

1 *General Directions: This Model SE provides the format and content to be used when preparing*  
2 *the plant-specific SE of an LAR to adopt traveler TSTF-564, Revision 1. The **bolded** bracketed*  
3 *information shows text that should be filled in for the specific amendment; individual licensees*  
4 *would furnish site-specific nomenclature or values for these bracketed items. The italicized*  
5 *wording provides guidance on what should be included in each section and should not be*  
6 *included in the SE.*

7  
8 DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

9  
10 RELATED TO TECHNICAL SPECIFICATIONS TASK FORCE TRAVELER

11  
12 TSTF-564, REVISION 1, "SAFETY LIMIT MCPR,"

13  
14 USING THE CONSOLIDATED LINE ITEM IMPROVEMENT PROCESS

15  
16  
17  
18 1.0 INTRODUCTION AND BACKGROUND

19  
20 By application dated **[enter date]**, (Agencywide Documents Access and Management System  
21 (ADAMS) Accession No. **[MLXXXXXXXXXX]**), **[as supplemented by letters dated [enter**  
22 **date(s)]**], **[name of licensee]** (the licensee) submitted a license amendment request (LAR) for  
23 **[name of facility (abbreviated name), applicable units]**.

24  
25 The LAR proposed to revise the basis, calculational method, and the value of the technical  
26 specification (TS) safety limit (SL) 2.1.1.2, which protects against boiling transition on the fuel  
27 rods in the core. The current basis ensures that 99.9 percent of the fuel rods in the core are not  
28 susceptible to boiling transition. The revised basis will ensure that there is a 95 percent  
29 probability at a 95 percent confidence level that no fuel rods will be susceptible to boiling  
30 transition using an SL based on critical power ratio (CPR) data statistics. Technical  
31 Specification 5.6.3, "Core Operating Limits Report [(COLR)]," is also modified.

32  
33 The proposed changes are based on Technical Specifications Task Force (TSTF) traveler  
34 TSTF-564, Revision 1, "Safety Limit MCPR [Minimum Critical Power Ratio]," dated May 29,  
35 2018 (ADAMS Accession No. ML18149A320). The U.S. Nuclear Regulatory Commission (NRC  
36 or the Commission) issued a final safety evaluation (SE) approving traveler TSTF-564,  
37 Revision 1, on **[enter date]** (ADAMS Accession No. **[MLXXXXXXXXXX]**).

38  
39 **[The licensee has proposed several variations from the TS changes described in traveler**  
40 **TSTF-564, Revision 1. The variations are described in Section [2.2] of this SE and**  
41 **evaluated in Section [3.6].]**

42  
43 **[The supplemental letter(s) dated [enter date(s)], provided additional information that**  
44 **clarified the application, did not expand the scope of the application as originally**  
45 **noticed, and did not change the NRC staff's original proposed no significant hazards**  
46 **consideration determination as published in the *Federal Register* on [enter date] (cite FR**  
47 **reference).]**

1 1.1 Background on Boiling Transition  
2

3 During steady-state operation in a boiling-water reactor (BWR), most of the coolant in the core  
4 is in a flow regime known as annular flow. In this flow regime, a thin liquid film is pushed up the  
5 surface of the fuel rod cladding by the bulk coolant flow, which is mostly water vapor with some  
6 liquid water droplets. This provides effective heat removal from the cladding surface; however,  
7 under certain conditions, the annular film may dissipate, which reduces the heat transfer and  
8 results in an increase in fuel cladding surface temperature. This phenomenon is known as  
9 boiling transition or dryout. The elevated surface temperatures resulting from dryout may cause  
10 fuel cladding damage or failure.

11  
12 1.2 Background on Critical Power Correlations  
13

14 For a given set of reactor operating conditions (pressure, flow, etc.), dryout will occur on a fuel  
15 assembly at a certain power, known as the critical power. Because the phenomena associated  
16 with boiling transition are complex and difficult to model purely mechanistically,  
17 thermal-hydraulic test campaigns are undertaken using electrically heated prototypical fuel  
18 bundles to establish a comprehensive database of critical power measurements for each BWR  
19 fuel product. These data are then used to develop a critical power correlation that can be used  
20 to predict the critical power for assemblies in operating reactors. This prediction is usually  
21 expressed as the ratio of the actual assembly power to the critical power predicted using the  
22 correlation, known as the CPR.

23  
24 One measure of the correlation's predictive capability is based on its validation relative to the  
25 test data. For each point  $j$  in a correlation's test database, the experimental critical power ratio  
26 (ECPR) is defined as the ratio of the measured critical power to the calculated critical power, or:  
27

28 
$$ECPR_j = \frac{\text{Measured Critical Power}_j}{\text{Calculated Critical Power}_j}$$

29  
30 For ECPR values less than or equal to 1, the calculated critical power is greater than the  
31 measured critical power and the prediction is considered to be non-conservative. Because the  
32 measured critical power includes random variations due to various uncertainties, evaluating the  
33 ECPR for all of the points in the dataset (or, ideally, a subset of points that were not used in the  
34 correlation's development) results in a probability distribution. This ECPR distribution allows the  
35 predictive uncertainty of the correlation to be determined. This uncertainty can then be used to  
36 establish a limit above which there can be assumed that boiling transition will not occur (with a  
37 certain probability and confidence level).

38  
39 1.3 Background on Thermal-Hydraulic Safety Limits  
40

41 To protect against boiling transition, BWRs have implemented an SL on the CPR, known as the  
42 minimum critical power ratio (MCPR) SL. As discussed in NUREG-1433 and NUREG-1434 for

1 General Electric BWR designs,<sup>1</sup> the current basis of the MCPR SL is to prevent 99.9 percent of  
2 the fuel in the core from being susceptible to boiling transition. This limit is typically developed  
3 by considering various cycle-specific power distributions and uncertainties, and is highly  
4 dependent on the cycle-specific radial power distribution in the core. As such, the limit may  
5 need to be updated as frequently as every cycle.  
6

7 The fuel cladding SL for pressurized-water reactor (PWR) designs, described in the Standard  
8 Technical Specifications (STS) for Babcock & Wilcox, Westinghouse, and Combustion  
9 Engineering<sup>2</sup> plants in NUREG-1430, NUREG-1431, and NUREG-1432,<sup>3</sup> respectively,  
10 correspond to a 95 percent probability at a 95 percent confidence level that departure from  
11 nucleate boiling will not occur. As a result of the overall approach taken in developing the PWR  
12 limits, they are only dependent on the fuel type(s) in the reactor and the corresponding  
13 departure from nucleate boiling ratio (DNBR) correlations. The limits are not cycle-dependent  
14 and are typically only updated when new fuel types are inserted in the reactor.  
15

16 BWRs also have a limiting condition for operation (LCO) that governs MCPR, known as the  
17 MCPR operating limit (OL). The OL on MCPR is an LCO which must be met to ensure that  
18 anticipated operational occurrences do not result in fuel damage. The current MCPR OL is  
19 calculated by combining the largest change in CPR from all analyzed transients, also known as  
20 the  $\Delta$ CPR, with the MCPR SL.  
21

## 22 2.0 REGULATORY EVALUATION

### 23 24 2.1 Description of TS Sections

#### 25 26 2.1.1 TS 2.1.1, "Reactor Core SLs"

27  
28 Safety limits ensure that specified acceptable fuel design limits are not exceeded during steady  
29 state operation, normal operational transients, and anticipated operational occurrences (AOOs).  
30

31 **[Name of facility]** TS 2.1.1.2 currently requires that with the reactor steam dome pressure  
32 greater than or equal to ( $\geq$ ) 785 pounds per square inch gauge (psig) and core flow  $\geq$  10 percent  
33 rated core flow, MCPR shall be  $\geq$  **[1.07]** for two recirculation loop operation or  $\geq$  **[1.08]** for single  
34 recirculation loop operation. The MCPR SL ensures that 99.9 percent of the fuel in the core is  
35 not susceptible to boiling transition.  
36

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<sup>1</sup> U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric Plants BWR/4," NUREG-1433, Volume 1, "Specifications," and Volume 2, "Bases," Revision 4.0, April 2012 (ADAMS Accession Nos. ML12104A192 and ML12104A193).

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, General Electric Plants BWR/6," NUREG-1434, Volume 1, "Specifications," and Volume 2, "Bases," Revision 4.0, April 2012 (ADAMS Accession Nos. ML12104A195 and ML12104A196).

<sup>2</sup> Denotes applicability to Combustion Engineering plants with digital control systems only.

<sup>3</sup> U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, Babcock and Wilcox Plants," NUREG-1430, Volume 1, "Specifications," and Volume 2, "Bases," Revision 4.0, April 2012 (ADAMS Accession Nos. ML12100A177 and ML12100A178).

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, Westinghouse Plants," NUREG-1431, Volume 1, "Specifications," and Volume 2, "Bases," Revision 4.0, April 2012 (ADAMS Accession Nos. ML12100A222 and ML12100A228).

U.S. Nuclear Regulatory Commission, "Standard Technical Specifications, Combustion Engineering Plants," NUREG-1432, Volume 1, "Specifications," and Volume 2, "Bases," Revision 4.0, April 2012 (ADAMS Accession Nos. ML12102A165 and ML12102A169).

1 2.1.2 TS 5.6.3, “Core Operating Limits Report **[(COLR)]**”

2  
3 **[Name of facility]** TS 5.6.3 requires core operating limits to be established prior to each reload  
4 cycle, or prior to any remaining portion of a reload cycle. These limits are required to be  
5 documented in the COLR.  
6

7 2.2 Proposed Changes to the TS

8  
9 The licensee proposed to revise the MCPR SL to make it cycle-independent, consistent with the  
10 method described in traveler TSTF-564, Revision 1.  
11

12 The proposed changes to the **[name of facility]** TS revise the value of the MCPR SL in  
13 TS 2.1.1.2 to **[proposed value of MCPR SL from LAR]**, with corresponding changes to the  
14 associated bases. The change to TS 2.1.1.2 replaces the existing separate SLs for single- and  
15 two-recirculation loop operation with a single limit since the revised SL is no longer dependent  
16 on the number of recirculation loops in operation.  
17

18 The MCPR<sub>99.9%</sub> (i.e., the current MCPR SL) is an input to the MCPR operating limit (OL) in  
19 limiting condition of operation (LCO) 3.2.2, “Minimum Critical Power Ratio (MCPR).” While the  
20 definition and method of calculation of both the MCPR<sub>99.9%</sub> and the LCO 3.2.2 MCPR OL  
21 remains unchanged, the proposed TS changes include revisions to TS 5.6.3, to require the  
22 MCPR<sub>99.9%</sub> value used in calculating the LCO 3.2.2 MCPR OL to be included in the  
23 cycle-specific COLR.  
24

25 2.3 Applicable Regulatory Requirements and Guidance

26  
27 The regulation at Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36(a)(1),  
28 requires an applicant for an operating license to include in the application proposed TSs in  
29 accordance with the requirements of 10 CFR 50.36. The applicant must include in the  
30 application, a “summary statement of the bases or reasons for such specifications, other than  
31 those covering administrative controls.” However, per 10 CFR 50.36(a)(1), these TS bases  
32 “shall not become part of the technical specifications.”  
33

34 As required by 10 CFR 50.36(c), TSs will include items in the following categories: (1) *Safety*  
35 *limits, limiting safety system settings, and limiting control settings*. As required by 10 CFR  
36 50.36(c)(1)(i)(A), safety limits for nuclear reactors are “limits upon important process variables  
37 that are found to be necessary to reasonably protect the integrity of certain of the physical  
38 barriers that guard against the uncontrolled release of radioactivity. If any safety limit is  
39 exceeded, the reactor must be shut down. The licensee shall notify the Commission, review the  
40 matter, and record the results of the review, including the cause of the condition and the basis  
41 for corrective action taken to preclude recurrence. Operation must not be resumed until  
42 authorized by the Commission.”  
43

44 As required by 10 CFR 50.36(c)(2)(i), the TSs will include LCOs, which are the lowest functional  
45 capability or performance levels of equipment required for safe operation of the facility. When  
46 an LCO of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any  
47 remedial action permitted by the TSs until the condition can be met.

1  
2 **[General Design Criterion 10 (GDC), “Reactor design,” of 10 CFR Part 50 Appendix A,**  
3 **“General Design Criteria of Nuclear Power Plants,” states:**

4  
5 **The reactor core and associated coolant control and protection systems**  
6 **shall be designed with appropriate margin to assure that specified**  
7 **acceptable fuel design limits are not exceeded during any condition of**  
8 **normal operation, including the effects of anticipated operational**  
9 **occurrences.**

10  
11 **Most plants have a plant-specific design criterion similar to GDC 10. The limit placed on**  
12 **the MCPR acts as a specified acceptable fuel design limit to prevent boiling transition,**  
13 **which has the potential to result in fuel rod cladding failure.]**

14  
15 The NRC staff’s guidance contained in Revision 2 of NUREG-0800, “Standard Review Plan for  
16 the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition” (SRP),  
17 Section 4.4, “Thermal and Hydraulic Design,”<sup>4</sup> provides the following two examples of  
18 acceptable approaches to meeting the SRP acceptance criteria for establishing fuel design  
19 limits (as stated in SRP Acceptance Criterion 1):

- 20  
21 A. For departure from nucleate boiling ratio (DNBR), CHF<sub>R</sub> [critical heat flux ratio]  
22 or CPR correlations, there should be a 95-percent probability at the 95-percent  
23 confidence level that the hot rod in the core does not experience a DNB or boiling  
24 transition condition during normal operation or AOOs.  
25  
26 B. The limiting (minimum) value of DNBR, CHF<sub>R</sub>, or CPR correlations is to be  
27 established such that at least 99.9 percent of the fuel rods in the core will not  
28 experience a DNB or boiling transition during normal operation or AOOs.

29  
30 **3.0 TECHNICAL EVALUATION**

31  
32 **3.1 Basis for Proposed Change**

33  
34 As discussed in Section 1.3 of this SE, the current MCPR SL (i.e., the MCPR<sub>99.9%</sub>), is affected by  
35 the plant’s cycle-specific core design, especially including the core power distribution, fuel  
36 type(s) in the reactor, and the power-to-flow operating domain for the plant. As such, it is  
37 frequently necessary to change the MCPR SL to accommodate new core designs. Changes to  
38 the MCPR SL are usually determined late in the design process and necessitate an accelerated  
39 NRC review (i.e., license amendment request) to support the subsequent fuel cycle.

40  
41 **[Name of licensee]** proposed to change the basis for the MCPR SL for **[name of facility]** so  
42 that it is no longer cycle-dependent, reducing the frequency of revisions and eliminating the  
43 need for NRC’s review on an accelerated schedule. The proposed revised basis for the MCPR  
44 SL aligns it with that of the DNBR SL used in PWRs, which, as previously noted in Section 2.3  
45 of this SE, provides a 95 percent probability at a 95 percent confidence level that no fuel rods  
46 will experience departure from nucleate boiling.

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<sup>4</sup> U.S. Nuclear Regulatory Commission, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition,” NUREG-0800, Section 4.4, “Thermal and Hydraulic Design, Revision 2, March 2007 (ADAMS Accession No. ML070550060).

1  
2 The intent of the proposed basis for the revised MCPR SL is acceptable to the NRC staff based  
3 on the discussion in SRP Section 4.4, SRP Acceptance Criterion 1. The remainder of this SE is  
4 devoted to ensuring that the methodology for determining the revised MCPR SL provides the  
5 intended result, that the revised MCPR SL can be adequately determined in the core using  
6 various types of fuel, that the proposed SL continues to fulfil the necessary functions of an SL  
7 without unintended consequences, and that the proposed changes have been adequately  
8 implemented in the **[name of facility]** TS.

9  
10 **3.2 Revised MCPR SL Definition**

11  
12 As discussed in Section 1.2 of this SE, a critical power correlation's ECPR distribution quantifies  
13 the uncertainty associated with the correlation. Traveler TSTF-564, Revision 1, provides a  
14 definition for a limit that bounds 95 percent of a correlation's ECPR distribution at a 95 percent  
15 confidence level, according to the following formula:

16  
17 
$$\text{MCPR}_{95/95}(i) = \mu_i + \kappa_i \sigma_i$$

18  
19 where  $\mu_i$  is the correlation's mean ECPR,  $\sigma_i$  is the standard deviation of the correlation's ECPR  
20 distribution, and  $\kappa_i$  is a statistical parameter chosen to provide "95% probability at 95%  
21 confidence (95/95) for the one-sided upper tolerance limit that depends on the number of  
22 samples ( $N_i$ ) in the critical power database." This formula is commonly used to determine a  
23 95/95 one-sided upper tolerance limit for a normal distribution, which is appropriate for the  
24 situation under consideration. The factor  $\kappa$  is generally attributed to D. B. Owen<sup>5</sup> and was also  
25 reported by M. G. Natrella,<sup>6</sup> as referenced in traveler TSTF-564, Revision 1. Example values of  
26  $\kappa$  are provided in Table 2 of traveler TSTF-564, Revision 1. Table 1 of the traveler includes  
27 some reference values of the  $\text{MCPR}_{95/95}$ .

28  
29 As discussed by Piepel and Cuta<sup>7</sup> for DNBR correlations, the acceptability of this approach is  
30 predicated on a variety of assumptions, including the assumptions that the correlation data  
31 comes from a common population and that the correlation's population is distributed normally.  
32 These assumptions are typically addressed generically when a critical power or critical heat flux  
33 correlation is reviewed by the NRC staff, who may apply penalties to the correlation to account  
34 for any issues identified. The traveler TSTF-564, Revision 1, states that such penalties applied  
35 during the NRC's review of the critical power correlation would be imposed on the mean or  
36 standard deviation used in the calculating the  $\text{MCPR}_{95/95}$  (ADAMS Accession  
37 No. ML18149A320). These penalties would also continue to be imposed in the determination of  
38 the  $\text{MCPR}_{99.9\%}$ , along with any other penalties associated with the process of (or other inputs  
39 used in) determining the  $\text{MCPR}_{99.9\%}$  (e.g., penalties applied to the  $\text{MCPR}_{99.9\%}$  SL for operation in  
40 the Maximum Extended Load Limit Line Analysis Plus (MELLLA+) operating domain).

41  
42 The NRC staff finds the definition of the  $\text{MCPR}_{95/95}$  will appropriately establish a 95/95 upper  
43 tolerance limit on the critical power correlation and that any issues in the underlying correlation  
44 will be addressed through penalties on the correlation mean and standard deviation, as

---

<sup>5</sup> D. B. Owen, "Factors for One-Sided Tolerance Limits and for Variables Sampling Plans," Sandia Corporation, SCR-607, March 1963, ADAMS Accession No. ML14031A495.

<sup>6</sup> M. G. Natrella, "Experimental Statistics," National Bureau of Standards, National Bureau of Standards Handbook 91 August 1963.

<sup>7</sup> G. F. Piepel and J. M. Cuta, "Statistical Concepts and Techniques for Developing, Evaluating, and Validating CHF Models and Corresponding Fuel Design Limits," SKI Technical Report, 93:46, 1993.

1 necessary. Therefore, the NRC staff concludes that the  $\text{MCPR}_{95/95}$  definition, as proposed,  
2 establishes an acceptable fuel design limit and is acceptable.

3  
4 **3.3 Determination of Revised MCPR SL for Mixed Cores**

5  
6 Traveler TSTF-564, Revision 1, proposed that a core containing a variety of fuel types would  
7 evaluate the  $\text{MCPR}_{95/95}$  for all of the fresh and once-burnt fuel in the core and apply the most  
8 limiting (i.e., the largest) value of  $\text{MCPR}_{95/95}$  for each of the applicable fuel types as the MCPR  
9 SL. As stated in Section 3.1 of traveler TSTF-564, Revision 1, this is because bundles that are  
10 twice-burnt or more at the beginning of the cycle have significant MCPR margin relative to the  
11 fresh and once-burnt fuel. The justification is that the MCPR for twice-burnt and greater fuel is  
12 far enough from the MCPR for the limiting bundle that its probability of boiling transition is very  
13 small compared to the limiting bundle and it can be neglected in determining the SL. Results of  
14 a study provided in the traveler indicate that this is the case even for fuel operated on short  
15 (12-month) reload cycles. As discussed in the traveler, twice-burnt or greater fuel bundles are  
16 included in the cycle-specific evaluation of the  $\text{MCPR}_{99.9\%}$  and the MCPR OL. If a twice-burnt or  
17 greater fuel bundle is found to be limiting, it would be governed by the MCPR OL, which will  
18 always be more restrictive than both the  $\text{MCPR}_{95/95}$  and the  $\text{MCPR}_{99.9\%}$ . The NRC staff found  
19 this justification to be appropriate and determined that it is acceptable to determine the  
20  $\text{MCPR}_{95/95}$  SL for the core based on the most limiting value of the  $\text{MCPR}_{95/95}$  for the fresh and  
21 once-burnt fuel in the core.

22  
23 The NRC staff reviewed the information furnished by the TSTF and determined that the process  
24 for establishing the revised MCPR SL for mixed cores ensures that the limiting fuel types in the  
25 core will be evaluated and the limiting  $\text{MCPR}_{99.9\%}$  will be appropriately applied as the SL. The  
26 NRC staff therefore found this process to be acceptable.

27  
28 **[The size, mean, and standard deviation of the ECPR database may need to be provided**  
29 **by a fuel vendor to determine the  $\text{MCPR}_{95/95}$  for a legacy fuel type. The value of  $\kappa$**   
30 **depends on the number of samples ( $N_i$ ) in the critical power database. If the number of**  
31 **data points in the database is not supplied by the vendor, the TSTF response to a**  
32 **request for additional information stated that a value of  $\kappa = 1.8$  would be imposed on the**  
33  **$\text{MCPR}_{95/95}$  determination, on the basis that any database used to develop a critical power**  
34 **correlation will need at least 500 points to be acceptable.<sup>8</sup> The limiting value from either**  
35 **the new or legacy fuel would then be applied as the SL. The NRC staff finds that there**  
36 **are potential circumstances where the number of data points used in determining the**  
37 **correlation's uncertainty may not correspond to a  $\kappa$  value of 1.8; for example, future**  
38 **correlations may need fewer data points, or the subset of data used to determine a**  
39 **correlation's uncertainty may be smaller than the full correlation database. Therefore,**  
40 **the NRC staff determined that a  $\kappa$  value of 1.8 for legacy fuel types where the number of**  
41 **data points  $N$  is not provided may not be acceptable, and the  $\kappa$  used in determining the**  
42  **$\text{MCPR}_{95/95}$  must be justified to be appropriate or conservative for the fuel type and**  
43 **correlation in question. This determination does not affect the overall acceptability of**  
44 **the process for determining the  $\text{MCPR}_{95/95}$  for a mix of fuel types as discussed above.**  
45 **The NRC staff also notes that, as stated in Section 1.0 of the traveler SE, this STS change**  
46 **is only available to licensees through the CLIP when using the fuel bundle types**

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<sup>8</sup> The NRC staff notes that a  $\kappa$  value of 1.8 corresponds to  $N = 300$  data points, as provided in Table T-11b of NUREG-1475, "Applying Statistics," Revision 1. This is more conservative than the  $\kappa$  for  $N = 500$  data points, which would be 1.763.

1 **specified in Table 1 of the traveler. Therefore, the use of legacy fuels, for which this**  
2 **determination would be relevant, is outside the scope of a CLIIP application.]**

3  
4 3.4 Relationship between MCPR Safety and Operating Limits

5  
6 As discussed in the traveler TSTF-564, Revision 1, the  $MCPR_{99.9\%}$  is expected to always be  
7 greater than the  $MCPR_{95/95}$  for two reasons. First, because the  $MCPR_{99.9\%}$  includes  
8 uncertainties not factored into the  $MCPR_{95/95}$ , and second, because the 99.9 percent probability  
9 basis for determining the  $MCPR_{99.9\%}$  is more conservative than the 95 percent probability at a  
10 95 percent confidence level used in determining the  $MCPR_{95/95}$ . The level of conservatism in  
11 the  $MCPR_{95/95}$  SL is appropriate because the lead fuel rod in the core (i.e., the limiting fuel rod  
12 with respect to MCPR) is used to evaluate whether any fuel rods in the core are susceptible to  
13 boiling transition, which is also discussed in the traveler). This is consistent with evaluations  
14 performed for PWRs using a 95/95 upper tolerance limit on the correlation uncertainty as an SL.

15  
16 Traveler TSTF-564, Revision 1, proposed that the MCPR OL defined in LCO 3.2.2 would  
17 continue to be evaluated using the  $MCPR_{99.9\%}$  as an input. The  $MCPR_{99.9\%}$  will continue to be  
18 evaluated in the same way as it is currently, using the whole core.

19  
20 Traveler TSTF-564, Revision 1, also changed TS 5.6.3 to require the cycle-specific value of the  
21  $MCPR_{99.9\%}$  to be included in the COLR. The methods supporting the inclusion of the  $MCPR_{99.9\%}$   
22 must also therefore, be included in the list of COLR references contained in TS 5.6.3.b. {NOTE:  
23 Verify that the licensee calculates MCPR SL and MCPR OL using the methodologies in the TS  
24 5.6.3.b COLR reference list.} The changes to TS 5.6.3.b help to ensure that the uncertainties  
25 being removed from the MCPR SL are still included as part of the MCPR OL and will continue to  
26 appropriately inform plant operation.

27  
28 The NRC staff therefore determined that the changes proposed by the licensee will retain an  
29 adequate level of conservatism in the MCPR SL in TS 2.1.1.2 while appropriately ensuring that  
30 plant- and cycle-specific uncertainties will be retained in the MCPR OL. The NRC staff notes  
31 that the  $MCPR_{95/95}$  represents a hard floor on the value of the  $MCPR_{99.9\%}$ , which should always  
32 be higher since it accounts for numerous uncertainties that are not included in the  $MCPR_{95/95}$  (as  
33 discussed in Section 3.1 of traveler TSTF-564, Revision 1).

34  
35 3.5 Implementation of the Revised MCPR SL in the TSs

36  
37 *{NOTE: If the licensee is in the midst of a fuel transition, all types of fresh and once-burnt fuel*  
38 *should be evaluated to determine which provides the limiting  $MCPR_{95/95}$ , in accordance with the*  
39 *process discussed in traveler TSTF-564, Revision 1.}*

40  
41 *{NOTE: If a fuel type not included in Table 1 of traveler TSTF-564, Revision 1, is loaded as*  
42 *fresh or once-burnt fuel, the value of the  $MCPR_{95/95}$  reported for that fuel type must be*  
43 *calculated using the mean and standard deviation from a critical power correlation found to be*  
44 *acceptable by the NRC staff. This should be evaluated by the NRC staff in this section of the*  
45 *SE.}*

46  
47 *{NOTE: The following text is only applicable if the licensee has a core loaded with the fuel(s)*  
48 *referenced in Table 1 of traveler TSTF-564, Revision 1.}*

49  
50 The licensee has proposed to change the value of the SL in TS 2.1.1.2 to **[value]**, consistent  
51 with the value from Table 1 of the TSTF-564, Revision 1, for the fuel type(s) in use at **[name of**



1 **facility]** (i.e., **[name of fuel from Table 1 of traveler TSTF-564, Revision 1 and from**  
2 **licensee application]**). The licensee has appropriately evaluated the fresh and once-burnt  
3 fuels in use at **[name of facility]** and the NRC staff has determined that the limiting MCPR<sub>95/95</sub>  
4 for these fuels was provided for inclusion in TS 2.1.1.2, consistent with the process described in  
5 traveler TSTF-564, Revision 1.  
6

7 The value reported in **[name of facility]** TS 2.1.1.2 was calculated using Equation 1 from  
8 traveler TSTF-564, Revision 1, and reported at a precision of two digits past the decimal point  
9 with the hundreds digit rounded up.  
10

11 **[Name of licensee]** also modified **[name of facility]**'s TS 5.6.3 to include the value of the  
12 MCPR in order to continue to be reported in the COLR. The COLR continues to report the  
13 cycle-specific value of the MCPR OL contained in LCO 3.2.2 and **[name of facility]** TS 5.6.3.b  
14 will continue to reference appropriate NRC-approved methodologies for determination of the  
15 MCPR<sub>99.9%</sub> and the MCPR OL.  
16

17 The NRC staff reviewed the licensee's proposed TS changes and found that the licensee  
18 appropriately implemented the revised MCPR SL, as discussed in this SE.  
19

### 20 3.6 NRC Staff Conclusion

21  
22 *{NOTE: The project manager or reviewer should check the facility's current licensing basis to*  
23 *determine if GDC 10 is applicable or if an equivalent plant-specific design criterion is used. If the*  
24 *facility licensing basis uses a plant-specific design criterion in lieu of GDC 10, the reference to*  
25 *GDC 10 below should be replaced with a reference to the appropriate design criterion from the*  
26 *facility's licensing basis.}*  
27

28 The NRC staff reviewed the licensee's proposed TS changes and determined that the proposed  
29 SL associated with TS 2.1.1.2 was calculated in a manner consistent with the process described  
30 in traveler TSTF-564, Revision 1, and was therefore acceptably modified to suit the revised  
31 definition of the MCPR SL. Under the new definition, the MCPR SL will continue to protect the  
32 fuel cladding against the uncontrolled release of radioactivity by preventing the onset of boiling  
33 transition, thereby fulfilling the requirements of 10 CFR 50.36(c)(1) for SLs. The MCPR OL in  
34 LCO 3.2.2 remains unchanged and will continue to meet the requirements of  
35 10 CFR 50.36(c)(2) **[and GDC 10 or the equivalent plant-specific design criterion]** by  
36 ensuring that no fuel damage results during normal operation and anticipated operational  
37 occurrences. The NRC staff determined that the changes to TS 5.6.3 proposed in the traveler  
38 are acceptable; upon adoption of the revised MCPR SL, the COLR will be required to contain  
39 the MCPR<sub>99.9%</sub>, supporting the determination of the MCPR OL using current methodologies.  
40

### 41 4.0 STATE CONSULTATION

42  
43 In accordance with the Commission's regulations, the **[Name of State]** State official was notified  
44 of the proposed issuance of the amendment on **[enter date]**. The State official had **[no]**  
45 comments. **[If comments were provided, they should be addressed here].**  
46

### 47 5.0 ENVIRONMENTAL CONSIDERATION

48  
49 *{NOTE: This section is to be prepared by the PM. As needed, the PM should coordinate with*  
50 *NRR's Environmental Review and NEPA Branch (MENB) to determine the need for an EA.*  
51 *Specific guidance on preparing EAs and considering environmental issues is contained in NRR*

1 *Office Instruction LIC-203, "Procedural Guidance for Preparing Categorical Exclusions,*  
2 *Environmental Assessments, and Considering Environmental Issues."*}

3  
4 The amendment changes requirements with respect to the installation or use of facility  
5 components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has  
6 determined that the amendment involves no significant increase in the amounts, and no  
7 significant change in the types, of any effluents that may be released offsite, and that there is no  
8 significant increase in individual or cumulative occupational radiation exposure. The  
9 Commission has previously issued a proposed finding that the amendment involves no  
10 significant hazards consideration, which was published in the *Federal Register* on **[DATE (XX**  
11 **FR XXX)]**, and there has been no public comment on such finding. Accordingly, the  
12 amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9).  
13 Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment  
14 need be prepared in connection with the issuance of the amendment.

15  
16 6.0 CONCLUSION

17  
18 The Commission has concluded, based on the considerations discussed above, that: (1) there  
19 is reasonable assurance that the health and safety of the public will not be endangered by  
20 operation in the proposed manner, (2) there is reasonable assurance that such activities will be  
21 conducted in compliance with the Commission's regulations, and (3) the issuance of the  
22 amendment will not be inimical to the common defense and security or to the health and safety  
23 of the public.

24  
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