

# 2013 | New Reactor Program



## Cover

*The CA04 module, also known as the reactor vessel cavity, is lifted into the Vogtle Unit 3 nuclear island in December 2013.*

*Photo courtesy of Georgia Power, a Southern Company.*

# 2013 NEW REACTOR PROGRAM



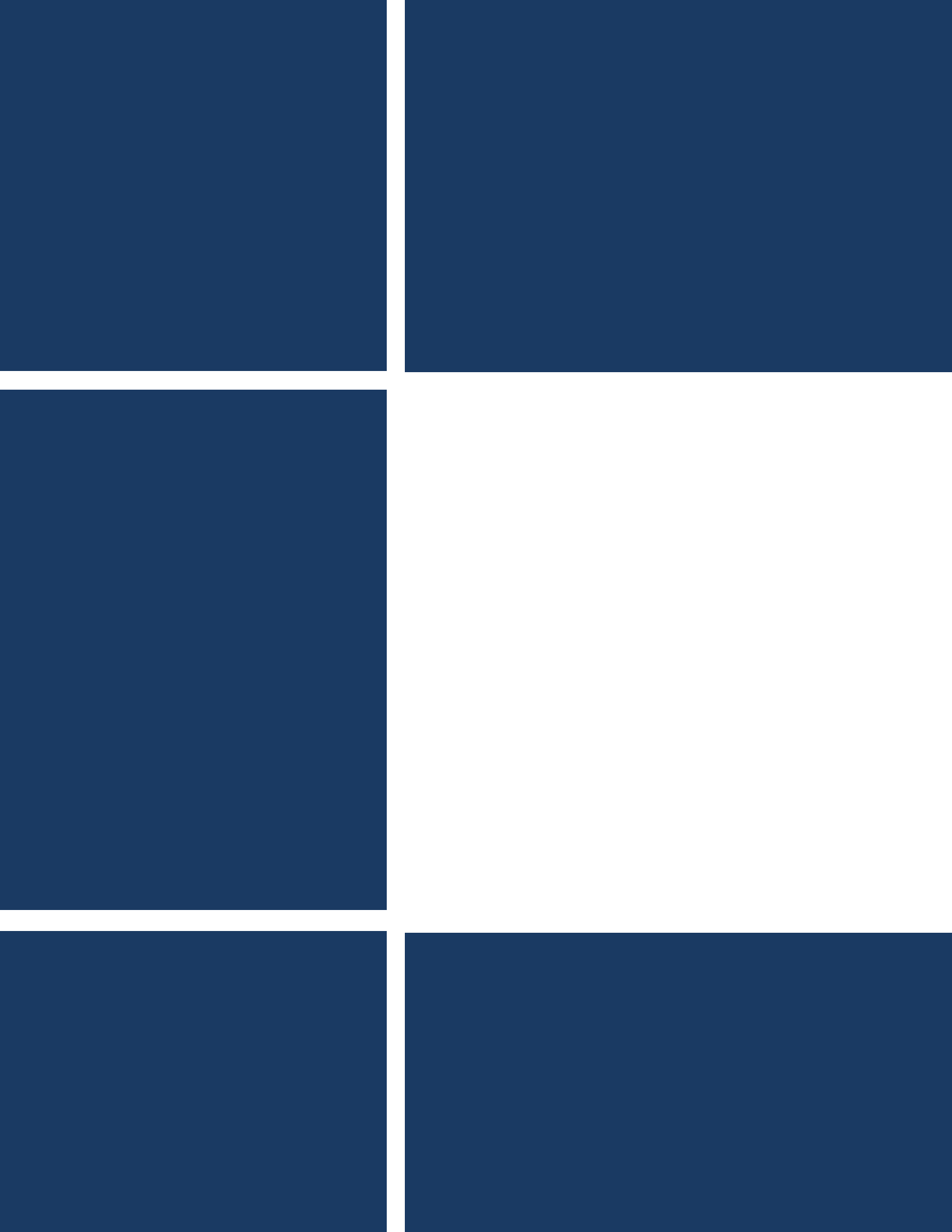
# OFFICE OF NEW REACTORS





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## A Message from the Director

This past year can best be characterized as one of focus, flexibility, and continued progress for the U.S. Nuclear Regulatory Commission's (NRC's) New Reactor Program. The program made strides amidst the unsteadiness that resulted from budget turbulence and applicant business decisions.

In 2013, the Office of New Reactors (NRO) and its partner offices continued to steadfastly support the agency's responsibility of ensuring U.S. public health and safety while enabling the safe, secure, and environmentally responsible use of nuclear power in meeting the Nation's future energy needs. This included diligently overseeing the construction of Vogtle Electric Generating Plant, Units 3 and 4, in Georgia, and Virgil C. Summer Nuclear Station, Units 2 and 3, in South Carolina—the first-ever combined licenses (COLs) issued—as well as construction at Watts Bar Unit 2 in Tennessee.

During increasingly uncertain times, we remained agile in meeting the goals of the New Reactor Program while safely managing vendor and construction inspections, initiatives in advanced reactors, and a growing level of international interest and cooperation. As in years past, we achieved our safe and timely outcomes consistent with agency values and our philosophy of *innovation with dedication*. In addition, the Office of New Reactors performed two comprehensive self assessments to evaluate the NRC's licensing and inspection requirements, policies, procedures, and practices during review of the first COLs and the first year of post combined license implementation of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." The implementation of the program enhancements and lessons learned from these assessments are underway.

The 2013 New Reactor Program annual review highlights the diverse array of activities undertaken and showcases the resilience and dedication of our employees to manage a myriad of projects toward safe closure. During 2013, this workload included: construction oversight; inspections of manufacturers and suppliers of safety components; safety and environmental reviews for design certifications and combined license applications; license amendments; verification of the first inspections, tests, analyses, and acceptance criteria closure notifications; the completion of the first design specific review standards for a small modular reactor; and final environmental impact statements for the Lee and Fermi COLs. We recognize the many contributions made by our partner offices supporting the New Reactor Program. These include Region II, the Office of the General Counsel, the Office of Nuclear Security and Incident Response, the Office of Nuclear Regulatory Research, the Office of Nuclear Reactor Regulation, the Office of Enforcement, the Office of Investigations, and the Advisory Committee on Reactor Safeguards.

The fourth edition of our annual review provides us with another venue to communicate with key stakeholders by sharing information about the 2013 activities of the New Reactor Program. We hope you find our reflection on 2013 experiences, activities, and accomplishments informative and enlightening. The Office of New Reactors and its partners stand ready to fulfill the agency's safety mission in meeting the Nation's future energy needs.

A handwritten signature in black ink, appearing to read "Glenn M. Tracy", written in a cursive style.

Glenn M. Tracy  
Director  
Office of New Reactors

# Overview



Top, NRO Office Director Glenn Tracy and Deputy Director Gary Holahan meet with NRO's newest employees.

Above, Division of Site Safety and Environmental Analysis' (DSEA) Diane Jackson, chief of Geoscience and Geotechnical Engineering Branch 2, observes Charles Carter of GeoVision, who conducts borehole loggings at the Clinch River Site in Tennessee.

Right, Region II's Chad Huffman, a resident inspector, performs independent visual inspection and measurement of the distance between the containment vessel bottom head shell and the reactor building sump at the Vogtle site.





Working with U.S. Nuclear Regulatory Commission (NRC) partner offices and the agency's advisory committees, the New Reactor Program achieved safe and timely regulatory outcomes in 2013 across the core areas—new reactor licensing, construction oversight, advanced reactors, and international cooperation. As the Office of New Reactors (NRO) continued to focus on fulfilling its mission in 2013, we remained diligent in raising safety concerns while seeking closure on issues related to ongoing application reviews.

For example, in 2013 we continued the review of design certifications (DC) for ESBWR, U.S. EPR, and U.S. APWR, an early site permit (ESP) for PSEG, and nine combined license (COL) applications for large, light water reactor designs. The NRC also completed an acceptance review for a new DC application. In addition, the first reviews of license amendments and exemption requests were conducted to support changes during construction for the Vogtle and V.C. Summer sites. NRO oversaw these activities despite the many challenges associated with applicants' delayed submittals and changing plans, agency budgetary constraints, and competition for critical NRC skill sets to support high-priority agency tasks including Fukushima Near Term Task Force Recommendations and the Waste Confidence rulemaking.

Meanwhile, in the construction oversight area, in 2013 the NRC staff fully implemented the Construction Reactor Oversight Process (cROP) at both the Vogtle and V.C. Summer sites. This is a risk-informed and performance-based oversight process that provides assurance that the new nuclear power plant is constructed in accordance with its licensing basis and NRC regulations. The staff also conducted 36 vendor inspections during fiscal year 2013, several with the cooperation of other national regulatory authorities. These inspections included providing technical support to ensure the safe operation of existing nuclear reactors. Additionally, the New Reactor Program verified the first 11 inspections, tests, analyses, and acceptance criteria closure notifications—an important step toward ensuring this key process of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," is effectively implemented.

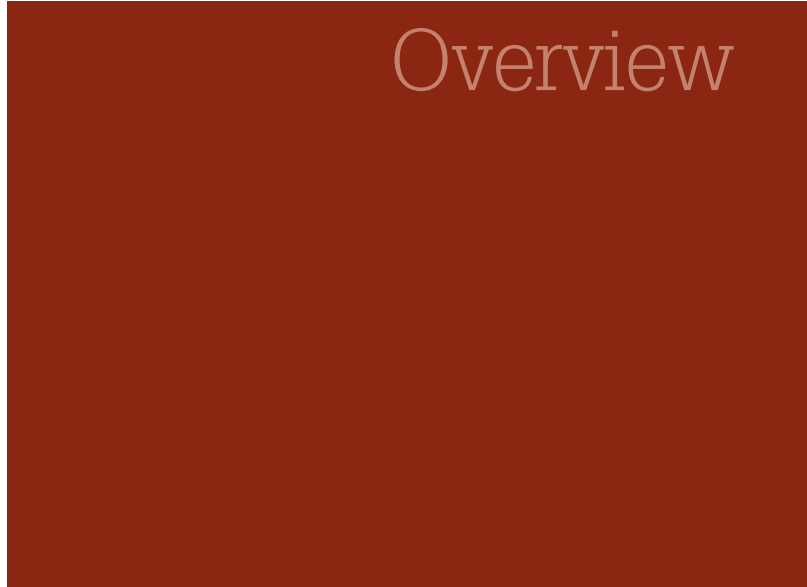
In April 2013, the staff issued a report of lessons learned during the first-time implementation of the licensing portion of 10 CFR Part 52. The report concluded that, while issuance of the first COLs were successful, there are several actions the agency can take to improve the process. These actions are underway. For example, the staff is revising its acceptance review process by accelerating the timing of pre-application audits from 30 days before the submittal to 6 months,



Photo courtesy of NRC Construction Resident Inspector Office

At the site, located near Jenkinsville, SC, the V.C. Summer Unit 2 reactor vessel cavity is moved into place.





*Top, Office Director Glenn Tracy presents the NRO Employee of the Month Award to Project Manager Tekia Govan of the Division of New Reactor Licensing (DNRL).*

*Above, Deputy Executive Director for Reactor and Preparedness Programs Michael Johnson makes a point at an NRO All Hands Meeting.*

*Right, Region II's Patrick Donnelly inspects the V.C. Summer Unit 3 nuclear island rebar.*

*Photo courtesy of NRC Construction Resident Inspector Office*





and changing the acceptance review criteria from enough information to “begin” the review to enough information to “conduct” the review in order to support timely outcomes.

In July 2013, the staff issued a report of lessons learned during the first year of post COL implementation of Part 52. The staff conducted interviews with 70 current and former NRC staff members, held three public meetings, and interviewed several dozen members of the public. The assessment concluded that post COL oversight was conducted with safety as the primary focus. It also found that most aspects of implementation were performed effectively and efficiently, and identified some areas that would benefit from enhancements.

On the increasingly busy advanced reactor front, the NRC continued preparing for future reviews of small modular reactor (SMR) licensing applications, which included undertaking pre-application activities with vendors, reviewing technical reports that SMR vendors submitted, developing a regulatory framework to actively support reviews of these new designs, and conducting extensive outreach to a host of external stakeholders. The volume of such activities continues to increase as vendors move closer to completing and submitting SMR applications to the NRC for review.

To support the expected receipt of an SMR DC application in 2014, the NRC completed the first Design Specific Review Standard that will guide its review of the mPower™ SMR design.

In the area of international cooperation, 2013 proved to be yet another significant year, as the

NRO Office Director led an agency delegation to the 2013 US China Steering Committee Meeting in Beijing along with subsequent tours of the Sanmen and Haiyang AP1000 construction sites. This fostered further cooperation and resulted in a detailed plan and agreement to exchange inspectors during pre- operational phases and testing of the AP1000. In addition, NRC staff engaged in effective dialogue with China’s National Nuclear Safety Administration (NNSA) on key regulatory and design issues related to the AP1000, including providing comprehensive responses to questions from NNSA.

Furthermore, the agency maintained its leadership role in the Multinational Design Evaluation Program (MDEP), the multilateral effort in which 13 countries cooperate on new reactor design reviews. The NRC also continued its vital participation in the EPR and AP1000 design working groups, and began cooperating in the APR 1400 MDEP Design Working Group. NRO staff continued to lead the AP1000 Working Group, the Digital Instrumentation and Controls Working Group, and the MDEP Vendor Inspection Cooperation Working Group, and participated in the Codes and Standards Working Group. As part of its international outreach, NRC also led a Nuclear Energy Agency task group to address counterfeit, fraudulent, and suspect items (CFSI). The lessons learned from that international effort will inform NRC’s ongoing efforts related to CFSI.

Other international highlights included NRO taking a lead role in the development of an international regulatory forum for cooperation on SMR designs. This effort included chairing a consultancy meeting at the International Atomic Energy Agency on licensing and safety policy issues for SMRs. ■



Photo courtesy of Tennessee Valley Authority

Rebar placement for a “flex” building wall at the Watts Bar Unit 2—one of several enhancements to the facility that the Tennessee Valley Authority is undertaking as part of the NRC’s Fukushima Order.



# Activities & Accomplishments



Top, Coleman Abbott, right, resident inspector at Vogtle Units 3 and 4, describes the construction of the Unit 3 battery room walls to his branch chief, Mike Ernstes.

Above, DNRL employees gather for a photo to honor the career of former DNRL Division Director David Matthews, seated in the center, who retired from the NRC after 40 years of service. From left to right, Deputy Director Mark Delligatti, Technical Assistant Laurel Bauer, Technical Assistant Tanya Ford, Administrative Assistant Lauren Saah, and Division Director Frank Akstulewicz help mark the occasion.

Right is the cover of the innovative Final Environmental Impact Statement Reader's Guide. NRC issued a reader's guide for the first time in December 2013. The guide is a detailed transmittal brochure to facilitate understanding of a proposed action and its potential environmental impacts.



Photo courtesy of Westinghouse Electric Company

## CONSTRUCTION AND OPERATION OF WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 AND 2

### Final Environmental Impact Statement Reader's Guide

December 2013

## New Reactor Licensing

Throughout 2013, the New Reactor Program continued to safely lead, manage, and facilitate a multitude of ever changing activity. The Office of New Reactors (NRO) reviews applications for standard design certifications (DCs), early site permits (ESPs), combined licenses (COLs), construction permits (CPs), and operating licenses (OLs). At the end of 2013, the U.S. Nuclear Regulatory Commission (NRC) was actively reviewing three DCs, one ESP, and nine COL applications for large, light water reactor designs. These applications were submitted to the NRC under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

The NRO staff made progress on all of these application reviews during 2013 despite a host of demanding challenges. As the NRC staff has remained focused on fulfilling its mission, it has been diligent in raising safety concerns while seeking closure on issues related to ongoing application reviews.

## Design Certification Reviews

By issuing a DC, the NRC approves a nuclear power plant design independent of an application to construct or operate a plant. A DC is valid for 15 years from the date of issuance, but can be renewed for an additional 10 to 15 years.

During 2013, the NRC continued reviewing the following DC applications:

- Economic Simplified Boiling Water Reactor (ESBWR)
- U.S. Advanced Pressurized Water Reactor (U.S. APWR)
- U.S. Evolutionary Power Reactor (U.S. EPR)

The NRC issued a final design approval for the ESBWR design and published the proposed DC rule for the ESBWR design in March 2011. In early 2012, the NRC staff identified errors in the benchmarking that the ESBWR applicant, General Electric Hitachi, used as a basis for determining fluctuating pressure loading on the steam dryer

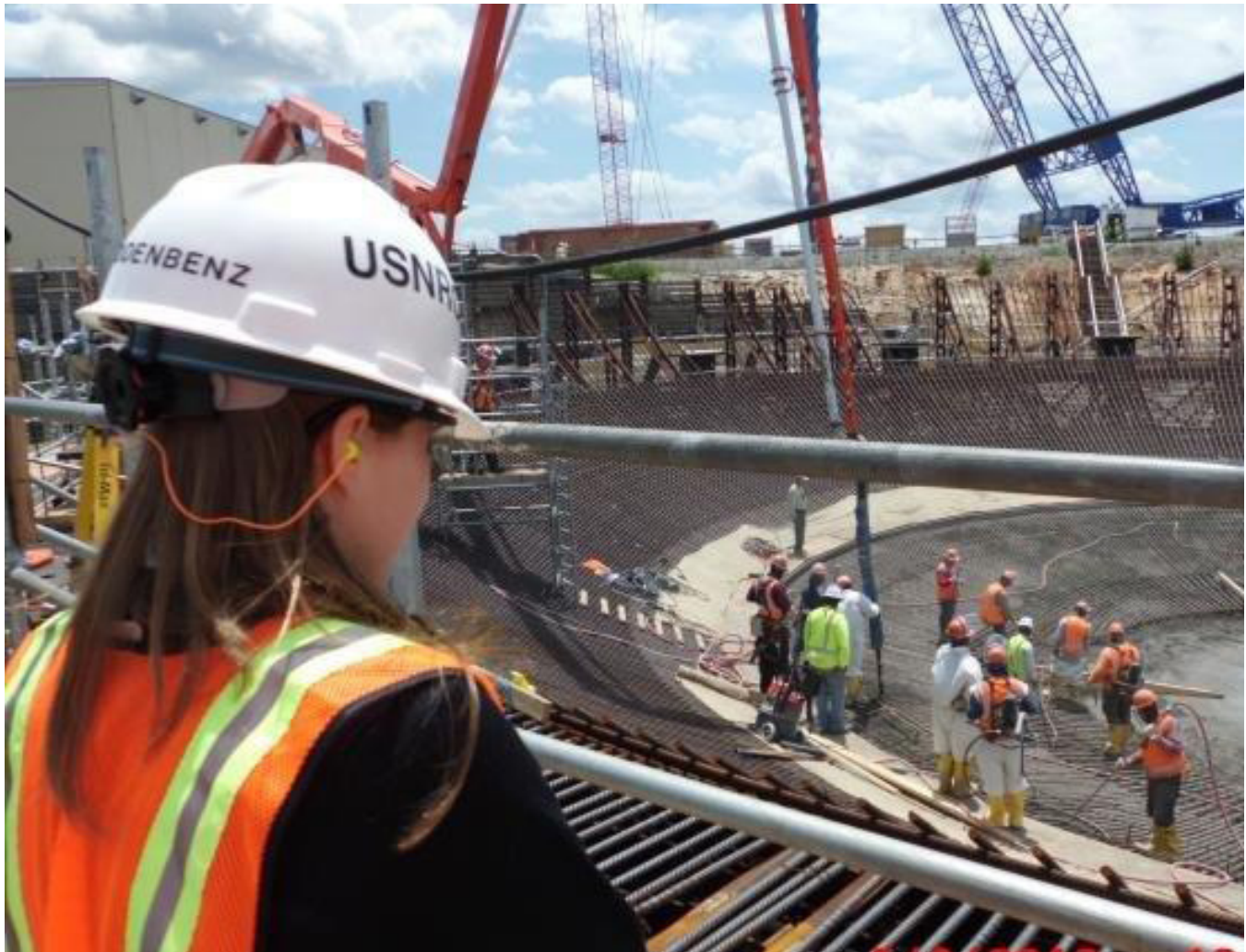


Photo courtesy of NRC Construction Resident Inspector Office

Katie Steddenbenz of Region II inspects placement of concrete under the containment vessel bottom head at the V.C. Summer Unit 2 site.





# Activities & Accomplishments

*Top, Charles Ader, Director of the Division of Safety Systems and Risk Assessment (DSRA), shares an observation at a quarterly review session.*

*Above, NRC Commissioner William Magwood, IV, and, at right, NRC Chairman Allison Macfarlane, right, and Commissioner Kristine Svinicki, discuss the agency's international programs at a Commission Meeting. As part of its international outreach effort, NRC is addressing counterfeit, fraudulent, and suspect items, or CFSI.*





for the ESBWR design. These errors needed to be addressed to support the staff's final safety evaluation. The NRC staff continued to address the steam dryer issue with General Electric Hitachi during 2013 and began preparing a supplemental final safety evaluation report. The NRC will reestablish a rulemaking schedule after the issue has been satisfactorily resolved.

For the U.S. EPR DC review, the staff evaluated several key technical issues during 2013, including the digital instrumentation and controls (I&C) design, seismic and structural analyses, fuel assembly seismic design, Generic Safety Issue (GSI) 191, "Assessment of Debris Accumulation on PWR [Pressurized Water Reactor] Sump Performance," methodology changes for the U.S. EPR design, and the implementation of the NRC's Fukushima Near Term Task Force Recommendations as they apply to the U.S. EPR DC application. The NRC issued a revised schedule for the U.S. EPR DC application review in March 2013. In July 2013, the NRC issued a letter informing AREVA that the NRC determined that AREVA had not demonstrated sufficient independence and diversity in its current U.S. EPR digital I&C design to meet the regulatory requirements. On October 21, 2013, AREVA issued a letter informing the NRC that it is reevaluating its entire U.S. EPR DC application closure strategy and is currently developing closure plans for the U.S. EPR DC project. In December 2013, AREVA provided the NRC with an additional letter that detailed its closure strategy for 2014.

For the US APWR DC review, the NRC staff evaluated key technical challenges, including the seismic and structural analyses and fuel assembly seismic grid deformation. On November 5, 2013, Mitsubishi Heavy Industries, Ltd. (MHI) issued a letter announcing its decision to implement a coordinated slowdown of the ongoing U.S. APWR Design Certification review activities. This decision allows MHI to focus its resources on supporting Japanese utilities in restarting Mitsubishi designed PWRs in Japan.

In 2010, the NRC received DC renewal applications from both Toshiba and General Electric Hitachi to renew the Advanced Boiling Water Reactor (ABWR) DC. The NRC will establish review schedules once it receives revised applications from both Toshiba and General Electric Hitachi.

On September 30, 2013, pursuant to Subpart B of 10 CFR Part 52, Korea Hydro and Nuclear Power Company (KHNP)/Korea Electric Power Corporation (KEPCO) submitted its application for the certification of the APR 1400. Consistent with its Part 52 self-assessment lessons learned, the NRC conducted a thorough acceptance review of

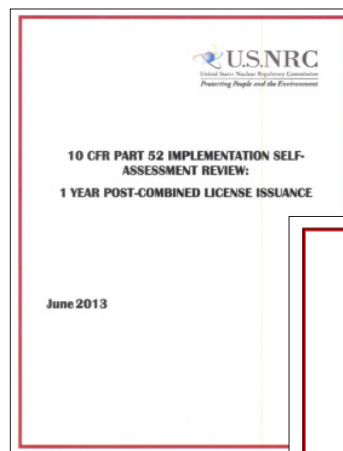
the APR 1400 DC application and determined that additional information was required before the application could be docketed for NRC review. KHNP plans to submit a revised application.

## Early Site Permit Reviews

As part of the licensing process, the NRC can issue an ESP to approve a site for a nuclear power plant independent of an application for a COL. ESPs are valid for 10 to 20 years and can be renewed for an additional 10 to 20 years. To date, the NRC has issued four ESPs to the following applicants:

- System Energy Resources, Inc., for the Grand Gulf ESP site (MS)
- Exelon Generation Company, LLC, for the Clinton ESP site (IL)
- Dominion Nuclear North Anna, LLC, for the North Anna ESP site (VA)
- Southern Nuclear Operating Company for the Vogtle ESP site (GA), which includes a limited work authorization

During 2013, the NRC continued its safety and environmental reviews of one ESP application submitted by PSEG Power, LLC, for a site adjacent to Salem Nuclear Generating Station and Hope Creek Generating Station, which currently are in operation in Lower Alloways Creek Township, Salem County, NJ. The NRC continues to engage in pre-licensing activities for the Blue Castle Nuclear Power Plant ESP application. The applicant's plans for submittal of the Blue Castle ESP application are uncertain.



*One of NRC's significant accomplishments in 2013 was the completion of our lessons learned reviews of Part 52—both the licensing part and post-license issuance.*

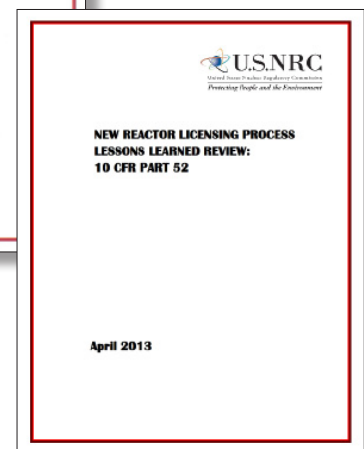


Photo courtesy of NRC Resident Inspectors



# Activities & Accomplishments

*Top, Senior Resident Inspector Justin Fuller, center, discusses construction activities at the Vogtle site with Laura Dudes, a Division Director in the NRC's Office of Federal and State Materials and Environmental Management Programs, Region II Regional Administrator Victor McCree, and NRO Office Director Glenn Tracy.*

*Above, DSRA employees listen intently to a presentation on nuclear safety.*

*Right, NRO Branch Chief John McKirgan provides the latest developments on containment integrity at a division meeting.*





## Combined License Reviews

A COL authorizes a licensee to both construct and operate a nuclear power plant at a specific site. The application for a COL must contain essentially the same information required in applications for a construction permit and an operating license under the 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities;" licensing process. The COL application must also describe the inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to ensure that the plant has been properly constructed and will operate safely.

In 2012, the NRC issued the first-ever COLs authorizing the building and operation of new nuclear power reactors to Southern Nuclear Operating Company and its co-applicants for Vogtle, Units 3 and 4, located in Georgia, and to South Carolina Electric & Gas Company and South Carolina Public Service Authority for Virgil C. Summer, Units 2 and 3, located in South Carolina. As of October 31, 2013, the NRC issued 11 license amendments for Vogtle Units 3 and 4 and 8 license amendments for V.C. Summer Units 2 and 3. Multiple license amendments for both Vogtle and V.C. Summer supported the licensees initial pouring of the concrete basemats for the nuclear islands at the sites.

During calendar year 2013, the NRC continued to actively review 9 COL applications to build and operate 14 new large, light water reactors throughout the United States at the following sites:

- Bell Bend Nuclear Power Plant (PA) (1 Unit)

- Calvert Cliffs Nuclear Power Plant (MD) (1 Unit)
- Comanche Peak Nuclear Power Plant (TX) (2 Units)
- Fermi Nuclear Generating Station (MI) (1 Unit)
- Levy County Nuclear Power Plant (FL) (2 Units)
- North Anna Power Station (VA) (1 Unit)
- South Texas Project (TX) (2 Units)
- Turkey Point Nuclear Generating Station (FL) (2 Units)
- William States Lee III Nuclear Generating Station (SC) (2 Units)

In January 2013, the NRC issued the agency's final environmental impact statement (FEIS) for the Fermi Nuclear Power Plant Unit 3 COL application, and in December 2013, the NRC issued the Final Supplemental Environmental Impact Statement for the William States Lee III Nuclear Generating Station. In May 2013, Duke Energy issued a letter to the NRC requesting that the NRC suspend review of the Shearon Harris, Units 1 and 2, COL application. Six COL reviews have been suspended to date because of changes in the applicants' business strategies. On November 26, 2013, UniStar submitted a letter to the NRC announcing formal withdrawal of the Nine Mile Point 3 Nuclear Power Plant COL application that has been suspended at the applicant's request since December 2009. Information on the current review schedule for new reactor COL applications can be obtained from the NRC public Web site at: [http://www.nrc.gov/reactors/new\\_reactors/col.html](http://www.nrc.gov/reactors/new_reactors/col.html).



Photo courtesy of NRC Construction Resident Inspector Office

At the V.C. Summer site in South Carolina, a look at the concrete pump truck setup for under containment vessel bottom head Layer A.



Photo courtesy of NRC Construction Resident Inspector Office



# Activities & Accomplishments

Top, at Vogtle Unit 3, the rebar is being installed for wall placement #4 in September 2013.

Above, Reactor Operations Engineer Yamir Diaz-Castillo, center, joined colleagues from NRO and Region II to perform a vendor inspection at Weir Valves & Controls USA, located in Ipswich, MA.

Right, NRC staff and officials from Poland's General Directorate for Environmental Protection and National Atomic Energy Agency pause for a group photo in Warsaw during a workshop on environmental reviews for new reactors. NRC staff members in the photo are NRO's Andy Kugler, Eduardo Sastre and Jack Cushing, and Danielle Emche of the Office of International Programs. Not pictured is Mike Masnik of NRO.





## OVERSIGHT

In 2013, the New Reactor Program achieved significant milestones in oversight responsibilities ranging from construction and vendor inspection to quality assurance and licensee performance assessment. The U.S. Nuclear Regulatory Commission's (NRC's) role in new reactor construction oversight includes inspecting (1) construction and operational programs, (2) the licensees' completion of their inspections, tests, analyses, and acceptance criteria (ITAAC), and (3) vendors supplying components and services for construction.

The primary goal of the New Reactor Program in 2013 was to ensure the safe construction of the new reactors: four AP1000 units at the Vogtle and Summer sites, and Watts Bar Unit 2. After the NRC issued combined licenses (COLs) to Southern Nuclear Operating Company in February 2012 for two Advanced Passive 1000 (AP1000) units at the Vogtle Electric Generating Plant near Augusta, GA, and to South Carolina Electric & Gas Company in March 2012 for two AP1000 units at the V.C. Summer Nuclear Station, the pace of construction inspection increased significantly. In 2013, construction activities for Vogtle, Units 3 and 4, and V.C. Summer, Units 2 and 3, focused on the nuclear island and fabrication of steel containment and structural modules. NRC activities focused on inspection of the licensees' quality assurance programs, welding, security, civil engineering structures, digital instrumentation and control system engineering, as well as manufacturing of key components such as squib valves and reactor coolant piping. Watts Bar Unit 2 is in the final stages of construction, with completion expected in late 2014.

In April 2013, agency staff issued a self assessment on the Construction Reactor Oversight Process (cROP), a risk-informed and performance-based oversight process that provides reasonable assurance that the plant is constructed and will be operated in accordance with its licensing basis. The lessons learned from this report were incorporated into guidance documents and the cROP was fully implemented at the four AP1000 reactors under construction on July 1.

The key elements of the process include the inspection of construction activities, the assessment of licensee performance during construction, and the enforcement of noncompliance with regulatory requirements. Similar to Reactor Oversight Process (ROP) practices used for operating nuclear power plants, the NRC periodically meets with interested stakeholders to collect feedback on the effectiveness of the process, which is then considered in making future refinements to the cROP.

The agency's most recent performance assessments show that reactor construction is being conducted safely at all four units. Based on the licensee's performance and the results of NRC inspections in 2013, the agency will continue performing the baseline inspection program, which provides a standard level of regulatory oversight. Plant assessments and the latest cROP related information are publicly available on the NRC's Web site, <http://www.nrc.gov/>.

In early 2013, the NRC completed its first year of construction oversight under the Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," process. To learn from these experiences, the agency performed a self assessment of NRC



Construction on the Vogtle Unit 3 cooling tower continues.

Photo courtesy of Georgia Power, a Southern Company



Photo courtesy of Justin Fuller



# Activities & Accomplishments

Top, Chad Huffman, Vogtle resident inspector, conducts a visual inspection of a pipe penetration associated with a Unit 3 auxiliary building wall submodule.

Above, a team of NRC inspectors completes a week-long technical inspection of AREVA's assessment of the capability of the U.S. EPR design to withstand the impacts of a large commercial aircraft.

Right, the Unit 3 basemat pour at V.C. Summer.

Photo courtesy of NRC Construction Resident Inspector Office



licensing and inspection requirements, policies, procedures, and practices during the first year of post COL implementation of 10 CFR Part 52. The NRC conducted an extensive outreach effort to solicit feedback from external and internal stakeholders and performed in depth reviews of the actions taken by the staff following the issuance of the four COLs. In July 2013, the working group issued a self assessment report that concluded that the NRC staff conducted regulatory activities with safety as its primary goal, but that efficiency could be improved through some minor changes to the NRC processes. The staff is currently working on several initiatives to improve the processes.

Construction resident inspectors and region-based inspectors conduct the majority of inspection activities, with the support of headquarters staff as needed. NRC Region II has assigned staff to both Vogtle and V.C. Summer construction resident inspector's offices. Each office now has a construction senior resident inspector and two construction resident inspectors. In addition, Region II routinely sends construction inspectors from the NRC's Region II office in Atlanta, GA, to conduct team inspections of construction activities at the sites. Over time, the number of full time construction resident inspectors at the site will increase from three to about five inspectors.

In 2013, the NRC completed its review of the first ITAAC Closure Notifications (ICNs) for the Vogtle Units 3 & 4. ITAAC are identified as those construction activities that, if met, provide reasonable assurance that a facility has been constructed and will operate in conformance with the COL and the NRC's regulations. The licensee is responsible for completing the ITAAC. The NRC's inspection program samples the licensee's processes for ITAAC completion and performs inspections to verify that the licensee will provide reasonable assurance that it has met all ITAAC acceptance criteria. The staff reviews these ICNs to determine whether they contain sufficient information to demonstrate that the ITAAC have been successfully completed. On June 17, 2013, the first Federal Register Notice (FRN) was published documenting the NRC staff's verification of the completion of a Vogtle Unit 3 ITAAC. As of December 3, the NRC has verified the completion of 11 ITAAC for Vogtle Units 3 and 4.

The NRC staff continues to implement and refine the processes and guidance developed for closure verification of ITAAC. The staff facilitated several public workshops to solicit input, exchange views, and reach consensus on several construction inspection issues, including the development of additional ICN examples. Members of the

public, the Nuclear Energy Institute, industry representatives, and other external stakeholders participated in these public workshops.

On the enforcement front, New Reactor Program activities include processing enforcement actions and coordinating reviews with the Office of Enforcement (OE) and regional offices. The Enforcement Policy was revised in June 2012 and again in January 2013 to address, in part, lessons learned during the initial phases of construction. In addition, the Enforcement Manual that provides the staff direction for implementing the policy was revised and issued on September 9, 2013. This revision included the guidance in Enforcement Guidance Memorandum 11-006, "Enforcement Actions Related to the Construction Reactor Oversight Process," as well as additional guidance based on lessons learned during construction. As part of the periodic cROP self assessment, the staff will continue to identify lessons learned and evaluate the need for additional NRC Enforcement Policy revisions.

Yet another achievement in the oversight area in 2013 was the growing success of the Construction Experience (ConE) Program, which provides NRC inspectors and NRO technical reviewers with insights on the design, construction, and preoperational testing of new reactors. The ConE program supported the issuance of 3 information notices, 14 operating experience communications on construction-related insights and lessons learned, and 12 ConE issues for resolution of events requiring further technical evaluation. Furthermore, the staff is incorporating lessons learned from the program's event evaluations and reviews into NRC programs.

## Vendor Inspection Program

Overseeing manufacturers and suppliers of safety related components is an important aspect of the oversight program. NRC inspectors determine if licensees are appropriately carrying out technical requirements and if they are in compliance with quality assurance and defect reporting requirements. The NRC conducted vendor inspections at manufacturers' and suppliers' facilities principally to examine, through observation of safety significant activities, their compliance with Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," as required by procurement contracts with licensees.

In 2012, NRO and the Office of Nuclear Reactor Regulation (NRR) created the Vendor Inspection



Photo courtesy of Georgia Power, a Southern Company



Top, Construction Resident Inspector Dave Failla observes the V.C. Summer Unit 2 containment vessel bottom head lift.

Above, Vogtle Unit 3 liquid processing tanks inside the nuclear island.

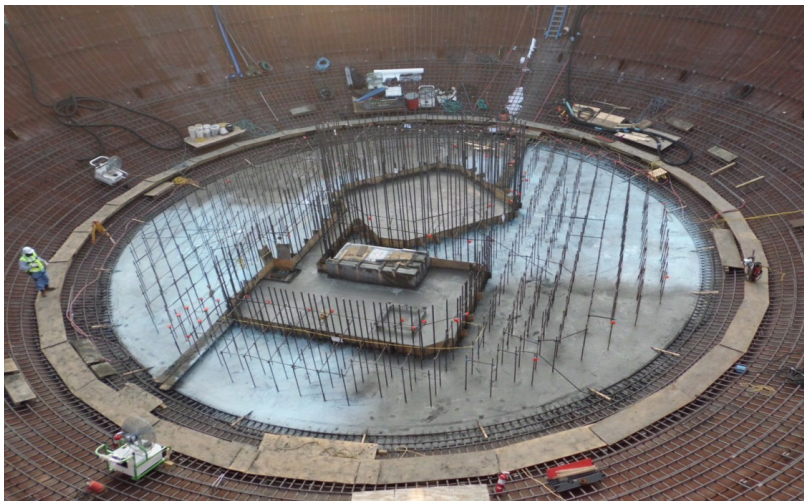
Right, the first concrete pour inside the V.C. Summer Unit 2 containment vessel bottom head.

Photo courtesy of NRC Construction Resident Inspector Office



# Activities & Accomplishments

Photo courtesy of NRC Construction Resident Inspector Office



Center of Expertise to inspect new reactor and existing reactor plant vendors and to support allegation resolution. The agency created the center to optimize the interdependency between offices by streamlining vendor oversight activities. The center also supports procurement-related inspections within the framework of the ROP and initiatives to address and deter the potential use of counterfeit, fraudulent, and suspect items (CFSIs) in safety related applications. During the first 2 years of its implementation, the center has proven effective in meeting the goals. Furthermore, it has provided resources to support procurement-related inspections within the framework of the ROP. In FY 2013, the staff conducted 36 vendor inspections, 4 observations, and 3 assists to other organizations. Some of these inspections were conducted in cooperation with other national regulatory authorities through the Multinational Design Evaluation Program.

The NRC also observes licensee oversight of manufacturers and suppliers. Licensees typically perform such oversight audits through participation on the Nuclear Procurement Issues Committee. The NRC also performs inspections to determine whether applicants for design certificates, early site permits, or COLs have effectively implemented quality assurance processes and procedures for activities related to their applications. These inspections focus on assessing compliance with the provisions of 10 CFR Part 21, "Reporting of Defects and Noncompliance," and with selected portions of Appendix B to 10 CFR Part 50.

The agency conducts an annual self assessment of its vendor inspection program to ensure that it continues to effectively identify emergent issues. The 2013 self assessment concluded that 9 of 11 performance metrics were met and corrective actions were implemented for those areas that did not meet the staff's expectations. The NRC staff is soliciting information from the nuclear industry to expand its internal database of vendor information, which is used to inform inspection activities. The NRC staff continues to make progress on its rulemaking efforts to clarify 10 CFR Part 21, consistent with its proposal in Commission paper SECY 11-0135, "Staff Plans To Develop the Regulatory Basis for Clarifying the Requirements in Title 10 of the *Code of Federal Regulations* Part 21, 'Reporting of Defects and Noncompliance.'" The staff hosted a series of public meetings to discuss the "Draft Regulatory Basis to Clarify 10 CFR Part 21, 'Reporting of Defects and Noncompliance.'" The draft

regulatory basis was made public to solicit early stakeholder feedback on how to best modify the regulations and align regulatory guidance for 10 CFR Part 21. The staff plans to use the feedback obtained from these meetings to improve the final version of the regulatory basis.

Additionally, the staff is continuing to implement the CFSI action items outlined in a 2011 Commission paper that assesses the agency's response to CFSI and provides recommendations for staff implementation. Of particular interest is the staff's current efforts to engage industry in developing practices that can be carried out as part of the licensee's quality assurance program to prevent CFSIs from entering the supply chain. In 2014, the staff plans to publish a Commission paper that assesses the effectiveness of current CFSI activities and evaluates the need to implement additional CFSI countermeasures. Officials from NRO also led a Nuclear Energy Agency (NEA) task group to enhance supply chain integrity by minimizing occurrences of non-conforming, counterfeit, fraudulent, or suspect items (NCFSI). In 2013, the NEA task group published a final report that described the international threat of NCFSI and recommended options to strengthen inspection programs and increase information sharing.

## Operator Licensing

The NRC staff also continues to develop the operator licensing process for new reactors. The agency has drafted a revision to NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," that went out for public comment in October 2013. This NUREG is used to develop and administer operator licensing examinations that meet all regulatory requirements. This revision incorporates the specific attributes of both the AP1000 and advanced boiling water reactor designs.

The NRC staff observed the Institute of Nuclear Power Operations (INPO) accrediting process for the technical training programs for Vogtle and V.C. Summer. Additionally, the staff observed the INPO accrediting process followup visit for the operator training programs at both Vogtle and V.C. Summer. Meanwhile, the agency continues to prepare for initial testing of plant operators. In November 2013, the NRC completed a simulator class pilot and plans to begin simulator training for NRC examiners and inspectors in early 2014.





# Activities & Accomplishments



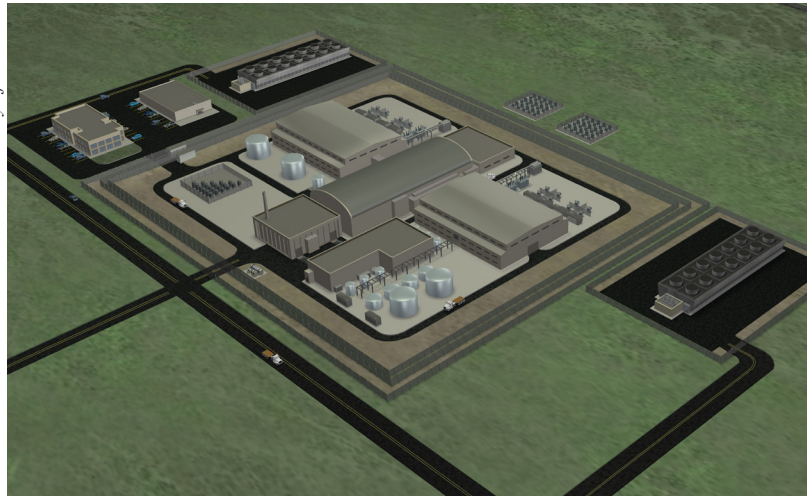
*Photo courtesy of Babcock & Wilcox*

*Top, NRO officials complete an inspection of NuScale's prototypical steam generator testing at the SIET S.p.A. facility in Italy.*

*Above, NRO employees visited the Babcock & Wilcox mPower™ offices and Integrated System Testing Facility in Lynchburg, VA.*

*Right, a NuScale schematic of a small modular reactor plant layout.*

*Illustration courtesy of NuScale*





## ADVANCED REACTOR PROGRAM

Following a year of intense and thorough preparation, the New Reactor Program is strategically positioned to receive and begin reviewing small modular reactor (SMR) design certifications (DCs) and associated licensing applications in 2014.

As it looks forward, the Office of New Reactors (NRO) will continue its development of construction inspection infrastructure for SMRs in fiscal year 2014. In addition, it anticipates that non-light water reactor designs will continue to evolve, with NRO staff developing and carrying out a strategy to ensure that the U.S. Nuclear Regulatory Commission (NRC) is ready for these advanced reactor designs.

Current interest in advanced reactors focuses on SMRs that use light water reactor technology. Starting in the early 2000s, the U.S. Department of Energy (DOE) began funding work at Oregon State University to develop a small, integral pressurized LWR. This work led to the formation of a private company, NuScale Power, LLC (NuScale), to commercialize this evolutionary reactor technology. Beginning in 2009, other reactor designers interested in developing small, integral pressurized LWRs contacted the NRC. Industry-identified potential benefits— including lower costs, a wider range of users, enhanced safety, and the ability to replace older coal fired units—have driven interest in these types of reactors.

In recent years, the NRC has continued to fully prepare for future reviews of SMR licensing applications. These preparation efforts have included pre-application activities with vendors, developing the regulatory framework to support reviews of these new designs, and conducting extensive outreach to external stakeholders. The NRC also reviewed technical reports that SMR vendors submitted. The agency expects these activities to continue as vendors move closer to completing and submitting SMR applications. On December 28, 2012, the NRC issued Regulatory Issue Summary (RIS) 2012–12, “Licensing Submittal Information and Design Development Activities for Small Modular Reactor Designs,” requesting potential applicants to provide information on proposed application submittal dates. This information has helped the staff to prepare for the receipt and review of design certifications, combined licenses, and construction permit applications over the next several years.

Early in 2012, DOE announced a cost-shared industry partnership program for small modular reactors to promote the accelerated commercialization of SMR technologies. This program is funding the Babcock & Wilcox (B&W) mPower reactor and the NuScale reactor that are currently undergoing pre-application activities with the NRC. The following sections briefly describe the status of SMR designs currently the subject of pre-application activities with the NRC:

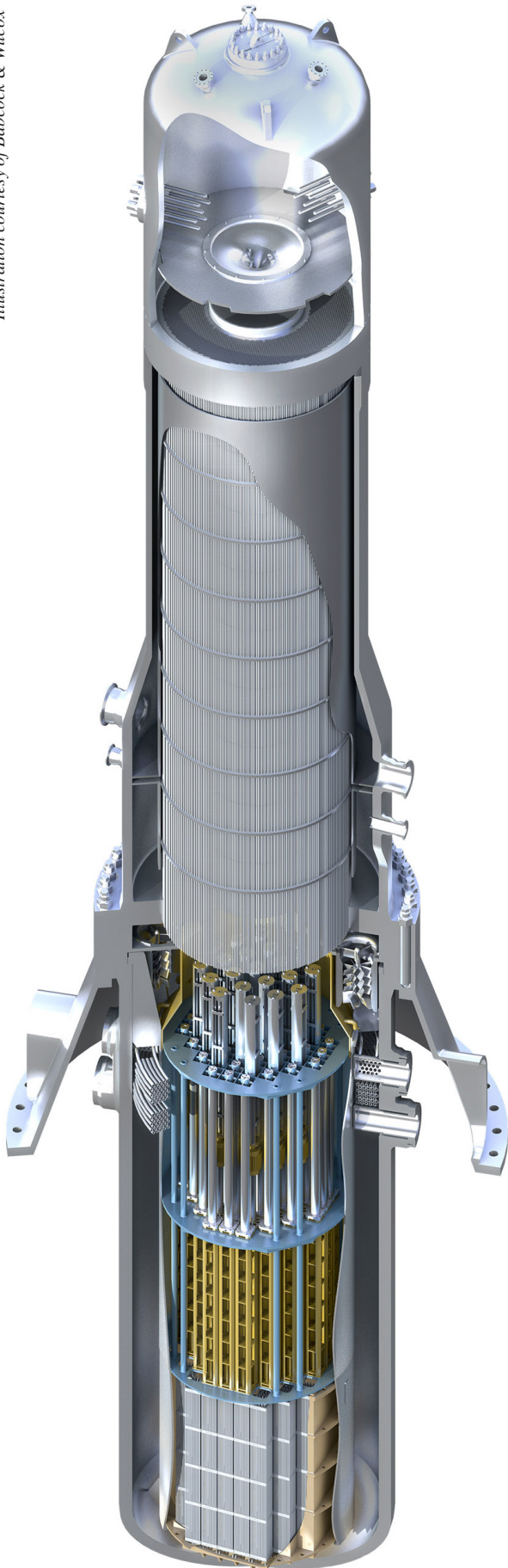
### Babcock and Wilcox (B&W) mPower™ and Tennessee Valley Authority

In response to RIS 2012–12, Babcock and Wilcox (B&W) mPower, Inc., announced a new DC application submittal date of the third quarter of calendar year (CY) 2014 in support of the Tennessee Valley Authority (TVA) Clinch River construction permit application. It also announced that Generation mPower LLC intend to assume responsibility for submittal of the DC application.

The NRC staff has been engaged in pre-application activities with B&W, since mid 2009. To date, the NRC has received technical reports on topics such as: quality assurance plan for the design certification, plant design overview, critical heat flux test and correlation development plan, core nuclear design codes and methods qualification, integrated system test (facility description and test plan), instrument set point methodology, control rod drive mechanism design and development, the physical security design and program considerations, reactor fuel system mechanical design criteria, and five human factors program reports. In addition, B&W submitted position papers on radiological source term methodology and the approach to satisfy Generic Safety Issue (GSI) 191, “Assessment of Debris Accumulation on Pressurized Water Reactor Sump Performance,” for the mPower™ reactor design. Through these early interactions, the NRC staff anticipates that it will be aware of many of the most critical technical issues before the application is received.

In 2013, the NRC staff developed the first Design Specific Review Standard (DSRS) for the mPower™ design. The DSRS will function like the standard review plan and will consider safety and risk categorization for the systems, structures, and components associated with the mPower™ design. The DSRS will allow the staff to clarify in advance its approach for reviewing complex technical issues, allowing the applicant to prepare its application in a manner that will be easier to review. The staff issued the draft version of the mPower™ DSRS in

Illustration courtesy of Babcock & Wilcox



Babcock & Wilcox mPower™ small modular reactor schematic.

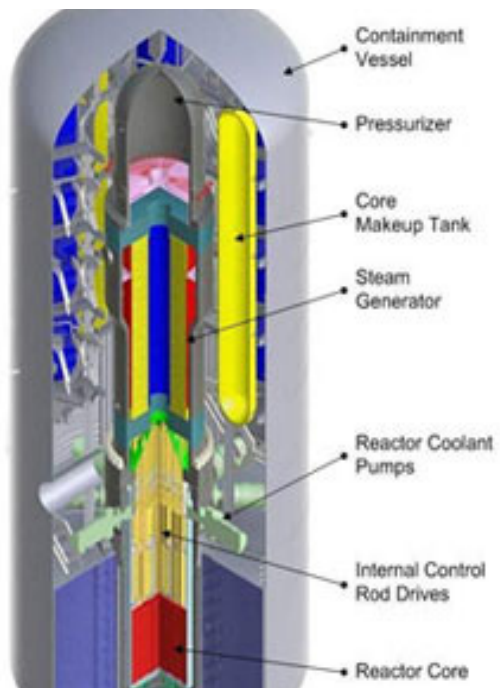
Photo courtesy of NuScale



NuScale's Integral System Test Facility at Oregon State University in Corvallis, OR.

# Activities & Accomplishments

Illustration courtesy of Westinghouse



Schematic of the Westinghouse small modular reactor.



May 2013 for interim use and comment through the Federal Register. The staff will continue to engage public stakeholders through meetings to discuss selected sections before issuing the final mPower™ DSRS.

On February 11, 2013, TVA responded to RIS 2012–12, stating that it currently plans to apply in the second quarter of 2015 for a construction permit for up to four mPower™ reactors at the Clinch River site in Tennessee. The NRC staff is conducting meetings with TVA to discuss the regulatory framework for this submittal.

## NuScale Power, LLC

In response to RIS 2012–12, NuScale Power, LLC, announced a new DC application submittal date of the third quarter of CY 2015, with the objective of obtaining a DC from the NRC under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” Subpart B, “Standard Design Certifications.”

The NRC and NuScale personnel met several times in 2013 to discuss various aspects of the design, such as steam and power conversion systems, auxiliary systems, instrumentation and control, and containment design. As previously noted, the NRC is well into its development of a DSRS to be used on the anticipated mPower DC application. The similarities between the mPower and NuScale designs will allow the staff to use portions of this DSRS in the review of the NuScale application.

## Westinghouse

Westinghouse is developing a 225 megawatt electric (MWe) power output SMR design and has stated that the smaller scale features of this design are analogous to those of the AP1000 design certified under 10 CFR Part 52. The NRC staff met with Westinghouse at NRC headquarters on several occasions on topics such as digital instrumentation and control and fuel design. In addition, the NRC staff is conducting a technical review of a topical report regarding Westinghouse’s small break loss of coolant accident phenomena identification and ranking. Westinghouse indicated that it intends to submit a DC application for the MWe power output small modular reactor at an unspecified date in the future.

## Holtec and PSEG

Holtec is developing the Holtec Inherently Safe Modular Underground Reactor SMR 160 design that has a 160 MWe electrical power output. On March 20, 2013, Holtec responded to RIS 2012–12, informing the NRC of its intention to submit a DC application during the fourth quarter of 2016. The NRC staff will continue meeting with Holtec, as resources allow, to gain a better understanding of its SMR 160 design. In early September, Holtec announced further developments in its business relationship with Public Service Enterprise Group (PSEG) Power. PSEG operates the three unit Salem/ Hope Creek site in southern New Jersey.

## Other Reactor Technologies

Several private industry reactor designers and vendors have held discussions with the NRC regarding different non-light water reactor (non LWR) designs. In addition, the NRC staff maintains awareness of DOE’s research programs for non-LWR technologies and the development of non-LWRs within the international community.

## Next Generation Nuclear Plant

Interactions with DOE in 2013 focused on four key issues previously highlighted in the Next Generation Nuclear Plant (NGNP) Licensing Strategy Report that DOE and the NRC jointly issued to Congress in 2008. These issues are: (1) licensing basis event selection, (2) radionuclide release source terms, (3) containment functional performance, and (4) emergency preparedness.

The staff is summarizing the results from these NGNP interactions, along with supporting technical observations, in updated assessment reports on DOE’s proposed approaches as follows: (1) “Summary Feedback on Four Key Licensing Issues;” (2) “Assessment of White Paper Submittals on Fuel Qualification and Mechanistic Source Terms (Revision 1);” and (3) “Assessment of White Paper Submittals on Defense in Depth; Licensing Basis Event Selection; and Safety Classification of Structures, Systems, and Components (Revision 1).” These are expected to be issued in 2014.

Photo courtesy of Justin Fuller



# Activities & Accomplishments

Top, Andrzej Glowacki and Marcin Dabrowski, of the Polish National Atomic Energy Agency, tour the Vogtle Units 3 and 4 site with NRC's Senior Resident Inspector Justin Fuller.

Above, Office Director Glenn Tracy, forefront center, along with Victor McCree, fourth from left, Region II Regional Administrator, lead an NRC delegation tour at the Haiyang Nuclear Power Units 1 and 2 construction site in China.

Right, members of the Multinational Design Evaluation Program AP1000 Working Group, including NRO's Larry Burkhart, Chief, Licensing Branch 4 (AP1000), third from right, and Project Manager Bruce Bavol, first from left. Also pictured are nuclear regulators from China, Canada, and Sweden.





## INTERNATIONAL COOPERATION

During 2013, the U.S. Nuclear Regulatory Commission (NRC) continued to actively support the development and implementation of programs to leverage the knowledge and resources within the international regulatory community in the licensing of new reactor designs and oversight of construction activities.

The agency continues to play a leading role in the Multinational Design Evaluation Program (MDEP), a multilateral effort in which 13 countries cooperate on new reactor design reviews. The NRC Chairman currently serves as the Chair of the MDEP Policy Group; the Office of New Reactors (NRO) Deputy Office Director co-chairs the MDEP Steering Technical Committee; and in 2013 NRO staff actively participated in all of the MDEP working group activities. In fiscal year (FY) 2013, the NRC continued international cooperation through participation in the EPR and AP1000 design working groups and began cooperating in the APR 1400 Design Working Group.

NRO staff continued to lead the AP1000 Working Group and the Digital Instrumentation and Controls Working Group, which published several common positions that document agreement by the regulators on instrumentation and controls design standards; participated in several inspection activities as part of the MDEP Vendor Inspection Cooperation Working Group; and participated in efforts toward convergence of pressure boundary codes and standards as part of the MDEP Codes and Standards Working Group.

In FY 2013, NRO staff took a lead role in the

development of an international regulatory forum for cooperation on small modular reactor (SMR) designs by chairing a consultancy meeting at the International Atomic Energy Agency (IAEA) on licensing and safety issues for SMRs. The result of the meeting was a detailed plan for a forum for regulators to discuss SMR issues.

The NRO Office Director led an NRC delegation to the 2013 U.S. China Steering Committee Meeting in China that resulted in a detailed plan and agreement to exchange inspectors and planned regulatory oversight programs during pre-operational phases and testing of the AP 1000. It also resulted in the first NRC representative to serve at NNSA's headquarters in Beijing.

NRO staff and management continued to provide support and leadership to the IAEA's International Seismic Safety Center and its working areas related to external hazards. In FY 2013, NRO staff supported multiple IAEA expert missions as well as consultancy meetings on these topics.

NRO also continued support of bilateral engagement through hosting assignees from countries building or planning to build new reactors. In FY 2013, the NRC hosted assignees from the Czech Republic, Japan, Korea, and the United Arab Emirates.

NRO plays a vital role in the activities of the Nuclear Energy Agency's Committee on Nuclear Regulatory Activities. In particular, NRO management and staff support the working group on the regulation of new reactors by contributing and reviewing information in its database for construction experience. NRO staff also support the working group's activities that provide for the exchange of information on the status of new reactor licensing and oversight activities. ■



*NRC Region II Deputy Regional Administrator for Construction Frederick Brown, back row, third from left, welcomes members of the Multinational Design Evaluation Program AP1000 Working Group to the region's headquarters building in Atlanta, GA.*

# A Look Ahead

Photo courtesy of Georgia Power, a Southern Company



Photo courtesy of China's National Nuclear Safety Administration



Photo courtesy of Georgia Power, a Southern Company





In 2014 and beyond, the New Reactor Program will focus on decisively and safely coming to closure on the design certification, combined license, and early site permit applications for large light water reactors under active review. The Office of New Reactors (NRO) will remain staunch in its commitment to regulation that ensures the safe, secure, and environmentally responsible use of nuclear power. Whether the U.S. Nuclear Regulatory Commission (NRC) determines that an application meets the agency's regulations or concludes that it does not, our actions will be technically sound, always putting safety first. The safe closure of issues will continue to be the hallmark of our decisionmaking going forward.

No matter the challenge—digital instrumentation and control, seismic and structural analysis, advanced reactor designs, requests for international regulatory interface—NRO is poised to meet each effectively and efficiently.

A primary focus in 2014 and the ensuing years will include the continued diligent oversight of the four AP1000 reactors now under construction, the completion of construction at Watts Bar 2 and the further implementation of the agency's vendor inspection program. As activities progress in the construction process, so too will the office's close monitoring of these activities, including the further development of procedures necessary to properly and safely ensure the operational readiness of licensees. The primary conduct of such inspection activities will be completed by the agency's Region II office and the new reactor resident inspectors who are already on site in full cooperation with the new reactor partner offices.

NRO also anticipates the submittal of numerous license amendment requests that will be needed to support changes in design as construction progresses.

Over the next few years, even in the face of evolving applicant priorities and resource challenges, the New Reactor Program will move steadily toward completion of reviews of the design certification, combined license, and early site permit applications currently before it. NRO also expects an additional early site permit application within the next 2 years.

In the advanced reactor arena, NRO plans to begin the review of the first design certifications for small modular reactors in 2014. At the same time, its staff will continue to move forward the office's regulatory infrastructure initiatives designed to comprehensively address and resolve fundamental policy and technical issues—including emergency preparedness and security considerations—for small modular reactors. NRO will maintain its focus on supporting the timely and safe resolution of these issues as it reviews those small modular reactor designs it expects to receive starting in 2014.

Meanwhile, on the international front, NRO staff will continue to maintain its leadership role in the development of an international regulatory forum for cooperation on small modular reactor designs by participating in consultancy meetings at the International Atomic Energy Agency on licensing and safety issues for small modular reactors. Additionally, 2014 and beyond will build on an agency and NRO action taken at this year's U.S.–China Steering Committee Meeting in China that led to a detailed plan and agreement to exchange inspectors during pre-operational phases and testing of the AP1000.

As the staff meets new and existing challenges in the coming years, it will further strengthen a strategic and cultural foundation built on the principles of transparency, integrity, and open communication. The New Reactor Program stands ready to fulfill its mission to enable the safe, secure, and environmentally responsible use of nuclear power in meeting the Nation's future energy needs. ■



*Members of the NRO Open Collaborative Work Environment (OCWE) Working Group enjoy a respite at a monthly meeting. This diverse team of employees is dedicated to exploring new ways of fostering an open, collaborative work environment across the office.*















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