

**POLICY ISSUE**  
**Information**

January 18, 2017

SECY-17-0009

FOR: The Commissioners

FROM: Victor M. McCree  
Executive Director for Operations

SUBJECT: STAFF'S STATEMENT IN SUPPORT OF THE UNCONTESTED  
HEARING FOR ISSUANCE OF A COMBINED LICENSE FOR NORTH  
ANNA POWER STATION UNIT 3

PURPOSE:

The U.S. Nuclear Regulatory Commission's (NRC or Commission) staff has completed its review of the application for a combined license (COL) to authorize construction and operation of North Anna Unit 3, located in Louisa County, Virginia. This subsequent combined license (SCOL) application incorporates by reference the codified version of the Economic Simplified Boiling Water Reactor (ESBWR) design certification rule (DCR) which is contained in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 52, Appendix E, "Design Certification Rule for the U.S. Economic Simplified Boiling Water Reactor." The ESBWR DCR was published in the *Federal Register* (FR) on October 15, 2014 (79 FR 61943), and was effective November 14, 2014. The ESBWR DCR references Revision 10 of the ESBWR Design Certification Document (DCD), dated April 1, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14104A929). In addition, the applicant incorporates by reference the North Anna Power Station (NAPS) early site permit (ESP) (ESP-003), last amended on January 30, 2013 (ADAMS Accession No. ML12297A207).

The staff presents this information paper pursuant to the revised Internal Commission Procedures dated March 24, 2016. Issuance of this paper follows the issuance of the North Anna Unit 3 COL final safety evaluation report (FSER) on January 12, 2017 (ADAMS Accession No. ML16259A210). The agency issued the North Anna Unit 3 COL final supplemental

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environmental impact statement (hereafter referred to as the COL SEIS), NUREG 1917, "Supplemental Environmental Impact Statement for the Combined License (COL) for North Anna Power Station Unit 3" Final Report, in March 2010 (ADAMS Accession No. ML100680117). This Commission paper references a draft COL for North Anna Unit 3 and a draft record of decision (ADAMS Accession Nos. ML16242A135 and ML16275A000, respectively).

This paper serves as the staff's primary prefiled testimony for the uncontested (mandatory) hearing for determining whether to issue the COL for North Anna Unit 3. This paper, with its references, also provides the information requested to support the Commission's determination that the staff's review has been adequate to support the findings set forth in 10 CFR 52.97, "Issuance of Combined Licenses," and 10 CFR 51.107, "Public hearings in proceedings for issuance of combined licenses; limited work authorizations."

In accordance with the Internal Commission Procedures, this paper focuses on nonroutine matters with regard to areas of particular importance in supporting the findings related to 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," and 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." Nonroutine matters are matters that relate to any unique features of the facility or novel issues that arose as part of the review process.

The staff's review of the combined license application (COLA) for North Anna Unit 3 is complete.

#### SUMMARY:

This paper addresses each of the findings in 10 CFR 52.97(a) and 10 CFR 51.107(a) and (d) and provides an adequate basis for the Commission to conclude that each of these findings can be made for the COLA for North Anna Unit 3. This paper also focuses on nonroutine matters such as unique features of the facility or novel issues that arose as part of the review process. This paper does not address routine aspects of the safety and environmental review process.

#### BACKGROUND:

##### I. Application History

###### *Application, Ownership, and Location*

On November 27, 2007, Virginia Electric and Power Company, doing business as Dominion Virginia Power (Dominion) and Old Dominion Electric Power Company (ODEC), submitted an application to the NRC for a COL to construct and operate an ESBWR at the NAPS ESP site in Louisa County, Virginia (ADAMS Accession No. ML073320913). The site of the proposed North Anna Unit 3 is within the existing boundaries of the currently operating NAPS site. The site is located on the shore of Lake Anna, approximately 64 kilometers (km) (40 miles (mi)) north-northwest of Richmond, Virginia. Two operating nuclear generating units, North Anna Units 1 and 2, are located within the NAPS site.

Dominion most recently updated the COLA for North Anna Unit 3 on June 30, 2016 (ADAMS Accession No. ML16208A322). The publicly available portions of the application are available in ADAMS and on the NRC Web site at <http://www.nrc.gov/reactors/new-reactors/col/north-anna/documents.html>. Portions of the application that contain nonpublic information, including

the security plan, which contains Safeguards Information, are located on the NRC's secure local area network.

Dominion is a regulated public utility engaged in the power generation and electric service delivery business within a 96,600 square kilometer (30,000 square mile) service area in Virginia and northeastern North Carolina. On March 8, 2012, Dominion updated the COLA for North Anna Unit 3 (ADAMS Accession No. ML12090A199). In the revised application, Dominion stated that it has acquired sole title to the portion of NAPS on which Unit 3 would be located, would own Unit 3, and would construct and operate Unit 3. Dominion and ODEC own the remainder of NAPS, including the existing nuclear units and the independent spent fuel storage installation (ISFSI) at that site, as tenants in common, with respective undivided ownership interests of 88.4 and 11.6 percent, respectively. Dominion is the licensed operator of the existing facilities, with control of the NAPS site and existing facilities and authority to act as ODEC's agent. Dominion currently owns Surry Nuclear Plant, Units 1 and 2; Kewaunee Power Station; and Millstone Power Station, Units 2 and 3.

Additional information about the applicant and ownership appears in Part 1 (General and Financial Information) of the COLA for North Anna Unit 3. Additional information about the site location and characteristics appears in Part 2 (Final Safety Analysis Report (FSAR)), Chapters 1 and 2, of the COLA. As noted previously, the COLA references the NAPS ESP, by which the NRC approved the suitability of the site.

#### *Referenced Design Certification*

The COLA for North Anna Unit 3 references the ESBWR certified design. GE-Hitachi Nuclear Energy was the applicant for the certification of the ESBWR design. The NRC issued the FSER as NUREG-1966, "Final Safety Evaluation Report Related to the Certification of the Economic Simplified Boiling-Water Reactor Standard Design," in April 2014 (ADAMS Accession No. ML14100A304) and supplemented it in September 2014. On October 15, 2014, the NRC published the ESBWR design certification final rule (ADAMS Accession No. ML14274A552) in the (FR) (79 FR 61943). The COLA for North Anna Unit 3 references the ESBWR certified design, including DCD Revision 10, as documented in Appendix E, "Design Certification Rule for the ESBWR Design," to 10 CFR Part 52.

#### *Referenced Early Site Permit*

The COLA for North Anna Unit 3 incorporates by reference the NAPS ESP (ESP-003), (ADAMS Accession No. ML12297A207). To document its review of the ESP application, the NRC issued an FSER in September 2005 (NUREG-1835), which was supplemented in November 2006 (ADAMS Accession Nos. ML052710305 and ML063170371, respectively.) The staff issued a final environmental impact statement (EIS) (NUREG-1811, Volumes 1 and 2) for the ESP in December 2006 (ADAMS Accession Nos. ML063480261 and ML063480263). Following an uncontested (mandatory) hearing, the Atomic Safety and Licensing Board (ASLB) issued findings and an order authorizing issuance of the ESP (ADAMS Accession No. ML071800470) on June 29, 2007.

The NAPS ESP authorizes certain activities related to the construction of up to two nuclear units at the NAPS site. The NRC reviewed and approved those activities in accordance with the regulations in effect on September 25, 2003 (the date of the ESP application submittal), and referred to the rules in effect at that time. The ESP contains terms and conditions related to the authorized construction activities. The ESP also states that a COLA referencing the ESP will

include an environmental protection plan (EPP) for the construction and operation of the proposed reactor.

On October 9, 2007, the NRC published revisions to its rule related to limited work authorizations (LWA) (72 FR 57422). The revised 10 CFR 50.10 includes a definition of “construction” that excludes from NRC jurisdiction certain activities such as site preparation and building of service facilities for the site. However, in the statement of considerations for this rulemaking, the agency indicated that the ESP applications under consideration as of the effective date of the LWA final rule, which include a request to conduct LWA activities, need not comply with the content of application requirements in the final rule. The term “construction” in the NAPS ESP EIS and COL SEIS therefore includes activities that are now considered “preconstruction” in the Office of New Reactors (NRO) EISs that the NRC issued based on the revised rule.

#### *Overview of the Approach for a Combined License Referencing an Early Site Permit*

For a COLA that references an ESP, the NRC staff prepares a supplement to the ESP EIS in accordance with 10 CFR 51.92(e). Therefore, the staff relied upon the analysis in the NAPS ESP EIS as the basis for preparing the COL SEIS. The NAPS ESP used the plant parameter envelope (PPE) approach, in which no specific reactor design was chosen as the source of parameters for analysis during the ESP review. Instead, the review relied upon a set of design parameters that served as a surrogate for actual design information. The applicant’s environmental report in support of the ESP, and subsequently the staff’s ESP EIS, evaluated the impacts at the site from the construction and operation of two new units with design characteristics bounded by a PPE. At the ESP stage, Dominion deferred topics that, under NRC regulations, are optional for ESP applicants, namely: the analyses of the economic, technical, and other benefits and costs of the project; the evaluation of alternative energy sources; and the analysis of the severe accident mitigation design alternatives. Consequently, pursuant to 10 CFR 51.92, “Supplement to the Final Environmental Impact Statement,” the staff’s environmental review of the COLA for North Anna Unit 3 focused on those issues that were either deferred or unresolved at the ESP stage and any new and potentially significant information for issues that were resolved during the ESP review, including information where the chosen ESBWR design fell outside the design parameters specified in the ESP.

For information to be significant for consideration in the environmental review of a COLA referencing an ESP, it must have the potential to affect the staff’s finding or conclusions from the ESP EIS. The staff’s environmental review of the COLA included an audit where the staff reviewed environmental information and analyses conducted by the applicant in the preparation of its environmental report for the COLA and evaluated the applicant’s methodology for identifying and evaluating the significance of new information to determine if the applicant’s process was reasonable. Based on its independent review, the staff determined that the applicant’s process was a reasonable approach for identifying and evaluating new and potentially significant information. The staff identified additional new information that warranted further analysis and evaluated it in the course of the staff’s preparation of the COL SEIS.

Dominion’s COLA includes an EPP that the staff evaluated in the COL SEIS. This EPP contains measures and controls related to the construction and operation of North Anna Unit 3, including provisions that consistent with 10CFR 51.50(c)(1)(v) were evaluated and approved in the ESP. The staff’s proposed EPP includes applicable measures and controls proposed by Dominion in its COLA EPP.

*Design-Centered Review Approach; Change to U.S. Advanced Pressurized-Water Reactor Design and Back to ESBWR*

Regulatory Issue Summary 2006-06, “New Reactor Standardization Needed to Support the Design-Centered Licensing Review Approach,” dated May 31, 2006 (ADAMS Accession No. ML053540251), describes the design-centered review approach (DCRA). The DCRA is a policy intended to promote COLA standardization. In this approach, the NRC designates the first COL referencing a design as the reference combined license (RCOL) and considers additional COLs as SCOLs. This policy directs the staff to perform one technical review for each standard issue outside the scope of the design criteria and to use this decision to support decisions on multiple COLAs. In this context, “standard” refers to essentially identical information and may include information provided by the applicant(s) to resolve plant-specific issues.

When Dominion originally submitted the COLA for North Anna Unit 3 in November 2007 the NRC designated it as the RCOL for the ESBWR design center. The staff issued a safety evaluation report (SER) with open items that documented a review of both standard and site-specific information. In May 2010 Dominion informed the NRC that it had changed reactor technology and had selected the U.S. Advanced Pressurized-Water Reactor (US-APWR) for its COLA for North Anna Unit 3. By letter dated April 25, 2013, Dominion notified the NRC staff that it planned to revert back to ESBWR reactor technology for its COLA for North Anna Unit 3. Dominion then submitted a revised application that incorporated by reference the ESBWR DCD, Revision 9, by letter dated December 18, 2013. Because Fermi Unit 3 had become the RCOL for the ESBWR in the interim, North Anna Unit 3 became an SCOL for the ESBWR design center and incorporated all responses to standard requests for additional information (RAI) in its FSAR.

When Dominion announced its decision to switch from the ESBWR to the US-APWR design in 2010, the staff had already completed its environmental review and had issued the COL SEIS (March 2010). Based upon Dominion’s revised application to change its referenced design to the US-APWR, the staff determined this change warranted a supplement to the COL SEIS. On February 7, 2011, the staff issued a notice of intent to prepare an SEIS in conjunction with its review of Dominion’s revised application. When Dominion notified the NRC of its intent to revert back to the ESBWR design (April 2013) the staff had not yet completed its draft supplement to the COL SEIS. Although the ESBWR design was the design evaluated in the COL SEIS, the design had changed in areas that could affect environmental determinations, as documented in the COL SEIS. The staff completed a review of those changes, along with an evaluation of new information unrelated to the reactor design change. The staff determined that none of the new information identified to date was sufficiently significant to warrant continuing with the staff’s intent to prepare an SEIS. Therefore, on January 29, 2015, the NRC withdrew its previously noticed intent to supplement the COL SEIS (80 FR 4949).

*Advisory Committee on Reactor Safeguards*

To support the Advisory Committee on Reactor Safeguards (ACRS) in providing an independent review and report to the Commission on the COLA for North Anna Unit 3, the staff presented the results of its safety review to the ESBWR subcommittee on October 19, 2016. The staff presented the results of its review of the COLA for North Anna Unit 3 to the ACRS Full Committee on November 9, 2016. ACRS issued its final letter regarding the North Anna COLA

on November 15, 2016 (ADAMS Accession No. ML16312A412). This letter is discussed further below.

## II. Outreach

### *Public Meetings*

Before the NRC docketed the COLA for North Anna Unit 3, the staff held a public outreach meeting in Louisa County, Virginia, on October 24, 2007, to discuss the safety and environmental review of the anticipated COLA, to describe opportunities for public participation in the review process, and to take questions from the public. On April 16, 2008, the staff held a scoping meeting in Louisa County, Virginia, to discuss the environmental scoping process and to give members of the public an opportunity to comment on environmental issues that the NRC should consider during its review of the application. After issuing the draft SEIS (DSEIS) in December 2008 the staff held a public meeting in Louisa County, Virginia, on February 3, 2009, to present an overview of the DSEIS and to accept comments on the document.

While reviewing the application, the staff conducted approximately 100 public meetings and public conference calls.

### *Federal Register Notices*

The NRC published FR notices, as required, for key milestones of the licensing process as follows:

- On December 4, 2007, the NRC published a notice of issuance of ESP-003 to Dominion Nuclear North Anna, LLC, for approval of a site located near Lake Anna in Louisa County, VA, approximately 64 km (40 mi) north-northwest of Richmond, Virginia, for one or more nuclear power reactors (72 FR 68202).
- After the NRC received the COLA on November 27, 2007, the agency published notice of such receipt in the FR on December 12, 2007 (72 FR 70619).
- The NRC docketed the COLA on January 28, 2008, and published a notice of docketing on February 4, 2008 (73 FR 6528).
- On March 10, 2008, the NRC published a notice of hearing and opportunity to petition for leave to intervene (73 FR 12760). On April 18, 2008, the NRC published a supplement to the notice of hearing and opportunity for leave to intervene, which included procedures for access to sensitive unclassified non-Safeguards Information and Safeguards Information for contention preparation (73 FR 12760). On June 2, 2008, the NRC published a correction to the notice of hearing and opportunity for leave to intervene to correctly identify the applicants (73 FR 31516).
- On March 13, 2008, the NRC published a notice of intent to prepare an SEIS (73 FR 13589). On July 17, 2008, the NRC published a correction and supplement to the notice of intent to prepare an SEIS (73 FR 41132).

- On December 24, 2008, the NRC published a notice of the availability of the draft COL SEIS for public comment and notice of public meetings to present an overview of the draft COL SEIS and accept public comments (73 FR 79197).
- On March 24, 2010, the NRC published a notice of availability of the COL SEIS for North Anna Unit 3 (75 FR 14207).
- On February 7, 2011, the NRC published a notice of intent to prepare an SEIS and conduct scoping in conjunction with its review of Dominion's revised application for the US-APWR (76 FR 6638).
- On January 29, 2015, the NRC published a notice of withdrawal of its intent to prepare an SEIS, based on the applicant's decision to return to the ESBWR, which was the design originally referenced and evaluated in the COL SEIS (80 FR 4949).
- On April 27, May 4, May 11, and May 18, 2016, the NRC published notices of the COLA in accordance with Section 182c of the Atomic Energy Act of 1954, as amended (AEA), and 10 CFR 50.43(a)(3) (81 FR 24900, 81 FR 26837, 81 FR 29308, and 81 FR 31263).

### *Consultations*

In accordance with Section 657 of the Energy Policy Act of 2005, the NRC consulted with the U.S. Department of Homeland Security. As part of its environmental review in accordance with the National Environmental Policy Act (NEPA) and other applicable statutes, including the Endangered Species Act and the National Historic Preservation Act, the staff consulted with and obtained input from the appropriate Federal, State, local, and Tribal organizations. Consultation with U.S. Fish and Wildlife Service (USFWS) is currently in progress to determine whether that agency concurs with the staff's determination that the construction and operation of North Anna Unit 3 will have no adverse effect on Federally protected species.

### *Adjudicatory Actions*

On March 10, 2008, the NRC published in the FR (73 FR 12760) a notice of hearing and opportunity to petition for leave to intervene in the North Anna Unit 3 COL proceeding.<sup>1</sup> On April 18, 2008, the NRC published in the FR (73 FR 21162) a supplement to the notice of hearing and opportunity to petition for leave to intervene. Two organizations, Blue Ridge Environmental Defense League (BREDL), and People's Alliance for Clean Energy (PACE), petitioned for leave to intervene (ADAMS Accession No. ML081330002). The North Carolina Utilities Commission (NCUC) submitted a request to participate as an interested State under 10 CFR 2.315 (ADAMS Accession No. ML081300423). On August 15, 2008, an ASLB established for the COL proceeding granted BREDL's petition and approved NCUC's request to participate. The Board found that PACE lacked standing and denied its petition. Of BREDL's contentions, the Board only admitted Contention 1 (ADAMS Accession No. ML082320065). This contention, as narrowed by the Board, alleged that Dominion's COLA failed to adequately explain how Dominion would meet regulations on the disposal of Class B and C low-level radioactive waste (LLRW) in the absence of an offsite disposal facility.

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<sup>1</sup> For background on contested adjudicatory matters resolved in the NAPS ESP proceeding, see LBP-06-24, 64 NRC 360 (2006).

Dominion subsequently filed an update to its COLA on May 21, 2009, which provided its plan for managing LLRW (ADAMS Accession No. ML091520636). The Board found that this additional information made Contention 1 moot and, therefore, dismissed it (ADAMS Accession No. ML092310462). However, the Board retained jurisdiction over the case to consider a new LLRW contention submitted on June 26, 2009. The Board admitted the new contention, in part, on November 25, 2009 (LBP-09-27, ADAMS Accession No. ML093290168).

Contention 10, as narrowed by the Board, challenged the Dominion claim that good fuel performance would reduce the volume of Class B and C waste generated and thus questioned the adequacy of Dominion's LLRW management plan. On June 29, 2010, Dominion filed a notice of revision of its COLA, incorporating the US-APWR design instead of the ESBWR. As the revised COLA did not contain the claim of improved fuel efficiency, the Board found that Contention 10 was moot and dismissed it (LBP-10-17, ADAMS Accession No. ML102450665). In the same order, the Board denied admission of an additional proposed contention. Although this resolved all admitted and pending contentions, the Board retained jurisdiction to consider new contentions BREDL might file pursuant to a previous scheduling order.

On September 22, 2011, BREDL submitted Contention 14, concerning the necessity of changes to the COLA in light of an earthquake that occurred near the proposed reactor site on August 23, 2011. Following a consent motion by all parties, Contention 14 was held in abeyance pending an assessment by Dominion of whether changes to the Unit 3 application should be made in light of the earthquake (ADAMS Accession No. ML11293A207).

While Contention 14 was still in abeyance, Dominion appealed the Board's decision not to terminate the hearing after the resolution of all other contentions. Dominion argued that the Board should have terminated the hearing at that point, as there were no unresolved contentions remaining. The Commission agreed with Dominion that the Board had erred in keeping the adjudicatory record open; the Commission held that new contentions would need to meet the standards for reopening the record, and it remanded the proceeding to the Board for the limited purpose of ruling on a motion to reopen the record with respect to Contention 14 (CLI-12-14, ADAMS Accession No. ML12159A164).

On March 7, 2014, BREDL filed a motion to reopen the proceeding and admit an amended Contention 14. On June 13, 2014, the Board denied the motion and rejected Contention 14 (LBP-14-08, ADAMS Accession No. ML14164A543).

A contention, motion to reopen, and suspension petition concerning safety issues related to the disposal of spent nuclear fuel were filed in this proceeding and others on September 29, 2014. The Commission denied the contention, motion to reopen, and suspension petition on February 26, 2015 (CLI-15-4, ADAMS Accession No. ML15057A288). On January 28, 2015, a petition was filed to supplement the EISs in this and other proceedings to reference the "Continued Storage" generic environmental impact statement (GEIS) (NUREG-2157; see below). The Commission denied this petition on April 23, 2015 (CLI-15-10, ADAMS Accession No. ML15113A280). The intervenors subsequently filed a hearing request, intervention petition, and motion to reopen, seeking admission of a "placeholder" contention on the NRC's reliance on the Continued Storage Rule and GEIS. The Commission denied these requests on June 9, 2015 (CLI-15-15, ADAMS Accession No. ML15160A174).

Currently, all contested issues in this proceeding have been resolved.

### *Other Significant Adjudicatory Matters*

Following the accident at the Fukushima Dai-ichi nuclear power plant in Japan in March 2011 a petition to suspend all reactor licensing decisions and certain aspects of ongoing licensing proceedings were filed in several proceedings beginning on April 14, 2011. Although the petition was not filed in this proceeding, the petition filed in other proceedings included references to North Anna Unit 3. On September 9, 2011, the Commission denied the suspension petition but granted the intervenors' request for a safety analysis to the extent that the NRC would conduct a short-term and long-term lessons-learned analysis of the Fukushima accident (CLI-11-05, ADAMS Accession No. ML11252B072).

On February 27, 2014, a petition was filed in this and other proceedings to suspend licensing decisions pending the resolution of a rulemaking petition on the environmental impacts of high-density spent fuel pool storage. The Commission denied this petition on July 17, 2014 (CLI-14-07, ADAMS Accession No. ML14198A127).

### III. Review Process/Methodology

The key processes and methodologies used to ensure quality, consistency, and completeness in the preparation of the FSER and COL SEIS are described below.

**NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition”** (ADAMS Accession No. ML070660036). The principal purpose of the Standard Review Plan (SRP) is to ensure the quality and uniformity of staff safety reviews. The staff uses the SRP as a routine tool for evaluating the safety of nuclear power plant designs. The SRP, comprehensively updated in 2007, is the most definitive basis available for demonstrating whether an application meets the Commission’s regulations. Each section of the SRP outlines the specific regulations that will be met when the review is complete, including the general design criteria (GDC) from Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities.”

**NUREG-1555, “Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan.”** This guidance, including a 2007 update that addresses environmental reviews for COLAs, includes environmental SRPs that staff uses when conducting environmental reviews of applications related to nuclear power plants, in accordance with NEPA and the NRC’s NEPA implementing regulations in 10 CFR Part 51.

**NUREG-2157, “Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel,”** issued September 2014 (ADAMS Accession No. ML14198A440). The NRC prepared a final GEIS that establishes a regulatory basis for the final rule entitled “Continued Storage of Spent Nuclear Fuel.” As directed by 10 CFR 51.23(b), the impacts assessed in NUREG-2157 are deemed to be incorporated in an EIS for an ESP or a COL.

**SRM-SECY-12-0025, “Proposed Orders and Requests for Information in Response to Lessons Learned from Japan’s March 11, 2011, Great Tohoku Earthquake and Tsunami,”** dated March 9, 2012 (ADAMS Accession No. ML120690347). This staff requirements memorandum (SRM) gives direction to the staff on implementing the Commission-approved recommended actions to be taken in response to Fukushima lessons learned.

**SECY-06-0019, “Semiannual Update of the Status of New Reactor Licensing Activities and Future Planning for New Reactors,”** dated January 31, 2006 (ADAMS Accession No. ML053530315). Under the DCRA, NRO has used, to the extent practicable, a “one issue—one review—one position” strategy to optimize the review effort and resources needed to perform these reviews. Within the ESBWR design center, the staff has conducted one technical review for each reactor design issue and is using this one decision to support the review of multiple COLAs.

**Regulatory Guides.** Regulatory guides (RGs) provide guidance to licensees and applicants on implementing specific parts of the NRC’s regulations, techniques used by the staff in evaluating specific problems or postulated accidents, and data needed by the staff in its review of applications for permits or licenses. Chapter 1, Table 1.9-202, “Conformance with Regulatory Guides,” of the applicant’s FSAR identifies the RGs associated with the COLA for North Anna Unit 3 and notes whether the applicant conformed to or departed from each RG. This list does not include departures from regulatory guidance associated with the ESBWR DCD and the NAPS ESP that have been incorporated by reference.

**Interim Staff Guidance.** For areas where the existing SRP does not contain review guidance, the staff prepared and used interim staff guidance (ISG) documents, found at <http://www.nrc.gov/reading-rm/doc-collections/isg/>. The ISGs clarify technical review approaches and address questions related to processes and licensing. The following list indicates the ISGs the staff used in the review of the COLA for North Anna Unit 3 and the FSER section(s) to which each ISG primarily relates:

- DC/COL-ISG-1, “Interim Staff Guidance on Seismic Issues of High Frequency Ground Motion,” dated May 19, 2008; FSER Section 3.7.2
- DC/COL-ISG-7, “Assessment of Normal and Extreme Winter Precipitation Loads on the Roofs of Seismic Category I Structures,” dated June 23, 2009; FSER Section 2.3.1
- DC/COL-ISG-8, “Necessary Content of Plant-Specific Technical Specifications,” dated December 9, 2008; FSER Chapter 16
- DC/COL-ISG-13, “Assessing the Radiological Consequences of Accidental Releases of Radioactive Materials from Liquid Waste Tanks for Combined License Applications,” issued January 2013; FSER Sections 2.4.13, 11.2
- DC/COL-ISG-14, “Assessing the Radiological Consequences of Accidental Releases of Radioactive Materials from Liquid Waste Tanks in Ground and Surface Waters for Combined License Applications,” issued January 2013; FSER Sections 2.4.13, 11.2
- DC/COL-ISG-16, “Compliance with 10 CFR 50.54(hh)(2) and 10 CFR 52.80(d)” (nonpublic), dated June 9, 2010; FSER Section 19A
- DC/COL-ISG-17, “Ensuring Hazard-Consistent Seismic Input for Site Response and Soil Structure Interaction Analyses,” dated March 24, 2010; FSER Section 3.7.1
- DC/COL-ISG-20, “Seismic Margin Analysis for New Reactors Based on Probabilistic Risk Assessment,” dated March 15, 2010; FSER Sections 19.2 and 19A

- DC/COL-ISG-22, “Interim Staff Guidance on Impact of Construction of New Nuclear Power Plant Units on Operating Units at Multi-Unit Sites,” dated May 11, 2012; FSER Section 1.4
- JLD-ISG-2012-01, Revision 0, “Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” dated August 29, 2012; FSER Section 20.1
- JLD-ISG-2012-03, Revision 0, “Compliance with Order EA-12-051, “Reliable Spent Fuel Pool Instrumentation,” dated August 29, 2012; FSER Sections 20.2 and 20.3
- NSIR/DPR-ISG-01, “Emergency Planning for Nuclear Power Plants,” issued November 2011; FSER Section 13.3

**Office Instructions.** In its review, the staff followed administrative guidance contained in a number of office instructions. These internal documents address a range of procedural matters, including the staff’s process for issuing RAls, handling audits, ensuring the qualification and training of technical staff and managers, ensuring consistency between staff offices, and overseeing interactions with applicants, intervenors, and public stakeholders.

**New and Significant Review Process.** The staff has developed a generic process to address circumstances in which there is an extended delay between the issuance of the final EIS for a particular license application review and the start of that proceeding’s mandatory hearing phase (ADAMS Accession No. ML13199A170). This process provides guidance to the environmental staff on identifying potentially new and significant information after the draft EIS or final EIS is issued to determine its significance and to consider whether the information requires a supplement to the draft EIS or final EIS in accordance with 10 CFR 51.72(a) or 51.92(a).

#### IV. *Advisory Committee on Reactor Safeguards Report*

The ACRS review of the North Anna 3 COL application culminated with a letter to the Commission dated November 15, 2016 (ADAMS Accession No. ML16312A412), concluding that: (1) there is reasonable assurance that North Anna Unit 3 can be built and operated without undue risk to public health and safety and that the Commission should approve the North Anna Unit 3 COL application; (2) the North Anna Unit 3 site-specific departures and exemptions from the ESBWR DCD in the areas of seismic design and analysis, electrical power distribution system, liquid effluent discharge, and design for hurricane wind generated missiles are acceptable and should be approved; and (3) there is reasonable assurance that the ESBWR design and North Anna Unit 3 site satisfy the requirements resulting from the Fukushima Near-Term Task Force Recommendations (ADAMS Accession No. ML14252A294). The ACRS letter did not identify any further issues or actions required by the staff. The staff responded to the ACRS in a letter dated December 22, 2016 (ADAMS Accession No. ML16340A261), in which the staff thanked the ACRS for their time and efforts.

DISCUSSION:

## I. Excluded Matters

This section discusses matters that were previously addressed and resolved in the context of other reviews undertaken as part of the 10 CFR Part 52 process. Such excluded matters include issues addressed under the ESBWR design certification review or the NAPS ESP review.

The SER and EIS for the NAPS ESP contain a complete list of matters resolved by the ESP. In the ESP proceeding, the ASLB conducted an uncontested (mandatory) hearing that considered the adequacy of the staff's review, including such aspects as site characterization (hydrology, soil, vadose zone, groundwater, and aquifers), tritium, zero release commitment (of radionuclides into any potential liquid pathways), radiological releases and doses from normal operations, surface water impacts and possible mitigation measures, seismic safety, and environmental impacts of alternatives. Following the proceeding, the Board determined that the staff's safety and environmental reviews were adequate and supported issuance of the ESP (see NAPS ESP initial decision on the uncontested hearing, LBP-07-09, dated June 29, 2007 (ADAMS Accession No. ML071800470)). The Commission issued its order approving issuance of the ESP on November 20, 2007 (see Memorandum and Order, CLI-07-27, ADAMS Accession No. ML073240391).

A full discussion of matters resolved by the ESBWR DCR, and thus excluded from the uncontested hearing, can be found in the final rule (79 FR 61943). As explained in the rule, those resolved matters include, for example, all nuclear safety issues associated with the information in the FSER and Supplement 1, Tier 1 and Tier 2 information, the documents listed in the table to the DCR, and the rulemaking record for certification of the ESBWR design, with the exceptions specified below. The ESBWR rulemaking also resolves all environmental issues concerning severe accident mitigation design alternatives associated with the information in the NRC's environmental assessment for the ESBWR design and NEDO-33306, Revision 4, "ESBWR Severe Accident Mitigation Design Alternatives," dated October 2010 for plants referencing the DCD with site characteristics that fall within those site parameters in NEDO-33306.

The ESBWR DCR does not provide finality on certain matters that, therefore, remain for COL applicants to consider. These include, for example, generic technical specifications and other operational requirements such as human factors engineering procedure development and training program development; hurricane loads on certain structures, systems, and components (SSCs) described in the generic DCD that are not bounded by the total tornado loads analyzed in the generic DCD; hurricane-generated missile loads on certain SSCs described in the generic DCD that are not bounded by tornado-generated missile loads analyzed in the generic DCD; and two limited aspects of spent fuel pool level instrumentation design (in regard to the connection of an independent power source and how the instrumentation will maintain its design accuracy following a power interruption or change in power source without recalibration). Furthermore, several tables in the DCD identify COL areas that interface with corresponding areas of the certified design. Tables 1.8-1 and 1.8-2 of the DCD list the interfaces between the COL and the certified design. Table 1.10-1 identifies the COL information items that address areas for which a COL applicant referencing the ESBWR design must provide additional supporting information to meet a regulatory requirement. The staff review of the COLA for North Anna Unit 3 confirmed that the applicant satisfactorily addressed all interface items and COL information items.

## II. Exemptions, Departures, and Variances

*Exemptions from NRC Regulations*

The COLA for North Anna Unit 3 identified five requests for exemption from NRC regulations. An exemption request is required when the COL applicant takes a departure from Tier 1, generic technical specifications (TS) and other operational requirements identified in a DCD. These requests require NRC review and approval. The staff evaluated and found acceptable the five exemptions from NRC regulations requested by the applicant. These exemption requests are summarized in Table 1 below and discussed in more detail below:

**Table 1: North Anna Unit 3 COLA Exemptions Table**

<b>COL Part 7 Exemption</b>	<b>Description</b>	<b>Regulation</b>	<b>Location of Evaluation in FSER</b>
<b>1</b>	An exemption is requested to apply the same regulations for the special nuclear material (SNM) control and accounting (MC&A) program description under 10 CFR Part 52 as for licensed reactors under 10 CFR Part 50.	10 CFR 70.22(b), 70.32(c), 74.31, 74.41, 74.51	Chapter 1 Section 1.5.4
<b>2</b>	An exemption is requested for certain information depicted on DCD Tier 1, Figure 2.13.1-1, "Electric Power Distribution System Functional Arrangement," Sheet 1.	As permitted by 10 CFR 52.7 and Section VIII.A.4 of the DCR	Chapter 8 Section 8.1
<b>3</b>	An exemption is requested for a new definition in Tier 1 and a change to DCD Tier 1, Table 5.1-1, footnote (4) to define the Unit 3 safe-shutdown earthquake (SSE) for purposes of performing the verification, through inspections, tests, and analyses, that applicable acceptance criteria specified in DCD Tier 1 inspections, tests, analyses, and acceptance criteria (ITAAC) are met for the seismic design, analyses, and qualification of SSCs.	10 CFR 50.12, 52.7, and 52.63(b)(1).	Chapter 3 Section 3.7

<b>COL Part 7 Exemption</b>	<b>Description</b>	<b>Regulation</b>	<b>Location of Evaluation in FSER</b>
<b>4</b>	An exemption is requested to change the following definition, "The liquid waste management system (LWMS) either returns processed water to the condensate system or discharges to the environment via the circulating water system." This description is changed to, "The LWMS either returns processed water to the condensate system or discharges to the environment using the liquid radwaste effluent discharge pipeline."	10 CFR 50.12, 52.7, and 52.63(b)(1).	Chapter 11 Section 11.2
<b>5</b>	An exemption is requested to modify footnote 7 to DCD Tier I, Table 5.1-1, to specify that the Unit 3 site-specific missile velocities derived in accordance with RG 1.221, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants," issued October 2011, are used in the design of structures housing Regulatory Treatment of Non-Safety Systems (RTNSS) equipment when the site-specific missiles are more severe than the missiles specified in the DCD.	10 CFR 50.12, 52.7, and 52.63(b)(1).	Chapter 19 Appendix 19A

#### *North Anna Unit 3 Exemption 1*

In accordance with 10 CFR 70.22(b), current applicants requesting a license to possess SNM must submit a full description of their MC&A program and show compliance with 10 CFR 74.31, "Nuclear Material Control and Accounting for Special Nuclear Material of Low Strategic Significance"; 10 CFR 74.33, "Nuclear Material Control and Accounting for Uranium Enrichment Facilities Authorized To Produce Special Nuclear Material of Low Strategic Significance"; 10 CFR 74.41, "Nuclear Material Control and Accounting for Special Nuclear Material of Moderate Strategic Significance"; or 10 CFR 74.51, "Nuclear Material Control and Accounting for Strategic Special Nuclear Material," as applicable. Also, in accordance with 10 CFR 70.32(c), applicants requesting a license to possess SNM in a quantity exceeding 1 effective kilogram are subject to a condition to maintain and follow an MC&A program for SNM in which decreases to the program's effectiveness will be submitted as a license amendment request under 10 CFR 70.34, "Amendment of Licenses." However, the requirements in 10 CFR 70.22(b) and 10 CFR 70.32(c) contain an exclusion for licensees governed by 10 CFR Part 50, including existing nuclear power plants.

In addition, the regulations referenced by 10 CFR 70.22(b) (10 CFR 74.31, 74.33, 74.41, and 74.51) either do not apply to reactors or explicitly exclude reactors licensed under 10 CFR Part 50. The COLA for North Anna Unit 3 was submitted, and accepted, as a licensing action for a nuclear power plant under 10 CFR Part 52, rather than 10 CFR Part 50. The

exclusions described above in 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," and 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material," do not include 10 CFR Part 52 applicants, even though, for the purposes of the requirement, the applications are for the same facility type. For both 10 CFR Part 50 and 10 CFR Part 52 applicants, Subpart B, "General Reporting and Recordkeeping Requirements," of 10 CFR Part 74 (excluding 10 CFR 74.17, "Special Nuclear Material Physical Inventory Summary Report") contains the appropriate MC&A performance requirements.

The applicant requested an exemption from the requirements in 10 CFR 70.22(b), 70.32(c), 74.31, 74.41, and 74.51, that an SNM license application describe an MC&A program and that the applicant establish, implement, maintain, and follow an MC&A program. The applicant provided a full discussion of the exemption request and noted that the cited regulations include exceptions from these requirements for nuclear reactors licensed under 10 CFR Part 50. The purpose of the request was to achieve an exception similar to the exemption already granted by regulation to a reactor applicant licensed pursuant to 10 CFR Part 50. The NRC has also granted the same exemption to the applicants for previously issued COLs.

The staff evaluated this exemption request and determined that such an exemption is authorized by law, will not present undue risk to the public health or safety, and is consistent with the common defense and security, and that special circumstances are present as described in 10 CFR 50.12(a)(2)(ii) because the Commission determined that these requirements are unnecessary for similar 10 CFR Part 50 applicants. The staff's evaluation of the exemption request appears in the FSER section listed in the table above.

#### *North Anna Unit 3 Exemptions 2–5*

The applicant for North Anna Unit 3 requested Exemptions 2 through 5 from the provisions of 10 CFR Part 52, Appendix E, Section III.B, which requires an applicant referencing a certified design to incorporate by reference Tier 1 information. In Exemption 2, the applicant proposed revising the ESBWR DCD Tier 1, Figure 2.13.1-1, Sheet 1, to accommodate site space constraints by adding an intermediate switchyard to revise the location information for the main generator circuit breaker and the two motor-operated disconnects. In Exemption 3, the applicant found that site-specific seismic conditions described in FSAR Chapter 2 and Section 3.7.1 are not bounded by the ESBWR DCD seismic design parameters. Therefore, North Anna Unit 3 defines the SSE to include the certified seismic design response spectra (CSDRS) and the site-specific foundation input response spectra (FIRS) for each seismically qualified structure. This exemption is related to the partial seismic exceedances of the site-specific horizontal and vertical FIRS when compared to the ESBWR CSDRS and represents changes to the DCD Tier 1, Tier 2, and Tier 2\* information as described in the Departure NAPS DEP 3.7-1. In Exemption 4, the applicant proposed revising the ESBWR DCD Tier 1 description of the LWMS discharge for North Anna Unit 3. In Exemption 5, the applicant proposed a site-specific ESBWR DCD Tier 1 departure from DCD Tier 1, Table 5.1-1, "Envelope of ESBWR Standard Plant Site Parameters," which includes criteria for the design of structures housing RTNSS SSCs to resist maximum hurricane winds and hurricane-wind-generated missiles.

The staff evaluated these four exemption requests and determined that such exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security, and that special circumstances under 10 CFR 50.12(a)(2)(ii) are present because application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule or outweigh any decrease in safety that may result from the reduction in

standardization caused by the exemption. The staff's full evaluation of these four ESBWR Tier 1 exemption requests appear in the FSER sections listed in the above table.

*Departures from ESBWR Design Control Document, Revision 10*

The COLA for North Anna Unit 3 identified six departures from the ESBWR design. Departures by a COL applicant from Tier 1, Tier 2\*, generic TS and other operational requirements in a DCD require NRC approval. Departures by a COL applicant for Tier 1, generic TS, and other operational requirements require NRC approval in the form of an exemption. The Tier 2 departures are subject to a process similar to that set forth in 10 CFR 50.59, as described in 10 CFR Part 52, Appendix E, Section VIII.B.5, and do not necessarily require NRC approval. Part 7 of the COLA describes, justifies, and evaluates the departures against criteria in 10 CFR Part 52, Appendix E, Section VIII.B.5 to determine whether the applicant could implement the departure without NRC approval. Part 7 of the COLA also identifies the affected sections in the FSAR. The staff evaluated the applicant's proposed departures from information in the ESBWR DCD, Revision 10, and the evaluations are presented in the FSER sections as presented in the Table 2 below:

**Table 2: North Anna Unit 3 COLA Departures Table**

<b>DCD Departure Number</b>	<b>Location of Evaluation in North Anna Unit 3 COLA</b>	<b>Staff Evaluation FSER Section</b>	<b>Description</b>
NAPS DEP 3.7-1	FSAR Sections 1.3, 1.11, 2.0, 3.7, 3.8, 4.2, 9.1, 19.1, 19.2, 19.5, and Appendices 3A, 3C, 3G, and 19A	FSER Sections 1.3, 2.0, 3.7, 3.8, 3.9, 3.12, 4.2, and 19A	Ground Response Spectra for Seismic Structural Loads and Floor Response Spectra
NAPS DEP 8.1-1	FSAR Section Figure 8.1-1, Sheet 1, and Section 8.2.1.2.1	FSER Section 8.1	Electrical Power System Functional Arrangement
NAPS DEP 8.1-2	FSAR Section 8.1.5.2.4 and Table 8.1-1R	FSER Section 8.1	Switchyard Surge Protection
NAPS DEP 11.4-1	FSAR Sections 1.2.2.10.2, 1.2.2.16.9, 11.4, 11.4.1, 11.4.2.2.1, 11.4.2.2.2, 11.4.2.2.4, 11.4.2.3.1, 12.2 and 12.3; FSAR Tables 1.9-11R, 9A.5-5R, 11.4-1R, 11.4-2R, 12.2-22R, and 12.3-8R; and FSAR Figures 1.2-21R, 1.2-22R, 1.2-23R, 1.2-24R, 1.2-25R, 9A.2-20R, 9A.2-21R, 9A.2-22R, 9A.2-23R, 9A.2-24R, 11.4-1R, 11.4-2R, 12.3-19R, 12.3-20R, 12.3-21R, 12.3-22R, 12.3-39R, 12.3-40R, 12.3-41R, 12.3-42R, 12.3-61R, 12.3-62R, 12.3-63R, and 12.3-64R	FSER Sections 11.4 and 12.2	Long-term, Temporary Storage of Class B and C Low-Level Radioactive Waste

NAPS DEP 12.3-1	FSAR Section 11.2.3.2	FSER Section 11.2	Liquid Radwaste Effluent Discharge Piping Flow Path
NAPS DEP 19A-1	FSAR Section 2.0 Table 2.2-201, and Appendix 19A	FSER Section 19, Appendix 19A	Design of Structures Housing RTNSS Equipment for Hurricane-Wind-Generated Missiles

- NAPS DEP 3.7-1 Ground Response Spectra for Seismic Structural Loads and Floor Response Spectra

The proposed NAPS DEP 3.7.1 is a result of the North Anna site-specific FIRS exceeding the CSDRS at certain frequencies and involves changes to ESBWR DCD Tier 1 and Tier 2\* information. The applicant revised the definition for the SSE to include the site-specific FIRS for each seismically qualified structure. Changes were identified in FSAR Sections 1.3, 1.11, 2.0, 3.7, 3.8, 4.2, 9.1, 19.1, 19.2, and 19.5, and FSAR Appendices 3A, 3C, 3G, and 19A. The staff evaluated the NAPS DEP 3.7-1 in the appropriate sections of the FSER for each applicable section of the North Anna 3 FSAR and found it to be acceptable.

Because the SSE is defined in DCD Tier 1, a request for exemption from DCD Tier 1 information was provided in Exemption 3 as described above. The staff evaluated this exemption request and found it acceptable in Section 3.7.1 in the FSER. This departure also involves Tier 2\* information related to the redefinition of the operating basis earthquake (OBE). The changes to the OBE definition are identified in FSAR Section 3.7.1 and reviewed in FSER Section 3.7.1.

- NAPS DEP 8.1-1 Electrical Power Distribution System Functional Arrangement

Because of physical space constraints on the North Anna Unit 3 site for the switchyard, the applicant proposed NAPS DEP 8.1-1 in order to change the on-site power supply system specified in ESBWR DCD Tier 1, Figure 2.13.1-1, Sheet 1, "Electric Power Distribution System Functional Arrangement," to accommodate an intermediate switchyard as part of the on-site power supply system for the ESBWR standard plant design. The intermediate switchyard does not change the functions performed by plant components. Because the requested departure involves DCD Tier 1 information, a request for exemption is provided as Exemption 2, which is described above. The staff evaluated this exemption request and found it acceptable in Section 8.1 of the FSER.

- NAPS DEP 8.1-2 Switch Yard Surge Protection

The applicant proposed NAPS DEP 8.1-2 in order to identify exceptions related to switchyard surge protection from the Institute of Electrical and Electronics Engineers (IEEE) C62.23, "Application Guide for Surge Protection of Electric Generating Plants" (as endorsed by RG 1.204, "Guidelines for Lightning Protection of Nuclear Power Plants"), which is described in Tier 2 information in the ESBWR DCD. The staff found that the applicant addressed each subsection of the standard for which an exception was taken, reviewed each exception, and concurred with the applicant that either the subsection did not apply in the case of North Anna Unit 3 or that the measures taken provided equivalent protection. The staff therefore found this departure to be acceptable, as discussed in Section 8.1 of the FSER.

- NAPS DEP 11.4-1 Long-term, Temporary Storage of Class B and C Low-Level Radioactive Waste

The ESBWR DCD states that the radwaste building (RWB) provides onsite storage space for a 6-month volume of packaged low-level radioactive waste. The applicant proposed NAPS DEP 11.4-1 in order to configure the North Anna Unit 3 RWB to accommodate a minimum of 10 years of Class B and C waste, while maintaining space for at least 3 months of packaged Class A waste. This departure is accomplished by reconfiguring the arrangement of systems and components within the design of the ESBWR RWB. The applicant provided various revised tables and figures for the new arrangement of systems and components in the reconfigured RWB. The applicant stated that NAPS DEP 11.4-1 only affects Tier 2 information. The staff confirmed that the departure only affects Tier 2 information and found the departure to be acceptable, as discussed in Section 11.4 and 12.2 of the FSER.

- NAPS DEP 12.3-1 Liquid Radwaste Effluent Discharge Piping Flow Path

The applicant proposed NAPS DEP 12.3-1 in order to change ESBWR DCD Tier 1 information related to the definition of the LWMS system discharge for North Anna Unit 3. The LWMS either returns processed water to the condensate system or discharges it to the environment. NAPS DEP 12.3-1 changes the discharge pathway to the environment from the circulating water system, as specified in the ESBWR DCD, to the liquid radwaste effluent discharge pipeline. Therefore, a request for exemption from DCD Tier 1 information is provided in Exemption 4 as described in the North Anna Unit 3 COL FSAR. The staff evaluated this exemption request and found it acceptable in Section 11.2 of the FSER.

The applicant also proposed NAPS DEP 12.3-1 in order to change the North Anna Unit 3 liquid effluent discharge pathway described in the ESBWR DCD Tier 2 information. The changes are to not use the cooling tower blowdown line to transfer radwaste effluent to the environment; and, to extend the liquid radwaste effluent discharge pipeline to transfer liquid radwaste from the LWMS, in the RWB, to the environment. This departure will simplify design and construction of the cooling tower blow-down line. The staff has reviewed this departure and agrees with the applicant that this Tier 2 departure does not change the function of this pipeline as described in the ESBWR DCD, and that the liquid radwaste effluent discharge pipeline will be extended to transfer liquid radwaste effluent from the LWMS directly to the environment only as necessary. The staff found this departure acceptable, as described in Section 11.2 of the FSER.

- NAPS DEP 19A-1 Design of Structures Housing RTNSS Equipment for Hurricane Wind Generated Missiles

The applicant proposed a site-specific Tier 1 DCD departure from DCD Tier 1, Table 5.1-1, "Envelope of ESBWR Standard Plant Site Parameters," which includes criteria for the design of structures housing RTNSS SSCs to resist maximum hurricane winds and hurricane wind generated missiles. Therefore, a request for exemption from DCD Tier 1 information is provided in Exemption 5 as described in the North Anna Unit 3 COL FSAR. This departure also involved conforming changes to Tier 2\* information in order to clarify that the design of RTNSS structures will account for the most limiting hurricane missile.

Since the ESBWR DCD approval, the NRC has issued new guidance related to hurricane generated missiles in RG 1.221, "Design Basis-Hurricane and Hurricane Missiles for Nuclear Power Plants." The applicant requested that DCD Tier 1 Table 5.1-1 be modified to take into account both the hurricane generated missiles described in the ESBWR DCD and the Unit 3

site-specific hurricane generated missiles evaluated in accordance with the new guidance in RG 1.221. The staff found this departure and exemption request to be acceptable, and the evaluation is in Section 19, Appendix 19A of the FSER as noted above.

*Variances from the North Anna Power Station Early Site Permit*

An applicant for a COL who references an early site permit may include requests for variance from one or more site characteristics, design parameters, or terms and conditions of the early site permit, or from the site safety analysis report. The COLA for the North Anna Unit 3 identified requests for 18 variances from the NAPS ESP per the requirements in 10 CFR 52.39(d) and are described in Table 3 below. In the identified FSER sections, the staff evaluated each variance request and determined that, for each variance, the alternative information supplied by the applicant was acceptable. Part 7, Section C, of the COLA describes the variances in detail. These variances are summarized in Table 3 below:

**Table 3: NAPS ESP Variances**

ESP Variance Number	Location of Evaluation in FSER	Description and Justification
NAPS ESP VAR 2.0-1	Section 2.3.5	<p>This is a variance from ESP Site Safety Analysis Report (SSAR) Table 2.3-16 in order to use the site-specific Unit 3 maximum long-term dispersion estimates (<math>\chi/Q</math> and <math>D/Q</math>) values as provided in FSAR Table 2.3-16R.</p> <p>This variance is acceptable because the Unit 3 maximum long-term dispersion estimates (<math>\chi/Q</math> and <math>D/Q</math>) values were calculated for the ESBWR design site meteorological data and were used to determine Unit 3 doses. The estimated annual doses from normal gaseous effluent releases remain within applicable limits, as shown in FSAR Table 12.2-201.</p>
NAPS ESP VAR 2.0-2	Section 2.4.12	<p>This is a variance from ESP SSAR Table 1.9-1 in order to use the site-specific Unit 3 maximum hydraulic conductivity value as provided in FSAR Section 2.4.12.1.2.</p> <p>This variance is acceptable for two reasons:</p> <ol style="list-style-type: none"> <li data-bbox="829 1528 1479 1900">1. Compliance with 10 CFR Part 20, "Standards for Protection against Radiation," is demonstrated in FSAR Section 2.4.13 with the use of a hydraulic conductivity value of 3.0 meter(m)/day (9.9 feet (ft)/day) to evaluate radionuclide concentrations and associated doses resulting from a postulated accidental release of liquid effluents in the groundwater pathways. The calculated radionuclide concentrations and associated doses are conservative, as the hydraulic conductivity of</li> </ol>

		<p>3.0 m/day (9.9 ft/day) is the maximum value identified in FSAR Table 2.4-16R.</p> <p>2. The groundwater flow model used to evaluate the maximum ground water level elevation at the Unit 3 site incorporated the hydraulic conductivity values measured during the Unit 3 subsurface investigation. The maximum groundwater level elevation in the power block area is predicted to range from approximately 82.3 to 86.8 m (270 to 284 ft) North American Vertical Datum of 1988 (NAVD88) (82.6 to 88.7 m (270.9 to 284.9 ft) National Geodetic Vertical Datum of 1929 (NGVD29)). The maximum groundwater level elevation in the power block area around seismic Category I structures is approximately 86.1 m (282.6 ft) NAVD88 (86.4 m (283.5 ft) NGVD29) or 2.3 m (7.4 ft) below the design plant grade elevation of 88.4 m (290 ft) NAVD88 (88.7 m (290.9 ft) NGVD29). As shown in FSAR Table 2.0-201, this Unit 3 site characteristic value for maximum groundwater level elevation falls within the DCD site parameter value in DCD Table 2.0-1. The ESBWR design assumes a maximum groundwater level no higher than 0.61 m (2 ft) below the design plant grade elevation at a site and the Unit 3 site characteristic value of 2.3 m (7.4 ft) below the Unit 3 design plant grade meets this requirement.</p>
<p>NAPS ESP VAR 2.0-3</p>	<p>Section 2.4.12</p>	<p>This is a variance from ESP SSAR Table 1.9-1 in order to use the site-specific Unit 3 hydraulic gradient value as provided in FSAR Section 2.4.12.1.2.</p> <p>This variance is acceptable because compliance with 10 CFR Part 20 is demonstrated in FSAR Section 2.4.13 with the use of the higher hydraulic gradient of 1.5 m (5 ft) per 30.5 m (100 ft) to evaluate radionuclide concentrations and associated doses as a result of a postulated accidental release of liquid effluents in the groundwater pathways.</p>

<p>NAPS ESP VAR 2.0-4</p>	<p>Section 2.5.2</p>	<p>This is a variance from the following:</p> <ol style="list-style-type: none"> <li>1. ESP SSAR Figure 2.5-48A in order to use the site-specific Unit 3 horizontal and vertical spectral acceleration values for the ground motion response spectra (GMRS) values as provided in FSAR Figure 2.5.2-313;</li> <li>2. ESP SSAR Section 2.5 References 1, 115, 120 and 121 in order to use FSAR Reference 2.5-233.</li> <li>3. ESP SSAR Section 2.5.2.7 information on the OBE is moved to FSAR Section 3.7.</li> </ol> <p>This variance is acceptable for the following reasons:</p> <ol style="list-style-type: none"> <li>1. The variance in the ground motion response spectra (GMRS) control point location is justified because its location at a hypothetical outcrop under the reactor building/fuel building (RB/FB) foundation is representative of the Unit 3 site below the foundations for the seismic Category I structures in the power block area. This location is also consistent with NUREG-0800, SRP Section 2.5.2, "Vibratory Ground Motion," which specifies that the GMRS be defined on an outcrop or a hypothetical outcrop that will exist after excavation.</li> <li>2. The variance in the horizontal and vertical spectral acceleration values results from and is justified not only by the change in control point location but also from application of updated methodology and data, consistent with current NRC guidance. The Unit 3 site GMRS was derived using the performance-based approach endorsed in RG 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," issued March 2007 and the new models and databases for the central and eastern United States (CEUS) seismic source characterization (CEUS-SSC). To evaluate the potential significance of any reinterpretation of past earthquakes and to consider the impact of more recent seismicity, including the 2011 magnitude (<b>M</b>) 5.8 Mineral,</li> </ol>
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		<p>VA, earthquake, the CEUS-SSC earthquake catalog was reviewed and updated for the period 2009 through mid-December 2011. Therefore, by using RG 1.208 and updating the CEUS-SSC, the Unit 3 GMRS is acceptable. The number of frequencies was increased to 38, based on the minimum number of points specified in RG 1.206, "Combined License Applications for Nuclear Power Plants (LWR Edition)," issued June 2007 and RG 1.208. The site safety analysis report (SSAR), which presents 21 points, was written before these documents were issued. Therefore, the FSAR was updated to conform to the existing guidance.</p> <p>3. The specification of the OBE in SSAR Section 2.5.2.7 is moved to FSAR Section 3.7, because neither SRP Section 2.5.2 nor the DCD requests that the OBE information be described in FSAR Section 2.5.2. Further, given that OBE instrumentation is likely to be at a surface location, the definition of the OBE ground motions should consider the site response of multiple possible surface or at grade locations, which is not assessed in FSAR Section 2.5.2 but is in FSAR Section 3.7. Therefore, the OBE is defined in FSAR Section 3.7.</p>
<p>NAPS ESP VAR 2.0-5</p>	<p>Section 2.4.13</p>	<p>This is a variance request from ESP SSAR Tables 1.9-1 and 2.4-20 in order to use the site-specific Unit 3 distribution coefficient (K<sub>d</sub>) values as provided in FSAR Table 2.4-206.</p> <p>This variance is acceptable because compliance with 10 CFR Part 20 is demonstrated in FSAR Section 2.4.13 with the use of the minimum site-specific K<sub>d</sub> values to evaluate radionuclide concentrations and associated doses as a result of a postulated accident release of liquid effluents in the groundwater pathways.</p>
<p>NAPS ESP VAR 2.0-6</p>	<p>Section 15.4</p>	<p>This is a variance from the accident source terms provided in ESP SSAR Chapter 15 in order to use the source terms as provided in ESBWR DCD Chapter 15, Sections 15.3 and 15.4 for analyses of design basis accidents.</p> <p>This variance is acceptable for the following reasons:</p>

		<ol style="list-style-type: none"> <li>1. Calculated doses for the ESBWR design are shown in DCD Chapter 15 to be within limits set by regulatory guidance documents and applicable regulations. These DCD analyses determined design-basis accident dose results based on assumed site parameters for short-term (accident) meteorological dispersion factors (<math>\chi/Q</math>)</li> <li>2. Unit 3 site-specific short-term (<math>\chi/Q</math>) values are demonstrated in FSAR Table 2.0-201 to fall within (are less than) the associated DCD site parameter values. Therefore, the dose consequences for the design-basis accidents evaluated in DCD Chapter 15 are bounding and applicable for the Unit 3 site, and, as shown in DCD Chapter 15 analyses, are within limits set by regulatory guidance documents and applicable regulations.</li> </ol>
<p>NAPS ESP VAR 2.0-7</p>	<p>Section 2.4.21, Section 2.0</p>	<p>This is a variance from the following:</p> <ol style="list-style-type: none"> <li>1. ESP-003 Appendix A Figure 1 in order to use the set of values as provided in FSAR Figure 2.0-205 as State Plane coordinates.</li> <li>2. Removal of Note 2 from ESP SSAR, Figure 1.2-4.</li> </ol> <p>This variance is acceptable for the following reasons:</p> <ol style="list-style-type: none"> <li>1. The use of values given in FSAR Figure 2.0-205 as State Plane coordinates corrects an administrative error and establishes the correct State Plane coordinates.</li> <li>2. Note 2 from ESP SSAR, Figure 1.2-4 states that “Abandoned Unit 3 and 4 Reactor Building Mat Foundations are to be removed.” The removal of this note is acceptable because the layout of the North Anna Unit 3 ESBWR design ensures that all Seismic Category I structures will be founded on new concrete fill with underlying sound rock, and all safety-related or Seismic Category I or II structures will be located away from the abandoned mat foundations. Therefore, removal of the abandoned mat foundations is not necessary.</li> </ol>

NAPS ESP VAR 2.3-1	Section 2.3.1	<p>This is a variance from ESP-003 Appendix A, ESP SSAR Section 2.3.1.3.2, and ESP SSAR Tables 1.9-1 and 2.3-1 in order to use the site-specific Unit 3 site characteristic values for tornadoes as provided in FSAR Section 2.3.1.3.2 and Table 2.3-225.</p> <p>This variance is acceptable because compliance with NRC regulations, including 10 CFR Part 50, Appendix A, GDC 2, "Design Bases for Protection against Natural Phenomena," is demonstrated by conformance to RG 1.76, Revision 1, "Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants," issued March 2007. The use of RG 1.76, Revision 1, is also consistent with the site parameter values for an ESBWR, as shown in FSAR Table 2.0-201. The comparisons in that table demonstrate that the DCD site parameters for tornado characteristics bound the values for Unit 3.</p>
NAPS ESP VAR 2.4-1	Section 2.4.12	<p>This is a variance from ESP SSAR Section 2.4.12.1.2 in order to use the site-specific Unit 3 values for void ratio, porosity and seepage velocity of saprolite as provided in FSAR Section 2.4.12.1.2.</p> <p>This variance is acceptable because compliance with 10 CFR Part 20 is demonstrated in FSAR Section 2.4.13, which evaluates radionuclide concentrations and associated doses as a result of a postulated accidental release of liquid effluents in the groundwater pathways.</p>
NAPS ESP VAR 2.4-2	Section 2.4.12	<p>This is a variance from ESP SSAR Table 2.4-17 in order to use corrected information for the site-specific Unit 3 values regarding the North Anna Power Station (NAPS) water supply wells as provided in FSAR Table 2.4-17R.</p> <p>This variance is acceptable because the corrected and new information continues to support the conclusions in FSAR Section 2.4.12.1.3 that "[a]ny groundwater supply required by the new units would likely come from an increase in the storage capacity for the existing wells or from drilling additional wells. In either event, additional groundwater withdrawal by the new units is not expected to impact any offsite wells due to: 1) their distance from the site, 2) the direction of the hydraulic gradient toward Lake Anna and the lake's recharge effect, and 3) the existence of</p>

		<p>hydrologic divides between the ESP site and the offsite wells.”</p>
<p>NAPS ESP VAR 2.4-3</p>	<p>Section 2.4.12</p>	<p>This is a variance from ESP SSAR Table 2.4-15 in order to use corrected information for the site-specific Unit 3 information regarding observation well No. WP-3 as described in FSAR Table 2.4-15R.</p> <p>This variance is acceptable for the following reasons:</p> <ol style="list-style-type: none"> <li>1. The new, corrected information continues to show that there are observation wells installed for the ISFSI. There is no change to the information on these wells in FSAR Section 2.4.12.1.2, which states, “[t]he other wells being monitored (P- and WP-) were installed previously for Units 1 and 2 groundwater monitoring purposes around the service water reservoir and the ISFSI, respectively. FSAR Figure 2.4-206 shows the locations of the observation wells.”</li> <li>2. The corrected reference point elevation resulted in minor revisions to FSAR Table 2.4-15R and FSAR Figures 2.4-207 through 2.4-214b, which contain the piezometric head contour maps for the site. The changes in observed groundwater levels for well No. WP-3, while not near the plant area for Unit 3, have been incorporated into the latest revision of the groundwater flow model. The revised post construction piezometric head contour map (FSAR Figure 2.4-216) indicates that the maximum groundwater level elevation in the power block area around seismic Category I structures is approximately 86.1 m (282.6 ft) NAVD88 (86.4 m (283.5 ft) NGVD29). The</li> </ol>

		<p>changes in observed groundwater levels for well No. WP-3 are also accounted for in the analysis of a postulated, accidental release of radioactive liquid effluents to the groundwater at the Unit 3 site.</p>
NAPS ESP VAR 2.4-4	Sections 2.4.3 and 2.4.11	<p>This is a variance from ESP SSAR Section 2.4.1.3, which described a lake level of 249.14 ft (75.93m) NAVD88, in order to use the lake level of 249.39ft (76.01 m) NAVD88 as provided in FSAR Section 2.4.1.3.</p> <p>This variance is acceptable because the new lake level is addressed as an input to various hydrological evaluations in FSAR Section 2.4 (for example, storage allocations, flooding, and groundwater). This FSAR section demonstrates that the increase in lake level does not result in hydrological site characteristics that could affect the safe design or siting of Unit 3.</p>
NAPS ESP VAR 2.4-5	Sections 2.4.3	<p>This is a variance from ESP SSAR Section 2.4, which described the Lake Anna probable maximum flood (PMF) level of 266.53ft (81.24m) NAVD88, in order to use a revised value of 266.56 ft (81.25m) NAVD88 as provided in FSAR Section 2.4.</p> <p>This variance is acceptable because the new PMF level is addressed in FSAR Section 2.4. This FSAR section demonstrates that the increase in the PMF level does not result in hydrological site characteristics that could affect the safe design or siting of Unit 3.</p>
NAPS ESP VAR 2.5-1	Section 2.5.5	<p>This is a variance from ESP SSAR Section 2.5.5 information regarding slopes and safety of slopes in order to use revised site-specific Unit 3 information as provided in FSAR Section 2.5.5.</p> <p>This variance is acceptable because the slopes being considered in FSAR Section 2.5.5 are lower, less steep, and have a smaller applied seismic acceleration than the slopes analyzed in SSAR Section 2.5.5. As a result, the Unit 3 slopes have a higher computed factor of safety against failure and are shown to be stable under both long-term static and short-term seismic conditions.</p>

<p>NAPS ESP VAR 12.2-1</p>	<p>Section 12.2</p>	<p>This is a variance from the ESP Application Environmental Report Table 5.4-9 in order to use updated site-specific Unit 3 gaseous effluent dose information as provided in FSAR Table 12.2.18bR.</p> <p>This variance is acceptable because estimated annual doses from normal gaseous effluent releases remain within applicable limits. FSAR Table 12.2-18bR shows the annual gaseous pathway doses to the maximally exposed individual (MEI) for Unit 3 and compares each to the corresponding estimate from the ESP Environmental Report Table 5.4-9. Not all doses increased as a result of changes in long-term dispersion estimates because the normal release source term is lower for Unit 3 than the composite source term used to bound the multiple reactor types considered in the ESP application.</p>
<p>NAPS ESP VAR 12.2-3</p>	<p>Section 12.2</p>	<p>This is a variance from ESP SSAR Section 2.3.5.1 in order to use the site-specific Unit 3 maximum annual liquid release values as provided in FSAR Table 12.2-29bR.</p> <p>This variance is acceptable for the following reasons:</p> <ol style="list-style-type: none"> <li>1. The estimated Unit 3 concentrations of normal liquid effluent releases remain within the applicable concentration limits, and the annual doses from normal liquid effluent releases remain within applicable limits.</li> <li>2. The estimated Unit 3 concentrations of normal liquid effluent releases for all nuclides meet the 10 CFR Part 20 concentration limits, as shown in FSAR Table 12.2-19bR. The estimated annual doses from Unit 3 to the MEI from liquid effluents are compared with the applicable limit in FSAR Table 12.2-202. The Unit 3 dose meets the limit in Appendix I, "Numerical Guides for Design Objectives and Limiting Conditions for Operation to Meet the Criterion 'As Low as is Reasonably Achievable' for Radioactive Material in Light-Water-Cooled Nuclear Power Reactor Effluents," to 10 CFR Part 50, and the Unit 3 dose estimates are lower than the corresponding ESP values.</li> </ol>

NAPS ESP VAR 12.2-4	Section 12.2	<p>This is a variance from ESP SSAR Section 2.3.5.1 in order to use updated information as provided in FSAR Table 12.2-203 for conservative dose estimates of direct radiation from the existing Units 1 &amp; 2 and the independent spent fuel storage installation (ISFSI).</p> <p>This variance is acceptable because the dose estimates are more conservative and complete with the addition of the dose contributions from direct radiation from the existing units and the ISFSI. As shown in FSAR Table 12.2-203, the annual total body, thyroid, and bone doses for the site, including the doses from the existing units and the ISFSI, meet the applicable limits in 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."</p>
NAPS ESP VAR 12.2-5	Section 12.2	<p>This is a variance from ESP SSAR Section 2.3.5.1 in order to use updated site-specific Unit 3 maximum gaseous effluent release values as provided in FSAR Table 12.2-17R.</p> <p>This variance is acceptable because the estimated Unit 3 concentrations of normal gaseous effluent releases remain within the applicable concentration limits, and the annual doses from normal gaseous effluent releases remain within applicable limits. The estimated Unit 3 concentrations of normal gaseous effluent releases for all nuclides meet the 10 CFR Part 20 concentration limits as shown in FSAR Table 12.2-17R. The estimated annual doses from Unit 3 to the MEI from gaseous effluent releases are compared with the applicable limit in FSAR Table 12.2-201. The Unit 3 doses meet the limits in Appendix I to 10 CFR Part 50, and the Unit 3 dose estimates are lower than the corresponding ESP values.</p>

### III. Nonroutine, Unique Facility Features or Novel Issues

#### Safety Matters

##### *North Anna Unit 3 Site-Specific Seismic Analyses*

Following the issuance of the NAPS ESP in 2006 relevant new information became available that required the applicant to revise its site-specific seismic hazard analysis. This re-analysis of seismic hazard resulted in a GMRS that exceeds the ESBWR CSDRS at several frequencies. Based on these exceedances, the applicant conducted additional analyses of the SSCs that may be impacted by vibratory ground motion to ensure that the plant could adequately accommodate the site-specific seismic hazard. The staff's review of the seismic hazard and subsequent analysis of SSCs is detailed in the following sections.

#### 1. Mineral, Virginia, Earthquake

On August 23, 2011, a magnitude (**M**)5.8 earthquake occurred near the town of Mineral, Virginia, approximately 18 km (11 mi) southwest of the North Anna Unit 3 site. Additionally, in 2012, the NRC issued NUREG-2115, "Central and Eastern United States Seismic Source Characterization for Nuclear Facilities," a new seismic source characterization model, and, in 2013, a new ground motion model was developed and approved for use in nuclear power plant seismic hazard assessments in the Central and Eastern United States (CEUS) region.

The Mineral, Virginia, earthquake was located within the Central Virginia Seismic Zone, which is a recognized intraplate seismic zone in the CEUS and is characterized by low to moderate seismicity. No evidence of surface rupture has been documented at the site of the earthquake. This was one of the largest magnitude earthquakes instrumentally recorded in eastern North America since the 1988 **M**5.9 Saguenay, Canada, earthquake and the most damaging earthquake in the CEUS since the 1886 **M**6.8 Charleston, South Carolina, earthquake. The Mineral, Virginia, earthquake was recorded at North Anna Unit 1 to be 0.26 g at the basemat and 0.38 g at the higher elevation containment deck. These accelerations are the strongest motions ever recorded at a U.S. nuclear power plant.

Because of the Mineral, Virginia, earthquake, the staff requested additional information from the applicant on the North Anna Unit 3 site probabilistic seismic hazard analysis (PSHA).

When the new NUREG-2115 CEUS-SSC became available in January 2012, the NRC issued RAI 01.05-1, dated June 25, 2012 (ADAMS Accession No. ML12177A435), asking the North Anna Unit 3 COL applicant to evaluate the potential impacts of the CEUS-SSC model on the seismic hazard, consistent with the need to consider the latest available information in the PSHA for the North Anna site, specified in RG 1.208. The applicant revised its PSHA and recalculated the GMRS at the North Anna Unit 3 site to address both the new information from the CEUS-SSC model and the August 2011 Mineral, Virginia, earthquake. The applicant compared the new GMRS to the CSDRS for the ESBWR design. The CSDRS defines the SSE design ground motion for the ESBWR standard plant structure. This comparison demonstrated that the CSDRS bounds the new GMRS at frequencies up to 40 hertz, and GMRS exceeds the CSDRS by not more than 10 percent at the higher frequencies. The applicant conducted additional analyses, described below, to ensure that the plant can accommodate the potentially higher ground motion. The applicant also compared the CSDRS and the GMRS with recordings of the Mineral, Virginia earthquake and demonstrated that CSDRS envelops the observed earthquake's spectra. The staff performed detailed confirmatory analysis of seismic information

that includes seismicity of the region and subsurface geophysical characterization used by the applicant. The staff performed independent calculations of the seismic hazard using the new models and confirmed the applicant's findings. The staff therefore concludes that the models used and the resulting seismic hazard developed for the proposed North Anna Unit 3 site are acceptable.

## 2. Certified Seismic Design Response Spectra Exceedances and Structural Analysis

GDC 2, in Appendix A to 10 CFR Part 50, requires that nuclear power plants be capable of withstanding the most severe earthquakes that have been historically reported for the site and surrounding areas. Under 10 CFR 52.79(d)(1), for a COLA referencing a design certification, sufficient information must be provided to demonstrate that the characteristics of the site fall within the site parameters specified in the DCD.

The site-specific seismic hazard at the North Anna Unit 3 site exceeds the seismic design hazards analyzed in the ESBWR DCD at certain frequencies. The site-specific horizontal and vertical seismic response spectra as shown in the North Anna Unit 3 COL, FSAR Figures 2.0-201 through 2.0-204 for RB/FB, control building (CB), and firewater service complex (FWSC), exhibit exceedances at certain frequencies when compared to the ESBWR CSDRS (also termed the SSE). The applicant evaluated this issue and took a departure NAPS DEP 3.7-1 from the ESBWR DCD in the North Anna Unit 3 COLA. Since this departure involves changes to ESBWR DCD Tier 1, Table 5.1-1, which defines the SSE, the applicant also requested an exemption (Exemption 3) from the DCD Tier 1 information. This departure also includes a redefinition of the OBE for plant shutdown because the OBE is based on one-third of the SSE.

Because of the exceedances described above, the applicant performed site-specific soil-structure interaction (SSI) analyses of the RB/FB, CB, and FWSC structures and revised the SSE definition to include both the ESBWR CSDRS and the site-specific FIRS for each seismically qualified SSC. At North Anna Unit 3, the applicant's seismic design, analyses, and qualification of SSCs use both the CSDRS and the site-specific FIRS. The applicant's site-specific SSI analyses, as described in FSAR Appendix 3A, indicate that the site-specific seismic demand, including the in-structure response spectra (ISRS) exceed the corresponding DCD seismic demand in some locations.

FSAR Appendix 3A indicates that the site-specific ISRS exceed the corresponding DCD ISRS. The ISRS are used as input for seismic qualifications of equipment, systems, and components. As described in FSAR Appendix 3A.18.2, the applicant developed site-specific design ISRS for all damping values and locations of the RB/FB, CB, and FWSC. The site-specific ISRS that exceeded the standard design ISRS is used in conjunction with the standard design ISRS for the seismic design and qualification of equipment and components, as discussed below under "Certified Seismic Design Response Spectra Exceedances and Structures, Systems, and Components Analysis."

The applicant used the seismic load demands obtained from the site-specific SSI analyses (including the impact of adjacent buildings) to determine the structural adequacy for those SSCs that it evaluated as part of the standard design. The site-specific evaluations presented in the COLA for North Anna Unit 3, FSAR Appendix 3G, show that the standard design, including site-specific design changes, is adequate to resist the site-specific seismic load demands in combination with the nonseismic ESBWR standard plant loads. Specifically, as discussed in the NAPS DEP 3.7-1 departure justification presented in the COLA for North Anna Unit 3, FSAR

Part 7, the applicant identified the changes that are necessary to ensure that the SSCs are seismically adequate to meet the site-specific seismic demand. Changes to the certified design identified by the applicant include the arrangement of some steel reinforcements and shear ties, the size of a steel girder, weld size, and anchor bolt sizes. No changes to the thickness of the concrete walls and slabs were needed.

As documented in Chapters 3.7 and 3.8 of the FSER, the NRC staff reviewed the information provided in the COLA and the responses to RAIs, performed confirmatory analyses, and conducted additional technical audits of the site-specific seismic analyses and structural evaluation of the ESBWR structures. The staff confirmed that site-specific design evaluation of the standard plant structures used the site-specific seismic demand. The staff found that the analysis model, industry codes and standards, structural materials and their properties, loads and load combinations, acceptance criteria, and the method of applying loads were consistent with those used in the ESBWR standard design.

The staff verified that the acceptability of the standard plant structures for site-specific conditions is demonstrated by comparing the site-specific structural demands (forces, moments, shear, etc.) with the ESBWR structural capacities at the same set of selected elements as those considered for standard design. The staff also verified that the site-specific SSE loads are combined with other non-seismic loads in the standard design using the same finite element model used for the standard design. The staff further reviewed the design changes that are identified by the applicant (FSAR Appendices 3G.7 through 3G.10 and COLA Part 7) to maintain the standard design. The staff confirmed that with the identified changes the calculated combination of site-specific seismic loads and non-seismic load does not exceed structural acceptance limit of the ESBWR standard design. No changes to the member sizes (e.g., wall and slab thicknesses, beam and column sizes) were necessary. Therefore with the identified design changes, the staff confirmed that the standard design is acceptable at the North Anna 3 site.

### 3. Certified Seismic Design Response Spectra Exceedances and Fuel Analysis

The staff reviewed the North Anna site-specific seismic exceedance departure as it relates to the changes the applicant made to Chapter 4.2 to ensure the GE14E fuel assembly and ESBWR Marathon control blade mechanical designs were still able to withstand loads resulting from natural phenomena, as required by GDC 2.

The staff reviewed the applicant's changes to Chapter 4.2 and performed a regulatory audit on the overall methodology and calculations. The staff confirmed that the calculations represent the most limiting seismic motions and that the applicant's method for determining the maximum seismic acceleration in the horizontal and vertical directions is consistent with RG 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," Revision 2, issued July 2006. The staff also confirmed that the applicant's methodology for calculating the seismic accelerations of the fuel assemblies and control blades is identical to the methodology described in the DCD. The staff confirmed that the calculated combination of hydrodynamic accident loads with the higher North Anna Unit 3 site-specific seismic loads does not cause the fuel assembly or control blade capacity limits to be exceeded. Additionally, the staff confirmed that under the combination of seismic and hydrodynamic loads the scram insertion time limits are met; therefore, GDC 2 requirements are met.

Additionally, the staff reviewed the applicant's site-specific ITAAC in Part 10 of the COLA, Table 2.4.19-1, Item 1. The staff confirmed that this site-specific ITAAC will ensure that the

applicant will complete a full analysis before fuel load using the as-built characteristics of the control blades and other reactor components to confirm that the site-specific combined loads on the control blade remain bounded by the control blade capacity limits and the scram insertion time limits. The staff confirmed that the successful completion of the site-specific ITAAC for the control blades and ITAAC Item 15 in the ESBWR DCD, Table 2.1.1-3, ensures that the as-built fuel assembly and the as-built control blades comply with GDC 2.

#### 4. Certified Seismic Design Response Spectra Exceedances and Structures, Systems, and Components Analysis

Because of the ESBWR DCD seismic exceedances discussed above, the staff reviewed North Anna Unit 3 FSAR Section 3.7.1, "Seismic Design Parameters," NAPS DEP 3.7-1, and verified that, according to this section, the Unit 3 SSE design ground motion applies to the seismic design, analysis, and qualification of North Anna Unit 3 plant SSCs. The staff also verified that, according to this section, for each structure and each equipment location within the buildings, the site-specific ISRS that exceed the standard design ISRS are used in conjunction with the standard design ISRS for seismic design and qualification of equipment and components. As documented in FSER Chapter 3, the staff confirmed that the seismic design methodology for SSCs is in accordance with the applicable American Society of Mechanical Engineers and IEEE codes and standards accepted by the NRC staff. This is the standard process for SSC design once the seismic inputs to the SSCs are known, and the staff therefore found it acceptable. The applicant will complete ITAAC for the detailed seismic Category I SSCs, and the staff will verify the completion of the ITAAC via inspections.

#### *Environmental Matters*

The NRC staff issued the COL SEIS for North Anna Unit 3 in March 2010. Since that time, the staff has assessed whether new information should supplement the COL SEIS, using the "Staff Process for Determining if a Supplement to an Environmental Impact Statement is Required in Accordance with 10 CFR 51.92(a) or 51.72(a)," dated November 24, 2014 (ADAMS Accession No. ML13199A170). Based on the staff's review, documented in the COL SEIS, and on implementation of the above-mentioned process for determining whether a supplement is warranted, the NRC staff found no novel issues for the environmental review of the COLA for North Anna Unit 3.

#### IV. Combined License Findings

10 CFR 52.97(a)(1):

- (i) The applicable standards and requirements of the Act [AEA] and the Commission's regulations have been met.

The staff reviewed the COLA for North Anna Unit 3 and evaluated it against the applicable regulations in 10 CFR Parts 20, 26, 30, 31, 32, 40, 50, 51, 52, 55, 70, 73, 74, 100, and 140. The staff performed this evaluation using applicable portions of the SRP,

ISG documents, RGs, bulletins, NUREGs, and generic letters. Based on the staff's review, documented in the FSER<sup>2</sup> and COL SEIS, the staff concludes that, for the purpose of issuing a COL for North Anna Unit 3, the applicable standards and requirements of the AEA and the Commission's regulations have been met.

(ii) Any required notifications to other agencies or bodies have been duly made.

The NRC took the actions required by Section 182(c) of the AEA and 10 CFR 50.43(a). In April 2008 the NRC published notices of the application in the local newspapers: *The Richmond Times-Dispatch*, *The Daily Progress*, *The Free-Lance Star*, and *The Central Virginian*. On April 20, 2016, the NRC notified the Virginia State Corporation Commission (ADAMS Accession No. ML16064A508), NCUC (ADAMS Accession No. ML16064A507), and the Federal Energy Regulatory Commission (ADAMS Accession No. ML16064A506) about the COLA for North Anna Unit 3. In addition, the staff published a notice of the application in the FR on April 27, May 4, May 11, and May 18, 2016 (81 FR 24900, 81 FR 26837, 81 FR 29308, and 81 FR 31263).

Based on the staff's completion of notification to regulatory agencies and the public notices described above, the staff concludes that, for the purposes of issuing a COL for North Anna Unit 3, all required notifications to other agencies or bodies have been duly carried out.

(iii) There is reasonable assurance that the facility will be constructed and will operate in conformity with the license, the provisions of the Act, and the Commission's regulations.

The staff reviewed information provided by the applicant to ensure that the plant will be constructed and will operate in conformity with the license, applicable provisions of the AEA, and applicable regulations. This includes the FSAR and other portions of the application, including general and financial information; technical specifications; the emergency plan; requests for departures, variances, and exemptions; the quality assurance (QA) plan; and the security plan.

In areas where the staff found that the information submitted initially was incomplete or insufficient to allow it to reach a reasonable assurance conclusion, the staff issued RAIs to the applicant to obtain additional information. The staff reviewed the applicant's responses to ensure that the additional information provided was sufficient to support the staff conclusion. As necessary, the staff also conducted audits of the applicant's records and calculations and performed its own confirmatory calculations to confirm applicant statements.

In some cases, the staff's reasonable assurance finding required the imposition of license conditions or ITAAC as part of the license. The draft COL lists the license conditions, including those resulting from the Fukushima Near-Term Task Force recommendations, and ITAAC. The basis for each license condition or ITAAC appears in the technical evaluations in the North Anna Unit 3 COL FSER or in the FSER

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<sup>2</sup> During the course of the final safety review, a non-concurrence was filed related to changing the text in the FSER regarding the staff's acceptance of the applicant's description of the inservice testing operational program. Staff management and the non-concurring individual were able to agree to a resolution of the concerns and the non-concurring individual ultimately concurred on the document. In accordance with Management Directive 10.158, "NRC Non-Concurrence Process," the resolution of the non-concurrence is documented in NCP-2016-022 (ADAMS Accession Nos. ML17011A203).

prepared for the NAPS ESP and in the ESBWR DCD FSER referenced by the COLA for North Anna Unit 3.

On the basis of the staff's review of the application discussed in this information paper and documented in the FSER and SEIS, the staff concludes that, for the purpose of issuing a COL for North Anna Unit 3, there is reasonable assurance that the facility will be constructed and will operate in conformance with the license, the provisions of the AEA, and the Commission's regulations.

(iv) The applicant is technically and financially qualified to engage in the activities authorized.

The staff reviewed information provided by the applicant about technical and financial qualifications.

- a. Technical Qualifications. The staff reviewed information provided by the applicant on its technical qualifications. The review included an evaluation of the applicant's operating experience, organizational structure, and QA program. Dominion has over 48 years of experience in the design, construction, and operation of nuclear generating plants. Dominion has designed, constructed, and currently operates North Anna Units 1 and 2 and Surry Units 1 and 2 in Virginia; and Dominion currently operates Millstone Units 2 and 3 in Connecticut. The combined electric generation of the six operating units is in excess of 5,600 megawatts electric. Dominion holds 10 CFR Part 50 licenses for these six nuclear power plants and has shown it can build and operate them. Dominion has also demonstrated the ability to choose and manage the oversight of nuclear steam supply system vendors, architect-engineers, and constructors of nuclear-related work. The staff's review of the applicant's organizational structure concluded that the management, technical support, and operating organizations are acceptable. The staff reviewed the QA program and found it acceptable. This QA program includes requirements that will be implemented by the applicant's engineering, procurement, and construction contractor.

The staff's evaluation of this information appears in Sections 1.4 and Chapters 13 and 17 of the FSER. Based on its evaluation of the applicant's experience with nuclear power plants, its operating organization, and its QA program, the staff finds that the applicant is technically qualified to hold a 10 CFR Part 52 license in accordance with 10 CFR 52.97(a)(1)(iv).

- b. Financial Qualifications. The staff reviewed information provided by the applicant about its financial qualifications to safely construct, operate, and decommission the proposed North Anna Unit 3 reactor. Specifically, the review included an evaluation of the applicant's financial qualifications; financial assurance for decommissioning; applicability of foreign ownership, control, or domination (FOCD); and financial protection in the form of nuclear insurance and indemnity. In its review of financial qualifications, the staff evaluated information on the total costs to build North Anna Unit 3, including expenditures associated with engineering of the facility, procurement of materials, construction costs, owners' costs (e.g., environmental studies and permitting, and legal fees), financing costs, inflation, as well as information on sources of funding available to the owner. Applicable regulations and guidance considered by the staff include

10 CFR 50.33, "Contents of Applications; General Information"; Section I.A.2, "Source of Construction Funds," of Appendix C, "A Guide for the Financial Data and Related Information Required To Establish Financial Qualifications for Construction Permits and Combined Licenses," to 10 CFR Part 50; 10 CFR 50.75, "Reporting and recordkeeping for decommissioning planning;" 10 CFR 50.38, "Ineligibility of certain applicants;" 10 CFR Part 140, "Financial Protection Requirements and Indemnity Agreements"; 10 CFR 52.97(a)(1)(iv); NUREG-1577, "Standard Review Plan on Power Reactor Licensee Financial Qualifications and Decommissioning Funding Assurance," Revision 1, issued February 1999; and guidance in the Standard Review Plan, "Foreign Ownership, Control, or Domination of applicants for Reactor Licenses," dated June 1999 (64 FR 52357-52359).

The staff's evaluation of this information appears in Chapter 1 of the FSER. Based on the financial information provided by the applicant, the NRC staff concludes that Dominion Virginia Power (DUP) is not subject to a review of its financial qualifications for operations pursuant to 10 CFR 50.33(f)(2) because it is considered a Utility pursuant to 10 CFR 50.2, "Definitions;" DVP has demonstrated that it possesses or has access to the financial resources necessary to meet estimated construction costs and related fuel cycle costs; and there are no decommissioning funding assurance, FOCD, or nuclear insurance and indemnity concerns. Therefore, the NRC staff concludes that the applicant is financially qualified to construct North Anna Unit 3 and to engage in the activities authorized by the licenses.

- (v) Issuance of the license will not be inimical to the common defense and security or to the health and safety of the public.

The staff reviewed the COLA for North Anna Unit 3 to ensure that issuance of the license will not be inimical to the common defense and security or to public health and safety. Specifically, the staff evaluated the applicant's analysis and conclusions about site-specific conditions, including the geography and demography of the site; nearby industrial, transportation, and military facilities; site meteorology; site hydrology; and site geology, seismology, and geotechnical engineering, to ensure that issuance of the license will not be inimical to public health and safety. With respect to conclusions about the site suitability issues that were incorporated by reference from the NAPS ESP without a variance, the staff verified that none of the criteria for disturbing ESP finality were met. The review also evaluated the design of SSCs and equipment to ensure safe operation, performance, and shutdown when subjected to extreme weather, floods, seismic events, missiles (including aircraft impacts), chemical and radiological releases, and loss of offsite power, to the extent not already resolved by the incorporation of the ESBWR design.

The review confirmed that radiological releases and human doses during both normal operation and accident scenarios will remain within regulatory limits, which supports the staff's conclusion that issuance of the license will not be inimical to public health and safety. The review determined that the security measures to be implemented at the site are adequate to protect the facility in accordance with NRC security regulations, which supports the staff's conclusion that issuance of the license will not be inimical to the common defense and security. Based on review of this and other information in the application, the NRC staff is not aware of any information presenting inimicality concerns

or FOCD concerns that would require additional assessment for inimicality purposes. In addition, the applicant is a wholly-owned United States company that is based in the United States and all members of senior management and the Board of Directors are also United States citizens.

The review also determined that operational programs identified by the applicant are sufficiently described to assure the staff of compliance with regulations. Where the staff needed to confirm operational program implementation to reach a reasonable assurance finding but the details of program implementation were not governed by specific regulatory requirements, the draft license contains license conditions to ensure that operational programs will be properly implemented and thus that issuance of the COL will not be inimical to the common defense and security or to public health and safety. The staff evaluation addressed the operational programs identified in the SRM, dated February 22, 2006, on SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," as well as three additional operational programs, including a cyber security program, a program for SNM, and an SNM physical security program. The staff's review of the applicant's emergency planning information, including the major features of the emergency plan approved as part of the ESP application and incorporated by reference in the COL application, concluded that the emergency plan is acceptable and supports the staff's conclusion that issuance of the license will not be inimical to the health and safety of the public.

On the basis of the staff's review of the application, as discussed in this information paper and the referenced documents, the staff concludes that issuance of the COL for North Anna Unit 3 will not be inimical to the common defense and security or to public health and safety.

(vi) The findings required by Subpart A of 10 CFR Part 51 have been made.

As discussed below, the staff concludes that, for the purpose of issuing a COL for North Anna Unit 3, the environmental review has been adequate to support the findings set forth in 10 CFR 51.107(a).

*10 CFR 52.97(a)(2):*

The staff concludes that there are no acceptance criteria from ITAAC in the referenced ESP or standard design certification that the applicant has asserted are met. Therefore, no Commission finding under this section is required for the purpose of issuing a COL for North Anna Unit 3.

*10 CFR 51.107(a):*

(i) Determine whether the requirements of Sections 102(2) (A), (C), and (E) of NEPA and the regulations in Subpart A of 10 CFR Part 51 have been met.

The staff reviewed the application and evaluated it against the applicable regulations in 10 CFR Parts 50, 51, 52, and 100. The staff performed this evaluation using applicable portions of the environmental SRP (NUREG-1555), issued in 2000 and updated in 2007, and ISG documents, RGs, and generic letters.

In accordance with NEPA Section 102(2)(A) (42 U.S.C. § 4332(2)(A)), the staff prepared both the EIS for the NAPS ESP and the COL SEIS, based on its independent assessment of the information provided by the applicant and information developed independently by the staff, including through consultation with other agencies. The staff's technical analysis used a systematic, interdisciplinary approach to integrate information from many fields, including the natural and social sciences.

In accordance with NEPA Section 102(2)(C)(i-v) (42 USC § 4332(2)(C)(i-v)), the COL SEIS and the ESP EIS together address (1) the environmental impact of the proposed action, (2) any unavoidable adverse environmental effects, (3) alternatives to the proposed action, (4) the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, and (5) any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented.

Appendix F to the ESP EIS and the COL SEIS present correspondence related to the staff's interactions with other Federal agencies during the preparation of these documents. Based on the listing of new species after the COL SEIS was issued, additional consultations with the USFWS and National Marine Fisheries Service (NMFS) were initiated. Consultations with NMFS were concluded in November 2016 with that agency's concurrence on the staff's determination that the construction and operation of North Anna Unit 3 is not likely to adversely affect Federally protected species under that agency's jurisdiction (ADAMS Accession No. ML16319A265). In December 2016 the staff submitted a Biological Assessment to the USFWS which documents the staff's determination that project activities are not likely to adversely affect Federally protected species under that agency's jurisdiction (ADAMS No. ML16312A321). In addition, following the process described earlier for determining whether new information warrants a supplemental EIS, the staff completed a significance evaluation to determine whether the new information regarding Federally listed species is significant according to 10 CFR 52.92 (a). The staff determined that the new information is not significant and a supplement to the COL SEIS is not warranted (ADAMS Accession No. ML16342B385). As supported by all of these documents, the staff concludes that it fulfilled the requirement of NEPA Section 102(2)(C) by consulting with and obtaining comments from other Federal agencies with jurisdiction by law or special expertise (see 42 USC § 4332(2)(C)). The staff did not identify any Federal agencies as cooperating agencies in preparation of the COL SEIS.

The staff concludes that the COL SEIS demonstrates that the staff adequately considered alternatives to the proposed action to the extent that it involves unresolved conflicts concerning alternative uses of available resources, consistent with the requirements of NEPA Section 102(2)(E) (42 USC § 4332(2)(E)). The alternatives considered in the COL SEIS include the no-action alternative, energy alternatives, system design alternatives, and mitigation alternatives for severe accidents.

For the reasons given above, the staff also concludes that its review meets the NRC's requirements in 10 CFR Part 51, Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)." The staff concludes that the environmental findings in the FEIS constitute the "hard look" required by NEPA and have reasonable support in logic and fact.

- (ii) Independently consider the final balance among conflicting factors contained in the record of the proceeding with a view to determining the appropriate action to be taken.

Section 10.6.3 of the COL SEIS provides the staff summary of the cost-benefit assessment. The staff concluded that, "On balance, the benefits of Unit 3 would significantly outweigh the economic, environmental and social costs of the project."

- (iii) Determine, after weighing the environmental, economic, technical, and other benefits against environmental and other costs, and considering reasonable alternatives, whether the COL should be issued, denied, or appropriately conditioned to protect environmental values.

As noted above, in its SEIS, the staff considered the cost-benefit analysis as well as reasonable alternatives. Based on that analysis, the staff recommends that the COL be issued. The staff based its recommendation on (1) the North Anna Unit 3 COLA environmental report and responses to staff RAIs, (2) the staff's review conducted for the ESP application and the assessment documented in the ESP EIS, (3) consultation with Federal, State, Tribal, and local agencies, (4) the staff's own independent review, including new and potentially significant information available since preparation and publication of the ESP EIS, (5) the staff's consideration of public comments related to the environmental review, and (6) the assessments summarized in the COL SEIS and the ESP EIS, including the mitigation measures identified.

- (iv) Determine, in an uncontested proceeding, whether the NEPA review conducted by the staff has been adequate.

The staff conducted an independent evaluation of the application; developed independent, reliable information; and conducted a systematic, interdisciplinary review of the potential impacts of the proposed action on the human environment and reasonable alternatives to the applicant's proposal. Before developing the DSEIS, the staff issued a notice of intent and invited the public to provide any new and potentially significant information relevant to the environmental review since issuance of the ESP EIS. The staff also provided opportunities for governmental and general public participation during the public meeting on the DSEIS and used publicly available guidance in the development of its SEIS, in conformance with the requirements of Appendix A, "Format for Presentation of Material in Environmental Impact Statements," to 10 CFR Part 51.

The staff considered the purpose of and need for the proposed action, the environment that could be affected by the action, and the consequences of the proposed action, including mitigation that could reduce impacts. In the COL SEIS, the staff supplemented the ESP EIS's evaluation of alternatives to the proposed action. The COL SEIS considered the no-action alternative, energy alternatives, and system design alternatives and the potential impact of conservation measures in determining the demand for power and consequent need for additional generating capacity. The ESP EIS and the COL SEIS compared the impacts of alternatives with those of the proposed action. The staff considered any adverse environmental effects that could not be avoided should the proposed action be implemented, the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity, and any irreversible or irretrievable commitments of resources that would be involved in the proposed project.

The NRC filed the COL DSEIS with the U.S. Environmental Protection Agency for its review, consistent with the requirements in Section 309 of the Clean Air Act (see 42 U.S.C. § 7609). The staff considered all comments received on the DSEIS and, in Appendix E to the COL SEIS, described the manner in which each comment was dispositioned.

On these bases, the staff concludes that, for the purpose of issuing the COL, it conducted a thorough and complete environmental review sufficient to meet the requirements of NEPA and adequate to inform the Commission's action on the COL request.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection.

*/RA/*

Victor M. McCree  
Executive Director  
for Operations

STAFF'S STATEMENT IN SUPPORT OF THE UNCONTESTED HEARING FOR ISSUANCE  
OF A COMBINED LICENSE FOR NORTH ANNA POWER STATION UNIT 3, (1/18/2017)

ADAMS ACCESSION NO.: ML15341A103

\* via email

SECY-17-0009

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<b>DATE</b>	11/28/2016	12/05/2016	11/30/2016	11/21/2016
<b>OFFICE</b>	D: NRO/PMDA*	D: NRR/DIRS*	Tech Editor*	OGC*
<b>NAME</b>	FMiller	CMiller	JDougherty	MCarpentier
<b>DATE</b>	11/22/2016	11/30/2016	11/3/2016	12/16/2016
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<b>DATE</b>	1/4/2017	1/13/2017	1/18/2017	

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