers during the notification closure process. Nonetheless, there are varying staff perspectives on what constitutes a sufficient review for ITAAC closure. Specifically, OIG identified staff difficulties in understanding:

- The use of the Strategy Documents,
- The procedures for selecting non-targeted ITAAC for inspection, and
- The ITAAC closure notification review procedures.

Staff Understanding of Strategy Documents Is Inconsistent

NRC staff do not uniformly understand the purpose and application of the ITAAC Strategy Documents (see text box, "The ITAAC Strategy Documents"), and have also expressed concerns as to whether the documents are kept up-to-date. During discussions with OIG, staff cited concerns regarding the purpose and utility of the Strategy Documents. For example, some staff stated that the documents were "high level" guidance to be used with Inspection Manual Chapters, a characterization at odds with their description as pre-inspection planning documents, as articulated to
OIG by regional staff. One NRC manager noted that the process of how to use the documents was "evolving." Further, some staff indicated that some of the documents are out of date and may not contain the latest technical information. Specifically, some NRO staff who might be expected to provide technical input into the Strategy Documents stated that their views were not being taken into consideration and it was difficult for them to communicate their concerns.

The ITAAC Strategy Documents

The Strategy Documents were developed beginning in 2006 by NRC staff for use by regional managers and inspection staff to prepare inspections of reactors under construction. Each Strategy Document is related to a specific ITAAC family in a given reactor type, such as the AP1000 series. Among other things, these documents provide examples of ITAAC families subject to inspection, references to appropriate inspection guidance documents, and descriptions of relevant structures, systems and components related to a given ITAAC family.

Staff Inconsistently Understand the Process for Inspection of Non-Targeted ITAAC

Region II and NRO staff have differing perspectives on how to inspect non-targeted ITAAC (see text box, "Targeted and Non-Targeted ITAAC"). A senior Region II staff member said that any ITAAC not meeting the selection criteria for targeted ITAAC should be potentially suitable for inspection. ITAAC technical consultants have asserted that a structured approach should be taken to selecting non-targeted ITAAC for inspection, ranking the below-threshold ITAAC in a systematic fashion. However, according to one senior regional staff member, Region II staff consider a more random approach to ITAAC inspection selection to be appropriate. For example, one staff member expressed concern that the existing, structured approach articulated by headquarters does not allow enough latitude on the part of inspectors to look at non-targeted ITAAC. The staff member also noted that having too rigid a methodological approach could lead to the potential for predictability in inspections of non-targeted ITAAC. Specifically, employing a rigid methodological approach could allow for licensees to pre-determine which non-targeted ITAAC would be inspected by NRC.

Targeted and Non-Targeted ITAAC

As part of the ITAAC inspection process, targeted ITAAC are identified through a ranking methodology. ITAAC are first reviewed for safety significance in conjunction with a probabilistic risk assessment. Then, all ITAAC are assigned a numerical value based on safety significance and a number of other factors, which is their "value of inspection." All ITAAC that meet a certain selection criteria are then identified as "targeted," and will be inspected during the construction process. Other ITAAC that fall below the threshold are designated as "non-targeted," but could still be subject to some level of inspection.

ITAAC Closure Notification Review Procedures Are Not Well Understood

Some NRC staff do not fully understand some aspects of the ITAAC closure notification review process (see text box, "The Closure Review Process"). To facilitate this process, NRO has developed a draft Office Instruction titled, "ITAAC Closure Verification Process," to provide guidance to staff. However, NRO is presently reevaluating the draft Office Instruction based on management and regional staff concerns regarding the validity of some of the guidance criteria. These concerns include:

The Closure Review Process

When an ITAAC is completed by the licensee, an ITAAC Closure Notice is submitted to NRO for a review. This review includes (1) verification of ITAAC closure notifications, as submitted by the licensee, and (2) instructions for reevaluation and opening of a closed ITAAC (if needed).

- The "2-4 hour" time frame cited in the draft guidance for the review of closure notices.
- The lack of specification in describing the roles and responsibilities of the various staff who might be involved in a closure review.

Programmatic Guidance Lacks Clarity and Training Is Improvised

There are two predominant factors contributing to NRC staff confusion regarding the ITAAC guidance and procedures: (1) a lack of specificity and clarity in the associated program guidance, and (2) the agency's improvised approach to training program staff on the ITAAC process.

Guidance Documents Are Unclear

ITAAC program guidance is unclear, which has led to inconsistent staff understanding of ITAAC guidance. OIG found some key areas, beginning with pre-inspection planning up through the ITAAC closure notification reviews, where existing guidance was unclear. Specifically:

Strategy Documents

There is currently no formal guidance regarding the use and maintenance of Strategy Documents. Although these documents are a key part of pre-inspection planning, they are currently monitored and updated by a primary point of contact, with input and updates occurring in an informal fashion. In

turn, regional and headquarters staff who could be providing useful input are not being consistently included in the revision process.

NRO's Draft Office Instruction

- Justification for the "2-4 hour" time estimates for closure notice reviews provided in the draft Office Instruction have not been communicated to staff. During several discussions with NRC staff there was no consistent understanding for why "2-4 hours" was chosen.
- The draft Office Instruction is ambiguous regarding the specific regional and headquarters staff roles and responsibilities associated with the closure notice review process. Frequently, the guidance simply states for a given office: "Provides technical support for the verification of the closure of ITAAC."

Training for ITAAC Staff Is Improvised

NRO provides ITAAC training in an improvised fashion as determined by various managers in headquarters and Region II. OIG discussions with NRO and Region II management and staff, including NRO's training coordinators, revealed that they have not systematically developed training in accordance with the training and development policies listed on the NRC's internal training Web site. These policies are based on the Office of Personnel Management's (OPM) training guidance. OPM/agency policies call for a training needs assessment to help agency and program managers identify appropriate subjects and methods for training.

OPM's direction for identifying agency training needs consists of a three-stage process that begins with an organizational assessment. The organizational assessment can be used to determine what skills, knowledge, and abilities an agency needs. Agency staff should then conduct an occupational assessment to identify the skills, knowledge, and abilities required for various staff. In the last stage, individual assessments are conducted to evaluate individual employee capabilities and whether or not additional training is required in order to do new or different work. Implementing a formal approach to training would greatly improve the range and consistency of knowledge on the part of NRO and Region II staff regarding their roles and responsibilities in the context of the overall ITAAC process.

Shortcomings in Existing Guidance Could Hinder Staff Efforts During ITAAC Closure Process

Inconsistent staff knowledge and understanding of the ITAAC inspection and closure processes, combined with ad hoc training practices, hinder the staff's ability to identify and conduct relevant ITAAC inspections and closure notice reviews. This, in turn, could negatively impact NRC's ability to provide reasonable assurance that a facility has been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and applicable Commission rules and regulations. For example, a lack of formal guidance related to the Strategy Documents could result in inconsistent application—or even misinterpretation—of existing guidance. Furthermore, as the documents are not formally controlled, there is currently no process to ensure that staff are using the most up-to-date versions of the Strategy Documents. This could potentially lead to inconsistencies in inspections, resulting in possible licensee perception of disparate treatment and might also negatively affect the Commission's ability to appropriately make a 10 CFR Part 52.103(g) finding.

During the ITAAC closure review process, there is potential for rushed closure reviews resulting from misperceptions associated with the length of time needed (e.g., 2-4 hours) to complete a review with limited resources. Confusion regarding the time needed to conduct reviews could potentially contribute to a loss of reasonable assurance that plants will be built according to established rules and regulations as a result of rushed or inadequate closure reviews.

Recommendations

OIG recommends that the Executive Director for Operations:

1. Develop formal guidelines governing the use of Strategy Documents in the context of construction inspection.

2. Specify procedures for updating Strategy Documents and communicating changes in a systematic and coordinated fashion.

3. Provide specific guidance for inspection of non-targeted ITAAC and clarify the specific roles and responsibilities of various stakeholders during ITAAC closure notification review.

4. Develop and deliver training for the ITAAC process based on the results of needs assessments.

B. Development and Implementation of CIPIMS Has Been Delayed

CIPIMS is a necessary tool to document all ITAAC and vendor inspections, inform the agency's ITAAC closure notice review, and support the Commission in making informed findings for permitting licensees to load fuel into a newly constructed reactor. However, CIPIMS was not available when ITAAC-related construction activities were begun at Vogtle, Georgia, in March 2010.[7] While CIPIMS was officially deployed in January, 2012, just prior to NRC's approval of the Vogtle COL on February 10, 2012, two software updates were already planned through the end of the fiscal year. Delays associated with the development and deployment of CIPIMS occurred due to insufficient oversight of database development. Consequently, NRC has spent approximately $2 million, some of which cannot be accurately accounted for, over a period of 5 years without developing a fully functional database for the ITAAC closure process. Additional delays and inaccurate accounting are likely to continue.

CIPIMS Is Needed To Track ITAAC Inspection Activity

NRC has been developing CIPIMS to document inspection items and report the results of ITAAC-related and vendor inspections. CIPIMS will be used to collect inspection data from multiple sources (e.g., inspection and construction schedules) and generate reports. It will also provide critical database support in the planning, execution, reporting, and reviewing of ITAAC inspections. In the ITAAC closure notification reviews, CIPIMS will be used by the agency as one means to verify that the prescribed inspections, tests, and analyses in the ITAAC were performed and that the acceptance criteria were satisfied. Thus, CIPIMS plays a critical role in NRC providing reasonable assurance of the safety and security of new reactors. In particular, the information collected in CIPIMS will be critical to NRC's ability to verify ITAAC closure, which will provide the basis for the Commission's 10 CFR Part 52.103(g) finding.

[7] Located near Augusta, Georgia, Southern Nuclear Company has begun construction on two AP1000 Pressurized Water Reactors that are designated as Vogtle, Units 3 & 4.

CIPIMS Was Not Available When First Needed and Remains Less than Fully Operational

CIPIMS was not available when ITAAC-related construction activities were initiated at Vogtle in March, 2010. CIPIMS development began in 2006 with the creation of what the staff refers to as the "CIPIMS Prototype" and legacy systems. CIPIMS 2.0 was implemented in January, 2012, nearly 5 years after initial development efforts commenced. Even after deployment of the current version, the agency is planning to implement future versions of CIPIMS that include additional system information and system capabilities.

Insufficient Oversight of CIPIMS System Development

NRO has not consistently applied the policies, principles, and best practices prescribed and endorsed by Federal guidelines and agency policy for systems development and investment management. Specifically, NRO did not provide consistent oversight, quality control, and executive review of the CIPIMS project to ensure that it has been developed and implemented in a well-managed and systematic manner. This lack of consistent oversight is exemplified by NRO's not appointing a single project manager thoroughly familiar with all aspects of the agency's Project Management Methodology.

Staff Not Familiar with Aspects of Project Management Methodology

In accordance with Federal and agency regulations, the agency's information technology capital investments are subject to the requirements of the agency's prescribed Project Management Methodology. However, OIG noted during the audit that NRC staff involved in the oversight of the CIPIMS project were unable to identify the tier designation of the information system—a central aspect of the Project Management Methodology. This lack of familiarity was evident in the staff's inability to accurately identify the tier of the system and the corresponding artifacts or provide artifacts when requested by OIG.

NRC staff were unfamiliar with the tier designation (see text box, "Project Management Methodology Tier Designations") of the current CIPIMS system. For example, during a demonstration of the CIPIMS 2.0 database, OIG inquired of one of the designated project managers what tier the system was assigned. The project manager could not provide a definitive answer and deferred to the Office of Information Services (OIS) contractor who stated that the database was categorized as Tier 1 because CIPIMS 2.0 is being developed under the Enterprise Project Management contract. OIG noted that the type of contract under which a system is being developed is not a factor in determining the tier designation. Consequently, OIG has concluded that because staff is not familiar with the tier of the CIPIMS system, the associated required artifacts (see text box, "Project Management Methodology Artifacts") are not likely to be consistently addressed.

Project Management Methodology Tier Designations

In accordance with agency requirements, information technology systems are to be designated by the agency as Tier 1, Tier 2, or Tier 3 based on several factors, including the complexity of the system, security requirements, and projected development cost. The tier designation is significant as it guides the development and implementation of the system. Additionally, it determines the requirements that must be addressed to ensure that the system is appropriately and systematically managed. Consequently, it is expected that the project manager of an information technology system should be familiar with the appropriate tier designation and the associated requirements.

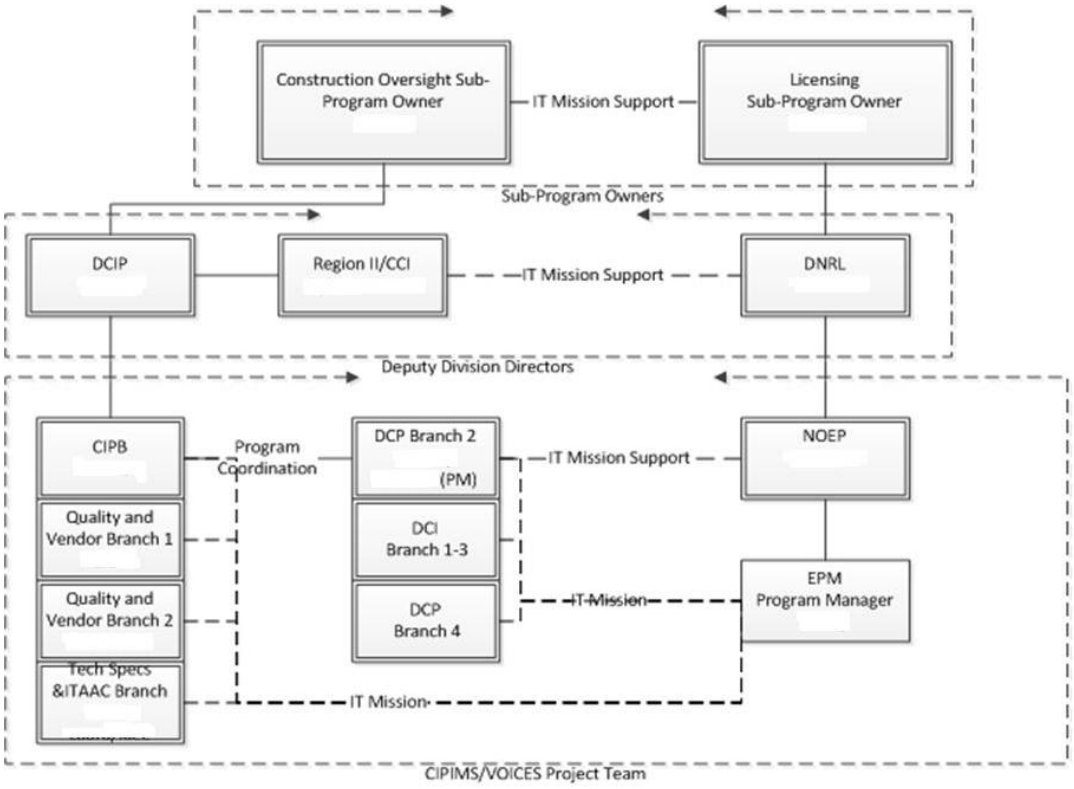
To gain a better understanding of how NRO addressed Project Management Methodology requirements (artifacts), OIG requested pertinent CIPIMS project planning and management documents from NRO early in the audit. After several weeks, OIG was provided with a project organizational chart (see Figure 3), the CIPIMS System Requirements Specifications, and an incomplete project plan. OIG issued a second

Project Management Methodology Artifacts

The tier-specific requirements are referred to as "artifacts" and include documentation such as a project plan, system requirements, and a risk assessment. Depending on the tier designation, certain artifacts are required while others are considered optional. There are a significant number of artifacts that are required for a Tier 1 system. See Appendix A.

request for information; however, the agency provided no additional documentation. Based on the information that was provided, OIG determined that the required artifacts for a Tier 1 system were not being appropriately maintained by NRO. In fact, NRO had only addressed some of the required artifacts and they were not consistently managed. Consequently, OIG concluded that the prolonged development and unaccounted costs associated with CIPIMS were, in part, a direct result of staff's lack of familiarity with the requirements of the Project Management Methodology.

Figure 3: NRO CIPIMS Project Team Organization as of August 3, 2011



Source: NRC[8]

[8] CCI (Center for Construction Inspection); CIPB (Construction Inspection Program Branch); DCI (Division of Construction Inspection); DCIP (Division of Construction Inspection and Operational Programs); DCP (Division of Construction Projects); DNRL (Division of New Reactor Licensing); EPM (Enterprise Project Management); NOEP (Organizational Effectiveness and Productivity Branch)

Lack of Clearly Designated Project Manager

A project manager plays a significant role in overseeing a project and is responsible for the planning, controlling, and monitoring of the project. However, during CIPIMS development there was not a clearly designated single project manager to oversee the CIPIMS project and coordinate staff and system end-user input. Specifically, during the course of the audit, staff could not consistently identify a single project manager for CIPIMS and noted there were "multiple project managers" overseeing the project that were located both in Region II and headquarters. Further, not having a clearly designated project manager to coordinate input made participating in developing the CIPIMS database difficult. This contributed to a general confusion within the agency as to who was responsible for overseeing the CIPIMS project, as indicated previously in Figure 3.

Delays and Unaccounted Costs in CIPIMS System Development

The lack of adequate project oversight has contributed to CIPIMS development delays. Moreover, during a prolonged period of time, the agency did not consistently or appropriately track and verify the costs associated with the development of the database as required by Federal and agency guidance. Consequently, NRC has spent approximately $2 million, with some expenditures lacking in supporting cost details, over a period of 5 years. Although inspectors started using CIPIMS at the end of January 2012, the database is still being updated and was not yet a fully functional database for the ITAAC closure process.

Prolonged Delays

NRC's CIPIMS database has been in development for a prolonged period of time. Specifically, the development of CIPIMS began in 2006 with the creation of what the staff refers to as the "CIPIMS Prototype" and legacy systems. In January, 2012, CIPIMS 2.0 was implemented nearly 5 years after initial development efforts commenced. OIG has recently learned that the agency is planning to implement future versions of CIPIMS that include additional system information and system capabilities.

Staff involved in the development of CIPIMS attributed the developmental delays to a variety of factors involving the coordination of regional and headquarters staff. For example, staff noted that poor communication between Region II and headquarters, "chronic IT issues," disagreement over system requirements and platforms, and differing expectations all contributed to the lengthy delay in developing and implementing a usable ITAAC database. Most notably, one staff member stated that at various phases of development it appeared that the "politics and management issues within [the Division of Construction Inspection and Operational Programs]," were impeding the progress of the project. Together, these factors effectively retarded the progress of CIPIMS development and significantly increased the cost of developing the database.

Development Costs Tracking Issues

The agency could not provide sufficient information documenting the development costs for the CIPIMS database. The documentation the agency provided was incomplete and inconsistent, and was analogous to summary data and cost estimates. For example, in some instances the agency provided a spreadsheet of approximated costs without any supporting documentation, such as invoices or signed contractor timesheets. As a result, OIG could not independently verify the CIPIMS development costs cited by the agency. The agency's inability to appropriately track CIPIMS development costs is evident in how CIPIMS-related invoices are processed and reconciled to the provisions of the Enterprise Project Management contract. Table 1 illustrates the various iterations of the CIPIMS database, including the associated development activities and costs.

Table 1: CIPIMS Development Timetable and Estimated Costs

Years	CIPIMS System	Development History	Estimated Cost
2007-08	CIPIMS Legacy	• Developed in NRR; • Based on RPS • Developed under Lockheed Martin Contract	$275,000
2008-09	CIPIMS Legacy	• Work continued by NRO • Developed under Lockheed Martin contract	$415,250
2008-11	CIPIMS 1.0 Development & Operations and Maintenance	• Migrated from RPS Legacy System to Microsoft application • Attempted implementation during 17-month period • Developed under the EPM contract	$942,550
2009-11	CIPIMS Lite	• Region II developed stop-gap system based on Microsoft Access™ in absence of functioning CIPIMS	$0 (Cost included as part of staff TAC code.)
2011-12	CIPIMS 2.0	• Major overhaul and redesign of system. • Developed under EPM contract • Operational as of January 9, 2012, while additions and upgrade work continues	$394,560 plus an added $450,000 (estimate) for latest work up to present
			Total: $2,477,360

Source: OIG analysis of NRC data as of January, 2012

Note: EPM is the abbreviation for Enterprise Project Management; RPS is the abbreviation for Reactor Program System; NRR is the abbreviation for Office of Nuclear Reactor Regulation

Invoice Processing Inconsistencies

According to NRO staff, CIPIMS 1.0 and 2.0 were developed under the agency's Enterprise Project Management contract and are currently co-managed by NRO and OIS.[9] Under this arrangement, NRO provides daily oversight of the contractor and manages the development of the CIPIMS database while OIS is charged with disbursing payment on behalf of NRO for the services rendered by the contractor under the Enterprise Project Management contract. According to one staff member, the arrangement between NRO and OIS did not allow the NRO project manager to be fully involved in reviewing the development costs associated with CIPIMS. For example, an NRO staff member with project manager experience noted that under the Enterprise Project Management contract only OIS receives invoices from the contractor and that these invoices are not routinely forwarded to the NRO project manager for review. The NRO staff member indicated that—although they are responsible for the day-to-day oversight of the CIPIMS project, including overseeing the contractor—the entire invoicing process is controlled by OIS. The individual characterized this arrangement as "a disaster." OIG has identified in previous audits that cost tracking for information technology systems has been a problem within the agency.[10]

[9] NRC's Enterprise Project Management tool is a Microsoft product that helps organizations manage capital projects by providing a framework for scheduling, tracking, and updating projects that help to optimize resources, minimize costs, manage scope, and deliver on time. NRO currently uses Enterprise Project Management to electronically support the agency's Licensing Program Plan through Microsoft Project™, Project Web Access™, and the SharePoint™ tools.

[10] See, for example, "Results of the Audit of the United States Nuclear Regulatory Commission's Financial Statements for Fiscal Years 2005 and 2004," OIG-06-A-01, November 10, 2005.

Lack of Clarity in Enterprise Project Management Contract Task Orders

The Enterprise Project Management contract is broadly written and did not always contain language specific to the development of the CIPIMS database. Specifically, the initial Enterprise Project Management contract contained task orders that were generically worded and provided only broad categorizations of the types of operations and maintenance activities allowable under the contract. A task order did not exist that was specific to CIPIMS development, making it unclear which task orders were to be used to track the costs associated with development of the database. Contract and project manager staff explained that CIPIMS-related work could be charged under multiple task orders depending on the type of work being performed. OIG questioned whether it was possible for staff to account for CIPIMS development costs if multiple task orders were being inconsistently utilized. In effect, actual costs could not be tracked and OIG could not separate CIPIMS work from that charged to the generalized task orders. Shortly after OIG raised this issue, the Enterprise Project Management contract was modified to include a CIPIMS-specific task order.

Recommendations

OIG recommends the Executive Director for Operations:

5. Designate a specific Project Manager for CIPIMS as required by the Project Management Methodology.

6. Develop and maintain project artifacts for CIPIMS as required in the Project Management Methodology.

C. A Formal Strategy for Inspection of Components at Modular Assembly Facilities Would Strengthen the ITAAC Inspection Program

The extent to which NRC's inspection activities for components manufactured and assembled offsite are sufficient for ITAAC verification is unclear. This is because NRC has not developed a formal strategy for evaluating what inspections are necessary at modular assembly facilities located away from the plant construction site. Consequently, NRC may not be able to provide reasonable assurance that new nuclear plants are constructed in accordance with NRC requirements.

Importance of ITAAC Construction Oversight and Inspection

NRO and Region II's Center for Construction Inspection construction oversight programs are intended to enable the safe and secure construction of nuclear reactors in accordance with approved designs and safety regulations. NRO's Division of Construction Inspection and Operational Programs, in conjunction with the Center for Construction Inspection, are responsible for overseeing inspections of reactors under construction as well as for inspecting structures, systems and components that are being assembled off-site. An example of such an off-site facility, Shaw Modular Solutions in Lake Charles, Louisiana—which is currently providing components to a nuclear power plant construction site located 834 miles away in Georgia—is shown in Figure 4.

Figure 4. Shaw Modular Solutions Facility, Lake Charles, Louisiana

Source: NRC

Role of Division of Construction Inspection and Operational Programs

NRO's Division of Construction Inspection and Operational Programs develops policy and provides overall program management and planning for the construction inspection program for new commercial nuclear power plants. Activities include oversight of licensee performance assessment, allegations, and enforcement activities.

Role of Region II Center for Construction Inspection

Region II's Center for Construction Inspection conducts oversight activities designed to ensure the safety of future operations at new nuclear facilities by monitoring licensees' efforts to construct the facilities according to approved design criteria, while using appropriate practices and quality materials. Guidance developed by Region II also addresses the importance of inspecting structures, systems and components that are assembled off-site at modular construction facilities.

Importance of Inspecting Components Assembled Off-Site

Strategy Documents, developed by Region II, provide detailed guidance to construction inspectors for pre-inspection planning activities. These documents also address the role of vendor inspections. For example, Strategy Documents associated with the pipe welding and supports/restraint ITAAC specifies that some pipe segments, pipe supports, and restraints will be fabricated off-site at modular fabrication or vendor fabrication sites.[11] NRC Strategy Documents note that there is the possibility NRC will be required to inspect some items "at the manufacturer" rather than after arrival at the construction site, which would also require Region II construction inspectors to coordinate with NRO vendor inspectors. As shown in Figure 5, many modular assemblies are complex in nature and the need for careful inspection planning is important. Therefore, ITAAC inspections should be coordinated with vendor inspections connected with modular fabrication facilities.

[11] Appendix B provides examples of ITAAC.

Figure 5: Installation of Modular Assemblies

Source: NRC

NRC's Approach to Inspection of Modular Assembly Facilities Not Fully Evaluated

There is currently no assurance that NRC's inspection activities for components manufactured and assembled offsite as part of modular assemblies are sufficient for ITAAC verification based on NRC's ability to inspect them. OIG reached this conclusion after inquiring of staff the extent to which resident inspectors would be needed at modular assembly facilities, and how vendor inspections would be factored into the ITAAC review process. Although NRC has taken initial steps to identify targeted ITAAC that can be inspected at modular assembly facilities, NRC still does not have formal documentation that outlines a comprehensive strategy for the inspection of modular assembly facilities.

NRC's Approach to Modular Assembly Inspection Could be Strengthened

NRC has not developed a formal strategy for evaluating what inspections at modular assembly facilities are necessary to support the ITAAC program. That is, staff are making decisions without the benefit of a structured and systematic evaluation to determine what systems, structures and components assembled or manufactured off-site need to be inspected prior to arrival at the construction site in support of the ITAAC closure process.

For example, during the audit, OIG observed NRC management and inspection staff at a meeting with vendor staff at Shaw Modular Solutions. The site visit was intended, in part, to help NRC staff better understand how the modular assembly facility fit into the overall inspection scheme for new construction inspections. After the visit, NRC staff still had unanswered questions regarding access to vendor data, the off-site assembly construction schedules, and even the precise make-up of some of the assemblies. Though NRC has taken initial steps to identify ITAAC that could be inspected at modular assembly facilities through updated procedures in the Strategy Documents, NRC has not developed a formal strategy to identify targeted and non-targeted ITAAC that could require some degree of inspection prior to arrival at a construction site.

Role of the Vendor Inspection Program Not Formalized

NRC has not fully determined how the NRO vendor inspection program should be integrated into NRC's overall ITAAC oversight activities. The vendor inspection program is an important part of the overall inspection process. Senior headquarters and regional staff stated that vendor inspections inform ITAAC. OIG noted that NRO has taken preliminary action to address the role of vendor inspections with respect to ITAAC inspections. Precisely how vendor inspections inform ITAAC inspections is not clear, however, and neither senior regional nor headquarters managers could articulate how this is being accomplished. OIG also learned that Region II construction inspection staff are relying, in part, on NRO vendor inspectors to inform Region II of any findings related to ITAAC that they identify during vendor and modular facility inspections.

To help understand the role of vendor inspectors in the ITAAC oversight process, OIG requested documentation reflecting a staff analysis of the role of vendor inspections in ITAAC-related oversight activities. NRC staff stated that no such analysis was conducted and, thus, no formal strategy for integrating and coordinating vendor inspections has been developed. As one senior NRO program staff member told OIG, from the standpoint of the vendor inspection program, the ITAAC inspections are considered as a "bonus" and not a necessity.

Figure 6: NRC Vendor Inspection Team at Shaw Modular Solutions Facility

Source: NRC

Opportunities To Identify Safety-Significant ITAAC Problems May Be Missed

Without a formal strategy to guide the evaluation of modular components and to delineate the role of vendor inspectors in the ITAAC oversight process, the agency may be missing opportunities to identify safety-significant problems. Specifically, opportunities for detecting safety-significant issues relating to targeted ITAAC during new reactor construction may be limited. The role of modular construction and vendor inspections is vitally important, in part because vendors—such as Shaw Modular Solutions—have already been assembling safety-related components destined for use at new reactor construction sites. Region II

staff acknowledged that some components would have to be inspected at Shaw Modular Solutions, or they might not be visible upon arrival onsite.

For example, certain modular assemblies have welding that, once assembled, would be inaccessible to resident inspectors when the module arrived on-site, which could prevent an accurate evaluation of a given ITAAC. Furthermore, both ITAAC and vendor inspection teams may be missing opportunities to identify problems early on and communicate them in a timely manner to those resident inspectors who can best make use of the information. For example, during meetings at Shaw Modular Solutions, licensee representatives revealed that some modular assembly activity was going on at sites other than Lake Charles. However, NRC staff were not aware of the activity and were not informed through vendor inspections. Without the full details of what is being assembled at locations other than the construction site, NRC may not be able to reasonably assure that the plant is being built in accordance with its license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

Recommendations

OIG recommends that the Executive Director for Operations:

7. Determine what systems, structures and components assembled or manufactured off-site need to be inspected prior to arrival at the construction site in support of the ITAAC closure process.

8. Develop a formal vendor inspection coordination strategy to ensure appropriate inspections of modular systems, structures and components assembled or manufactured off-site.

D. Coordination Between Headquarters and Region II Could Be Improved

There is a lack of sustained coordination both within headquarters and between headquarters and Region II for ITAAC program related activities and interactions. These problems would have been minimized if NRO and Region II had in place formalized change management processes to address communications and coordination problems in a changing environment. Without a formalized change management process, coordination and communication concerns between NRO and Region II will continue to proliferate, with the potential to affect the agency's safety mission.

The Importance of Coordination and Communication to Program Success

Key agency guidance documents note the importance of employing effective business methods—such as sustained coordination and clear communication—to achieve and maintain operational excellence. For example, the agency's current Strategic Plan references coordination and communication as effective business methods. Change management, in particular, is vital to enhancing an organization's effectiveness and efficiency. Key aspects of change management include realizing the need for increased training and systematically documenting new procedures to assist staff throughout the transition process. Furthermore, NRO's internal guidance documents note the key role that interdependence and coordination play in its ability to effectively attain its mission. For example, in *NRO Vision of Success,* NRO recognizes the importance of interdependent relationships within the agency, and the subsequent need for clearly delineating roles and responsibilities. Additionally, the Division of Construction Inspection and Operational Programs Web page states its approach to the oversight of new reactor construction is based on coordination between and within headquarters and Region II.

Management best practices also acknowledge the significant impact coordination has on an organization's ability to attain its goals. According to recognized management best practices, "…the goal of the enterprise cannot be successfully obtained without it [coordination]." Management best practice states that effective coordination includes sound planning, a clear delineation of responsibility, and effective communication within an organization. Furthermore, recognized management best practices

emphasize change management as entailing thoughtful planning, sensitive implementation of change, and consultation with, and involvement of, the people affected by the changes. An organization's management is responsible for facilitating and enabling change by preparing staff to understand the purpose of the change. This requires management to effectively communicate and involve staff early on in the process to facilitate a sentiment of trust and openness. Management must clearly articulate to affected staff what their role is in facilitating the change, including the new roles and responsibilities they will be expected to perform and how they will interact with other entities within the organization. Furthermore, management is responsible for identifying potential barriers to change and developing plans to address them, in addition to providing a systematic transition plan and schedule to guide the organizational change.

Lack of Sustained Coordination and Communication Hinders ITAAC Process

During OIG's review of NRC's ITAAC oversight process, development of CIPIMS, and oversight of modular components constructed and assembled offsite, auditors noted a lack of sustained coordination between headquarters and Region II staff. Specifically, OIG observed a lack of sustained coordination during the development and revision of ITAAC guidance documents, the creation of the CIPIMS database, and the interaction between the vendor inspection and ITAAC programs.

ITAAC Closure Guidance

There is inconsistent coordination between headquarters and regional staff in the development and revision of ITAAC-related guidance and procedures. Specifically, the process by which the ITAAC Strategy Documents are revised is informal, occurs on an irregular basis, and does not lend itself to broad staff participation. During the audit, OIG learned that revisions to the Strategy Documents are managed via a limited-access Region II Microsoft SharePoint™ site. Furthermore, the revision process is not formalized and occurs on a sporadic, ad hoc basis. Staff also expressed significant concern that there did not seem to be any formal method for submitting changes to the Strategy Documents, which were essentially overseen by a single point of contact and not subject to an objective vetting process.

Development of CIPIMS Database

The development and implementation of CIPIMS has been lengthy and characterized by inadequate coordination at various levels within and between headquarters and regional staff. This lack of coordination occurred throughout the development of all iterations of CIPIMS, but was most apparent in the development of pre-CIPIMS 2.0 variants. Specifically, there was a lack of coordination in how the differing priorities, system change requests, and user needs were managed during the database's development.

- *Differing Priorities Hampered Coordination.* Coordination between headquarters and Region II during various phases in the development of the CIPIMS 1.0 database was hampered, according to staff, as a result of the shifting priorities at headquarters and Region II that were driven by resource and staff availability issues.
- *System Change Requests Not Coordinated.* The manner in which system change requests were managed illustrates a lack of coordination during CIPIMS development. Specifically, there was no formal process for submitting, evaluating and implementing the system change requests proposed by staff.
- *User Needs Were Not Sufficiently Coordinated.* Both Region II and headquarters staff agree that communication was lacking and often led to additional confusion. In some cases, headquarters and regional staff indicated that they felt their input was not being adequately taken into account.
- *Management Efforts to Address Coordination and Communications Issues.* During the course of OIG's audit, NRO managers and staff began taking steps to employ a more systematic approach toward the development and implementation of the CIPIMS 2.0 database. For example, an NRO staff member involved with CIPIMS told OIG that a formalized change request management system has been implemented for CIPIMS 2.0. This includes taking steps to ensure that user needs and requirements are identified and met through implementing a more formalized communication mechanism.

Interaction of the Vendor Inspection and ITAAC Programs

There is limited coordination between the NRO's vendor inspection program and Region II's Center for Construction Inspection despite their interdependent inspection activities. Specifically, communication between the organizations is informal and occurs inconsistently. For example, staff noted that information sharing primarily occurs via e-mail or word-of-mouth on an irregular basis. Additionally, OIG found evidence that although NRC is aware of coordination issues, there is not yet in place a formal process for how NRC plans to coordinate construction and vendor inspections involving modular assembly facilities. For example, ITAAC inspection staff have noted their reliance on the results of the vendor inspections to better inform ongoing and future ITAAC inspection work. In contrast, an NRO senior manager stated that conducting any work involving or relating to ITAAC is a "bonus," thereby implying that the ITAAC process is not routinely considered in the conduct of vendor inspections.[12]

NRO and Region II managers have identified this issue as an impediment to the efficacy of both the ITAAC and the vendor inspection programs. As a result, according to NRO management, they are taking steps to ensure that the coordination between the programs is strengthened by defining a formalized means of communication and developing clearly written guidance that addresses the expectations regarding interaction, and identifies the specific roles and responsibilities of each program.

Change Management Process Not Employed

Communication and coordination problems would have been minimized if NRO and Region II had in place formalized change management processes to mitigate barriers to change in a dynamic environment. A senior NRO manager indicated that they were unaware if any change management process had been used to facilitate the most recent NRO office reorganization performed in late 2011. During discussions with OIG,

[12] Nor did it appear that ITAAC were specifically considered during NRC's vendor inspection of Shaw Modular Solutions in November 2011. The resulting inspection report (Inspection Report No. 99901401/2011-202) does not mention ITAAC. This is due, in part, to the traditional role of vendor inspections to review the vendor's compliance with 10 CFR Part 50, Appendix B "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Given such a restricted inspection focus, anything specific that the vendor inspection team might find regarding an individual ITAAC appears unlikely and exceptional and, indeed, might legitimately be characterized as a "bonus."

managers and staff cited instances of communication and coordination problems that were exacerbated by staff turnover. The problems included communication of inspection-related activity, as well as communication and coordination associated with the development of CIPIMS. In addition, as changes to project management occurred, they were not always communicated or coordinated effectively to staff, leading to what one NRO manager characterized as having to start things all over again.

Continued Coordination Problems May Affect Safety Mission

Given the changing budget and regulatory environment, it is prudent to assume NRC may undergo further change. Some of this change may be a result of the projected development and licensing of new reactors, including small modular and other advanced reactors, ongoing license renewals, as well as the natural evolution and revision of the agency's regulations in response to external events. Without an effective change management program in place, continued problems with coordination and communication can be expected to continue to adversely affect the ITAAC process and the degree to which new plants are safely constructed.

Recommendations

OIG recommends that the Executive Director for Operations:

9. Develop a plan to correct the existing communication and coordination problems between headquarters and Region II that resulted from lack of a change management process for ITAAC-related issues.

10. Develop and implement a change management process to address future change in the ITAAC process that can create barriers to effective communication and coordination.

IV. CONSOLIDATED LIST OF RECOMMENDATIONS

OIG recommends that the Executive Director for Operations:

1. Develop formal guidelines governing the use of Strategy Documents in the context of construction inspection.

2. Specify procedures for updating Strategy Documents and communicating changes in a systematic and coordinated fashion.

3. Provide specific guidance for inspection of non-targeted ITAAC and clarify the specific roles and responsibilities of various stakeholders during ITAAC closure notification review.

4. Develop and deliver training for the ITAAC process based on the results of needs assessments.

5. Designate a specific project manager for CIPIMS as required by the Project Management Methodology.

6. Develop and maintain project artifacts for CIPIMS as required in the Project Management Methodology.

7. Determine what systems, structures and components assembled or manufactured off-site need to be inspected prior to arrival at the construction site in support of the ITAAC closure process.

8. Develop a formal vendor inspection coordination strategy to ensure appropriate inspections of modular systems, structures and components assembled or manufactured off-site.

9. Develop a plan to correct the existing communication and coordination problems between headquarters and Region II that resulted from lack of a change management process for ITAAC-related issues.

10. Develop and implement a change management process to address future change in the ITAAC process that can create barriers to effective communication and coordination.

V. AGENCY COMMENTS

On May 9, 2012, the Office of the Inspector General (OIG) issued the discussion draft of this report to the Executive Director for Operations. OIG met with NRC management officials and staff on May 22, 2012, at which time the agency provided informal comments to the draft report. OIG subsequently met with agency management and staff during a May 30, 2012, exit conference to discuss agency informal comments that OIG incorporated into the draft report as appropriate. NRC management and staff reviewed the revised draft report and generally agreed with the recommendations in this report. Furthermore, the agency opted not to provide formal comments for inclusion in this report.

Appendix A

Example of Tier 1 Project Management Methodology Artifacts

PMM Project Management Artifacts	T1*
• Transmittal Memorandum • Vision Document	R
Business Case (The Business Case Package includes the following: • Transmittal Memorandum • Vision Document • Executive Summary • System Requirements Specification • Business Case • Project Management Plan • System Architecture Document *and* • Security Categorization Package)	R
Project Management Plan (Project Schedule, Budget/Cost, Quality Assurance Plan, etc).	R
Project Schedule • Project Schedule Templates	R
Software Development Plan Template (if outsourced; includes schedule, and other supporting management approaches)	R
Risk/Issues List	R

Source: NRC *T1 = Tier 1 Project; R = Required by PMM

Note: OIG requested documentation from NRO staff to provide support that required Tier 1 artifacts had been addressed during the development of CIPIMS. To date, OIG has received no documentation that provides sufficient evidence that Tier 1 artifacts were appropriately addressed.

Appendix B

Examples of ITAAC

Design Commitment	Inspection, Test and/or Analyses	Acceptance Criteria
1. The Remote Manual and Fuel Handling Mechanism gripper assemblies are designed to prevent opening while the weight of the fuel assembly is suspended from the gripper.	The Remote Manual and Fuel Handling Mechanism will be tested by operating the open controls of the gripper while suspending a dummy fuel assembly.	The gripper will not open while suspending a dummy test assembly.
2. Pressure boundary welds in components identified in Table 2.1.3-1 as American Society of Mechanical Engineers (ASME) Code Section III meet ASME Code Section III.	Inspection of the as-built pressure boundary welds will be performed in accordance with ASME Code Section III.	A report exists and concludes that ASME Code Section III requirements are met for Non-destructive examination of pressure boundary welds.

Source: NRC

This chart contains two examples of ITAAC. The first example (row 1) is a simple ITAAC and involves verifying whether the gripper of the fuel handling mechanism functions properly through visual inspection. The second example (row 2) is a complex ITAAC and involves examining welds in components located on the reactors' pressure boundary to determine conformance to ASME code requirements.

Appendix C

OBJECTIVE, SCOPE, AND METHODOLOGY

OBJECTIVE

The audit objective was to assess NRC's regulatory approach, through the ITAAC review process, to ensure that new nuclear power plants have been constructed and will be operated in conformity with the license, the provisions of the Atomic Energy Act, and the Commission's rules and regulations.

SCOPE

The audit focused on assessing NRC's ITAAC inspections and evaluations associated with the ITAAC closure process. The audit reviewed current agency guidance and practices pertinent to ITAAC, and also included a review of Federal regulations and agency policies regarding new information technology projects.

We conducted this performance audit at NRC headquarters (Rockville, Maryland) from April 2011 through January 2012. The audit also included site visits to Region II offices in Atlanta, Georgia; the Vogtle Electric Generating Plant construction site in Waynesboro, Georgia; and Shaw Modular Solutions modular assembly facility in Lake Charles, Louisiana. Internal controls related to the audit objective were reviewed and analyzed. Throughout the audit, auditors were aware of the possibility or existence of fraud, waste, or misuse in the program.

METHODOLOGY

OIG reviewed Federal regulations and agency guidance regarding the ITAAC inspection and closure process and new information technology projects, including:

- 10 CFR Part 52 – *Licenses, Certifications, and Approvals for Nuclear Power Plants.*

- Technical Report on the Prioritization of Inspection Resources for Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC).
- Proposed Rule: Requirements for Maintenance of Inspections, Tests, Analyses, and Acceptance Criteria (RIN 3150-AI77).
- Inspection Procedure 40600 – *Licensee Program for Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Management.*
- Inspection Manual Chapter 2506 – "Construction Reactor Oversight Process General Guidance and Basis Document."
- Inspection Manual Chapter 2503 – "Construction Inspection Program: Inspections of Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC)."
- AP1000, ITAAC Family 01F, "*Foundations and Building Design/Fabrication Requirements Inspection Strategy."*
- NEI 08-01 – *Industry Guideline for the ITAAC Closure Process Under 10 CFR Part 52,* Revision 4*,* Draft E.
- *Simulated ITAAC Closure and Verification Demonstration Final Report.*
- Office of Management and Budget Circular No. A-130 – *Management of Federal Information Resources.*
- NRC Management Directive 2.8 – *Project Management Methodology (PMM).*

OIG interviewed NRC managers and staff involved in the ITAAC inspection and closure process. These interviews included an NRO Division Director; NRO and Region II Branch Chiefs; NRO Project Managers; Resident Construction Inspectors; and OIS, and Office of the Chief Financial Officer personnel. Additionally, OIG interviewed Shaw Modular Solutions and Southern Nuclear Company representatives. Overall, OIG conducted interviews with the key program and regional representatives necessary to obtain their insights into the agency's planning and management of the ITAAC closure process.

We conducted this performance audit in accordance with generally accepted Government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a

reasonable basis for our findings and conclusions based on our audit objective.

The audit work was conducted by R. K. Wild, Team Leader; Kevin Nietmann, Senior Technical Advisor; Jacki Storch, Audit Manager; Timothy Wilson, Senior Management Analyst; and Larry J. Weglicki, Senior Auditor.