



*Protecting People and the  
Environment*

---

SEMIANNUAL STATUS REPORT ON THE  
LICENSING ACTIVITIES AND REGULATORY DUTIES OF THE  
U.S. NUCLEAR REGULATORY COMMISSION

**April–September 2018**

Note: The period of performance covered by this report includes activities that occurred from the first day of April to the last day of September 2018. The transmittal letter to Congress accompanying this report provides additional information to keep Congress fully informed on the current licensing and regulatory activities of the U.S. Nuclear Regulatory Commission.

Enclosure

## CONTENTS

I.	Reactor Oversight Process .....	2
II.	Implementing Risk-Informed and Performance-Based Regulations .....	2
III.	Status of Issues Tracked in the Reactor Generic Issues Program.....	3
IV.	Licensing Actions and Other Licensing Tasks .....	5
V.	Status of License Renewal Activities .....	6
VI.	Summary of Reactor Enforcement Actions .....	9
VII.	Security and Emergency Preparedness and Incident Response Activities.....	13
VIII.	Power Uprates .....	16
IX.	New Reactor Licensing .....	16
X.	Response to Lessons Learned from the Fukushima Accident in Japan .....	26
XI.	Planned Rulemaking Activities .....	28

## **I. Reactor Oversight Process**

The U.S. Nuclear Regulatory Commission (NRC) continues to use the Reactor Oversight Process (ROP) at all nuclear power plants to assess the performance of reactor licensees and to guide the assignment of inspection resources. Using inputs from both self-assessments and independent evaluations, the NRC continuously assesses the ROP to enhance its effectiveness and efficiency. The NRC staff meets with interested stakeholders periodically to collect feedback on the effectiveness of the process and considers this feedback when making improvements to the ROP.

The agency's most recent performance assessments show that all plants continue to operate safely. The staff continues to conduct assessment reviews, communicate changes in the assessment of licensee performance quarterly, and issue end-of-cycle assessment letters. The NRC issued the annual assessment letters in early 2018. The staff has updated the Web site to reflect the latest performance assessments as of the end of the second quarter of calendar year (CY) 2018.

## **II. Implementing Risk-Informed and Performance-Based Regulations**

Currently, 46 operating nuclear power reactors have committed to transitioning to the risk-informed, performance-based fire protection licensing basis permitted under Title 10 of the *Code of Federal Regulations* (10 CFR) 50.48(c), also known as National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants." Of these 46 reactor units, 41 have already transitioned to the Standard 805 licensing basis, and the NRC staff is currently reviewing three other transition plans. The NRC anticipates completing its evaluation of the three plans by the end of the third quarter of fiscal year (FY) 2018. The agency expects to receive one license amendment application for the remaining two reactor units in the third quarter of FY 2018.

The industry communicated its plans to submit, in the near future, many applications under 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors." In 2014, the NRC reviewed and approved the pilot application for the Vogtle Electric Generating Plant (Vogtle). Currently, the NRC has received 12 applications under 10 CFR 50.69 and has accepted all 12 for review. The NRC has approved one application, while the review of the remaining applications is in progress.

After the March 2011 event at the Fukushima Dai-ichi nuclear power plant in Japan, the NRC developed and issued orders to implement a comprehensive set of recommendations. These recommendations would enhance the mitigating strategies for maintaining or restoring core cooling, containment, and spent fuel pool cooling capabilities following a beyond-design-basis external event. The Commission is also reviewing a draft final rule that would make the order requirements generically applicable. Although the equipment and strategies were specifically intended to mitigate the effects of a beyond-design-basis external event, the NRC recognizes that the equipment can also be used for other functions (e.g., to support refueling outages, as defense-in-depth measures). The NRC staff is evaluating how mitigating strategies equipment (referred to as FLEX) may be credited in various risk-informed regulatory decisions. This evaluation will be informed, in part, by a guidance document from the Nuclear Energy Institute (NEI), NEI 16-06, "Crediting Mitigating Strategies in Risk-Informed Decision Making," which outlines a three-tiered approach for evaluating the potential safety benefits of plant mitigation strategies: (1) qualitative assessment, (2) semiquantitative streamlined assessment, and (3) full probabilistic risk assessment (PRA). NEI has not requested endorsement of this guidance

document; however, the NRC staff reviewed the document and developed a draft staff position for consideration when licensees use the approach to request credit in various risk-informed decisionmaking areas.

The NRC is also pursuing a risk-informed approach in its rulemaking on the decommissioning of production and utilization facilities, particularly commercial nuclear power reactors. The Commission is currently considering a draft proposed rule that would implement a graded approach to the requirements applicable throughout the transition from operating status to decommissioning, as well as addressing other relevant issues such as cybersecurity and drug and alcohol testing. The draft proposed rule would also align regulatory requirements with the reduction in risk that occurs over time as facilities decommission, while continuing to maintain safety and security. Following public comment on the draft regulatory basis, the NRC staff completed and issued the regulatory basis in November 2017, and provided the draft proposed rule to the Commission in May 2018. Similarly, the staff is applying a consequence-oriented approach to emergency preparedness requirements in the draft proposed rule on emergency preparedness for small modular reactors (SMRs) and other new technologies, discussed in Section IX of this report.

### **III. Status of Issues Tracked in the Reactor Generic Issues Program**

During this reporting period, the staff continued its evaluation of three open generic issues (GIs) and two proposed GIs. For the first proposed GI, related to the effects of high-energy arcing faults involving aluminum at nuclear power plants, the staff continued its assessment to determine whether the issue should proceed to the regulatory office implementation stage of the GI process. In particular, Sandia National Laboratories performed small-scale testing during August 2018, and the first round of large-scale testing took place during September 2018. For the second proposed GI, related to the adequacy of licensees' procedures to address anticipated operational occurrences, the staff determined that there is no immediate safety concern and is currently evaluating whether the issue meets the screening criteria to proceed in the GI program.

The open GIs currently in the regulatory office implementation stage are GI-191, GI-199, and GI-204. The subsections below summarize the actions associated with these three open GIs. The NRC provides additional information on the status of open GIs on the GI dashboard on the agency's public Web site at <http://www.nrc.gov/about-nrc/regulatory/gen-issues/dashboard.html>.

#### **GI-191, "Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance"**

GI-191 concerns the possibility that, after a loss-of-coolant accident in a pressurized-water reactor (PWR), debris accumulating on the emergency core cooling system sump screen may result in clogging and restriction of water flow to the pumps. In response to GI-191, all PWR licensees increased the size of their containment sump strainers, significantly reducing the risk of debris clogging the strainers. Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004, considered a related issue: the potential for debris to pass through the sump strainers and enter the reactor core.

In 2008, the NRC staff determined that additional industry-sponsored testing was necessary to resolve this issue, and in 2012, the NRC approved the industry topical report WCAP-16793-NP, "Evaluation of Long-Term Cooling Considering Particulate, Fibrous and Chemical Debris in the

Recirculating Fluid,” as an acceptable model for assessing the effects on core cooling from fibrous, particulate, and chemical debris reaching the reactor vessel. This included a conservative generic limit on the amount of fiber reaching the core.

The PWR Owners Group developed a methodology to justify higher in-vessel limits using plant-specific analyses and submitted topical report WCAP-17788, “Comprehensive Analysis and Test Program for GSI-191 Closure (PA-SEE-1090)—Cold Leg Break (CLB) Evaluation Method for GSI-191 Long-Term Cooling.” The NRC staff expects to complete its review of this topical report by the end of 2019. The extended time for completion is the result of delays in industry responses to staff questions and complexities in the review of the revised methodology.

SECY-12-0093, “Closure Options for Generic Safety Issue-191, Assessment of Debris Accumulation on Pressurized Water Reactor Sump Performance,” dated July 9, 2012, proposed three options for closure of GSI-191. In response, the Commission approved these options on December 14, 2012. Licensees have since notified the NRC of their selected options and are developing proposed technical resolutions for staff review.

There are 37 operating reactor sites subject to GI-191. All nine operating reactor sites that chose Option 1, which involves using WCAP-16793, have submitted their evaluations. The NRC staff reviewed these evaluations and closed the issue for these plants. The remaining 28 operating reactor sites chose Option 2, which involves implementing mitigative measures and a deterministic (Option 2a) or risk-informed approach (Option 2b). Of these 28 sites, 21 chose Option 2a, and 7 chose Option 2b. Plants that elect to use a risk-informed approach are following the pilot plant for that method, the South Texas Project, which closed the issue in the summer of 2017. No sites are pursuing Option 3, which involves separating the regulatory treatment of the sump strainer and in-vessel effects.

The NRC is continuing its review of a technical report from Vogtle for closure of GL 2004-02, which it received on April 21, 2017, as well as a license amendment request and closure letter for GL 2004-02 for Calvert Cliffs Nuclear Power Plant, which it received on August 14, 2018. Based on current schedules, the staff expects to complete all activities associated with this GI by the end of 2021.

### **GI-199, “Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States for Existing Plants”**

This GI addresses how current estimates of the seismic hazard level at some nuclear sites in the Central and Eastern United States might be higher than the values used in their original designs and previous evaluations. The scope was expanded later to include plants in the Western United States. Following collaboration with the Electric Power Research Institute, in September 2010, the NRC staff issued a safety/risk assessment report, “Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants.” The NRC staff issued Information Notice 2010-18, “Generic Issue 199, ‘Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants,’” dated September 2, 2010.

After the nuclear event at Fukushima, the NRC incorporated GI-199 into the work being performed in response to the accident, which this report discusses further in Section X.

As of September 30, 2018, the NRC staff had completed its assessment and closed out actions concerning seismic hazard reevaluations for 45 of the 60 operating reactor sites. Based on

current schedules, the staff expects to complete activities associated with this GI by the end of 2020.

#### **GI-204, “Flooding of Nuclear Power Plant Sites Following Upstream Dam Failures”**

This GI relates to potential flooding effects from upstream dam failures on nuclear power plant sites, spent fuel pools, and sites undergoing decommissioning with spent fuel stored in spent fuel pools. The NRC is addressing this GI as part of its response to the Fukushima nuclear accident, which this report discusses further in Section X.

As of September 30, 2018, the NRC staff had completed its assessment and closed out all required actions concerning flooding hazard reevaluations for 44 of the 60 operating reactor sites. Based on current schedules, the staff expects to complete the activities associated with this GI by the end of 2020.

#### **IV. Licensing Actions and Other Licensing Tasks**

Licensing actions related to operating power reactors include orders, license amendments, exemptions from regulations, relief from inspection or component testing, topical reports submitted on a plant-specific basis, or other actions requiring NRC review and approval before licensees can carry out certain activities.

Other licensing tasks for operating power reactors include the following:

- licensees’ responses to NRC requests for information through GLs or bulletins
- NRC review of generic topical reports
- updates to final safety analysis reports
- other licensee actions that do not require NRC review and approval before licensees can carry them out

The FY 2018 NRC Congressional Budget Justification (CBJ) incorporates two output measures related to other licensing tasks: (1) the number of other licensing tasks completed each year and (2) the age of the other licensing task inventory.

Table 1 shows the actual FY 2014 through FY 2018 results to date and the FY 2018 goals for the NRC CBJ performance indicators for operating power reactor licensing actions and other licensing tasks.

The agency continues to communicate with licensees about planned licensing submittals. The NRC’s senior management remains fully engaged in monitoring the licensing action workload to maintain target performance goals.

**Table 1 Results and FY 2018 Goals for NRC’s Congressional Budget Justification Performance Indicators**

<b>NRC’s CONGRESSIONAL BUDGET JUSTIFICATION PERFORMANCE INDICATORS</b>						
<b>Output Measure</b>	<b>FY 2014 Actual</b>	<b>FY 2015 Actual</b>	<b>FY 2016 Actual</b>	<b>FY 2017 Actual</b>	<b>FY 2018 Actual</b>	<b>FY 2018 Goals</b>
Licensing actions completed per year	607	792	837	967	861	700
Age of inventory of licensing actions	87% ≤1 year and 99% ≤2 years	88% ≤1 year and 99% ≤2 years	95% ≤1 year and 100% ≤2 years	96% ≤1 year and 99% ≤2 years	98% ≤1 year and 100% ≤2 years	95% ≤1 year and 100% ≤2 years
Other licensing tasks completed per year	765	461	641	644	362	300
Age of inventory of other licensing tasks	87% ≤1 year and 100% ≤2 years	87% ≤1 year and 97% ≤2 years	90% ≤1 year and 99% ≤2 years	100% ≤1 year and 100% ≤2 years	98% ≤1 year and 100% ≤2 years	90% ≤1 year and 100% ≤2 years

**V. Status of License Renewal Activities**

During this reporting period, the NRC issued renewed licenses for two operating plants, continued its review of three license renewal applications (LRAs), and completed the sufficiency reviews and accepted for docketing two subsequent license renewal applications (SLRAs) for four operating plants. One LRA was withdrawn by the applicant. During this reporting period, the NRC conducted license renewal activities for 11 power reactors.

**Applications Currently under Review**

The sections below discuss the status of each application under review during the reporting period.

*Indian Point Nuclear Generating, Units 2 and 3*

On April 30, 2007, Entergy Nuclear Operations, Inc., submitted an LRA for Indian Point Nuclear Generating, Units 2 and 3, to extend the operating licenses for 20 years beyond the current license periods. In December 2015, the staff issued for public comment a second draft supplement to the December 2010 final supplemental environmental impact statement (SEIS) to address new information and other developments since it published Supplement 1 to the final SEIS in June 2013. On February 8, 2017, the parties filed an unopposed motion before the Atomic Safety and Licensing Board (ASLB), seeking permission to withdraw the remaining contentions pursuant to a settlement agreement under which Units 2 and 3 will cease operations no later than April 30, 2024, and April 30, 2025, respectively. The ASLB granted that motion and terminated the adjudicatory proceeding; that decision became final on July 11, 2017. The staff received a new biological opinion, concluding consultation with the National Marine Fisheries Service, and issued the final SEIS supplement on April 20, 2018. On August 1, 2018, the staff issued Supplement 3 to the safety evaluation report (SER). Following review of SER Supplement 3, the Advisory Committee on Reactor Safeguards (ACRS) met on

September 7, 2018, and concluded that no further interaction with the staff was necessary and recommended issuance of the renewed licenses.

The NRC issued the renewed licenses for Indian Point Nuclear Generating, Units 2 and 3, on September 17, 2018.

#### *Diablo Canyon Power Plant, Units 1 and 2*

On November 24, 2009, Pacific Gas and Electric Company (PG&E) submitted an LRA for Diablo Canyon Power Plant, Units 1 and 2, to extend the operating licenses for 20 years beyond the current license periods. In June 2016, the applicant announced that it had reached an agreement with interested parties not to seek license renewal for Units 1 and 2 and asked the staff to suspend its review of the LRA pending approval of the agreement by the California Public Utilities Commission (CPUC). The applicant further stated that, if CPUC approved the agreement, PG&E would withdraw its LRA. In July 2016, the staff informed the applicant that it had suspended its review of the LRA. CPUC held a public meeting on January 11, 2018, during which it approved PG&E's proposal to close Diablo Canyon Power Plant in 2025. On March 7, 2018, PG&E requested withdrawal of its LRA. The NRC staff issued a *Federal Register* notice, dated April 23, 2018, granting PG&E's request to withdraw the LRA.

#### *Seabrook Station, Unit 1*

On June 1, 2010, NextEra Energy Seabrook, LLC, submitted an LRA for Seabrook Station, Unit 1, to extend the operating license for 20 years beyond the current license period. In July 2015, the staff issued the final SEIS. Additionally, the staff completed activities related to the ASLB hearing process, and no adjudicatory matters are pending before the Commission or the ASLB on the Seabrook LRA. In June 2012, the staff issued an SER with open items and briefed the ACRS in July 2012.

Since that time, all open items in the SER have been closed, including the technical issue related to the alkali-silica reaction (ASR) that affects some concrete structures. In August 2016, NextEra submitted a license amendment request to address ASR in its current licensing basis. The license amendment would revise the current licensing basis to adopt a methodology for the analysis of seismic Category I structures with concrete affected by ASR. This methodology is also the cornerstone for the aging management program that was evaluated under the LRA review. The staff has completed its review of this methodology in the license amendment request and developed a draft SER. The staff has also completed its safety review of the LRA and issued its SER on September 28, 2018. The staff plans to brief the ACRS on the results of its review of the ASR methodology on October 31, 2018. The staff also plans to brief the Committee on the results of its review of the LRA on November 15, 2018. Final action on the license amendment request is necessary before the staff can reach a decision on the LRA. In addition, on October 6, 2017, the ASLB granted a hearing and admitted one contention on the license amendment request. This case remains pending before the ASLB. As a result of the technical nexus between the LAR and the LRA, a decision on the license renewal is not anticipated prior to completion of the hearing on the admitted contention. The staff currently anticipates making a decision on renewing the operating license by April 2019.

#### *Waterford Steam Electric Station, Unit 3*

On March 30, 2016, Entergy submitted an LRA for Waterford Steam Electric Station, Unit 3, to extend the operating license for 20 years beyond the current license period. During the

reporting period, the staff completed the draft SEIS and issued it for public comment on August 15, 2018. The applicant also submitted a license amendment request in November 2017 for approval of its plant-specific neutron fluence methodology, which is applied to the reactor vessel neutron fluence embrittlement analysis referred to in the LRA. The NRC completed its review of this license amendment request and issued the license amendment on July 23, 2018. Completion of the staff's review of this license amendment allowed the staff to finish its safety review of the LRA. As a result, the staff issued its SER for the LRA on August 17, 2018. The staff briefed the ACRS on the results of its review of the Waterford LRA as described in the SER on September 20, 2018. The staff expects to make a decision on renewing the operating license for Waterford Steam Electric Station, Unit 3, in the first quarter of FY 2019.

#### *River Bend Station, Unit 1*

On May 31, 2017, Entergy submitted an LRA for River Bend Station, Unit 1, to extend the operating license for 20 years beyond the current license period. During the reporting period, the staff completed the draft SEIS and issued it for public comment on May 25, 2018. The staff is currently addressing public comments received on the draft SEIS and is preparing the final SEIS. In addition, the staff completed its safety review of the River Bend LRA and issued the result of its review in an SER on August 16, 2018. The staff briefed the ACRS on the results of its review of the River Bend LRA as described in the SER on September 20, 2018. Additionally, a petition to intervene and request for hearing were filed in connection with this proceeding. The ASLB ruled the petitioner's contentions inadmissible and denied the petition in January 2018; the petitioner did not appeal the decision. The staff expects to make a decision on renewing the operating license for River Bend Station, Unit 1, in the first quarter of FY 2019.

#### *Turkey Point Nuclear Generating, Units 3 and 4*

On January 30, 2018, Florida Power & Light Company submitted the first SLRA for renewal of the operating licenses for an additional 20 years for Turkey Point Nuclear Generating, Units 3 and 4 (Turkey Point). On February 26, 2018, the NRC staff began the sufficiency review for acceptance and docketing of the SLRA. The staff determined that the application was acceptable for docketing and issued the acceptance letter and application review schedule on April 26, 2018. The NRC staff issued a notice of opportunity to request a hearing and petition to intervene, which was published in the *Federal Register* on May 2, 2018. The Commission partially approved a request to extend the deadline for filing hearing requests and petitions to intervene, which extended the deadline to August 1, 2018. The NRC has received three requests for hearing, and they are currently before the ASLB for consideration.

A public scoping meeting took place on May 31, 2018, in Homestead, FL, during which members of the public provided comments on the scope of the environmental review for consideration by the NRC staff in preparing its draft SEIS. In addition, the staff began its detailed technical review of the SLRA and completed an operating experience audit, an environmental audit and site tour, and an offsite and onsite aging management audit. The staff is currently performing a topic-specific technical audit. The staff has issued requests for additional information (RAIs) for both the safety and environmental reviews and is beginning to review recently received applicant responses to some of these RAIs. The staff anticipates issuing several audit reports during the first quarter of FY 2019 and issuing the draft SEIS for public comment in the second quarter of FY 2019.

### *Peach Bottom Atomic Power Station, Units 2 and 3*

On July 10, 2018, Exelon submitted the second SLRA to the NRC for renewal of the operating licenses for an additional 20 years for Peach Bottom Atomic Power Station, Units 2 and 3. On July 16, 2018, the NRC staff began the sufficiency review for acceptance and docketing of the SLRA. The staff determined that the application was acceptable for docketing and issued the acceptance letter and application review schedule on August 27, 2018. The staff issued a notice of opportunity to request a hearing and petition to intervene, which was published in the *Federal Register* on September 6, 2018. The NRC held a public scoping meeting on September 25, 2018, in Delta, PA, during which members of the public provided comments on the scope of the environmental review for consideration by the NRC staff in preparing its draft SEIS. In addition, the staff began its detailed technical review of the SLRA and completed an operating experience audit. The staff has scheduled the environmental audit and site tour and the offsite and onsite aging management audit for the first quarter of FY 2019.

## **VI. Summary of Reactor Enforcement Actions**

The reactor enforcement statistics in the tables below are arranged by region, half FY, FY total, and two previous FYs for comparison purposes. These tables provide the nonescalated and escalated reactor enforcement data, as well as the escalated enforcement data associated with traditional enforcement and the ROP. The severity level assigned to a violation (i.e., traditional enforcement) generally reflects the significance of a violation. However, for most violations, the significance is assessed using the significance determination process under the ROP, which uses risk insights, where appropriate, to assist the NRC in determining the safety or security significance of inspection findings identified within the ROP.

Brief descriptions of the escalated reactor enforcement actions associated with traditional enforcement and the ROP (as well as any other significant actions) taken during the applicable fiscal half-year follow the tables.

**Table 2 Nonescalated Reactor Enforcement Actions\***

<b>NONESCALATED REACTOR ENFORCEMENT ACTIONS</b>						
		Region I	Region II	Region III	Region IV	TOTAL
Cited Severity Level IV or Green	1 <sup>st</sup> Half FY 18	2	1	0	2	5
	2 <sup>nd</sup> Half FY 18	0	3	0	1	4
	FY 18 Total	2	4	0	3	9
	FY 17 Total	2	5	2	2	11
	FY 16 Total	4	6	2	3	15
Noncited Severity Level IV or Green	1 <sup>st</sup> Half FY 18	43	35	62	73	213
	2 <sup>nd</sup> Half FY 18	58	34	46	71	209
	FY 18 Total	101	69	108	144	422
	FY 17 Total	116	120	146	179	561
	FY 16 Total	169	137	171	190	667
<b>TOTAL Cited and Noncited Severity Level IV or Green</b>	1 <sup>st</sup> Half FY 18	45	36	62	75	218
	2 <sup>nd</sup> Half FY 18	58	37	46	72	213
	FY 18 Total	103	73	108	147	431
	FY 17 Total	118	125	148	181	572
	FY 16 Total	173	143	173	193	682

\* The nonescalated enforcement data above reflect the cited and noncited violations either categorized at Severity Level IV (the lowest level) or associated with green findings during the indicated time periods. The numbers of cited violations are based on Enforcement Action Tracking System data that may be subject to minor changes following verification. The monthly totals generally lag by 30 days because of the time needed to complete inspection reports and enforcement actions. These data do not include green findings that do not have associated violations.

**Table 3 Escalated Reactor Enforcement Actions Associated with Traditional Enforcement\***

<b>ESCALATED REACTOR ENFORCEMENT ACTIONS ASSOCIATED WITH TRADITIONAL ENFORCEMENT</b>						
		Region I	Region II	Region III	Region IV	TOTAL
<b>Severity Level I</b>	1 <sup>st</sup> Half FY 18	0	0	0	0	0
	2 <sup>nd</sup> Half FY 18	0	0	0	0	0
	FY 18 Total	0	0	0	0	0
	FY 17 Total	0	0	0	0	0
	FY 16 Total	0	0	0	0	0
<b>Severity Level II</b>	1 <sup>st</sup> Half FY 18	0	0	0	0	0
	2 <sup>nd</sup> Half FY 18	0	0	0	0	0
	FY 18 Total	0	0	0	0	0
	FY 17 Total	0	0	0	0	0
	FY 16 Total	0	0	0	0	0
<b>Severity Level III</b>	1 <sup>st</sup> Half FY 18	0	1	0	0	1
	2 <sup>nd</sup> Half FY 18	0	0	0	0	0
	FY 18 Total	0	1	0	0	1
	FY 17 Total	1	3	0	1	5
	FY 16 Total	1	0	1	1	3
<b>TOTAL Violations Cited at Severity Level I, II, or III</b>	1 <sup>st</sup> Half FY 18	0	1	0	0	1
	2 <sup>nd</sup> Half FY 18	0	0	0	0	0
	FY 18 Total	0	1	0	0	1
	FY 17 Total	1	3	0	1	5
	FY 16 Total	1	0	1	1	3

\* The escalated enforcement data above reflect the Severity Level I, II, or III violations or problems cited during the indicated time periods.

**Table 4 Escalated Reactor Enforcement Actions Associated with the ROP\***

<b>ESCALATED REACTOR ENFORCEMENT ACTIONS ASSOCIATED WITH THE REACTOR OVERSIGHT PROCESS</b>						
		Region I	Region II	Region III	Region IV	TOTAL
Violations Related to Red Findings	1 <sup>st</sup> Half FY 18	0	0	0	0	0
	2 <sup>nd</sup> Half FY 18	0	0	0	0	0
	FY 18 Total	0	0	0	0	0
	FY 17 Total	0	0	0	0	0
	FY 16 Total	0	0	0	0	0
Violations Related to Yellow Findings	1 <sup>st</sup> Half FY 18	0	0	0	0	0
	2 <sup>nd</sup> Half FY 18	0	0	0	0	0
	FY 18 Total	0	0	0	0	0
	FY 17 Total	0	0	0	0	0
	FY 16 Total	0	0	0	0	0
Violations Related to White Findings	1 <sup>st</sup> Half FY 18	0	1	2	0	3
	2 <sup>nd</sup> Half FY 18	0	0	1	0	1
	FY 18 Total	0	1	3	0	4
	FY 17 Total	2	1	4	3	10
	FY 16 Total	2	0	0	0	2
<b>TOTAL Related to Red, Yellow, or White Findings</b>	1 <sup>st</sup> Half FY 18	0	1	2	0	3
	2 <sup>nd</sup> Half FY 18	0	0	1	0	1
	FY 18 Total	0	1	3	0	4
	FY 17 Total	2	1	4	3	10
	FY 16 Total	2	0	0	0	2

\* The escalated enforcement data above reflect the violations or problems cited during the indicated time periods that were associated with either red, yellow, or white findings. These data do not include red, yellow, or white findings that do not have associated violations.

### **Reactor Escalated Enforcement Actions and Other Significant Actions Taken**

#### *FirstEnergy Nuclear Operating Company (Davis-Besse Nuclear Power Station) EA-18-008*

On April 13, 2018, the NRC issued a notice of violation to FirstEnergy Nuclear Operating Company (FENOC) for a violation of 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," Criterion V, "Instructions, Procedures, and Drawings," at Davis-Besse Nuclear Power Station. This violation was associated with a white significance determination process finding. Contrary to the requirements, FENOC failed to ensure that documented instructions, procedures, or drawings prescribed activities affecting quality. Specifically, FENOC

failed to provide appropriate instructions to calibrate the turbine bearing oil sight glasses for the auxiliary feedwater pumps. The lack of instructions resulted in failure of the inboard turbine bearing on the number 1 auxiliary feedwater pump because of low bearing oil levels when the pump was tested in September 2017. Additionally, there are associated violations of Technical Specification 3.7.5, "Emergency Feedwater," which requires three trains of emergency feedwater to be available at power or restored to operable condition within 72 hours and plant shutdown if the 72-hour requirement cannot be met.

## **VII. Security and Emergency Preparedness and Incident Response Activities**

The NRC continues to maintain an appropriate regulatory infrastructure and to perform its licensing and oversight functions to ensure adequate protection of public health and safety and promote the common defense and security. The NRC's security and emergency preparedness and incident response programs contribute to fulfilling this mission.

### **Security**

The NRC continues to conduct force-on-force (FOF) inspections at each nuclear power reactor and Category I fuel cycle facility on a regular 3-year cycle. Each FOF inspection includes both tabletop drills and exercises that simulate combat between a mock adversary force and the licensee's security force. These inspections assess the ability of power reactor licensees to defend against the design-basis threat (DBT) for radiological sabotage. The NRC uses a similar process at Category I fuel cycle facilities to assess the effectiveness of the licensees' protective strategy against two DBTs—one for radiological sabotage and another regarding theft or diversion of special nuclear material. FOF exercises also provide valuable insights that enable the NRC to evaluate the effectiveness of licensee security programs.

In response to Commission direction, the NRC staff completed an assessment of the NRC's security baseline inspection program, including FOF, with a focus on security inspections at nuclear power reactors. The assessment found that the overall program remains effective; however, the staff identified potential efficiencies and improvements that could be applied throughout the program. Specifically, the staff committed to reviewing and updating the security baseline inspection program significance determination process; reviewing and potentially revising associated inspection procedures; addressing whether crediting operator actions, the use of diverse and flexible mitigation capabilities equipment, or response by Federal, State, and local law enforcement would improve the realism of FOF exercises; and assessing next steps for the existing integrated response program. The assessment also recommended modifying the FOF inspection program to consist of one NRC-conducted FOF exercise and an enhanced NRC inspection of a licensee-conducted annual FOF exercise. The Commission is reviewing this recommendation.

In early 2018, Entergy and NextEra ended their NEI memberships; this resulted in the NEI-managed mock adversary force not being available for use in NRC-evaluated FOF inspections at these two utilities' facilities. As a result, the NRC staff rescheduled five FOF inspections at Entergy and NextEra facilities to later in CY 2018 to accommodate this change.

In April 2018, the NRC approved a joint proposal from Entergy and NextEra to provide an alternative mock adversary force (the Joint Composite Adversary Force) to enable completion of all required NRC-evaluated FOF inspections in CY 2018 and CY 2019. The Joint Composite Adversary Force is comprised of members of each utility but excludes personnel who work at the site being evaluated. Mock adversary force directors are assigned from the corresponding

peer company to help avoid conflicts of interest. The NRC provides increased oversight of the Joint Composite Adversary Force to verify a clear separation of functions between that force and the host site's guard force. The NRC determined that Entergy and NextEra's proposal is a reasonable alternative to the NEI-managed mock adversary force that will allow the NRC staff to complete scheduled NRC-evaluated FOF inspections. This alternative gives the staff time to assess other potential long-term solutions for effective and efficient implementation of the NRC FOF program.

Separately, the Commission is considering a final rule that would, in part, amend the security requirements in 10 CFR Part 73, "Physical Protection of Plants and Materials," to implement the statutory authority provided to the Commission under Section 161A of the Atomic Energy Act of 1954, as amended. This authority allows the Commission to designate the classes of facilities eligible to apply for NRC authorization to use various types of weapons and large-capacity ammunition-feeding devices, notwithstanding State and local and certain Federal firearms laws and regulations prohibiting such possession and use. The draft final rule establishes the requirements that licensees must meet when applying for this authority. In developing the rulemaking, the NRC has worked closely with the U.S. Department of Justice's Office of the Attorney General; the Federal Bureau of Investigation; the Bureau of Alcohol, Tobacco, Firearms and Explosives; and other interested stakeholders.

In advance of the final rulemaking, eight licensees at seven sites requested permission to use the authority granted the Commission under Section 161A of the Atomic Energy Act. Between September 2015 and January 2016, the Commission issued seven confirmatory orders to these eight licensees authorizing them to use the Commission's Section 161A authority. In addition, to add consistency and clarity, the draft final rule would revise the mandatory physical security event notification requirements for different classes of facilities and the transportation of radioactive material. The draft final rule would also add mandatory event notification requirements for the theft or loss of enhanced weapons and imminent or actual hostile acts and new reporting requirements for suspicious activities.

Finally, the Commission is considering a draft proposed rule that would amend the drug testing requirements of 10 CFR Part 26, "Fitness for Duty Programs," to better align NRC drug testing requirements with those of the 2008 version of the U.S. Department of Health and Human Services' report "Mandatory Guidelines for Federal Workplace Drug Testing Programs." Specifically, the proposed changes would broaden the panel of drugs to be tested for during required drug testing; lower cutoff levels for certain types of drug testing; improve the testing methods to identify subversion attempts; and improve the clarity, organization, and flexibility of the rule language.

The NRC continues to support the Federal Bureau of Investigation's efforts to improve the tactical responses of Federal, State, and local law enforcement to beyond-DBT events at nuclear power plant sites.

## **Cybersecurity**

Under 10 CFR 73.54, "Protection of Digital Computer and Communication Systems and Networks," the NRC requires nuclear power plant licensees and new license applicants to provide high assurance that digital computer and communication systems and networks are adequately protected against cyberattacks. These licensees must implement a cybersecurity program to ensure that safety, important-to-safety, security, and emergency preparedness functions are protected from cyberattacks. Because of the extensive work and lead time

required to fully implement the provisions called for in licensees' NRC-approved cybersecurity plans, the agency established interim milestones to focus efforts on the highest priority activities. Licensees had taken measures to protect their highest priority digital assets by December 31, 2012.

The NRC has developed an oversight program for cybersecurity that includes an inspection program, inspector training, and a process for evaluating the significance of inspection findings. The agency accomplished this in collaboration with stakeholders, including members of industry and representatives from the U.S. Department of Homeland Security, the Federal Energy Regulatory Commission, and the National Institute of Standards and Technology. The NRC completed inspection activities related to the interim milestones in CY 2015. In July 2017, the NRC began the full implementation inspection activities; as of September 30, 2018, the agency has completed 13 inspections. This initial round of inspections will continue through CY 2020.

The NRC staff proposed several options to the Commission in SECY-14-0147, "Cyber Security for Fuel Cycle Facilities," dated December 30, 2014 (Agency Documents Access and Management System (ADAMS) Accession Number ML15083A175), for implementing cybersecurity requirements for fuel cycle facilities. In response, the Commission issued Staff Requirements Memorandum for SECY-14-0147, dated March 24, 2015, which directed the staff to initiate a rulemaking. The Commission is currently considering a draft proposed rule on this subject.

In SECY-17-0034, "Update to the U.S. Nuclear Regulatory Commission Cyber Security Roadmap," dated February 28, 2017 (ADAMS Accession Number ML16354A258), the NRC staff updated the Commission on the agency's cybersecurity requirements. SECY-17-0034 shows the current status of the staff's evaluations of the need for cybersecurity requirements for other NRC license holders, including nonpower reactors, independent spent fuel storage installations, byproduct materials licensees, and decommissioning reactors. Use of the roadmap helps the NRC determine the appropriate levels of cybersecurity protections and ensures that NRC-licensed facilities implement them promptly and effectively.

### **Emergency Preparedness and Incident Response**

Following the accident at the Fukushima Dai-ichi nuclear power plant in Japan, the NRC issued information requests concerning licensee emergency preparedness staffing and communications capabilities during a large-scale natural event. Based on the review of the industry responses, the NRC concluded that additional regulatory action was prudent. The staff determined that the industry's interim actions (e.g., portable satellite phones), combined with long-term enhancements (e.g., new radio systems, sound-powered telephones, battery-powered radio repeaters, and satellite phone systems), will help to ensure that licensees can communicate effectively during a station blackout event affecting multiple units. The staff has reviewed the staffing assessments submitted by licensees and has verified that the existing emergency response resources, as described in the licensees' emergency plans, are sufficient to support required plant actions and emergency plan functions. The NRC incorporated several enhancements of emergency preparedness, including those described above, into the draft final rule for mitigation of beyond-design-basis events currently under Commission consideration.

In April 2012, the NRC and the Federal Emergency Management Agency (FEMA) began a multiyear initiative to revise NUREG-0654/FEMA-REP-1, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Revision 1, issued November 1980. This is one of the key guidance documents

for developing and evaluating onsite and offsite emergency plans for nuclear power plants and for the State and local government emergency response organizations that would respond to the plant sites. In FY 2014, the joint NRC/FEMA working group completed initial drafts of the introductory information and the emergency plan evaluation criteria. The NRC and FEMA staff jointly conducted a series of public meetings in FY 2014 to solicit feedback from stakeholders and members of the public on the initial drafts. The NRC and FEMA completed a final draft of this document in FY 2015 and issued it for a 90-day public comment period on May 29, 2015. The agencies extended the comment period to October 13, 2015, in response to requests from stakeholders. On March 31, 2017, the NRC and FEMA completed the review of the comments and started processing the document for final review and approval. As of April 2, 2018, both agencies have completed their internal reviews and reached consensus that the Office of Management and Budget should evaluate the document to determine whether it is a major rule. The NRC sent the document to the Office of Management and Budget on July 10, 2018.

The NRC continues to work with States to replenish potassium iodide supplies for use as a supplement to public protective actions within the 10-mile emergency planning zones around nuclear power plants.

All licensing reviews for new power reactor applications under the physical security and emergency preparedness program remain on schedule. The NRC staff is using its established licensing process to ensure that the safety and environmental reviews meet all milestones and provide appropriate opportunities for stakeholder input.

## **VIII. Power Upgrades**

Licensees have applied for and implemented power upgrades since the 1970s as a way to increase the power output of their plants. The NRC staff has reviewed and approved 164 power upgrades to date. Existing plants have gained approximately 23,769 megawatts thermal or 7,923 megawatts electric (MWe) in electric generating capacity (the equivalent of about seven large nuclear power plant units) through power upgrades.

Currently, the NRC has no power upgrade applications under review. No licensees of nuclear power plants have indicated that they plan to request power upgrades over the next 5 years.

## **IX. New Reactor Licensing**

The NRC's new reactor program is focusing on licensing and construction oversight activities that support applicants and licensees of large light-water reactors (LWRs) and small modular LWRs and is enhancing the regulatory framework and infrastructure for advanced reactors (non-LWRs). In addition, the NRC is actively engaged in several international cooperative initiatives focused on addressing safety reviews of new reactor designs and improving the effectiveness and efficiency of inspections and the collection and sharing of construction experience.

### **Reviews of Applications for Large and Small Modular Light-Water Reactors**

The NRC is currently reviewing applications for new large LWRs and small modular LWRs that have been submitted under the provisions of 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

## *Early Site Permit Reviews*

### Tennessee Valley Authority Clinch River Early Site Permit Application

On May 12, 2016, the Tennessee Valley Authority (TVA) submitted an early site permit (ESP) application for the Clinch River Nuclear Site near Oak Ridge, TN. This application is based on a plant parameter envelope characterizing several small modular LWR designs. By December 30, 2016, TVA had submitted all supplemental information to the NRC in support of its application, and by letter dated January 5, 2017, the NRC staff informed TVA that its application, as supplemented, was accepted for docketing and detailed technical review.

The NRC staff began its detailed technical review of the ESP application in January 2017 and issued a full review schedule with public milestones on March 17, 2017. The staff completed the Phase A safety review for all chapters of the application on August 4, 2017 (consistent with the established schedule). The staff is currently in Phase B of its review, which is scheduled to conclude in October 2018. Phase C review activities are also now underway (in parallel with Phase B) for some safety evaluation sections, and the staff expects to complete Phase C in March 2019. The final SER is currently scheduled to be issued in August 2019. For the environmental review, the NRC staff completed Phase 1 of the review ahead of schedule on October 30, 2017. Additionally, the NRC staff completed Phase 2 ahead of schedule by issuing the DEIS on April 27, 2018. The public comment period for the DEIS closed on July 13, 2018. The final EIS is scheduled to be completed by June 2019.

Three intervenors filed requests for hearing on TVA's application. On October 10, 2017, the ASLB granted two requests and denied the third. On May 21, 2018, the intervenors submitted two new contentions on the draft EIS. On July 31, 2018, the ASLB issued a memorandum and order (LBP-18-04) in which it denied the intervenors' motion for leave to file new contentions, granted the TVA and NRC staff motions to dismiss the remaining admitted contention, and terminated the contested proceeding. The intervenors did not appeal the Board's decision.

On August 23, 2018, the Secretary for the Commission transmitted a memorandum to the Atomic Safety and Licensing Board Panel to announce the Commission's decision to conduct the mandatory hearing itself. This will be the first Commission-conducted mandatory hearing on an ESP.

## *Design Certification Reviews*

### NuScale Power, LLC, Small Modular Reactor Design Certification Application

On January 6, 2017, NuScale submitted the first SMR design certification application for review by the NRC. On March 15, 2017, the NRC completed its acceptance review and docketed the application. The staff issued the acceptance review letter to NuScale on March 23, 2017, and developed a full review schedule with public milestones, which it sent to NuScale on May 22, 2017. On April 11, 2018, the staff completed Phase 1 of the review. The staff's review is currently in Phase 2 and Phase 3. Currently, there are 20 challenging issues that require resolution and have the potential to adversely affect the review schedule. Eight previously identified challenging issues are now considered resolved.

The NRC has implemented a new safety-focused review process, based on lessons learned from previous design reviews, to improve the effectiveness and efficiency of reviews. This process uses a graded review approach, in which the review focus and resources are aligned

with risk-significant structures, systems, and components and other aspects of the design that contribute most to safety. This graded approach applies the appropriate level of review for structures, systems, and components by considering both the safety classification and the risk significance. The final SER is still scheduled to be completed in September 2020.

#### Advanced Power Reactor 1400

On December 23, 2014, Korea Electric Power Corporation and Korea Hydro & Nuclear Power Company, Ltd., submitted an application to the NRC for certification of the Advanced Power Reactor 1400 (APR1400) standard plant design for use in the U.S. domestic energy market. The NRC staff developed a six-phase milestone schedule for completing the application review within 42 months. The staff completed the Phase 4 review (issuing the advanced SER with no open items) in May 2018 and Phase 5 (response to the ACRS) on July 30, 2018. On September 28, 2018, the staff issued the final SER. The NRC also issued a standard design approval for the APR1400 to Korea Hydro & Nuclear Power on September 28, 2018. The NRC staff has begun activities associated with the development of a direct final rule to certify the APR1400 standard plant design.

#### U.S. Advanced Pressurized-Water Reactor

On December 31, 2007, Mitsubishi Heavy Industries, Ltd., submitted its application to the NRC for certification of the U.S. Advanced Pressurized-Water Reactor design. On November 5, 2013, the company issued a letter informing the NRC of its plans to slow down licensing activities related to the application review. Given this request, the NRC staff has been performing this review at a reduced pace with limited use of resources since March 24, 2014, and will continue in this manner until further notice from the applicant or until the review is completed.

#### U.S. Evolutionary Power Reactor

On December 11, 2007, AREVA, Inc., submitted its application to the NRC for certification of the U.S. Evolutionary Power Reactor design. On February 25, 2015, AREVA asked the NRC to suspend the application review until further notice. The NRC staff's review of the application for this design remains suspended.

#### *Design Certification Renewals*

##### Advanced Boiling-Water Reactor Renewal (General Electric-Hitachi)

On December 7, 2010, General Electric-Hitachi (GEH) submitted an application for renewal of the advanced boiling-water reactor (ABWR) design certification. By letter dated January 8, 2016, GEH submitted proposed changes to the ABWR design control document to redesign the containment overpressure protection system piping and, on February 19, 2016, submitted a revised application to incorporate changes in the design control document. The staff issued a milestone schedule letter to GEH on August 30, 2016, which was based on resolving all open items by January 2017. However, some open items associated with the review of the application remain unresolved. As a result, on August 3, 2017, the staff issued a letter to GEH indicating that the NRC would not be able to complete its review on the original schedule. The letter also stated that the NRC would issue a revised schedule letter to GEH after additional discussions with the applicant to resolve these issues and after the staff receives complete responses to its RAIs. The NRC staff has issued a letter and safety

evaluations documenting closure of 23 out of 39 review items pertaining to this review. However, the review remains unscheduled due to one open item associated with a reported increase to the ABWR peak cladding temperature.

### *Combined License Activities*

The NRC staff has received a total of 18 combined license (COL) applications to date. The NRC has issued COLs at 8 sites for 14 units (Vogle, Units 3 and 4; Virgil C. Summer Nuclear Station (V.C. Summer), Units 2 and 3; Fermi, Unit 3; South Texas Project, Units 3 and 4; Levy Nuclear Plant, Units 1 and 2; William States Lee III Nuclear Station, Units 1 and 2; North Anna Power Station, Unit 3; and Turkey Point, Units 6 and 7). The NRC has suspended two COL application reviews at the request of the applicants because of changes in their business plans (Shearon Harris Nuclear Power Plant and Comanche Peak Nuclear Power Plant). Eight COL applications have been withdrawn (Bellefonte Nuclear Station, River Bend Station, Bell Bend Nuclear Power Plant, Victoria County Station, Nine Mile Point Nuclear Station, Callaway Plant, Calvert Cliffs Nuclear Power Plant, and Grand Gulf Nuclear Station).

The licensees for the COLs for V.C. Summer, Units 2 and 3, Levy Nuclear Plant, Units 1 and 2, and South Texas Project (STP), Units 3 & 4, have informed the NRC of plans to terminate the COLs. By letter dated December 27, 2017, South Carolina Electric & Gas Company (SCE&G), one of the owners of the V.C. Summer COLs, requested withdrawal of the COLs for V.C. Summer, Units 2 and 3. On January 8, 2018, Santee Cooper, another of the owners of the V.C. Summer COLs, submitted a letter to the NRC in response to SCE&G's letter requesting withdrawal of the COLs for these units. In its letter, Santee Cooper asked that the NRC hold in abeyance any action on SCE&G's request to terminate the COLs for V.C. Summer, Units 2 and 3, for 180 days or until the South Carolina Public Service Authority can complete an evaluation of whether to seek a license transfer. On January 25, 2018, SCE&G and SCANA Corporation requested written consent approving the indirect transfer of control of V.C. Summer, Units 1, 2, and 3, and Unit 1's independent spent fuel storage installation to Dominion Energy to support a potential merger of Dominion and SCANA. On August 30, 2018, the NRC issued orders approving an indirect license transfer for V.C. Summer, Units 1, 2, and 3, and the independent spent fuel storage installation to Dominion Energy, related to the proposed merger. Santee Cooper's ownership interest in V.C. Summer Units 1, 2, and 3 and Unit 1's ISFSI was not changed as a result of the indirect license transfer. SCE&G's request to terminate the COLs remains pending.

On January 25, 2018, Duke Energy submitted a letter to the NRC requesting approval to terminate the COLs for Levy Nuclear Plant, Units 1 and 2, after Duke Energy announced it will no longer move forward with building the plant. On April 26, 2018, the NRC staff approved Duke Energy's request to terminate the COLs for Levy Nuclear Plant, Units 1 and 2. On June 22, 2018, Nuclear Innovation North America, LLC, requested that the NRC terminate the STP Units 3 & 4 COLs. The NRC approved this request and issued its termination of the COLs on July 13, 2018.

In this reporting period, the NRC completed its review of one COL application for a total of two units, as discussed below. The NRC currently has no COL applications under active review.

### Turkey Point Combined License Application

On June 30, 2009, Florida Power & Light Company submitted a COL application for two Advanced Passive 1000 (AP1000) units at the existing Turkey Point site in Miami-Dade

County, FL. The NRC staff completed its safety review of the COL application for the two AP1000 units and presented the final SER to the ACRS on August 19, 2016. The NRC issued the final SER for Turkey Point, Units 6 & 7, on November 10, 2016. The NRC issued its final EIS on October 28, 2016.

On May 2–3, 2017, the ASLB conducted an evidentiary hearing in Homestead, FL, in the contested proceeding involving the Southern Alliance for Clean Energy, the National Parks Conservation Association, and other joint intervenors. On July 10, 2017, the ASLB ruled in favor of the NRC staff and terminated the contested proceeding. On April 18, 2017, the City of Miami, City of South Miami, and Village of Pinecrest (petitioners) filed a new petition to intervene and request for hearing. On July 31, 2017, the ASLB rejected the proposed contention and terminated the contested proceeding involving those petitioners. The petitioners filed an appeal to the Commission. The Commission affirmed the Board's decision on December 11, 2017 (CLI-17-12). The mandatory hearing took place on December 12, 2017, and the Commission approved issuance of the COLs on April 5, 2018 (CLI-18-01). The NRC issued the COLs to Florida Power & Light Company for Turkey Point, Units 6 and 7, on April 12, 2018.

### **Construction Oversight under 10 CFR Part 52**

The NRC is implementing activities to oversee the safe construction and operational readiness of the two AP1000 units under construction at the Vogtle site. The NRC's Region II coordinates, plans, schedules, and implements the construction inspections in coordination with the licensee's construction schedules to verify compliance with the agency's regulations and to ensure that the new plants are built in accordance with their COLs. NRC inspections continue to focus on all inspection activities in support of inspections, tests, analyses, and acceptance criteria (ITAAC), including, but not limited to, welding, module installation, and civil and structural engineering activities, as well as any associated system tests. The NRC is developing an office instruction in support of the planning and inspection activities for the licensee's initial test programs. Communications with Vogtle management to assess the scope of construction and operational activities continue to inform NRC inspections.

The NRC has enhanced its public Web sites for the new units under construction to provide a convenient portal for stakeholders to find information related to ITAAC closure. The Web sites include links to the ITAAC hearing procedures, links to guidance on ITAAC closure, status reports for ITAAC notifications, and other upgrades for faster access to information such as departure reports and license amendments.

The NRC has implemented the Construction Reactor Oversight Process (cROP) at the site of the two new Vogtle reactor units. The cROP ensures safety and security through objective, risk-informed, transparent, and predictable NRC oversight during new reactor construction. Using practices similar to those of the ROP for operating reactors, the NRC continues to meet periodically with interested stakeholders to collect feedback on the effectiveness of the process, which the agency then considers in enhancing the cROP. The agency's most recent performance assessments demonstrate that the reactors are being constructed safely and both units are performing well against the cROP criteria. Plant assessments and the latest cROP-related information are publicly available on the NRC Web site.

Also, in anticipation of the final phase of construction, the NRC created the Vogtle Readiness Group (VRG), whose primary objective is to identify and resolve any licensing, inspection, or regulatory challenges or gaps that could affect the schedule for completion of Vogtle Units 3

and 4. The VRG Charter, issued in March 2018, identifies the steps the NRC is taking (including reviewing inspection results, assessing construction activities, reviewing system tests, and completing the transition to operations activities) to ensure that the regulatory requirements in the COLs will be met. The NRC is implementing an integrated project plan that overlays key NRC activities on the licensee's construction and startup schedule. The VRG ensures management attention to the timely implementation of the integrated project plan.

### *Vendor Inspections*

The NRC staff uses a Vendor Inspection Program (VIP) to confirm that reactor applicants and licensees are fulfilling their regulatory obligations to provide effective oversight of the supply chain. The NRC staff conducts inspections to verify the effective implementation of vendor quality assurance programs to ensure the quality of materials, equipment, and services supplied to the commercial nuclear industry. These inspections ensure that vendors maintain an effective system for reporting defects under the requirements of 10 CFR Part 21, "Reporting of Defects and Noncompliance," and verify the effective use of commercial-grade dedication programs for safety-related materials, equipment, and services. Other activities of the vendor inspection staff include resolving allegations, ensuring that counterfeit items are removed and prevented from use in safety-related applications, participating in international cooperation efforts, and developing industry consensus standards. VIP focus areas for new reactors include integrated system validation for the control room simulators, digital instrumentation and control systems, modular fabrication, safety-related valves, and reactor coolant pumps. For FY 2018, the NRC planned to perform approximately 25 percent fewer vendor inspections because of the completion of many of the structural modules for the Vogtle site and the cancellation of construction at the V.C. Summer site. The VIP met its goal of completing 25 inspections in FY 2018, in addition to supporting inspections of the initial test program for Vogtle, Units 3 and 4, and reviewing the quality assurance program for NuScale.

### *Operator Licensing*

The NRC staff in the Office of New Reactors (NRO) supports and provides programmatic oversight for Region II implementation of operator licensing training, procedure inspections, and licensee examinations.

NRO and Region II continue to review the lessons learned from operator licensing activities for the plants under construction at Vogtle and previously under construction at V.C. Summer (also referred to as "cold licensing activities"). Cold license examinations are administered before completion of preoperational and initial startup testing at new reactors. During this reporting period, NRO and Region II issued a series of recommendations for improving operator licensing activities at plants under construction. These recommendations came from the lessons-learned effort and include a proposal for a 10 CFR Part 55, "Operators' Licenses," rulemaking to address nuances associated with licensing operators at new reactors. As part of this effort, the staff expects to issue improved guidance for performing technical reviews of new simulators at the end of CY 2018. This effort included input from both internal and external stakeholders.

The staff continued preparations for operator licensing examinations for the NuScale SMR technology. This included an observation of main control room simulator scenarios at a NuScale facility and continued development of the knowledge and abilities catalog, from which the licensing examinations are generated.

## Non-Light-Water Reactors

As the NRC prepares to review and regulate a new generation of non-LWRs, it has developed a vision and strategy to ensure the agency's readiness to effectively and efficiently conduct its mission for these technologies. The staff described the vision and strategy in its report, "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," issued December 2016.

The NRC's non-LWR vision and strategy have three strategic objectives: (1) enhancing technical readiness, (2) optimizing regulatory readiness, and (3) optimizing communication. The NRC prepared implementation action plans (IAPs) to identify the specific activities that it will conduct in the near-term (0–5 years), midterm (5–10 years), and long-term (beyond 10 years) timeframes to achieve non-LWR readiness. To obtain stakeholder feedback, the NRC released the draft near-term IAPs in 2016 and the draft midterm and long-term IAPs in February 2017. The NRC updated and finalized its IAPs to reflect stakeholder feedback in July 2017.

The staff issued SECY-18-0011, "Advanced Reactor Program Status," on January 25, 2018 (ADAMS Accession No. ML17334B217). This paper provides the status of the NRC staff's activities related to advanced reactors, including the progress and path forward on each of the IAP strategies. It also summarizes the various external factors influencing the staff's preparations for possible licensing and deployment of advanced reactors.

As part of near-term IAP Strategy 1, the NRC is acquiring and developing sufficient knowledge, technical skills, and capacity to perform non-LWR regulatory activities. The NRC contracted with Oak Ridge National Laboratory to develop a 12-module training course on molten salt reactors. Approximately 90 NRC staff members attended the training between May and November 2017. The NRC also developed models of the competencies required for reviewing advanced reactor designs.

As part of near-term IAP Strategy 2, the NRC is acquiring and developing sufficient computer codes and tools to perform non-LWR regulatory reviews. The NRC has begun to identify and evaluate computer codes and tools and has documented the status of these efforts in the "Strategy 2 Near-Term Implementation Action Plan Progress Report for Fiscal Year 2017," dated November 24, 2017. An initial screening of analysis codes for design-basis and beyond-design-basis event simulation was completed, and a suite of tools for further examination and consideration has been identified. The staff had identified several functional areas to focus on in the near-term based on an assessment of the gaps between the current state and what is needed for advanced reactors. One of these areas is PRA. In 2017, the staff completed a report that documented the previous work and issues in the area of PRA, and identified several policy decisions that may need to be made for non-LWRs. In addition, the staff conducted a preliminary phenomena identification and ranking table (PIRT) exercise for molten salt reactors. The staff anticipates amending this PIRT once specific applications are submitted for review.

As part of near-term IAP Strategy 3, the NRC is working to optimize the regulatory framework for non-LWR reviews and licensing processes. On December 26, 2017, the NRC issued the final report "A Regulatory Review Roadmap for Non-Light Water Reactors," which describes potential examples of flexibility, including the use of a staged review process and conceptual design assessments during the preapplication period. Over the longer term, the NRC will examine whether a new risk-informed, performance-based regulatory framework for non-LWRs would be beneficial, effective, and efficient. The staff released final regulatory guide

(RG) 1.232, “Guidance for Developing Principal Design Criteria for Non-Light-Water Reactors,” on April 10, 2018. This activity is part of a joint initiative with the U.S. Department of Energy (DOE) to address a key portion of the licensing framework essential to advanced reactor technologies. The initiative addresses the general design criteria in Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50, which the NRC developed primarily for LWRs, by adapting them to the needs of advanced reactor design and licensing. The NRC has engaged with the Licensing Modernization Project (LMP), which is led by Southern Company and coordinated by NEI, with costs shared with DOE. The LMP’s objective is to develop technology-inclusive, risk-informed, and performance-based regulatory guidance for licensing non-LWRs for the NRC’s consideration and possible endorsement. The NRC has reviewed four LMP white papers and sent a letter to the LMP on February 21, 2018, concluding its review of the white papers. On March 29, 2018, the industry submitted a working draft of a consolidated guidance document, “Risk-Informed Performance-Based Guidance for Non-Light Water Reactor Licensing Basis Development,” to support discussions during an April 5 and 6, 2018, public meeting. The NRC also held public meetings on June 5 and 6, 2018, August 21, 2018, and September 13, 2018, to discuss Southern’s updated draft revisions “M” and “N” of the LMP document and to obtain stakeholder feedback on the NRC staff’s August 16, 2018, working draft of Regulatory Guide (DG) 1353 regarding potential endorsement of the LMP document. The staff and industry then briefed the ACRS Future Plant Design Subcommittee meeting on June 19, 2018. In preparation for the Future Plant Design Subcommittee meeting on October 30, 2018, industry issued its September 28, 2018, revision of the LMP document (as NEI 18-04) and the NRC staff released its September 28, 2018, working draft of DG-1353. The ACRS full committee is scheduled to meet in December 2018.

As part of near-term IAP Strategy 4, the NRC is working to facilitate the development of industry codes and standards needed to support the non-LWR life cycle. The NRC staff is actively participating in subgroups and working groups associated with the development of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section III, Division 5. The ASME B&PV Code, Section III, Division 5, provides rules for the design, construction, testing, certification, and quality assurance of high-temperature reactors and covers the use of metallic, graphite, and composite materials. The NRC has identified the 2017 edition of this standard for potential endorsement to improve the efficiency and effectiveness of the agency’s review process, provide the non-LWR designers a stable set of rules for reactor development, and facilitate the certification of non-LWR component vendors. The NRC staff is also participating in the Task Group on ASME/NRC Liaison for Division 5, which seeks NRC, DOE, and industry input in identifying gaps in ASME B&PV Code Section III, Division 5, that need to be resolved before the NRC considers endorsing it in 10 CFR 50.55a, “Codes and Standards.” The staff is also actively participating on several American Nuclear Society (ANS) standards working groups and consensus committees related to non-LWR safety standards and the joint ASME/ANS non-LWR PRA standard.

As part of near-term IAP Strategy 5, the NRC is identifying and resolving technology-inclusive (not specific to a particular non-LWR design or category) policy issues that affect regulatory reviews, siting, permitting, and licensing of non-LWR nuclear power plants. The technology-inclusive policy issues that the NRC staff has been discussing with stakeholders include the following:

- Siting—In November 2017, the NRC issued the draft white paper “Siting Considerations Related to Population for Small Modular and Non-Light Water Reactors.” The purpose of the paper was to facilitate stakeholder engagement in a potential policy issue involving siting considerations for SMRs and non-LWRs related to population distribution

and density. SECY-16-0012, “Accident Source Terms and Siting for Small Modular Reactors and Non-Light Water Reactors,” dated February 7, 2016, had previously identified this issue. During a May 3, 2018, public meeting, NEI provided feedback on behalf of its members in the nuclear industry, stating its position that RG 4.7, “General Site Suitability Criteria for Nuclear Power Stations,” should be updated to scale the population density guidance based on the smaller source term and lower probability of release anticipated for SMRs and advanced reactors. NEI plans to make a more specific proposal on potential updates to the RG. The staff will consider insights obtained from stakeholder discussions and determine whether clarifications to siting guidance or other actions would be beneficial to address siting criteria for SMRs and non-LWRs.

- Offsite Emergency Planning—Consistent with the Commission’s direction in 2015, the NRC staff is developing a proposed rule that would provide for alternative emergency preparedness requirements for SMRs and other new technologies. The proposed alternative emergency preparedness requirements adopt a consequence-oriented, risk-informed, and performance-based approach. In part, this rulemaking would reduce requests for exemptions from the current emergency preparedness requirements and promote regulatory stability, predictability, and clarity in the licensing process for these future facilities. The NRC published the regulatory basis on November 15, 2017. In support of the August 22, 2018, ACRS public meeting, the NRC staff made the preliminary proposed rule package publicly available (ADAMS Accession No. ML18213A278). The proposed rule is scheduled to be provided to the Commission in October 2018.
- Insurance and Liability—In SECY-11-0178, “Insurance and Liability Regulatory Requirements for Small Modular Reactor Facilities,” dated December 22, 2011, the NRC identified a potential inequity between the insurance requirements for facilities with power reactors that produce electrical power equal to or greater than 100 MWe per unit, and multi-module facilities with SMR designs that individually produce less than 100 MWe, but, in combination, produce more than 100 MWe. Since then, the NRC has prepared a comparative analysis of different SMR designs to further explore the potential inequity and is developing a SECY paper on this topic. In the paper, the NRC staff will discuss whether it recommends rulemaking or a change to the current interpretation of the definitions given in the Price-Anderson Act. In accordance with the latest version of the Price-Anderson Act, the NRC will prepare a report to Congress and an associated SECY paper, recommending the need for continuation or modification of the provisions of the Price-Anderson Act by December 31, 2021. The staff will address any changes that may be needed for non-LWRs and SMRs in that report and SECY paper.
- Security and Safeguards Requirements—On December 14, 2016, NEI submitted a white paper, “Proposed Consequence-Based Physical Security Framework for Small Modular Reactors and Other New Technologies.” This paper “proposes an approach to security that considers the enhanced safety and security incorporated into these designs and provides a more effective and efficient means to protect the public health and safety.” In the transmittal letter, NEI asked that “the NRC establish regulatory positions on this approach and the associated policy and technical issues.” The staff considered stakeholder input and prepared SECY-18-0076, “Options and Recommendation for Physical Security for Advanced Reactors,” which it sent to the Commission on August 1, 2018.

- Functional Containment Performance—On November 30, 2017, the NRC issued the draft white paper “Functional Containment’ Performance Criteria.” The purpose of the paper was to facilitate stakeholder engagement with a policy issue on the use of a functional containment approach for non-LWRs. The staff discussed the draft white paper with stakeholders on December 14, 2017, and February 1, 2018, and with the ACRS Future Plant Designs Subcommittee on February 22, 2018, and April 5, 2018. The ACRS provided a letter on May 10, 2018. The staff considered ACRS and stakeholder feedback and provided SECY-18-0096, “Functional Containment Performance Criteria for Non-Light-Water Reactors,” to the Commission on September 28, 2018.

As part of near-term IAP Strategy 6, the NRC is optimizing communications. The agency is conducting public meetings with stakeholders every 4 to 6 weeks. The NRC continues to meet with potential applicants upon request and to share information with various international groups, including the Organisation for Economic Co-operation and Development’s Nuclear Energy Agency, the International Atomic Energy Agency, the Generation IV International Forum, and the NRC’s international regulatory counterparts. The NRC chairs the Nuclear Energy Agency’s Working Group on the Safety of Advanced Reactors for international regulators of non-LWRs. The purpose of the group is to bring interested regulators together to discuss common interests, practices, and problems and to address both the regulatory interests and research needs in support of nuclear safety and security.

## **Regulatory Infrastructure**

The NRC continues to enhance its regulatory infrastructure with the goals of improving the planning, licensing, and oversight of future new reactor applications; making timely and effective policy decisions; and enhancing and updating regulatory guidance for large LWRs, SMRs, and non-LWRs. In addition to updating regulatory guidance, the NRC continues to review its internal processes to enhance the effectiveness and efficiency of its application review process. The NRC provides several opportunities for external stakeholder input as part of these enhancements. In addition, the NRC rigorously assesses licensing and oversight performance and uses the results to inform these regulatory infrastructure activities.

The previous section discussed infrastructure activities that are largely aimed at non-LWRs. The sections below describe other infrastructure activities conducted during the reporting period.

### *Revision to Regulatory Guide 1.206*

The NRC is revising RG 1.206, “Combined License Applications for Nuclear Power Plants,” issued June 2007, to include applicants for all licensing processes under 10 CFR Part 52, including design certifications and ESPs. In June 2017, the staff issued a draft of the proposed revision, DG-1325, “Applications for Nuclear Power Plants,” for formal public comment. The draft guide captured important lessons learned from recent licensing actions on large LWRs and was informed by a series of public meetings. The NRC received comments on DG-1325 in September 2017 and issued the revised guide on October 12, 2018.

### *NUREG-0800*

The NRC staff continues its systematic update of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” (SRP), to support its

reviews of applications for COLs, design certifications, and ESPs; limited work authorization requests; and license amendment requests. During this reporting period, the staff issued eight draft SRP sections and one final SRP section. The draft SRP sections addressed hydrologic issues such as tsunami hazards and channel mitigation or diversion; geologic issues such as surface faulting; meteorological issues such as onsite meteorological monitoring programs; physical security and operational programs; fracture toughness requirements; and ITAAC for piping systems and components. The final SRP section addressed physical security for COLs and operating reactors.

### *Environmental Guidance Updates*

The NRC staff published Revision 3 of RG 4.2, "Preparation of Environmental Reports for Nuclear Power Stations," in the *Federal Register* on September 24, 2018. The agency had issued the previous revision (Revision 2) of RG 4.2 in July 1976. The staff is currently updating NUREG-1555, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan," last revised in July 2007. The revisions will incorporate lessons learned from the first set of environmental reviews for new reactors and address reviews of SMRs, greenhouse gas emissions, and issues related to climate change. The NRC expects to publish a draft of the revised NUREG-1555 for public comment in June 2019. The revised guidance will improve the effectiveness of the staff's reviews of applications for ESPs, design certifications, and COLs; limited work authorization requests; and license amendment requests.

## **X. Response to Lessons Learned from the Fukushima Accident in Japan**

The NRC's response to the lessons learned from the Fukushima accident in Japan during the reporting period has focused on implementing the highest priority (Tier 1) activities. The agency continued to assign resources to address these activities while ensuring a balance between implementing lessons learned from Fukushima and ensuring that those efforts do not displace ongoing work of greater safety benefit, work that is necessary to maintain safety, or other higher priority work.

The NRC continues to review nuclear power plant licensee plans to achieve compliance with the mitigating strategies and spent fuel pool instrumentation orders issued March 12, 2012. The NRC has been issuing safety evaluations documenting its assessment of licensees' implementation plans and inspecting licensees' implementation of these important safety improvements. As of September 28, 2018, all operating units have fully implemented the mitigating strategies order, and the NRC has completed inspections at more than 90 percent of operating power reactor sites. All licensees have also implemented the spent fuel pool instrumentation order.

In June 2013, the NRC issued a revised order requiring boiling-water reactors with Mark I and II containments to install a hardened containment vent capable of withstanding a severe accident. Licensees are implementing this order in two phases, with the first phase addressing venting of the wetwell, and the second addressing either venting of the drywell or management of water addition to prevent the need to vent the drywell. All operating units subject to the order have reported compliance with Phase 1 of the order, with the exception of two sites that are scheduled to permanently shut down in 2018 and 2019. In November 2017, the first operating reactor site achieved full compliance with both phases of the order. The NRC issued its safety evaluation of this site in late April 2018 and completed the subsequent inspection in July. The remaining operating reactor sites subject to this order are scheduled to complete the

requirements and achieve full compliance no later than mid-2019, with the exceptions noted above. The NRC will continue to issue safety evaluations documenting its assessment of licensees' final implementation plans and will then inspect licensees' implementation of these important safety improvements into mid-2020.

Also on March 12, 2012, the NRC issued a 10 CFR 50.54(f) request for information asking nuclear power plant licensees to reevaluate flooding and seismic hazards that could affect their sites. If these newly reevaluated hazards are not bound by the current design basis, licensees must determine whether interim protective measures are necessary while they complete a longer term evaluation of the hazard's impact on the plant.

Following Commission direction, the NRC staff is now implementing the closure plan for the flooding hazard reevaluations. As part of this plan, all sites have completed flooding hazard reevaluation reports (FHRRs) and submitted them to the NRC for review. The NRC staff has reviewed the FHRRs and has issued interim evaluations, also called interim hazard letters, to all licensees. The NRC staff has also issued staff assessments fully documenting its review of the FHRRs for 58 sites and expects to complete the remaining staff assessments in 2018. Licensees were expected to use the information in these letters to ensure that their mitigating strategies can be implemented under the reevaluated hazard conditions. As of April 2, 2018, all sites had completed flooding mitigating strategies assessments (MSAs) to address the impact of the reevaluated flooding hazards on the strategies they developed under the mitigating strategies order.

Depending on site-specific considerations, other evaluations may be required beyond those associated with mitigating strategies. The staff determined the need for any other evaluations using a graded approach to ensure that plants are appropriately protected against the reevaluated flooding hazards. This graded approach focuses on areas with the greatest potential safety benefit. Those sites that had flood-causing mechanisms that exceeded their current design basis are required to perform an additional analysis (e.g., focused evaluation or integrated assessment) to evaluate the site response to the updated flood hazard. The NRC expects to receive most of the additional analyses by the end of 2018 and a few analyses in early 2019. The NRC has already received 44 of the expected 54 additional analyses. As of September 28, 2018, the NRC staff completed its assessment and closed out all required actions concerning flooding hazard reevaluations for 44 sites.

In October 2015, the NRC issued a letter establishing the final list of operating reactor sites that will be required to perform a full seismic probabilistic risk assessment (SPRA) and other seismic evaluations. As discussed in that letter and a subsequent letter in December 2016, 18 sites (32 units) are required to perform an SPRA. For the remaining reactors, the NRC staff concluded that sufficient margin exists that a detailed SPRA is not necessary. Licensees for six sites have submitted their SPRAs, and the NRC is expecting all but one SPRA submittal to be completed by December 2019. (One site has received an extension to August 2021, which is after its expected shutdown date.) Of the remaining sites, 38 were expected to perform limited-scope evaluations (i.e., a high-frequency evaluation, low-frequency evaluation, or spent fuel pool evaluation). These limited-scope evaluations are all complete. Eleven sites screened out and did not need to perform any further seismic evaluations.

In December 2014 or January 2016, the 34 sites that are required to conduct an SPRA or limited scope evaluation submitted interim actions or evaluations as part of the expedited seismic evaluation process. These evaluations assessed systems and components used to shut down a plant safely under certain accident conditions to (1) confirm that a plant has

sufficient margin to continue with a longer term evaluation without any plant modifications, or (2) identify the need to enhance the seismic capacity of the plant. The NRC staff completed its review of the submittals for the expedited seismic evaluation process and found them acceptable.

Licenses are expected to use their reevaluated seismic hazard information to ensure that they can implement mitigating strategies under the reevaluated hazard conditions. As of September 28, 2018, 48 operating reactor sites completed their seismic MSAs. The remaining sites will submit their MSAs coincident with their SPRA. As of September 28, 2018, the NRC staff completed its assessment and closed out all required actions concerning seismic hazard reevaluations for 45 sites.

As of September 28, 2018, 24 operating power reactor sites have completed all post-Fukushima activities in response to the three orders and 10 CFR 50.54(f) request for information. The NRC staff will oversee compliance with the NRC's post-Fukushima requirements through the ROP. In addition, the Commission is considering a draft final rule on mitigation of beyond-design-basis events. The draft final rule would make generically applicable the post-Fukushima regulatory actions addressing the mitigation of beyond-design-basis external events.

The Fukushima-related activities described above demonstrate consistent progress in completing safety enhancements at U.S. facilities in response to lessons learned from the accident. As expected, most of the safety benefits from the post-Fukushima enhancements were in place by December 31, 2016. The ongoing work is primarily associated with completing implementation of the order for the severe-accident-capable hardened containment vents, activities associated with reevaluating flooding and seismic hazards, post-order compliance inspections, and implementation of long-term NRC oversight.

## **XI. Planned Rulemaking Activities**

The attached report lists the status of NRC rulemaking activities as of October 5, 2018, including their priorities and schedules. Of a total of 82 rulemaking activities, 59 rulemakings are planned activities. The NRC is reviewing 23 petitions for rulemaking. The 59 planned rulemaking activities include 10 rulemakings in response to industry requests, 10 rulemakings that could reduce or clarify existing requirements, 20 rulemakings that would comply with congressional statute or conform NRC regulations to other agency requirements or to international treaties or agreements, and 19 rulemakings that could establish new requirements. The NRC uses a single tracking and reporting system to provide real-time updates on all NRC rulemaking activities. Members of the public can access the NRC's rulemaking activity information at <https://www.nrc.gov/about-nrc/regulatory/rulemaking/rules-petitions.html>.