

**POLICY ISSUE**  
**(Information)**

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FOR: The Commissioners

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SUBJECT: CONSTRUCTION REACTOR OVERSIGHT PROCESS  
SELF-ASSESSMENT FOR CALENDAR YEAR 2017

PURPOSE:

This paper presents the results of the U.S. Nuclear Regulatory Commission (NRC) staff's calendar year (CY) 2017 self-assessment of the Construction Reactor Oversight Process (cROP). This paper does not address any new commitments.

SUMMARY:

The results of the CY 2017 self-assessment show that the staff effectively applied the NRC's Principles of Good Regulation while implementing the cROP. The cROP met the agency's strategic goals of ensuring safety and security through objective, risk-informed, transparent, and predictable oversight. Moreover, the staff found that the cROP met eight out of eight applicable performance metrics. The staff completed cROP updates in 2017 to maintain consistency with recent changes to the Reactor Oversight Process (ROP). In addition, the staff made progress on resolving issues related to inspections, tests, analyses, and acceptance criteria (ITAAC) and on planning for the large number of ITAAC closure notification (ICN) submittals expected late in the construction schedule. The staff continues to monitor inspection resources expended at the construction site and to evaluate potential effects of construction schedule delays. The staff originally estimated that direct inspection (on a per unit basis) would require a total of 35,000 hours, which includes: 15,000 hours for inspections related to ITAAC; 10,000 hours for construction and operational program inspections; 5,000 hours for reactive inspections above

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the baseline program in response to licensee performance issues, allegations, and nonperformance issues or events; and 5,000 hours for technical support for construction inspections.

Based on current planning estimates, the staff has expended approximately 43 percent of the total number of planned ITAAC direct inspection hours at Vogtle Electric Generating Plant (Vogtle), Unit 3, and 32 percent of the planned hours at Vogtle, Unit 4. Based on detailed inspection planning for ITAAC inspections, the staff has determined that the number of direct inspection hours for ITAAC inspections may exceed the original estimate of 15,000 hours on average for Vogtle, Units 3 and 4.

The 10,000-hour estimate for construction and operational programs was based on a 5-year construction schedule. In CY 2017, Units 3 and 4 of Vogtle were in their sixth year of construction. These construction schedule delays have increased the number of programmatic inspection hours because of annual quality assurance (QA) inspections, which result in the expenditure of several hundred hours per year. The staff will reevaluate the original estimate of 10,000 direct inspection hours for construction and operational program inspections as construction progresses. The staff will also continue to evaluate the efficacy of the overall program and solicit input from internal and external stakeholders to further improve the cROP.

#### BACKGROUND:

On July 31, 2017, South Carolina Electric & Gas Company (SCE&G) announced that it had stopped construction of V.C. Summer, Units 2 and 3. In a letter dated August 17, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17229B487), SCE&G formally notified the NRC that, as of July 31, 2017, it had stopped construction activities on V.C. Summer, Units 2 and 3, and placed the two partially constructed nuclear units in a terminated status. The NRC stopped performing inspection and cROP activities for these units as of July 31, 2017. This paper evaluates V.C. Summer, Units 2 and 3, cROP activities completed before July 31, 2017.

The staff conducted the CY 2017 cROP self-assessment in accordance with NUREG-1614, "Strategic Plan: Fiscal Years 2014–2018," Volume 6, dated August 31, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14246A439), and Inspection Manual Chapter (IMC) 2522, "Construction Reactor Oversight Process Self-Assessment Program," dated July 28, 2014 (ADAMS Accession No. ML14189A211).

NUREG-1614 describes how the NRC plans to achieve its two strategic goals: (1) to ensure the safe use of radioactive materials and (2) to ensure the secure use of radioactive materials. The plan provides an overview of the NRC's responsibilities; describes how stakeholders participated in plan development; summarizes key challenges that the agency will face during the planning period; and lays out the objectives, strategies, and key activities that will be used to achieve the agency's goals.

As described in NUREG-1614, Appendix C, "Planned Program Reviews," the agency expects to complete annual reviews of the cROP. The annual cROP self-assessment has three objectives: (1) to determine whether the ongoing program is effective in supporting the achievement of the performance goals and the agency's strategic goals, (2) to provide timely, objective information to inform program planning and to develop recommended improvements to the cROP, and (3) to inform the Commission, NRC senior management, and the public of the results of the cROP self-assessment program, including any conclusions and resulting improvement actions.

The minimum scope of the evaluation includes (1) an evaluation of the construction inspection program, the construction significance determination process (SDP), the closure verification program for ITAAC, the construction enforcement program, and the construction assessment program, (2) discussions and assessments of cROP communications and cROP resource expenditures, and (3) updates on recent issues associated with ITAAC and recent domestic and international construction experience. The cROP self-assessment process (specifically the program evaluations described below and in the enclosure to this paper) fulfills the intent of NUREG-1614, Appendix C.

As a part of the annual cROP self-assessment, the staff determines the effectiveness of the cROP by evaluating its success in meeting the established goals and metrics described in IMC 2522, Appendix A, "Construction Reactor Oversight Process Self-Assessment Metrics," dated October 4, 2017 (ADAMS Accession No. ML17257A163). The staff presents results of the assessment at the annual Commission briefing on the results of the agency action review meeting (AARM). Following the 2016 AARM briefing, the Commission, in the associated staff requirements memorandum (SRM),<sup>1</sup> directed that "the staff should provide very consistent attention on the needed inspection resources at the Vogtle construction sites over the next 12 to 24 months." The staff addresses construction inspection resources in the enclosure to this paper. The Commission did not provide any additional cROP requirements for staff action as a result of the 2017 AARM briefing.

The staff also discussed cROP effectiveness with the Commission during the strategic programmatic overview of the New Reactors Business Line on January 25, 2018. During the meeting, the staff discussed how the termination of Virgil C. Summer Nuclear Station (V.C. Summer), Units 2 and 3, construction activities affects resources. In the SRM<sup>2</sup> for this briefing, the Commission did not identify any new cROP requirements for staff action.

#### DISCUSSION:

To ensure that the cROP self-assessment for CY 2017 was comprehensive and robust, the staff conducted numerous activities and obtained data from several sources, including the cROP performance metrics described in IMC 2522, Appendix A; internal and external stakeholder feedback; and direction and insight given by the Commission in recent SRMs. The staff analyzed the data to gauge cROP effectiveness and potential areas for improvement. In addition, the scope of the staff's self-assessment included cROP program area evaluations (i.e., the construction inspection program, the construction SDP, and construction assessment and enforcement programs); staff progress in resolving issues associated with ITAAC; the construction experience program; independent evaluations; cROP communications; and cROP resources.

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<sup>1</sup> See "Staff Requirements Memorandum—Briefing on Results of the Agency Action Review Meeting (AARM), 9:00 A.M., Thursday, June 2, 2016, Commissioners' Conference Room, One White Flint North, Rockville, Maryland (Open to Public Attendance)," dated June 24, 2016 (ADAMS Accession No. ML16176A078).

<sup>2</sup> See "Staff Requirements Memorandum—Briefing on Strategic Programmatic Overview of the New Reactors Business Line, 10:00 a.m., Thursday, January 25, 2018, Commissioners' Conference Room, One White Flint North, Rockville, Maryland (Open to Public Attendance)," dated February 5, 2018 (ADAMS Accession No. ML18036A908).

### **Construction Reactor Oversight Process Performance Metrics**

The staff found that the cROP met all eight applicable performance metrics by meeting the criteria defined in IMC 2522, Appendix A. The staff deemed two metrics not applicable for the CY 2017 self-assessment because they were related to significant events and the timeliness of supplemental inspections. No significant construction-related events occurred in CY 2017, and the NRC did not perform any supplemental inspections under the cROP. The annual performance metric report, titled "Construction Reactor Oversight Process Performance Metric Report for Calendar Year 2017," dated February 15, 2018, further discusses the staff's analysis of the performance metrics (ADAMS Accession No. ML18033A934).

### **Construction Reactor Oversight Process Program Evaluations**

The staff conducted program evaluations in the three key cROP areas: (1) the construction inspection program, (2) the construction SDP, and (3) construction assessment and enforcement programs.

#### Construction Inspection Program

During CY 2017, the staff continued to effectively implement the construction baseline inspection program and independently verify that the Advanced Passive 1000 (AP1000) licensees were constructing the reactors in accordance with the approved design. The staff ensured that inspection guidance for all phases of construction was available to the inspection staff. There are no outstanding procedure change requests that need resolution to support ongoing and planned inspections in CY 2018.

Two of the self-assessment metrics listed in IMC 2522, Appendix A, are associated with the construction inspection program: (1) "Inspection Reports Are Issued within Timeliness Requirements" and (2) "NRC's Response to Technical Assistance Requests (TAR[s]) Is Timely." The staff met both metrics because it issued all inspection reports within the timeliness goals and completed all TARs closed out in 2017 by the requested due date.

In SECY-17-0048, "Construction Reactor Oversight Process Self-Assessment for Calendar Year 2016," dated April 11, 2017 (ADAMS Accession No. ML17047A694), the staff noted that the TAR metric was not met because four of the five TARs closed out in CY 2016 were resolved after the date requested by inspection personnel. However, the staff concluded that, although the metric was missed, ongoing or planned construction inspection activities were not adversely impacted. To prevent recurrence, the staff formalized communications with requestors and technical staff members who provide input to TAR responses to ensure resolution of future TARs by the requested due dates. The staff's change also helped ensure that the due date is reasonable and that extensions of the due date are clearly documented. The staff has implemented this change to the TAR process and is documenting the changes in a desktop guide to be issued in 2018. In addition, the staff conducted an internal review of the TAR program to identify further efficiencies and recommendations for program improvement. The staff completed the internal review in November 2017, and identified 4 findings and 11 recommendations for improvement. The findings and recommendations focused on improving the efficiency of TAR processing and accessibility of information related to the status and supporting information for both in-process and closed TARs. The staff is evaluating the results of the internal review and will make additional improvements to the program, including to the desktop guide, in CY 2018.

Following the July 31, 2017, announcement that V.C. Summer, Units 2 and 3, construction would not be continued, the agency promptly conducted an assessment of its inspection resources needed to implement the construction inspection program. The NRC evaluated the inspection and supervision staffing needs. The inspection schedule for Vogtle, Units 3 and 4, construction activities informed the resource projections. This assessment identified a reduction of 16 inspection staff and 3 supervisors. Although some inspectors have moved to other divisions, Region II continues to use these resources as needed. The construction inspectors were able to move between business lines because the inspectors have been engaged in cross-training during the last several years. Many of these individuals will be available to support the longer term inspection activities at Vogtle, Units 3 and 4.

In addition, Region II continues to identify efficiencies and incorporate lessons learned into the inspection program. Before cancellation of V.C. Summer, Units 2 and 3, construction, the NRC took an approach such that, where feasible, inspection activities performed at one unit could be credited at the remaining three construction units to gain efficiency. This approach continues to be used at the Vogtle, Units 3 and 4, site to maximize efficiency. The incorporation of lessons learned by the licensee, sequencing of work, and design certainty has allowed the licensee to gain efficiencies. For this reason, NRC inspections are being brought forward commensurate with the licensee's construction schedule. In addition, the NRC has incorporated lessons learned from the Vogtle, Unit 3, inspections into the inspection plans and procedures, which typically result in fewer inspection hours being expended on the second unit without a loss of effectiveness.

As part of the ITAAC Closure and Verification Demonstration Project, Region II and the Office of New Reactors (NRO) have worked together to establish metrics to represent the different aspects of the inspection program. The inspection metrics are both performance based and anticipatory to allow for early management attention and to assist in discussions with the licensee. The inspection metrics track performance, reinforce accountability, and communicate issues needing attention at the appropriate management levels both internal and external to the NRC. For example, an inspection scheduling metric tracks required inspections associated with upcoming anticipated ICN submittals and highlights inspections that will not be completed within 60 days after the licensee has submitted its ICN. This allows for the early review of inspection resources and, if necessary, timely interactions with the licensee on inspection support. A second metric tracks the timeliness of completing TARs and unresolved items. These metrics enhance the early engagement of NRO and Region II management, provide a leading indicator for inspection status, and are key communications tools between the staff and licensee. The section titled "Staff Progress in Resolving Issues Associated with ITAAC" of this paper provides additional information on ITAAC-related metrics.

### Construction SDP

During CY 2017, the staff continued to effectively implement the construction SDP in support of the cROP goals to be objective, predictable, understandable, and open. Two of the self-assessment metrics listed in IMC 2522, Appendix A, are associated with the construction SDP: "SDP Results Are Predictable and Repeatable" and "Appeals of SDP Results." The staff met both of the metrics. An independent reviewer from NRC Headquarters reviewed all inspection findings issued during CY 2017 and determined that the findings contained adequate detail to support the significance determination that was documented in the Region II inspection report, and there were no appeals of any of the inspection findings' significance determinations.

In SECY-17-0048, the staff noted that the second metric was not met in CY 2016 because two findings did not contain adequate detail to enable an independent reviewer to reach the same significance determination as documented in the inspection report. The staff issued errata to add the required detail to the existing reports; however, it was not necessary to change the very low safety significance (Green) characterization of the findings. The staff also conducted training for inspectors on the required level of detail to be included in inspection reports. The staff will continue to monitor implementation of the construction SDP and consider additional improvements, as necessary.

During the cROP self-assessment for CY 2016, the staff identified the need for a clarification to the flow diagram in Appendix A, "AP1000 Construction Significance Determination Process," to IMC 2519, "Construction Significance Determination Process," dated July 15, 2013 (ADAMS Accession No. ML13150A137). The staff updated IMC 2519 in CY 2017 and modified the metric on significance determination findings for small sample sizes. The acceptance criteria for the metric require inspection findings to contain adequate detail to enable an independent auditor to trace through the SDP and reach the same significance determination that was identified in the inspection report. The change to IMC 2522, Appendix A, changes the threshold for meeting the metric from 0 to 1 for findings that do not meet the acceptance criteria if there are fewer than 10 findings. If there are 10 or more findings, the metric will require a 90 percent success rate to meet the metric. The staff implemented these changes after concluding that the construction program met its goals in 2016 despite missing the metric noted above.

#### Construction Assessment and Enforcement Programs

During CY 2017, the staff continued to effectively implement the construction assessment program and ensured that the NRC and licensees took appropriate actions to address performance issues commensurate with their safety significance. The staff met all three of the applicable construction assessment program metrics listed in IMC 2522, Appendix A: "Deviations from the Construction Action Matrix," "Assessment Program Results (Assessment Reviews, Assessment Letters and Public Meetings) Are Completed in a Timely Manner," and "Degradations in Quality of Construction Are Gradual and Allow Adequate Agency Engagement of the Licensee." The staff considers the metrics to be met because (1) there were no deviations from the Construction Action Matrix, (2) all assessment program timeliness goals were met, and construction inspections were conducted in a timely manner, and (3) all units under construction remained in the licensee response column of the Construction Action Matrix. The staff determined that the metric on timeliness of supplemental inspections did not apply because such inspections were not performed in CY 2017.

The staff did not make any significant changes to the construction assessment and enforcement programs in 2017.

#### **Staff Progress in Resolving Issues Associated with ITAAC**

##### ITAAC Closure

As construction progresses at Vogtle, Units 3 and 4, the NRC staff continues to refine the ITAAC closure verification process and identify means to promptly resolve emerging issues. The ICN submittals decreased to 69 during CY 2017 for both Vogtle, Units 3 and 4, and V.C. Summer, Units 2 and 3, down from 136 in CY 2016. As of the end of CY 2017, the staff received a total of 277 ICNs for both Vogtle, Units 3 and 4, and V.C. Summer, Units 2 and 3. License Amendment 85 for Vogtle, Unit 3, and License Amendment 84 for Vogtle, Unit 4,

(ADAMS Accession No. ML17216A064) deleted 228 ITAAC per unit, which decreased the overall number of ITAAC per combined license. These license amendments combined ITAAC with similar topics, such as testing and qualification, in an effort to lessen the licensee's administrative burden of preparing multiple notifications. These new, complex ITAAC retain the acceptance criteria of the original ITAAC. In August 2017, the V.C. Summer, Units 2 and 3, sites stopped construction and ceased submitting ITAAC notifications.

In October 2016, the staff began reviewing uncompleted ITAAC notifications (UINs) submitted earlier than required by Title 10 of the *Code of Federal Regulations* (10 CFR) 52.99(c)(3). The staff found that the early UIN review process provides earlier communication to public stakeholders and earlier identification of issues related to ITAAC completion. To date, 205 UINs have been submitted for Vogtle, Units 3 and 4. For CY 2018, the NRC expects the notifications submitted for Vogtle, Units 3 and 4, to increase, particularly with Vogtle's effort to submit UINs for the majority of uncompleted ITAAC by the end of 2018.

The staff met the ITAAC closure metric ("Analysis of ITAAC Reopened after Closure Verification") listed in IMC 2522, Appendix A, as no ICNs were verified as completed and then reopened by the staff. In addition, the New Reactors Business Line tracks timeliness of ICN reviews by fiscal year. As of the end of CY 2017, the staff met the timeliness goal as it had reviewed over 90 percent (96.7 percent) of the ICNs within 60 days.

During CY 2017, the NRC did not receive any ITAAC postclosure notifications under 10 CFR 52.99(c)(2) for either site. Vogtle, Units 3 and 4, will use ITAAC postclosure notifications to inform the NRC of new information that materially alters the determination basis for a previously completed ITAAC, including how this new information is resolved, during the ITAAC maintenance phase.

For CY 2017, issues with insufficient information or potential problems with the content submitted in a notification on ITAAC were resolved through weekly public meetings with the licensees. Such meetings increase agility, effectiveness, and efficiency because issues are resolved in a fraction of the time previously required. The NRC continues to make the status of notifications on ITAAC for Vogtle, Units 3 and 4, available on the agency's public Web site at <http://www.nrc.gov/reactors/new-reactors/oversight/itaac.html>, on a biweekly basis. The NRC also publishes *Federal Register* notices documenting the staff's determination of the successful completion of ITAAC under 10 CFR 52.99(e).

In anticipation of the surge in ICNs before the date of the first 10 CFR 52.103(g) finding, additional NRC staff members have successfully completed qualification as ITAAC notification reviewers. The staff continuously monitors and forecasts the expected workload for ITAAC notification reviews. If the notifications submitted exceed the review capacity of the core review team, the NRC will use additional reviewers, as needed, to meet the required capacity.

#### Demonstration Project and Tabletop Exercise

In spring 2017, the staff completed an ITAAC demonstration project to evaluate the readiness and reliability of the ITAAC inspection and verification processes. This project specifically addressed the period during the last year of construction. The purpose of the demonstration project was to enhance the NRC's ITAAC inspection, closure, and verification processes and to identify potential gaps in preparation for the surge in ITAAC notifications expected towards the end of construction. The June 1, 2017, final report (ADAMS Accession No. ML17135A415 (package)) of the demonstration project includes recommendations.

The staff issued an action plan on September 29, 2017 (ADAMS Accession No. ML17271A266) with milestones to implement the recommendations of the final report. The staff is currently completing the following recommended actions from the project: (1) enhancing external stakeholder interactions, (2) improving NRC processes guidance, and (3) creating organizational structures and information dashboards. The dashboards present graphics showing the status of ITAAC notification reviews and alert management to potential delays in notification reviews and inspection schedules. The office instruction NRO-REG-103, "Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC) Closure Verification Process," is being updated to include action items from the demonstration project and will be publicly available during spring 2018.

In preparation for processing the new, complex ITAAC that were formed by License Amendment 85 for Vogtle, Unit 3, and License Amendment 84 for Vogtle, Unit 4, and in response to the ITAAC demonstration project action plan, the staff completed a tabletop exercise with industry and other stakeholders on December 12, 2017, targeting two complex ITAAC. By working through two complex ITAAC examples, staff and industry gained alignment on the expectations for the licensee's completion and the staff's verification of these ITAAC. Although many ITAAC have been consolidated into larger complex ones, the required review time for these complex ITAAC will be equal to the cumulative review times for the original ITAAC.

#### Public Web Site and Office Instruction

SRM-SECY-15-0010, "Staff Requirements—SECY-15-0010—Final Procedures for Hearings on Conformance with the Acceptance Criteria in Combined Licenses," dated April 1, 2016 (ADAMS Accession No. ML16092A099), states that the staff should keep the public Web site current and continue to explore ways to make it easier for interested members of the public to identify and access information related to ITAAC. The staff completed key enhancements to the public Web pages for the new units under construction to provide a convenient "portal" for stakeholders to find ITAAC hearing-related information, including links to the ITAAC hearing procedures, links to guidance on ITAAC closure, and other upgrades to links for faster access to information such as license amendments. A message map for the NRC's ITAAC closure verification process is also available on the Web site, which completes an action from the ITAAC demonstration project action plan.

The NRC staff continues to develop an NRO office instruction to provide guidance on the review of a licensee's completion of all ITAAC in a combined license, which will support the staff in making the 10 CFR 52.103(g) finding that all ITAAC are met. In addition, the office instruction will provide guidance on the staff's implementation of a Commission decision allowing interim operation under 10 CFR 52.103(c) and will reflect the Commission-approved ITAAC hearing procedures. The NRC expects to complete the office instruction by the end of CY 2018.

The NRC published the final ITAAC hearing procedures in Volume 81 of the *Federal Register*, page 43,266 (81 FR 43266), on July 1, 2016. Under the Commission's direction, the staff completed internal implementation processes and a *Federal Register* notice template in June 2017, to further support the ITAAC hearing process.



### Modification of ITAAC Closure Methodology

In SRM-SECY-07-0047, “Staff Requirements—SECY-07-0047—Staff Approach to Verifying the Closure of Inspections, Tests, Analyses, and Acceptance Criteria Through a Sample-Based Program,” dated May 16, 2007 (ADAMS Accession No. ML071360265), the Commission approved the staff’s proposal concerning ITAAC closure as presented in SECY-07-0047, dated March 8, 2007 (ADAMS Accession No. ML070430501). In SRM-SECY-07-0047, the Commission stated, “in order to provide the staff with the authority and flexibility to incorporate improvements as experience is gained and to address unanticipated situations, the staff is not required to seek Commission approval of the inspection methodology.”

The staff updated the Commission in SECY-08-0117, “Staff Approach to Verify Closure of Inspections, Tests, Analyses, and Acceptance Criteria and to Implement 10 CFR 52.99, ‘Inspection during Construction,’ and Related Portion of 10 CFR 52.103(g) on the Commission Finding,” dated August 7, 2008 (ADAMS Accession No. ML081220237). SECY-08-0117 states the following:

As part of the ITAAC closure strategy, the staff plans to ensure that a sufficient number of ITAAC targeted for direct inspection have been inspected prior to closing other ITAAC in the same family that were not directly inspected. This strategy should minimize the likelihood that a closed non-targeted ITAAC will require a revision or retraction of the 10 CFR 52.99 notification and FRN because of an inspection finding related to the targeted ITAAC in that family.

The staff is modifying its closure methodology for nontargeted ITAAC. The staff no longer requires that 50 percent of the targeted ITAAC be closed before closing a nontargeted ITAAC from the same family. Experience has shown that the 50-percent step was unnecessary. Further, the new process will provide clarification to stakeholders, including members of Congress, by aligning the number of *Federal Register* notices with the number of closed ITAAC.

This change in strategy does not hinder the staff’s ability to make the 10 CFR 52.103(g) finding. The licensee and the NRC’s inspection staff continue to perform “extent of condition” reviews for all ITAAC inspection findings. The processes in place continue to ensure that the necessary actions are taken for an ITAAC maintenance issue, including submittal of a post-ICN for any ITAAC that may need to be performed again.

### **Construction Experience Program**

#### Operating Experience Center of Expertise

During CY 2017, the staff from the Office of Nuclear Reactor Regulation (NRR) Operating Experience (OpE) Center of Expertise (COE) continued to collect, evaluate, and communicate information on construction experience. The OpE COE staff reviewed and evaluated domestic and international operational events and construction-related issues for applicability to domestic reactor designs, the new reactor licensing process, and the vendor and construction inspection programs. In CY 2017, the staff expanded the review for the first time to include construction-related data from the Institute of Nuclear Power Operations (INPO) Consolidated Events System (ICES). The INPO construction experience data were previously unavailable to NRC staff. Construction related data in ICES include issues stemming from construction

activities since 2009 at Watts Bar Nuclear Plant (Watts Bar), Unit 2; Vogtle, Units 3 and 4; and V.C. Summer, Units 2 and 3.

Examples of domestic experience that the OpE COE staff communicated during CY 2017 include the V.C. Summer heavy lift derrick weather incident and quality issues associated with the inadequate organizational effectiveness at the Chicago Bridge and Iron Laurens piping fabrication facility.

Similarly, the OpE COE staff reviewed, and communicated to impacted staff members, information from international events and activities applicable to new reactor design and construction. Examples included breakdowns in the nondestructive examinations of safety-related welds in the Czech Republic, improperly routed cables with inadequate separation in Japan, record falsification information from Kobe Steel, Ltd., in Japan and Creusot Forge in France, and hot functional testing information from China.

Moreover, in cooperation with the NRC's international partners, the OpE COE staff is pursuing the merger of the Working Group on the Regulation of New Reactors (WGRNR) construction experience database with the International Atomic Energy Agency (IAEA) operating experience database. The merging of the two databases should result in a more efficient and effective process for sharing commercial nuclear experience between the agency and its international partners. It should also expand the sharing of construction experience to additional states that are members of IAEA but not of WGRNR.

During CY 2017, the OpE COE staff continued to review generic communications for potential impact on new reactor activities and contributed to the issuance of regulatory issue summary 2017-01, "Human Reliability and Human Performance Database" (ADAMS Accession No. ML16257A399), related to the human reliability and human performance database. Finally, in CY 2017, the OpE COE staff, as a result of operating experience, proposed a revision to a new reactors inspection procedure related to the review of training and qualification programs. The NRC will evaluate and disposition the proposed change before implementation of the affected inspection procedure.

### China AP1000 Observations

The NRC staff further strengthened the working relationship with the National Nuclear Safety Administration (NNSA) of China through technical exchanges and inspector exchange rotations to the Sanmen AP1000 construction site in China. Sharing knowledge and inspector insights has mutual benefits for the NRC and NNSA; it enhances nuclear safety both in China and the United States while providing a chance for NRC inspectors to observe the startup and operational inspection and testing activities of the AP1000 plants in China. In fall 2017, three inspectors traveled to China as part of the exchange. These inspectors gained valuable AP1000 construction and testing experience that resulted in the following improvements:

- The staff enhanced the AP1000 training classes to include information obtained from inspector rotations at Sanmen on the physical plant layout of important safety systems and components.
- The staff will use operational insights gained by walkdowns, procedure reviews, and observations of integrated systems operations during the hot functional testing of Sanmen, Unit 2, to further inform NRC inspection activities, including the development of ITAAC and initial test program inspection procedures and plans.

## Independent Evaluations

The NRC's Office of the Inspector General did not perform an independent audit of any specific aspect of the cROP in CY 2017.

The Watts Bar, Unit 2, Construction Oversight Lessons Learned Working Group published its report, titled "Watts Bar Unit 2 Construction Lessons Learned Review Report," dated December 20, 2017 (ADAMS Accession No. ML17356A269). This report summarizes the Watts Bar, Unit 2, construction lessons-learned project, which identified lessons learned from the reactivation of Watts Bar, Unit 2. Although the working group did not specifically examine the cROP, the report highlighted actions that contributed to the effectiveness of the reactivation program and identified enhancements for future activities, consistent with the NRC's Principles of Good Regulation (independence, openness, efficiency, clarity, and reliability). In CY 2017, the staff implemented the following enhancements to the cROP based on the Watts Bar, Unit 2, lessons-learned report:

- The staff used tabletop exercises to demonstrate new processes (e.g., the ITAAC closure tabletop public meeting held in December 2017).
- The staff developed a Charter for the Vogtle Readiness Group, titled "Charter for Instituting the Vogtle Readiness Group to Oversee the Vogtle Units 3 and 4 Transition to Operations," dated March 12, 2018 (ADAMS Accession No. ML18059A273). The group is co-chaired by two NRO Division Directors and one Region II Division Director, with membership from each of the affected offices (NRO, NRR, Office of the General Counsel, Office of Nuclear Security and Incident Response (NSIR), and Region II). The Vogtle Readiness Group will provide oversight and management direction to the NRC staff to ensure that the units under construction meet regulatory requirements and are safe to operate. The staff will comprehensively track milestones and monitor progress for timely completion.
- The staff revised construction inspector qualification requirements to enhance the focus on testing.

## Construction Reactor Oversight Process Communications

The staff continued to facilitate the means for external stakeholders to access cROP information and to offer feedback. The staff conducted annual public end-of-cycle performance assessment meetings near Vogtle, Units 3 and 4, and V.C. Summer, Units 2 and 3. In addition, the cROP public Web page includes a link that allows external stakeholders to offer feedback to the staff. Senior managers from Region II and NRO continue to visit the Vogtle, Units 3 and 4, site on a quarterly basis and discuss topics of mutual interest with senior licensee and other consortium management. Senior managers from NSIR and NRR also met with licensee management and conducted site tours of Vogtle, Unit 3 and 4. V.C. Summer, Units 2 and 3 (before construction activities stopped), were included in these site visits during CY 2017.

In CY 2017, the staff held two public meetings to discuss the construction inspection program. Topics covered during the two public meetings included resident inspector perspectives on the AP1000 construction sites, the transition from the cROP to the ROP, ITAAC inspections, preoperational test performance inspections, emergency preparedness support, and related topics. Members of the public, industry representatives, and other external stakeholders participated in the public meetings. To encourage and facilitate stakeholder

involvement, the staff held one of the meetings at the Vogtle site. The staff noted that, as expected, there were more working-level Vogtle staff members and members of the public in attendance than had attended construction inspection public meetings held at Headquarters. The staff plans to hold at least two public meetings to discuss construction inspection in CY 2018.

The staff continues to believe in the value of soliciting stakeholder feedback. Weekly Thursday public meetings are held for specific licensing action reviews. In addition, to maintain stakeholder interaction, the staff discussed construction inspection processes at two public meetings on ITAAC closure and discussed the transition from the cROP to the ROP during the NRR's monthly public ROP meetings. In CY 2018, the staff plans to continue to gauge industry and public interest in cROP topics and to hold construction inspection public meetings as the need is identified.

### **Construction Reactor Oversight Process Resources**

Effective October 1, 2017, the NRC implemented actions to reduce staffing because of V.C. Summer's termination of its construction project. NRO reduced vacancies and staffing levels, including a reduction in the number of branches that make up the Vendor Inspection COE from three to two. The total reduction for Region II included 16 inspection staff, 2 supervisors, and the Deputy Regional Administrator for Construction position. At the end of CY 2017, some personnel were still in the process of transitioning or relocating. The Vogtle site continues to maintain five construction resident inspectors supplemented by inspectors from the regional office and technical experts from the program offices. The Division of Reactor Safety has an additional six full-time equivalent staff members for operator licensing, security, emergency preparedness, and radiation protection inspections.

The NRC has been completing the targeted ITAAC inspection activities for CY 2017 and into CY 2018 commensurate with Vogtle, Units 3 and 4 construction schedules. Operational program inspections are also on pace with the licensee's programs and implementation. The NRC staff uses the licensee's construction schedule to link with Region II's inspection plans and to schedule inspections. Through this scheduling, the NRC ensures that inspections are timely and are completed before the licensee submits its ICN. This close coordination with the licensee gives the NRC an opportunity to adjust the inspection schedule, and it enables the licensee to determine what must be complete and when to support the associated ITAAC inspections. This strategy was effective during this last year. In addition, the NRC identified an opportunity to enhance communication with the licensee's management in order to ensure the licensee's support of NRC inspection activities occurred on a timeline that was mutually understood and acceptable. The inspection scheduling metrics developed in CY 2017 were used to inform these discussions. This type of strategic planning and scheduling is maximizing efficiency to help ensure that inspections are accomplished within budgeted resources.

As part of its reorganization in CY 2017, Region II developed a testing group that is responsible for the oversight of the inspection activities for the initial testing program and operational programs. This includes digital testing, first plant only and first three plants only testing, and preoperational and startup tests. Teams of inspectors from NRC Headquarters and the regions also continue to conduct vendor inspections in addition to onsite inspections. These vendor inspections focus on specific type and qualification testing at the facilities of AP1000 suppliers that the licensee will ultimately use to support ITAAC closure.

The staff originally estimated that direct inspection, on a per unit basis, would require a total of 35,000 direct inspection hours, with 15,000 hours for inspections related to ITAAC; 10,000 hours for construction and operational program inspections; 5,000 hours for reactive inspections above the baseline program in response to licensee performance issues, allegations, and nonperformance issues or events; and 5,000 hours for technical support of construction inspections. Based on detailed inspection planning for ITAAC inspections, the staff has concluded that the number of direct inspection hours for ITAAC inspections may exceed the original estimate of 15,000 hours, on average, for Vogtle, Units 3 and 4. In addition, the 10,000-hour estimate for construction and operational programs was based on a 5-year construction schedule. Moreover, construction schedule delays have increased the number of programmatic inspection hours because of annual QA inspections, which result in the expenditure of several hundred hours per year. The staff will continue to closely monitor direct inspection resource expenditures and will validate and adjust its estimates as construction progresses. The enclosure to this paper provides a more detailed evaluation of cROP inspection resources.

#### CONCLUSION:

The self-assessment results for CY 2017 show that the cROP provided effective oversight by meeting program goals and achieving intended outcomes. The cROP was objective, risk informed, transparent, and predictable. The cROP also ensured openness and effectiveness in support of the agency's mission and its strategic goals of safety and security. During CY 2017, the staff continued to find opportunities to strengthen program effectiveness and implementation. The staff recognizes the value of continuous improvement and will continue to consider stakeholder feedback in its efforts to apply lessons learned and improve various aspects of the cROP. The staff will continue to monitor and ensure that appropriate resources are allocated to the New Reactor Business Line through the planning, budgeting, and performance management process.

#### COORDINATION:

This paper has been coordinated with the Office of the General Council, which has no legal objection. The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections.

*/RA/*

Victor M. McCree  
Executive Director  
for Operations

Enclosure:  
cROP Resources

CONSTRUCTION REACTOR OVERSIGHT PROCESS SELF-ASSESSMENT FOR  
CALENDAR YEAR 2017 DATED: APRIL 27, 2018.

**201100140**

<b>ADAMS Accession No: ML18059A247</b>		<b>*via email</b>	<b>SECY-012</b>
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<b>DATE</b>	02/07/18	02/08/18	03/12/18
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<b>NAME</b>	NCoover*	SCoffin*	JDougherty*
<b>DATE</b>	03/26/18	03/20/18	03/20/18
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<b>NAME</b>	JMartin*	FBrown	VMcCree
<b>DATE</b>	03/23/18	04/02/18	04/27/18

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## CONSTRUCTION REACTOR OVERSIGHT PROCESS RESOURCES

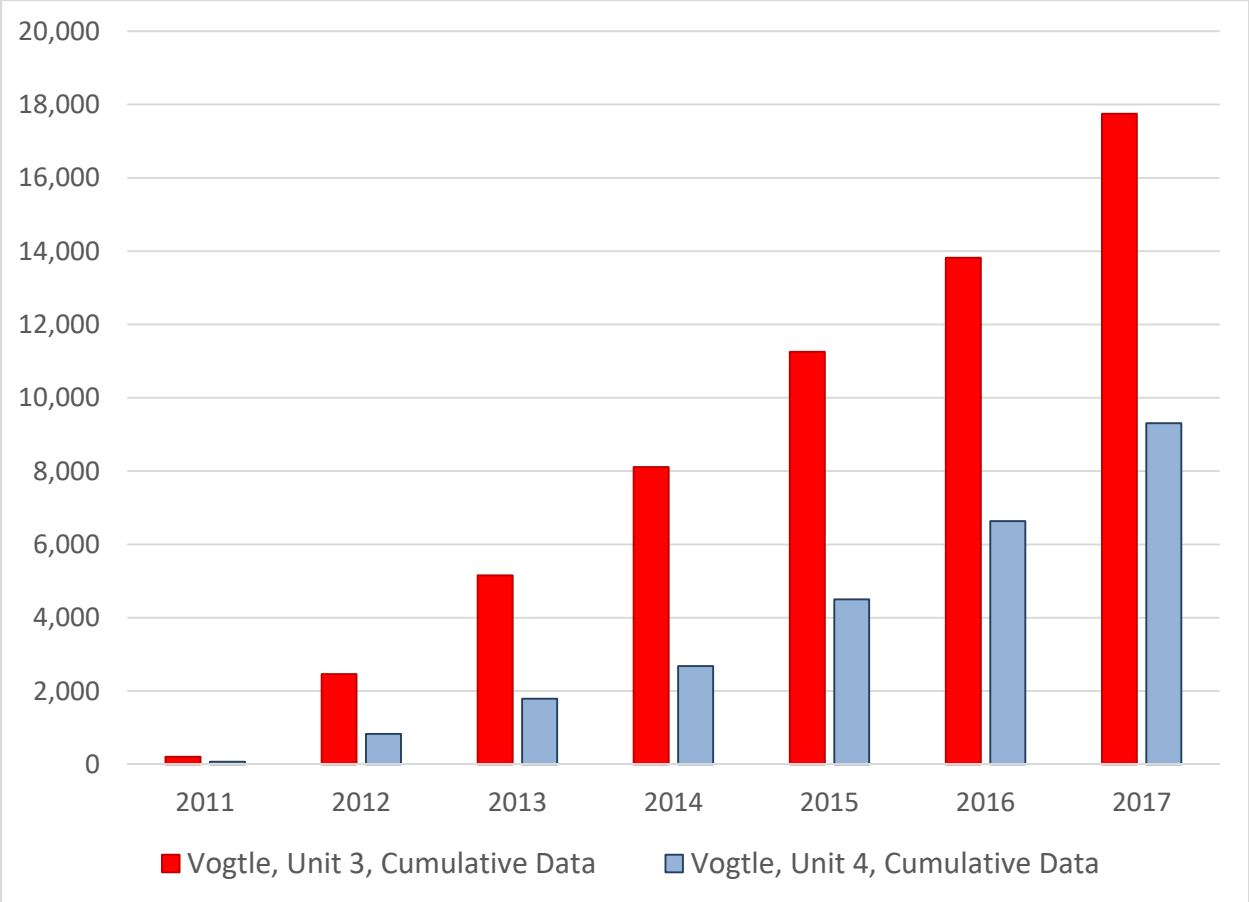
The U.S. Nuclear Regulatory Commission (NRC) staff originally estimated that direct inspection will require 35,000 hours per unit over the course of the construction project. This estimate included 15,000 hours for inspections related to inspections, tests, analyses, and acceptance criteria (ITAAC); 10,000 hours for construction and operational program inspections; 5,000 hours for reactive inspections above the baseline program in response to licensee performance issues, allegations, and nonperformance issues or events; and 5,000 hours for technical support of construction inspections. These estimates, based on a 5-year construction schedule, have always been stated as average values with initial units likely to require more time for inspection than subsequent units. During calendar year (CY) 2017, Vogtle, Units 3 and 4 were in their sixth year of construction. The consolidation of ITAAC, including those in the initial test program area, has not resulted in a decrease in the inspection hours.

Table 1 lists the total number of direct inspection hours expended through CY 2017 for Vogtle, Units 3 and 4. Figure 1 shows this information in a graph.

**Table 1 Actual Total Construction Inspection Program Resource Expenditures  
Calendar Years 2011–2017 (Hours)**

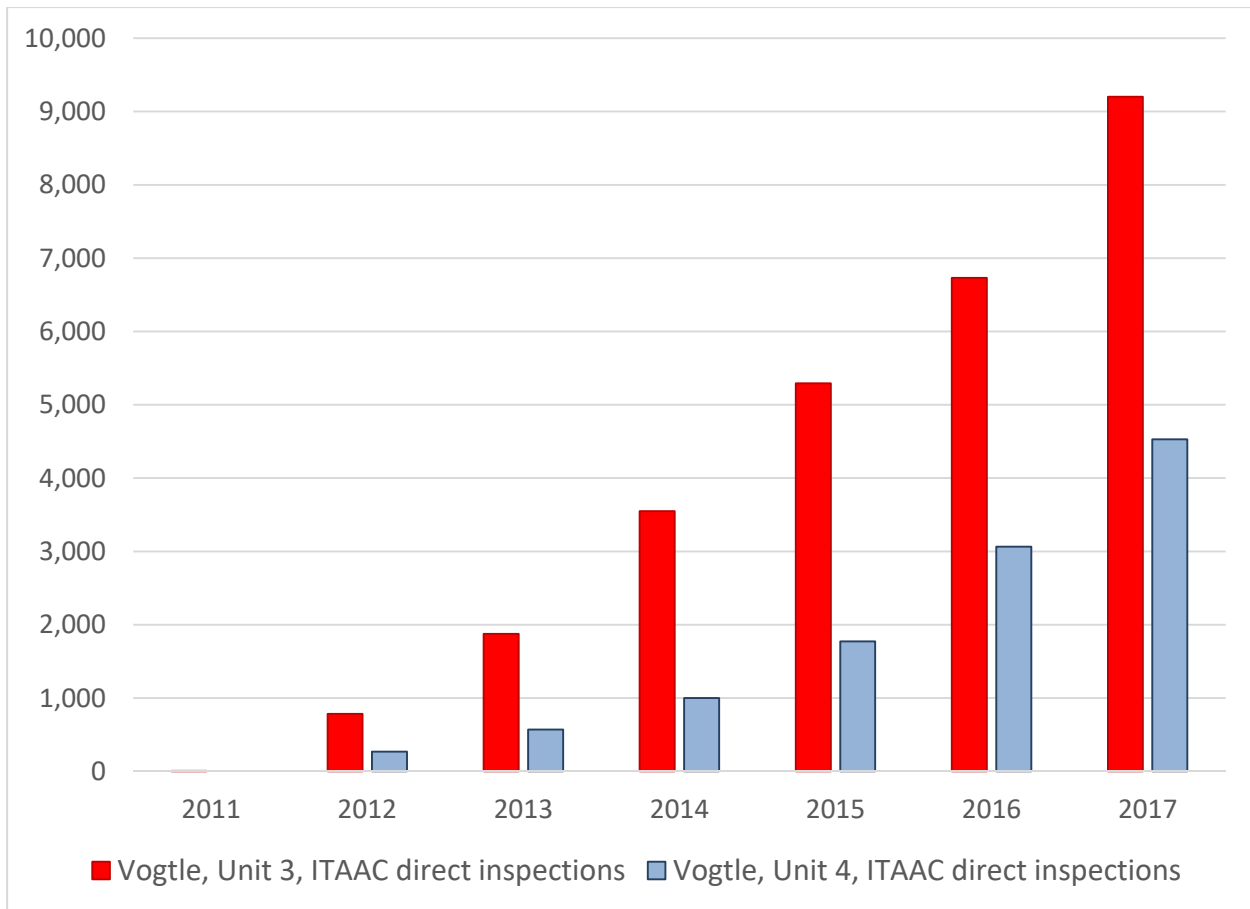
Unit	ITAAC Inspection Hours/Percentage of Planned Inspections	Program Inspections	Reactive/Allegation-Related Inspections	Technical Support*	Total
Vogtle, Unit 3	9,201/43%	6,451	427	1,670	17,749
Vogtle, Unit 4	4,529/32%	3,741	214	823	9,307

\* To date, NRC Headquarters technical staff inspection support has not been linked to a specific docket and has not been fee billable. Therefore, it is not possible to distinguish the technical support hours expended by the Office of New Reactors on each unit. In Table 1, the total hours expended on technical support have been prorated between the units under construction based on total inspection hours.



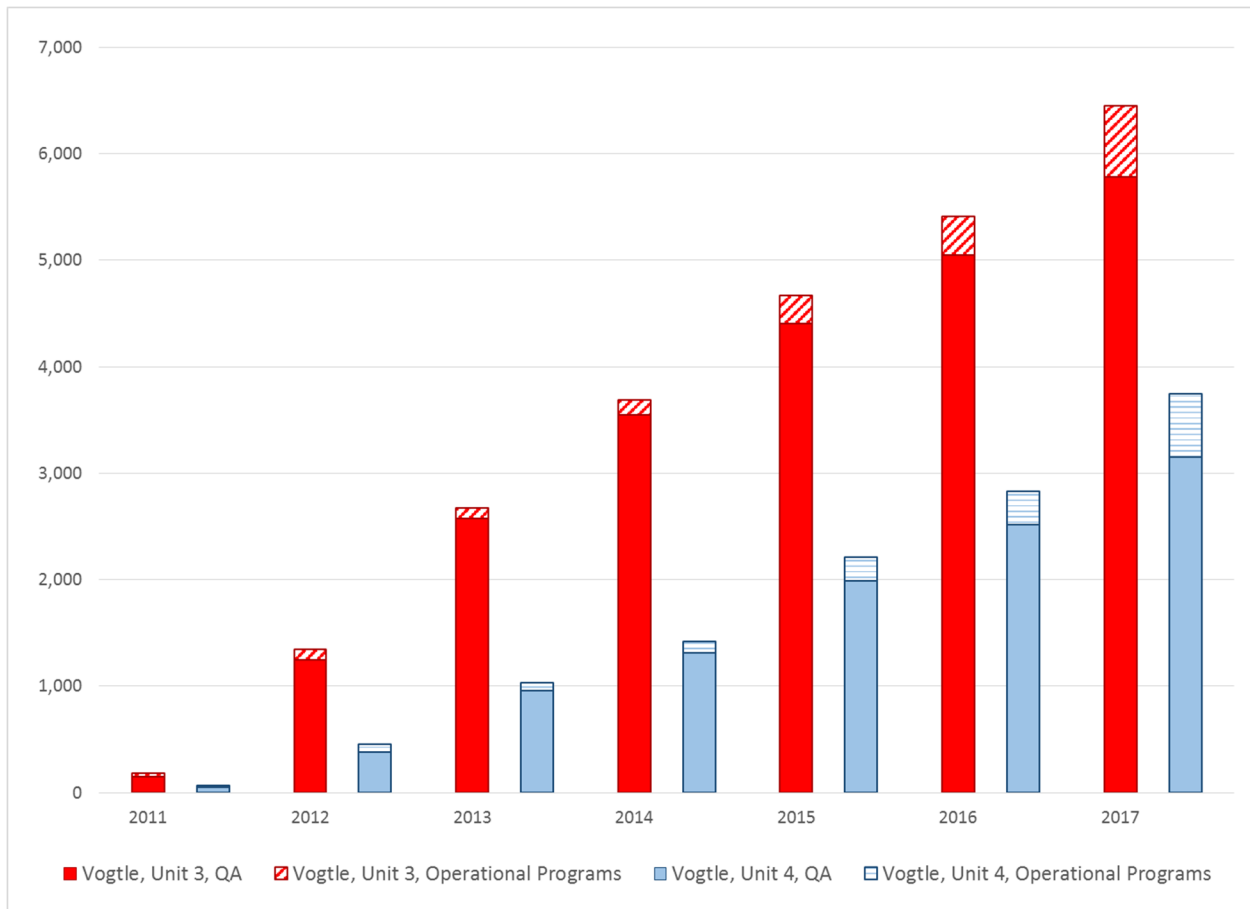
**Figure 1 Total cumulative direct inspection hours for Vogtle, Units 3 and 4**





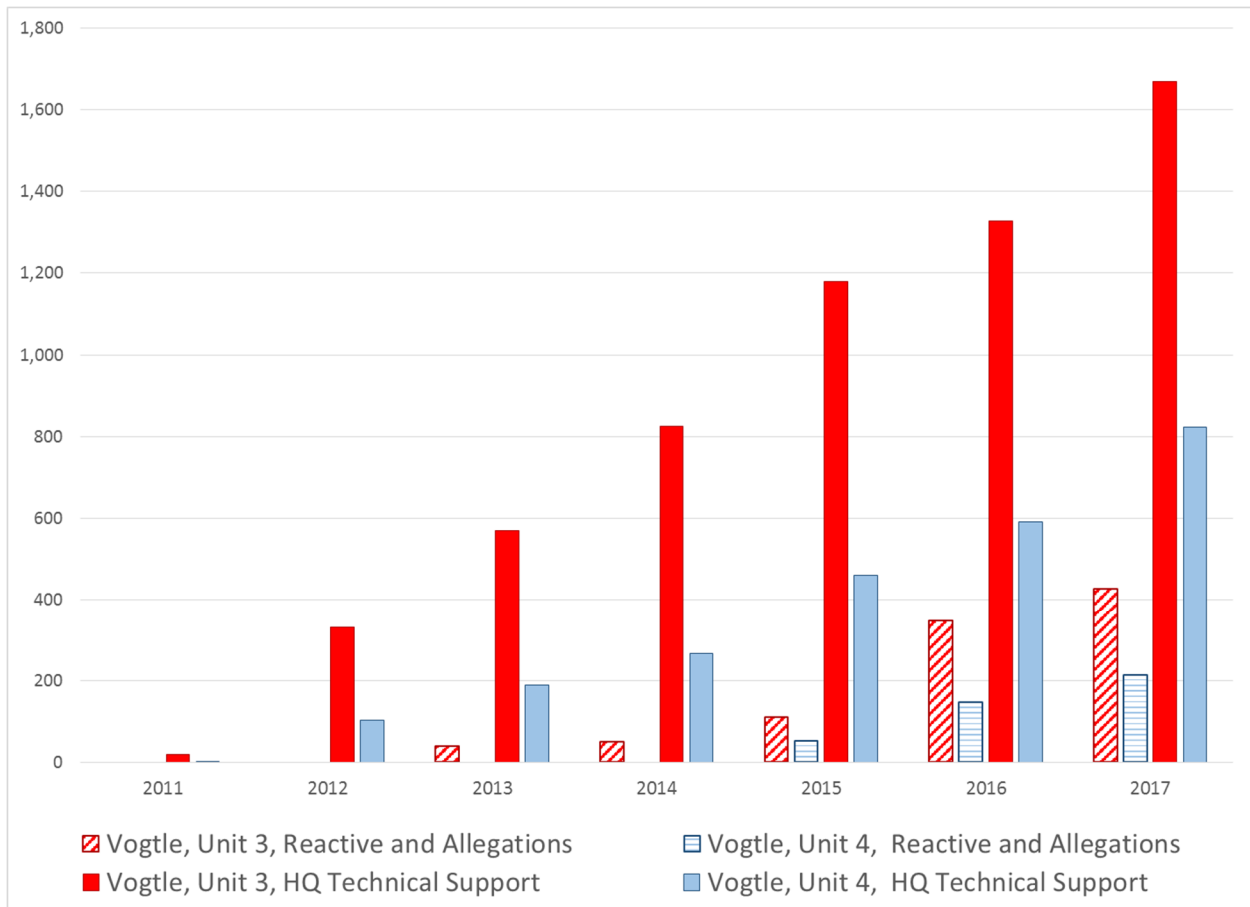
**Figure 2 Cumulative ITAAC-related direct inspection hours for Vogtle, Units 3 and 4**

Figure 2 summarizes the direct inspection hours expended for inspections related to ITAAC since the start of construction at Vogtle, Units 3 and 4. As construction at Vogtle, Units 3 and 4, has progressed and more detailed construction schedules have become available, the staff has been able to perform detailed inspection planning for ITAAC-related inspections. As a result, the staff has been able to refine its estimate of the direct inspection hours required for ITAAC inspection. The staff now estimates that the direct inspection hours for ITAAC inspection will likely exceed 15,000 hours, on average, for Vogtle, Units 3 and 4. Despite this potential increase, based on planning assumptions, the NRC has consistently expended less inspection hours than planned. For example, plans for the first and second units are similar, but the inspections of the second unit require less effort. The staff expects that efficiencies in the inspection process will continue to result in a lower number of actual direct inspection hours than planned. The staff estimates that there will be approximately 21,000 hours of direct inspection related to ITAAC for Unit 3 and 15,000 hours of direct inspection related to ITAAC for Unit 4, based on detailed planned hours and efficiencies that have been observed between planned and actual hours. Based on current estimates, the staff has expended approximately 43 percent of the total number of planned ITAAC direct inspection hours at Vogtle, Unit 3, and 32 percent of the planned hours at Vogtle, Unit 4.



**Figure 3 Cumulative quality assurance and program inspection for Vogtle, Units 3 and 4**

Figure 3 summarizes the NRC staff resources in hours expended for programmatic inspection since the start of construction at Vogtle, Units 3 and 4. As shown in the figure, hours expended during construction quality assurance (QA) inspections have been the largest contributor to the total number of expended hours. The staff performs construction QA inspections annually in accordance with Inspection Procedure 35007, "Quality Assurance Program Implementation during Construction and Pre-Construction Activities," dated December 8, 2016 (Agencywide Documents Access and Management System Accession No. ML16285A443). The current procedure identifies that approximately 1,557 hours are needed for the first year of construction with up to 686 additional hours for each annual inspection thereafter. The original estimate of 10,000 hours for program inspections was based on a 5-year construction schedule. Each year that the construction schedule exceeds the original 5-year estimate adds nearly seven hundred hours of construction QA inspection. The staff is developing an updated estimate for the total number of direct inspection hours that will be required for programmatic inspections based on Vogtle's detailed schedule. As construction progresses, the staff expects to obtain additional information on licensee operational program content and schedule. The staff expects to use this information to perform detailed inspection planning for programmatic inspections, which may result in a revised estimate of the total number of hours required.



**Figure 4 Cumulative reactive and technical support hours for Vogtle, Units 3 and 4**

The staff has not identified a need to revise the estimate of 5,000 hours for reactive inspections above the baseline program in response to licensee performance issues, allegations, and nonperformance issues or events, or the 5,000 hours estimated for technical support for construction inspections. Figure 4 summarizes the direct inspection hours expended for reactive and allegation inspections and hours spent providing technical support for inspections since the start of construction at Vogtle, Units 3 and 4. NRC Headquarters technical staff inspection support is not linked to a specific docket. Therefore, it is not possible to distinguish the technical support hours expended by NRO on each unit. Figure 4 shows the total hours expended on technical support prorated between the two units under construction based on total inspection hours. Based on experience, there is no clear indication that the initial estimates will be exceeded, as shown in Figure 4.

The staff will continue to monitor and refine the estimated number of direct inspection hours in each of the direct inspection categories and revise estimates as needed.