

1 **DRAFT SAFETY EVALUATION**

2 **BY THE OFFICE OF NUCLEAR REACTOR REGULATION**

3 **TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER**

4 **TSTF-557, REVISION 1,**

5 **“SPENT FUEL STORAGE RACK NEUTRON ABSORBER MONITORING PROGRAM”**

6 **USING THE CONSOLIDATED LINE ITEM IMPROVEMENT PROCESS**

7 **(EPID L-2017-PMP-0025)**

8 **1.0 INTRODUCTION**

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18 By letter dated December 19, 2017 (Agencywide Documents Access and Management System  
19 (ADAMS) Accession No. ML17353A608), the Technical Specifications Task Force (TSTF)  
20 submitted Technical Specifications Task Force (TSTF) Traveler TSTF-557, Revision 1, “Spent  
21 Fuel Storage Rack Neutron Absorber Monitoring Program.” Traveler TSTF-557 proposes  
22 changes to the Standard Technical Specifications (STS) for all plant designs, including Babcock  
23 and Wilcox, Combustion Engineering, Westinghouse, General Electric, and Westinghouse  
24 AP1000® plants. These changes will be incorporated into future revisions of NUREG-1430,  
25 NUREG-1431, NUREG-1432, NUREG-1433, NUREG-1434, and NUREG-2194.<sup>1</sup> This traveler  
26 will be made available to licensees for adoption through the consolidated line item improvement  
27 process.  
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<sup>1</sup> U.S. Nuclear Regulatory Commission, “Standard Technical Specifications, Babcock and Wilcox Plants,” NUREG-1430, Revision 4.0, April 2012, Volume 1, “Specifications” (ADAMS Accession No. ML12100A177), and Volume 2, “Bases” (ADAMS Accession No. ML12100A178).

U.S. Nuclear Regulatory Commission, “Standard Technical Specifications, Westinghouse Plants,” NUREG-1431, Revision 4.0, April 2012, Volume 1, “Specifications” (ADAMS Accession No. ML12100A222), and Volume 2, “Bases” (ADAMS Accession No. ML12100A228).

U.S. Nuclear Regulatory Commission, “Standard Technical Specifications, Combustion Engineering Plants,” NUREG-1432, Revision 4.0, April 2012, Volume 1, “Specifications” (ADAMS Accession No. ML12102A165), and Volume 2, “Bases” (ADAMS Accession No. ML12102A169).

U.S. Nuclear Regulatory Commission, “Standard Technical Specifications, General Electric Plants, BWR/4,” NUREG-1433, Revision 4.0, April 2012, Volume 1, “Specifications” (ADAMS Accession No. ML12104A192), and Volume 2, “Bases” (ADAMS Accession No. ML12104A193).

U.S. Nuclear Regulatory Commission, “Standard Technical Specifications, General Electric Plants, BWR/6,” NUREG-1434, Revision 4.0, April 2012, Volume 1, “Specifications” (ADAMS Accession No. ML12104A195), and Volume 2 (ADAMS Accession No. ML12104A196).

U.S. Nuclear Regulatory Commission, “Standard Technical Specifications, Westinghouse Advanced Passive 1000 (AP1000®) Plants,” NUREG-2194, Revision 0, April 2016, Volume 1, “Specifications” (ADAMS Accession No. ML16110A277), and Volume 2, “Bases” (ADAMS Accession No. ML16110A369).

1 The proposed changes would add a new program entitled, "Spent Fuel Storage Rack Neutron  
2 Absorber Monitoring Program." The purpose of the program is to ensure the boron-10 areal  
3 density of the neutron absorber material assumed in the spent fuel pool (SFP) storage rack  
4 nuclear criticality analyses remains conservative with respect to the actual plant conditions. The  
5 program is optional and may be adopted by licensees that have licensing requirements for a  
6 SFP neutron absorber material (NAM) monitoring program.

7  
8 **2.0 REGULATORY EVALUATION**

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10 **2.1 DESCRIPTION OF SPENT FUEL POOL STORAGE RACKS**

11  
12 The credited NAM installed in the SFP storage racks ensures that the effective multiplication  
13 factor ( $k$ -effective,  $k_{\text{eff}}$ ) does not exceed the values and assumptions used in the criticality  
14 analysis of record (AOR) and other licensing basis documents. The AOR is the basis, in part,  
15 for demonstrating compliance with plant technical specifications (TS) and with applicable NRC  
16 regulations. Degradation or deformation of the credited NAM may reduce safety margin and  
17 potentially challenge the subcriticality requirement. The NAM utilized in SFP racks exposed to  
18 treated water or treated borated water may be susceptible to reduction of neutron absorbing  
19 capacity, changes in dimension that increase  $k_{\text{eff}}$ , and loss of material. A monitoring program is  
20 implemented to ensure that degradation of the NAM used in SFPs, which could compromise the  
21 ability of the NAM to perform its safety function as assumed in the AOR, will be detected.

22  
23 **2.2 PROPOSED CHANGES TO THE STANDARD TECHNICAL SPECIFICATIONS**

24  
25 A new program would be added to Section 5.5, "Program and Manuals." The new program  
26 would appear in each STS NUREG as:

27  
28 5.5.XX [Spent Fuel Storage Rack Neutron Absorber Monitoring Program

29  
30 This Program provides controls for monitoring the condition of the  
31 neutron absorber used in the spent fuel pool storage racks to  
32 verify the Boron-10 areal density is consistent with the  
33 assumptions in the spent fuel pool criticality analysis. The  
34 program shall be in accordance with NEI 16-03-A, "Guidance for  
35 Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools,"  
36 Revision 0, May 2017[, with the following exceptions:

37  
38 1. .].]

39  
40 **2.3 APPLICABLE REGULATORY REQUIREMENTS AND GUIDANCE**

41  
42 Section IV, "The Commission Policy," of the "Final Policy Statement on Technical Specifications  
43 Improvements for Nuclear Power Reactors," published in the *Federal Register* on July 22, 1993  
44 (58 FR 39132), states, in part:

45  
46 The purpose of Technical Specifications is to impose those  
47 conditions or limitations upon reactor operation necessary to  
48 obviate the possibility of an abnormal situation or event giving rise  
49 to an immediate threat to the public health and safety by  
50 identifying those features that are of controlling importance to

1 safety and establishing on them certain conditions of operation  
2 which cannot be changed without prior Commission approval.

3  
4 ...[T]he Commission will also entertain requests to adopt portions  
5 of the improved STS [(e.g., TSTF-557)], even if the licensee does  
6 not adopt all STS improvements. ...The Commission encourages  
7 all licensees who submit Technical Specification related submittals  
8 based on this Policy Statement to emphasize human factors  
9 principles.

10  
11 ...In accordance with this Policy Statement, improved STS have  
12 been developed and will be maintained for each NSSS [nuclear  
13 steam supply system] owners group. The Commission  
14 encourages licensees to use the improved STS as the basis for  
15 plant-specific Technical Specifications. ...[I]t is the Commission  
16 intent that the wording and Bases of the improved STS be used ...  
17 to the extent practicable.

18  
19 As described in the Commission's "Final Policy Statement on Technical Specifications  
20 Improvements for Nuclear Power Reactors," the NRC and industry task groups for new STS  
21 recommended that improvements include greater emphasis on human factors principles in order  
22 to add clarity and understanding to the text of the STS, and provide improvements to the Bases  
23 of STS, which provides the purpose for each requirement in the specification. The improved  
24 vendor-specific STS were developed and issued by the NRC in September 1992.

25  
26 The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.36(b)  
27 requires:

28  
29 Each license authorizing operation of a ... utilization facility ... will  
30 include technical specifications. The technical specifications will  
31 be derived from the analyses and evaluation included in the safety  
32 analysis report, and amendments thereto, submitted pursuant to  
33 [10 CFR] 50.34 ["Contents of applications; technical information"].  
34 The Commission may include such additional technical  
35 specifications as the Commission finds appropriate.

36  
37 The regulation at 10 CFR 50.36(c)(5) requires TS to include administrative controls, which "are  
38 the provisions relating to organization and management, procedures, recordkeeping, review and  
39 audit, and reporting necessary to assure operation of the facility in a safe manner."

40  
41 The regulation in paragraph (b)(4) of 10 CFR 50.68, "Criticality accident requirements," states  
42 that if the licensee does not credit soluble boron in the SFP criticality AOR, the  $k_{\text{eff}}$  of the SFP  
43 storage racks must not exceed 0.95 at a 95 percent probability, 95 percent confidence level if  
44 flooded with unborated water. If the licensee does take credit for soluble boron, the  $k_{\text{eff}}$  of the  
45 SFP storage racks must not exceed 0.95 at a 95 percent probability, 95 percent confidence  
46 level, if the racks are flooded with borated water, and if flooded with unborated water, the  $k_{\text{eff}}$   
47 must remain below 1.0 at a 95 percent probability, 95 percent confidence level.

48  
49 The STS Section 5.5 program imposes a requirement to have a licensee-controlled program  
50 that is in accordance with Nuclear Energy Institute (NEI) topical report NEI 16-03-A, "Guidance  
51 for Monitoring of Fixed Neutron Absorbers in Spent Fuel Pools," Revision 0, dated May 26, 2017

1 (ADAMS Accession No. ML17263A133). The NRC staff approved NEI 16-03 in a safety  
2 evaluation (SE) dated March 3, 2017 (ADAMS Accession No. ML16354A486). The  
3 NEI 16-03-A topical report and the NRC's SE for NEI 16-03 provide the technical justification for  
4 the proposed program.  
5

6 The NRC staff's guidance for the review of TS is in Chapter 16.0, "Technical Specifications," of  
7 NUREG-0800, Revision 3, "Standard Review Plan for the Review of Safety Analysis Reports for  
8 Nuclear Power Plants, LWR [Light-Water Reactor] Edition" (SRP), March 2010 (ADAMS  
9 Accession No. ML100351425). As described therein, as part of the regulatory standardization  
10 effort, the NRC staff has prepared STS for each of the LWR designs. Accordingly, the NRC  
11 staff's review includes consideration of whether the proposed changes are consistent with the  
12 applicable reference STS (i.e., the current STS), as modified by NRC-approved travelers. In  
13 addition, the guidance states that comparing the change to previous STS can help clarify the TS  
14 intent  
15

16 Section 9.1.1, Revision 3, of the SRP, "Criticality Safety of Fresh and Spent Fuel Storage and  
17 Handling," March 2007 (ADAMS Accession No. ML070570006), provides guidance regarding  
18 the acceptance criteria and review procedures to ensure that the proposed changes satisfy the  
19 requirements in 10 CFR 50.68.  
20

21 Section 9.1.2, Revision 4, of the SRP, "New and Spent Fuel Storage" (ADAMS Accession  
22 No. ML070550057), provides guidance regarding the acceptance criteria and review procedures  
23 to ensure that the proposed changes satisfy the requirements in 10 CFR 50.68.  
24

25 NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report," December 2010  
26 (ADAMS Accession No. ML103490041), provides guidance on what constitutes an acceptable  
27 monitoring program for NAM credited for criticality control in the SFP.  
28

### 29 **3.0 TECHNICAL EVALUATION**

30  
31 The NRC staff reviewed the proposed changes to STS and the technical justification for the  
32 changes provided in Traveler TSTF-557. The NRC staff reviewed the technical justification for  
33 the proposed changes to ensure the reasoning was logical, complete and clearly written as  
34 described in Chapter 16 of NUREG-0800. The NRC staff reviewed the proposed changes for  
35 consistency with conventional terminology and with the format and usage rules embodied in the  
36 STS. The NRC staff also reviewed the STS changes to ensure adoption of the traveler by  
37 future applicants would provide assurance that an applicant's TS would continue to comply with  
38 the requirements of 10 CFR 50.36. Finally, NRC staff also reviewed the changes to ensure any  
39 limitations or conditions placed on adoption of the traveler by future applicants were clearly  
40 described.  
41

#### 42 **3.1 NEW PROGRAM FOR MONITORING NEUTRON ABSORBER**

43  
44 The purpose of the program is to ensure the boron-10 areal density of the neutron absorber  
45 material assumed in the SFP storage rack nuclear criticality analyses remains conservative with  
46 respect to the actual plant conditions.  
47

48 The TS Section [5.5] program imposes a requirement to have a licensee-controlled program that  
49 is in accordance with NEI 16-03-A, "Guidance for Monitoring of Fixed Neutron Absorbers in  
50 Spent Fuel Pools," Revision 0, May 2017. In the SE for NEI 16-03, dated March 3, 2017, the  
51 NRC approved and accepted the document for referencing in licensing applications for nuclear

1 power plants. The NEI 16-03-A topical report and the NRC's SE for NEI 16-03 provide the  
2 technical justification for the proposed program.

3  
4 The purpose of a NAM monitoring program is to verify that the NAM installed in SFPs continues  
5 to perform its safety function (i.e., criticality control) as assumed in the AOR. The guidance  
6 provided in NEI 16-03-A for a NAM monitoring program relies on periodic inspection, testing,  
7 monitoring, and analysis of the NAM to ensure that the required subcriticality margin is  
8 maintained in accordance with 10 CFR 50.68 requirements. To accomplish this purpose, the  
9 guidance document states that a monitoring program must be capable of identifying  
10 unanticipated changes in the absorber material and determining whether anticipated changes  
11 can be verified. The guidance recommends a combination of coupon testing, in situ  
12 measurement, and SFP water chemistry monitoring as a means to monitor potential changes in  
13 characteristics of the NAM. The NRC staff reviewed the proposed guidance for what constitutes  
14 an acceptable monitoring program and its ability to ensure that potential degradation of SFP  
15 NAM will be detected, monitored, and mitigated.

16  
17 In the NRC staff's SE of NEI 16-03, the staff determined that an appropriate combination of the  
18 three methods listed above (coupon testing, in situ measurement, and SFP water chemistry  
19 monitoring) as described in NEI 16-03-A, can comprise an effective NAM monitoring  
20 program. Section 3.4 of the NRC's SE of NEI 16-03 states that in order for a NAM program to  
21 be acceptable, a licensee must perform neutron attenuation testing to verify the boron-10 areal  
22 density. Further, in Section 4.0 of the NRC staff's SE of NEI 16-03, the staff concluded that a  
23 NAM monitoring program implementing the guidance in NEI 16-03-A provides reasonable  
24 assurance that such program will be able to detect degradation of neutron absorbing material,  
25 and provides assurance that the ability of the NAM to provide the criticality control relied upon in  
26 the AOR, is maintained. As noted above, the topical report NEI 16-03-A and the NRC staff's SE  
27 approving NEI 16-03 provide the technical justification for the proposed program in TSTF-557.

28  
29 The NRC staff reviewed the technical justification in TSTF-557 and determined it was logical,  
30 complete, and clearly written as described in Chapter 16 of NUREG-0800. The NRC staff  
31 further notes that the NRC's approval of TSTF-557 will allow licensees to more readily  
32 incorporate an acceptable NAM monitoring program into their TS.

### 33 34 3.2 FORMATTING OF PROPOSED PROGRAM

35  
36 The specification is in brackets, indicating that its applicability is plant-specific. A monitoring  
37 program is only applicable to plants that credit NAM in their SFP criticality analysis. In addition,  
38 plants may have been approved for use of NAM without a TS monitoring program, or may have  
39 adopted alternate TS or license condition monitoring requirements. Likewise, brackets are used  
40 to denote optional provisions for a licensee to request exceptions to NEI 16-03-A.

41  
42 The NRC staff reviewed the format and content of the proposed change to STS in TSTF-557  
43 and determined that the change is consistent with conventional terminology and with the format  
44 and usage rules embodied in the STS.

### 45 46 3.3 CONTINUED COMPLIANCE WITH THE REQUIREMENTS OF 10 CFR 50.36

47  
48 Adoption of the STS changes proposed in TSTF-557 by future applicants should provide  
49 assurance that an applicant's TS would continue to comply with the requirements of  
50 10 CFR 50.36. Based on its review, the NRC staff determined that implementation of a  
51 monitoring program into the TS, as described in TSTF-557, meets the regulatory requirements

1 and provides reasonable assurance that plants adopting these TS will have the requisite  
2 requirements to continue to meet 10 CFR 50.36.

3  
4 **3.4 MODEL LICENSE AMENDMENT**

5  
6 A model license amendment application was included in Traveler TSTF-557. It is anticipated  
7 that licensees may request adoption of the proposed change as part of a larger license  
8 amendment request related to SFP storage and a revised SFP critical analysis. However, the  
9 model may be used by licensees desiring to voluntarily adopt the traveler. The model includes  
10 appropriate bracketed sections to accommodate plant-specific information as well as requests  
11 for plant-specific exceptions and required justifications. The model also includes a reviewer's  
12 note to prompt licensees to include appropriate required information to fully describe and justify  
13 any variations from the model.

14  
15 The NRC staff reviewed the model license amendment application and determined that  
16 limitations or conditions placed on adoption of the traveler by future applicants are clearly  
17 described.

18  
19 **4.0 CONCLUSION**

20  
21 The NRC staff reviewed Traveler TSTF-557, which proposed changes to NUREG-1430,  
22 NUREG-1431, NUREG-1432, NUREG-1433, NUREG-1434, and NUREG-2194. The NRC staff  
23 determined that the proposed changes to the STS meet the standards for TS in  
24 10 CFR 50.36(b). The regulations at 10 CFR 50.36 require that TS include items in specified  
25 categories, including administrative controls.

26  
27 Based on its review of TSTF-557 and previous approval of NEI 16-03, the NRC staff has  
28 determined that a NAM monitoring program meeting the provisions in NEI 16-03-A will allow a  
29 licensee to reasonably ensure that the ability of the NAM to perform its safety function, as  
30 assumed in the AOR, is maintained, thus demonstrating compliance with the subcriticality  
31 requirements of 10 CFR 50.68. The NRC staff finds that the proposed new monitoring program,  
32 as adopted by licensees, will allow a licensee's TS to continue to meet the requirements of  
33 10 CFR 50.36(c)(5). The STS, as modified by TSTF-557, will continue to specify the  
34 requirements for administrative controls. The NRC staff also concluded that the traveler and  
35 model application contain appropriate limitations or conditions for adoption of the traveler by  
36 future applicants.

37  
38 Additionally, the changes to the STS were reviewed and found to be technically clear and  
39 consistent with customary terminology and format in accordance with SRP Chapter 16.0. The  
40 NRC staff reviewed the proposed changes against the regulations and concludes that the  
41 changes continue to meet the requirements of 10 CFR 50.36(b), 50.36(c)(5), and 50.68, for the  
42 reasons discussed above, and thus provide reasonable assurance that adoption of these  
43 changes will have the requisite requirements and controls to operate safely. Therefore, the  
44 NRC staff concludes that the proposed changes are acceptable.

45  
46 Principal Contributors: M. Hamm, NRR/DSS  
47 M. Yoder, NRR/DLMR

48  
49 Date: