



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

February 23, 2017

Mr. Joseph W. Shea  
Vice President, Nuclear Licensing  
Tennessee Valley Authority  
1101 Market Street, LP 3R-C  
Chattanooga, TN 37402-2801

SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 – ISSUANCE OF  
AMENDMENTS REGARDING TECHNICAL SPECIFICATIONS CHANGE TO  
ADD LIMITING CONDITION FOR OPERATION 3.0.8 ON THE INOPERABILITY  
OF SNUBBERS (CAC NOS. MF7549 AND MF7550)

Dear Mr. Shea:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment Nos. 111 and 6 to Facility Operating License Nos. NPF-90 and NPF-96 for the Watts Bar Nuclear Plant, Units 1 and 2. These amendments consist of changes to the licenses in response to your application dated March 29, 2016.

The amendments use the Consolidated Line Item Improvement Process to add Limiting Condition for Operation 3.0.8, allowing a delay time for entering a supported system Technical Specification, when the inoperability is due solely to an inoperable snubber, if risk is assessed and managed.

A copy of the related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice. If you have any questions regarding this letter, please contact me at (301) 415-6020.

Sincerely,

*Frederic E. Schaaf*

*for*

Robert G. Schaaf, Senior Project Manager  
Plant Licensing Branch II-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-390 and 50-391

Enclosures:

1. Amendment No. 111 to NPF-90
2. Amendment No. 6 to NPF-96
3. Safety Evaluation

cc w/enclosures: Distribution via Listserv



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-390

WATTS BAR NUCLEAR PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 111  
License No. NPF-90

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by the Tennessee Valley Authority (the licensee) dated March 29, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

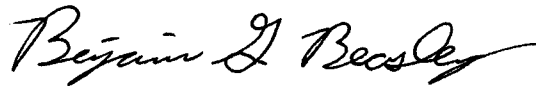
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-90 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 111 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, and shall be implemented within 45 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Benjamin G. Beasley, Chief  
Plant Licensing Branch II-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Operating License  
and Technical Specifications

Date of Issuance: February 23, 2017

ATTACHMENT TO LICENSE AMENDMENT NO. 111

WATTS BAR NUCLEAR PLANT, UNIT 1

FACILITY OPERATING LICENSE NO. NPF-90

DOCKET NO. 50-390

Replace Page 3 of Facility Operating License No. NPF-90 with the attached Page 3.

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

REMOVE

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INSERT

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- (4) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required, any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis, instrument calibration, or other activity associated with radioactive apparatus or components; and
  - (5) TVA, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.
  - (1) Maximum Power Level

TVA is authorized to operate the facility at reactor core power levels not in excess of 3459 megawatts thermal.
  - (2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 111 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.
  - (3) Safety Parameter Display System (SPDS) (Section 18.2 of SER Supplements 5 and 15)

Prior to startup following the first refueling outage, TVA shall accomplish the necessary activities, provide acceptable responses, and implement all proposed corrective actions related to having the Watts Bar Unit 1 SPDS operational.
  - (4) Vehicle Bomb Control Program (Section 13.6.9 of SSER 20)

During the period of the exemption granted in paragraph 2.D.(3) of this license, in implementing the power ascension phase of the approved initial test program, TVA shall not exceed 50% power until the requirements of 10 CFR 73.55(c)(7) and (8) are fully implemented. TVA shall submit a letter under oath or affirmation when the requirements of 73.55(c)(7) and (8) have been fully implemented.

### 3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1	LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2, LCO 3.0.7, and LCO 3.0.8.
LCO 3.0.2	<p>Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5 and LCO 3.0.6.</p> <p>If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required unless otherwise stated.</p>
LCO 3.0.3	<p>When an LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS the unit shall be placed in a MODE or other specified condition in which the LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:</p> <ul style="list-style-type: none"> <li>a. MODE 3 within 7 hours;</li> <li>b. MODE 4 within 13 hours; and</li> <li>c. MODE 5 within 37 hours.</li> </ul> <p>Exceptions to this Specification are stated in the individual Specifications.</p> <p>Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the actions required by LCO 3.0.3 is not required.</p> <p>LCO 3.0.3 is only applicable in MODES 1, 2, 3, and 4.</p>
LCO 3.0.4	<p>When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:</p> <ul style="list-style-type: none"> <li>a. When the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time;</li> </ul>

(continued)

### 3.0 LCO APPLICABILITY

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LCO 3.0.6 (continued)	When a support system's Required Action directs a supported system to be declared inoperable or directs entry into Conditions and Required Actions for a supported system, the applicable Conditions and Required Actions shall be entered in accordance with LCO 3.0.2.
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LCO 3.0.7	Test Exception LCOs 3.1.9 and 3.1.10 allow specified Technical Specification (TS) requirements to be changed to permit performance of special tests and operations. Unless otherwise specified, all other TS requirements remain unchanged. Compliance with Test Exception LCOs is optional. When a Test Exception LCO is desired to be met but is not met, the ACTIONS of the Test Exception LCO shall be met. When a Test Exception LCO is not desired to be met, entry into a MODE or other specified condition in the Applicability shall be made in accordance with the other applicable Specifications.
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LCO 3.0.8	<p>When one or more required snubbers are unable to perform their associated support function(s), any affected supported LCO(s) are not required to be declared not met solely for this reason if risk is assessed and managed, and</p> <ul style="list-style-type: none"><li>a. the snubbers not able to perform their associated support function(s) are associated with only one train or subsystem of a multiple train or subsystem supported system or are associated with a single train or subsystem supported system and are able to perform their associated support function within 72 hours; or</li><li>b. the snubbers not able to perform their associated support function(s) are associated with more than one train or subsystem of a multiple train or subsystem supported system and are able to perform their associated support function within 12 hours.</li></ul> <p>At the end of the specified period, the required snubbers must be able to perform their associated support function(s), or the affected supported system LCO(s) shall be declared not met.</p>
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

TENNESSEE VALLEY AUTHORITY

DOCKET NO. 50-391

WATTS BAR NUCLEAR PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 6  
License No. NPF-96

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by the Tennessee Valley Authority (the licensee) dated March 29, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.



2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-96 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 6 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, and shall be implemented within 45 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Benjamin G. Beasley, Chief  
Plant Licensing Branch II-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Attachment:  
Changes to the Operating License  
and Technical Specifications

Date of Issuance: February 23, 2017

ATTACHMENT TO LICENSE AMENDMENT NO 6

WATTS BAR NUCLEAR PLANT, UNIT 2

FACILITY OPERATING LICENSE NO. NPF-96

DOCKET NO. 50-391

Replace Page 3 of Facility Operating License No. NPF-96 with the attached Page 3.

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

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- C. The license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act, and to the rules, regulations, and orders of the Commission now or hereafter in effect, and is subject to the additional conditions specified or incorporated below.

(1) Maximum Power Level

TVA is authorized to operate the facility at reactor core power levels not in excess of 3411 megawatts thermal.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A as revised through Amendment No. 6 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this license. TVA shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

- (3) TVA shall implement permanent modifications to prevent overtopping of the embankments of the Fort Loudon Dam due to the Probable Maximum Flood by June 30, 2018.
- (4) PAD4TCD may be used to establish core operating limits for Cycles 1 and 2 only. PAD4TCD may not be used to establish core operating limits for subsequent reload cycles.
- (5) By December 31, 2017, the licensee shall report to the NRC that the actions to resolve the issues identified in Bulletin 2012-01, "Design Vulnerability in Electrical Power System," have been implemented.
- (6) The licensee shall maintain in effect the provisions of the physical security plan, security personnel training and qualification plan, and safeguards contingency plan, and all amendments made pursuant to the authority of 10 CFR 50.90 and 50.54(p).
- (7) TVA shall fully implement and maintain in effect all provisions of the Commission approved cyber security plan (CSP), including changes made pursuant to the authority of 10 CFR 50.90 and 10 CFR 50.54(p). The TVA approved CSP was discussed in NUREG-0847, Supplement 28.
- (8) TVA shall implement and maintain in effect all provisions of the approved fire protection program as described in the Fire Protection Report for the facility, as described in NUREG-0847, Supplement 29, subject to the following provision:

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### 3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

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LCO 3.0.1	LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2, 3.0.7, and 3.0.8.
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LCO 3.0.2	Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5 and LCO 3.0.6.
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If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required unless otherwise stated.

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LCO 3.0.3	When an LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS the unit shall be placed in a MODE or other specified condition in which the LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:
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- a. MODE 3 within 7 hours;
- b. MODE 4 within 13 hours; and
- c. MODE 5 within 37 hours.

Exceptions to this Specification are stated in the individual Specifications.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the actions required by LCO 3.0.3 is not required.

LCO 3.0.3 is only applicable in MODES 1, 2, 3, and 4.

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LCO 3.0.4	When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:
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- a. When the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time;

(continued)

3.0 APPLICABILITY (continued)

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LCO 3.0.7	Test Exception LCO 3.1.9 allows specified Technical Specification (TS) requirements to be changed to permit performance of special tests and operations. Unless otherwise specified, all other TS requirements remain unchanged. Compliance with Test Exception LCOs is optional. When a Test Exception LCO is desired to be met but is not met, the ACTIONS of the Test Exception LCO shall be met. When a Test Exception LCO is not desired to be met, entry into a MODE or other specified condition in the Applicability shall be made in accordance with the other applicable Specifications.
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LCO 3.0.8	<p>When one or more required snubbers are unable to perform their associated support function(s), any affected supported LCO(s) are not required to be declared not met solely for this reason if risk is assessed and managed, and</p> <ul style="list-style-type: none"><li>a. the snubbers not able to perform their associated support function(s) are associated with only one train or subsystem of a multiple train or subsystem supported system or are associated with a single train or subsystem supported system and are able to perform their associated support function within 72 hours; or</li><li>b. the snubbers not able to perform their associated support function(s) are associated with more than one train or subsystem of a multiple train or subsystem supported system and are able to perform their associated support function within 12 hours.</li></ul> <p>At the end of the specified period, the required snubbers must be able to perform their associated support function(s), or the affected supported system LCO(s) shall be declared not met.</p>
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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 111 TO FACILITY OPERATING LICENSE NO. NPF-90  
AND AMENDMENT NO. 6 TO FACILITY OPERATING LICENSE NO. NPF-96  
TENNESSEE VALLEY AUTHORITY  
WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2  
DOCKET NOS. 50-390 AND 50-391

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated March 29, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16089A452), Tennessee Valley Authority (TVA, the licensee) submitted a License Amendment Request (LAR) for changes to the Watts Bar Nuclear Plant (WBN), Units 1 and 2, Technical Specifications (TSs).

The proposed changes would revise the TSs to add Limiting Condition for Operation (LCO) 3.0.8 to address conditions where one or more snubbers are unable to perform their associated support function. A conforming change would also be made to TS 3.0.1 to reference TS LCO 3.0.8. These proposed changes are based on Technical Specifications Task Force (TSTF) change TSTF-372, Revision 4 (ADAMS Accession No. ML041200567), which has been approved generically for the Standard Technical Specifications (STTs) (NUREGs 1430 - 1434) by the NRC. The NRC staff published a Notice of Availability (NOA) of this TS change in the *Federal Register* on May 4, 2005 (70 FR 23252) as part of the Consolidated Line Item Improvement Process. The NOA included a model Safety Evaluation (SE) that may be referenced by licensees in plant-specific applications to adopt the TSTF-372 changes. In its application, the licensee stated that the justifications presented in the model SE for TSTF-372 are applicable to WBN and justify the proposed TS changes. The SE that follows is based on the model SE.

TSTF-372, Revision 4, is an improvement to the STTs that allows licensees, through a license amendment, to add an LCO allowing a delay time for entering a supported system TS, when the inoperability is due solely to an inoperable snubber, if risk is assessed and managed. The postulated seismic event requiring snubbers is a low-probability occurrence, and the overall TS system safety function would still be available for the vast majority of anticipated challenges.

TSTF-372 was approved under the risk-informed TS program. These initiatives are intended to maintain or improve safety through the incorporation of risk assessment and management techniques in the TSs, while reducing unnecessary burden and making the TS requirements consistent with the Commission's other risk-informed regulatory requirements, in particular the Maintenance Rule.

In accordance with the approved TSTF-372, the proposed change would add LCO 3.0.8 to the licensee's TSs. LCO 3.0.8 allows licensees to delay declaring an LCO not met for equipment that is supported by snubbers unable to perform their associated support functions when the risk associated with the delay is assessed and managed.

This proposed new LCO 3.0.8 states:

When one or more required snubbers are unable to perform their associated support function(s), any affected supported LCO(s) are not required to be declared not met solely for this reason if risk is assessed and managed, and:

- a. the snubbers not able to perform their associated support function(s) are associated with only one train or subsystem of a multiple train or subsystem supported system or are associated with a single train or subsystem supported system and are able to perform their associated support function within 72 hours; or
- b. the snubbers not able to perform their associated support function(s) are associated with more than one train or subsystem of a multiple train or subsystem supported system and are able to perform their associated support function within 12 hours.

At the end of the specified period the required snubbers must be able to perform their associated support function(s), or the affected supported system LCO(s) shall be declared not met.

Consistent with TSTF-372, a conforming change would also be made to LCO 3.0.1 to reference the proposed new LCO 3.0.8. WBN Unit 2 TS LCO 3.0.1 currently reads as follows:

LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2 and LCO 3.0.7.

WBN Unit 2 LCO 3.0.1 would be revised to read as follows:

LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2, 3.0.7, and 3.0.8.

In addition, the licensee proposed to add LCO 3.0.7 as an exception in LCO 3.0.1 for WBN Unit 1 in accordance with TSTF-6, Revision 1. TSTF-6, Revision 1, amended an inadvertent error in TSTF-6, Revision 0, by not referencing LCO 3.0.7 as an exception in LCO 3.0.1. This change is administrative in nature and corrects LCO 3.0.1 to accurately show that LCO 3.0.7 is an exception to LCO 3.0.1.

WBN Unit 1 TS LCO 3.0.1 currently reads as follows:

LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2.

Incorporating the changes consistent with TSTF-372 and TSTF-6, Revision 1, WBN Unit 1 LCO 3.0.1 would be revised to read as follows:

LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2, 3.0.7, and 3.0.8.

## 2.0 REGULATORY EVALUATION

In Section 50.36 of Title 10 of the *Code of Federal Regulations* (10 CFR), the Commission established its regulatory requirements related to the content of the TSs. Pursuant to 10 CFR 50.36, TSs are required to include items in the following five specific categories related to station operation: (1) safety limits, limiting safety system settings, and limiting control settings; (2) LCOs; (3) Surveillance Requirements (SRs); (4) design features; and (5) administrative controls. The rule does not specify the particular requirements to be included in a plant's TSs. As stated in 10 CFR 50.36(c)(2)(i), "limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications ...." WBN TS Section 3.0, "Limiting Condition for Operation (LCO) Applicability," provides details or general application rules for complying with the LCOs.

Snubbers are chosen in lieu of rigid supports in areas where restricting thermal growth during normal operation would induce excessive stresses in the piping nozzles or other equipment. Although they are classified as component standard supports, they are not designed to provide any transmission of force during normal plant operations. However, in the presence of dynamic transient loadings, which are induced by seismic events as well as by plant accidents and transients, a snubber functions as a rigid support. The location and size of the snubbers are determined by stress analyses based on different combinations of load conditions, depending on the design classification of the particular piping.

Prior to the conversion to the improved STSs, TS requirements applied directly to snubbers.

These requirements included:

- A requirement that snubbers be operable and in service when the supported equipment is required to be operable;
- A requirement that snubber removal for testing be done only during plant shutdown;
- A requirement that snubber removal for testing be done on a one-at-a-time basis when supported equipment is required to be operable during shutdown;



- A requirement to repair or replace within 72 hours any snubbers, found to be inoperable during operation in Modes 1 through 4, to avoid declaring any supported equipment inoperable;
- A requirement that each snubber be demonstrated operable by periodic visual inspections; and
- A requirement to perform operability tests on a representative sample of at least 10 percent of plant snubbers, at least once every 18 months during shutdown.

In the late 1980s, a joint initiative of the NRC and industry was undertaken to improve the STSs. This effort identified the snubbers as candidates for relocation to a licensee-controlled document, based on the fact that the TS requirements for snubbers did not meet any of the four criteria in 10 CFR 50.36(c)(2)(ii) for inclusion in the improved STSs. The NRC approved the relocation without placing any restriction on the use of the relocated requirements. However, this relocation resulted in different interpretations between the NRC and the industry regarding its implementation.

The NRC has stated that since snubbers are supporting safety equipment that is in the TSs, the definition of OPERABILITY must be used to immediately evaluate equipment supported by a removed snubber and, if found inoperable, the appropriate TS required actions must be entered. This interpretation has, in practice, eliminated the 72-hour delay to enter the actions for the supported equipment that existed prior to the conversion to the improved STSs (the only exception is if the supported system has been analyzed and determined to be OPERABLE without the snubber). The industry has argued that since the NRC approved the relocation without placing any restriction on the use of the relocated requirements, the licensee-controlled document requirements for snubbers should be invoked before the supported system's TS requirements become applicable. The industry's interpretation would, in effect, restore the 72-hour delay to enter the actions for the supported equipment that existed prior to the conversion to the improved STSs. The industry's proposal would allow a time delay for all conditions, including snubber removal for testing at power.

The option to relocate the snubbers to a licensee-controlled document, as part of the conversion to improved STSs, has resulted in non-uniform and inconsistent treatment of snubbers. On the one hand, plants that have relocated snubbers from their TSs to licensee-controlled documents such as the Technical Requirements Manual, etc., are allowed to change the requirements for snubbers under the auspices of 10 CFR 50.59, provided the requirements of 10 CFR 50.55a continue to be met, but they are not allowed a 72-hour delay before they enter the actions for the supported equipment. On the other hand, plants that have not converted to improved STSs have retained the 72-hour delay if snubbers are found to be inoperable, but they are only allowed to change TS requirements for snubbers by an LAR within the 10 CFR 50.55a requirements. It should also be noted that a few plants that converted to the improved STSs chose not to relocate the snubbers to a licensee-controlled document and, thus, retained the 72-hour delay. In addition, it is important to note that, unlike plants that have not relocated snubbers, plants that have relocated snubbers can perform functional tests on the snubbers at power (as long as they enter the actions for the supported equipment). Some potential undesirable consequences of this inconsistent treatment of snubbers are:

- Performance of testing during crowded time period windows when the supported system is inoperable with the potential to reduce the snubber testing to a minimum since the snubber requirements relocated from TSs are controlled by the licensee;
- Performance of testing during crowded windows when the supported system is inoperable with the potential to increase the unavailability of safety systems; and
- Performance of testing and maintenance on snubbers affecting multiple trains of the same supported system during the 7 hours allotted before entering MODE 3 under LCO 3.0.3.

To remove the inconsistency in the treatment of snubbers among plants, TSTF-372 was approved by the NRC to allow a risk-informed TS change that introduces a delay time before entering the actions for the supported equipment, when one or more snubbers are found inoperable or removed for testing, if risk is assessed and managed. Such a delay time will provide needed flexibility in the performance of maintenance and testing during power operation and at the same time will enhance overall plant safety by:

- Avoiding unnecessary unscheduled plant shutdowns and, thus, minimizing plant transition and realignment risks;
- Avoiding reduced snubber testing and, thus, increasing the availability of snubbers to perform their supporting function;
- Performing most of the required testing and maintenance during the delay time when the supported system is available to mitigate most challenges and, thus, avoiding increases in safety system unavailability; and
- Providing explicit risk-informed guidance in areas in which that guidance currently does not exist, such as the treatment of snubbers impacting more than one redundant train of a supported system.

### 3.0 TECHNICAL EVALUATION

The industry submitted TSTF-372, Revision 4, "Addition of LCO 3.0.8, Inoperability of Snubbers," in support of the proposed TS change. This submittal (Reference 1) documents a risk-informed analysis of the proposed TS change. Probabilistic Risk Assessment (PRA) results and insights are used, in combination with deterministic and defense-in-depth arguments, to identify and justify delay times for entering the actions for the supported equipment associated with inoperable snubbers at nuclear power plants. This is in accordance with guidance provided in Regulatory Guides (RG s) 1.174 and 1.177 (References 2 and 3, respectively).

The risk impact associated with the proposed delay times for entering the TS actions for the supported equipment can be assessed using the same approach as for allowed Completion Time (CT) extensions. Therefore, the risk assessment was performed following the three-tiered approach recommended in RG 1.177 for evaluating proposed extensions in currently allowed CTs:

- The first tier involves the assessment of the change in plant risk due to the proposed TS change. Such risk change is expressed (1) by the change in the average yearly Core Damage Frequency ( $\Delta$ CDF) and the average yearly Large Early Release Frequency ( $\Delta$ LERF) and (2) by the Incremental Conditional Core Damage Probability (ICCDP) and the Incremental Conditional Large Early Release Probability (ICLERP). The assessed  $\Delta$ CDF and  $\Delta$ LERF values are compared to acceptance guidelines, consistent with the Commission's Safety Goal Policy Statement as documented in RG 1.174, so that the plant's average baseline risk is maintained within a minimal range. The assessed ICCDP and ICLERP values are compared to acceptance guidelines provided in RG 1.177, which aim at ensuring that the plant risk does not increase unacceptably during the period the equipment is taken out of service.
- The second tier involves the identification of potentially high-risk configurations that could exist if equipment in addition to that associated with the change were to be taken out of service simultaneously, or other risk-significant operational factors such as concurrent equipment testing were also involved. The objective is to ensure that appropriate restrictions are in place to avoid any potential high-risk configurations.
- The third tier involves the establishment of an overall Configuration Risk Management Program (CRMP) to ensure that potentially risk-significant configurations resulting from maintenance and other operational activities are identified. The objective of the CRMP is to manage configuration-specific risk by appropriate scheduling of plant activities and/or appropriate compensatory measures.

A simplified bounding risk assessment, which is also applicable to the LAR for WBN, was performed to justify the proposed addition of LCO 3.0.8 to the TSs. This approach was necessitated by (1) the general nature of the proposed TS changes (i.e., they apply to all plants and are associated with an undetermined number of snubbers that are not able to perform their function), (2) the lack of detailed engineering analyses that establish the relationship between earthquake level and supported system pipe failure probability when one or more snubbers are inoperable, and (3) the lack of seismic risk assessment models for most plants. The simplified risk assessment is based on the following major assumptions, which the staff finds acceptable, as discussed below:

- The accident sequences contributing to the risk increase associated with the proposed TS changes are assumed to be initiated by a seismically-induced Loss-of-Offsite-Power (LOOP) event with concurrent loss of all safety system trains supported by the out-of-service snubbers. In the case of snubbers associated with more than one train (or subsystem) of the same system, it is assumed that all affected trains (or subsystems) of the supported system are failed. This assumption was introduced to allow the performance of a simple bounding risk assessment approach with application to all plants. This approach was selected due to the lack of detailed plant-specific seismic risk assessments for most plants and the lack of fragility data for piping when one or more supporting snubbers are inoperable.

- The LOOP event is assumed to occur due to the seismically-induced failure of the ceramic insulators used in the power distribution systems. These ceramic insulators have a High Confidence (95 percent) of Low Probability (5 percent) of Failure (HCLPF) of about 0.1g (gravitational force), expressed in terms of peak ground acceleration. Thus, a magnitude 0.1g earthquake is conservatively assumed to have 5 percent probability of causing a LOOP initiating event. The fact that no LOOP events caused by higher magnitude earthquakes were considered is justified because (1) the frequency of earthquakes decreases with increasing magnitude and (2) historical data (References 4 and 5) indicate that the mean seismic capacity of ceramic insulators (used in seismic PRAs), in terms of peak ground acceleration, is about 0.3g, which is significantly higher than the 0.1g HCLPF value. Therefore, the simplified analysis, even though it does not consider LOOP events caused by earthquakes of magnitude higher than 0.1g, bounds a detailed analysis that would use mean seismic failure probabilities (fragilities) for the ceramic insulators.
- Analytical and experimental results obtained in the mid-1980s as part of the industry's "Snubber Reduction Program" (References 4 and 6) indicated that piping systems have large margins against seismic stress. The assumption that a magnitude 0.1g earthquake would cause the failure of all safety system trains supported by the out-of-service snubbers is very conservative because safety piping systems could withstand much higher seismic stresses even when one or more supporting snubbers are out of service. The actual piping failure probability is a function of the stress allowable and the number of snubbers removed for maintenance or testing. Since the licensee-controlled testing is done on only a small (about 10 percent) representative sample of the total snubber population, typically only a few snubbers supporting a given safety system are out for testing at a time. Furthermore, since the testing of snubbers is a planned activity, licensees have flexibility in selecting a sample set of snubbers for testing from a much larger population by conducting configuration-specific engineering and/or risk assessments. Such a selection of snubbers for testing provides confidence that the supported systems would perform their functions in the presence of a design-basis earthquake and other dynamic loads and, in any case, the risk impact of the activity will remain within the limits of acceptability defined in risk-informed RGs 1.174 and 1.177.
- The analysis assumes that one train (or subsystem) of all safety systems is unavailable during snubber testing or maintenance (an entire system is assumed unavailable if a removed snubber is associated with both trains of a two-train system). This is a very conservative assumption for the case of corrective maintenance since it is unlikely that a visual inspection will reveal that one or more snubbers across all supported systems are inoperable. This assumption is also conservative for the case of the licensee-controlled testing of snubbers since such testing is performed only on a small representative sample.
- In general, no credit is taken for recovery actions and alternative means of performing a function, such as the function performed by a system assumed failed (e.g., when LCO 3.0.8b applies). However, most plants have reliable alternative means of performing certain critical functions. For example, Feed and Bleed (F&B) can be used to remove heat in most Pressurized-Water Reactors (PWRs), when Auxiliary Feedwater

(AFW), the most important system in mitigating LOOP accidents, is unavailable. A 10-percent failure probability for recovery actions to provide core cooling using alternative means is assumed for Diablo Canyon, the only West Coast PWR plant with F&B capability, when a snubber impacting more than one train of the AFW system (i.e., when LCO 3.0.8b is applicable) is out-of-service. This failure probability value is significantly higher than the value of  $2.2\text{E-}2$  used in Diablo Canyon's PRA. Furthermore, Diablo Canyon has analyzed the impact of a single limiting snubber failure, and concluded that no single snubber failure would impact two trains of AFW. No credit for recovery actions to provide core cooling using alternative means is necessary for West Coast PWR plants with no F&B capability, because it has been determined that there is no single snubber whose non-functionality would disable two trains of AFW in a seismic event of magnitude up to the plant's Safe Shutdown Earthquake (SSE). It should be noted that a similar credit could have been applied to most Central and Eastern U.S. plants, such as WBN, but this was not necessary to demonstrate the low risk impact of the proposed TS change due to the lower earthquake frequencies at Central and Eastern U.S. plants as compared to West Coast plants.

- The earthquake frequency at the 0.1g level was assumed to be  $1\text{E-}3/\text{year}$  for Central and Eastern U.S. plants and  $1\text{E-}1/\text{year}$  for West Coast plants. Each of these two values envelop the range of earthquake frequency values at the 0.1g level, for Eastern U.S. and West Coast sites, respectively (References 5 and 7).
- The risk impact associated with non-LOOP accident sequences (e.g., seismically initiated Loss-of-Coolant-Accident (LOCA) or Anticipated-Transient-Without-Scram (ATWS) sequences) was not assessed. However, this risk impact is small compared to the risk impact associated with the LOOP accident sequences modeled in the simplified bounding risk assessment. Non-LOOP accident sequences, due to the ruggedness of nuclear power plant designs, require seismically-induced failures that occur at earthquake levels above 0.3g. Thus, the frequency of earthquakes initiating non-LOOP accident sequences is much smaller than the frequency of seismically-initiated LOOP events. Furthermore, because of the conservative assumption made for LOOP sequences that a 0.1g level earthquake would fail all piping associated with inoperable snubbers, non-LOOP sequences would not include any more failures associated with inoperable snubbers than LOOP sequences. Therefore, the risk impact of inoperable snubbers associated with non-LOOP accident sequences is small compared to the risk impact associated with the LOOP accident sequences modeled in the simplified bounding risk assessment.
- The risk impact of dynamic loadings other than seismic loads is not assessed. These shock-type loads include thrust loads, blowdown loads, waterhammer loads, steamhammer loads, LOCA loads and pipe rupture loads. However, there are some important distinctions between non-seismic (shock-type) loads and seismic loads which indicate that, in general, the risk impact of the out-of-service snubbers is smaller for non-seismic loads than for seismic loads. First, while a seismic load affects the entire plant, the impact of a non-seismic load is localized to a certain system or area of the plant. Second, although non-seismic shock loads may be higher in total force and the impact could be as much or more than seismic loads, generally they are of much shorter duration than seismic loads. Third, the impact of non-seismic loads is more plant

specific, and thus harder to analyze generically, than for seismic loads. For these reasons, licensees will be required to confirm every time LCO 3.0.8 is used, that at least one train of each system that is supported by the inoperable snubber(s) would remain capable of performing their required safety or support functions for postulated design loads other than seismic loads.

### 3.1 Risk Assessment Results and Insights

The results and insights from the implementation of the three-tiered approach of RG 1.177 to support the proposed addition of LCO 3.0.8 to the TSs are summarized and evaluated in the following Sections 3.1.1 to 3.1.3.

#### 3.1.1 Risk Impact

The bounding risk assessment approach, discussed in Section 3.0, was implemented generically for all U.S. operating nuclear power plants. Risk assessments were performed for two categories of plants, Central and East Coast plants and West Coast plants, based on historical seismic hazard curves (earthquake frequencies and associated magnitudes). The first category, Central and East Coast plants, includes the vast majority of the U.S. nuclear power plant population (Reference 7). For each category of plants, two risk assessments were performed:

- The first risk assessment applies to cases where all inoperable snubbers are associated with only one train (or subsystem) of the impacted safety systems. It was conservatively assumed that a single train (or subsystem) of each safety system is unavailable. It was also assumed that the probability of non-mitigation using the unaffected redundant trains (or subsystems) is 2 percent. This is a conservative value given that for core damage to occur under those conditions, two or more failures are required.
- The second risk assessment applies to the case where one or more of the inoperable snubbers are associated with multiple trains (or subsystems) of the same safety systems. It was assumed in this bounding analysis, except for West Coast PWR plants, that all safety systems are unavailable to mitigate the accident. Credit for using F&B to provide core cooling is taken for plants having F&B capability (e.g., Diablo Canyon) when a snubber impacting more than one train of the AFW system is inoperable. Credit for one AFW train to provide core cooling is taken for West Coast PWR plants with no F&B capability (e.g., San Onofre), because it has been determined that there is no single snubber whose non-functionality would disable two trains of AFW in a seismic event of a magnitude up to the plant's SSE.

The results of the performed risk assessments, in terms of core damage and large early release risk impacts, are summarized in Table 1. The first row lists the conditional risk increase, in terms of CDF,  $\Delta R_{CDF}$ , caused by the out-of-service snubbers (as assumed in the bounding analysis). The second and third rows list the ICCDP and the ICLERP values, respectively.

The ICCDP for the case where all inoperable snubbers are associated with only one train (or subsystem) of the supported safety systems, was obtained by multiplying the corresponding

$\Delta R_{CDF}$  value by the time fraction of the proposed 72-hour delay to enter the actions for the supported equipment. The ICCDP for the case where one or more of the inoperable snubbers are associated with multiple trains (or subsystems) of the same safety system, was obtained by multiplying the corresponding  $\Delta R_{CDF}$  value by the time fraction of the proposed 12-hour delay to enter the actions for the supported equipment.

The ICLERP values were obtained by multiplying the corresponding ICCDP values by 0.1 (i.e., by assuming that the ICLERP value is an order of magnitude less than the ICCDP). This assumption is conservative since containment bypass scenarios, such as steam generator tube rupture accidents and interfacing system loss-of-coolant accidents, would not be uniquely affected by the out-of-service snubbers.

Finally, the fourth and fifth rows list the assessed  $\Delta CDF$  and  $\Delta LERF$  values, respectively. These values were obtained by dividing the corresponding ICCDP and ICLERP values by 1.5 (i.e., by assuming that the snubbers are tested every 18 months, as was the case before the snubbers were relocated to a licensee-controlled document). This assumption is reasonable because (1) it is not expected that licensees would test the snubbers more often than what used to be required by the TSs, and (2) testing of snubbers is associated with higher-risk impact than the average corrective maintenance of snubbers found inoperable by visual inspection (testing is expected to involve significantly more snubbers out of service than corrective maintenance). The assessed  $\Delta CDF$  and  $\Delta LERF$  values are compared to acceptance guidelines, consistent with the Commission's Safety Goal Policy Statement as documented in RG 1.174, so that the plant's average baseline risk is maintained within a minimal range. This comparison indicates that the addition of LCO 3.0.8 to the existing TSs would have an insignificant risk impact.

**Table 1: Bounding Risk Assessment Results for Snubbers Impacting a Single Train and Multiple Trains of a Supported System.**

	Central and East Coast Plants		West Coast Plants	
	Single Train	Multiple Train	Single Train	Multiple Train
$\Delta R_{CDF}/yr$	1E-6	5E-6	1E-4	5E-4
ICCDP	8E-9	7E-9	8E-7	7E-7
ICLERP	8E-10	7E-10	8E-8	7E-8
$\Delta CDF/yr$	5E-9	5E-9	5E-7	5E-7
$\Delta LERF/yr$	5E-10	5E-10	5E-8	5E-8

The assessed  $\Delta CDF$  and  $\Delta LERF$  values meet the acceptance criteria of 1E-6/year and 1E-7/year, respectively, based on guidance provided in RG 1.174. This conclusion is true without taking any credit for the removal of potential undesirable consequences associated with the current inconsistent treatment of snubbers (e.g., reduced snubber testing frequency, increased safety system unavailability, and treatment of snubbers impacting multiple trains) discussed in Section 2.0 above, and given the bounding nature of the risk assessment.

The assessed ICCDP and ICLERP values are compared to acceptance guidelines provided in RG 1.177, which aim at ensuring that the plant risk does not increase unacceptably during the period the equipment is taken out of service. This comparison indicates that the addition of LCO 3.0.8 to the existing TSs meets the RG 1.177 numerical guidelines of 5E-7 for ICCDP and 5E-8 for ICLERP. The small deviations shown for West Coast plants are acceptable because of the bounding nature of the risk assessments, as discussed in Section 3.0.

The risk assessment results of Table 1 are also compared to guidance provided in the revised Section 11 of NUMARC 93-01, Revision 2 (Reference 8), endorsed by RG 1.160 (Reference 9), for implementing the requirements of paragraph (a)(4) of the Maintenance Rule, 10 CFR 50.65. Such guidance is summarized in Table 2. Guidance regarding the acceptability of conditional risk increase in terms of CDF (i.e.,  $\Delta R_{CDF}$ ) for a planned configuration is provided. This guidance states that a specific configuration that is associated with a CDF higher than 1E-3/year should not be entered voluntarily. Since the assessed conditional risk increase,  $\Delta R_{CDF}$ , is significantly less than 1E-3/year, plant configurations including out-of-service snubbers and other equipment may be entered voluntarily if supported by the results of the risk assessment required by 10 CFR 50.65(a)(4), by LCO 3.0.8, or by other TSs.

**Table 2: Guidance for Implementing 10 CFR 50.65(a)(4)**

$\Delta R_{CDF}$	Guidance	
Greater than 1E-3/year	Configuration should not normally be entered voluntarily	
ICCDP	Guidance	ICLERP
Greater than 1E-5	Configuration should not normally be entered voluntarily	Greater than 1E-6
1E-6 to 1E-5	Assess non-quantifiable factors; Establish risk management actions	1E-7 to 1E-6
Less than 1E-6	Normal work controls	Less than 1E-7

Guidance regarding the acceptability of ICCDP and ICLERP values for a specific planned configuration and the establishment of risk management actions is also provided in NUMARC 93-01. This guidance, as shown in Table 2, states that a specific plant configuration that is associated with ICCDP and ICLERP values below 1E-6 and 1E-7, respectively, is considered to require "normal work controls." Table 1 shows that for the majority of plants (i.e., for all plants in the Central and East Coast category) the conservatively assessed ICCDP and ICLERP values are over an order of magnitude less than what is recommended as the threshold for the "normal work controls" region. For West Coast plants, the conservatively assessed ICCDP and ICLERP values are still within the "normal work controls" region. Thus, the risk contribution from out-of-service snubbers is within the normal range of maintenance activities carried out at a plant. Therefore, plant configurations involving out-of-service snubbers and other equipment may be entered voluntarily if supported by the results of the risk assessment required by 10 CFR 50.65(a)(4), by LCO 3.0.8, or by other TSs. However, this simplified bounding analysis indicates that for West Coast plants the provisions of LCO 3.0.8 must be used



cautiously and in conjunction with appropriate management actions, especially when equipment other than snubbers is also inoperable, based on the results of configuration-specific risk assessments required by 10 CFR 50.65(a)(4), by LCO 3.0.8, or by other TSs.

In its approval of TSTF-372, the NRC staff found that the risk assessment results supported the proposed addition of LCO 3.0.8 to the TSs. The risk increases associated with this change to the WBN TSs will be insignificant (based on guidance provided in RGs 1.174 and 1.177) and within the range of risks associated with normal maintenance activities. In addition, LCO 3.0.8 will remove potential undesirable consequences stemming from the current inconsistent treatment of snubbers in the TSs, such as reduced frequency of snubber testing, increased safety system unavailability, and the treatment of snubbers impacting multiple trains.

### 3.1.2 Identification of High-Risk Configurations

The second tier of the three-tiered approach recommended in RG 1.177 involves the identification of potentially high-risk configurations that could exist if equipment, in addition to that associated with the TS change, were to be taken out of service simultaneously. Insights from the risk assessments, in conjunction with important assumptions made in the analysis and defense-in-depth considerations, were used to identify such configurations. To avoid these potentially high-risk configurations, specific restrictions to the implementation of the proposed TS changes were identified.

For cases where all inoperable snubbers are associated with only one train (or subsystem) of the impacted systems (i.e., when LCO 3.0.8a applies), it was assumed in the analysis that there will be unaffected redundant trains (or subsystems) available to mitigate the seismically initiated LOOP accident sequences. This assumption implies that there will be at least one success path available when LCO 3.0.8a applies. Therefore, potentially high-risk configurations can be avoided by ensuring that such a success path exists when LCO 3.0.8a applies. Based on a review of the accident sequences that contribute to the risk increase associated with LCO 3.0.8a, as modeled by the simplified bounding analysis (i.e., accident sequences initiated by a seismically-induced LOOP event with concurrent loss of all safety system trains supported by the out-of-service snubbers), the following restrictions were identified to prevent potentially high-risk configurations:

- For PWR plants, at least one AFW train (including a minimum set of supporting equipment required for its successful operation) not associated with the inoperable snubber(s), must be available when LCO 3.0.8a is used.

For cases where one or more of the inoperable snubbers are associated with multiple trains (or subsystems) of the same safety system (i.e., when LCO 3.0.8b applies), it was assumed in the bounding analysis that all safety systems are unavailable to mitigate the accident, except for West Coast plants. Credit for using F&B to provide core cooling is taken for plants having F&B capability (e.g., Diablo Canyon) when a snubber impacting more than one train of the AFW system is inoperable. Credit for one AFW train to provide core cooling is taken for West Coast PWR plants with no F&B capability (e.g., San Onofre) because it has been determined that there is no single snubber whose non-functionality would disable more than one train of AFW in a seismic event of magnitude up to the plant's SSE. Based on a review of the accident sequences that contribute to the risk increase associated with LCO 3.0.8b (as modeled by the simplified

bounding analysis) and defense-in-depth considerations, the following restrictions were identified to prevent potentially high-risk configurations:

- LCO 3.0.8b cannot be used at West Coast PWR plants with no F&B capability when a snubber whose non-functionality would disable more than one train of AFW in a seismic event of magnitude up to the plant's SSE is inoperable (it should be noted, however, that based on information provided by the industry, there is no plant that falls in this category);
- When LCO 3.0.8b is used at PWR plants, at least one AFW train (including a minimum set of supporting equipment required for its successful operation) not associated with the inoperable snubber(s), or some alternative means of core cooling (e.g., F&B, firewater system or "aggressive secondary cooldown" using the steam generators) must be available.

### 3.1.3 Configuration Risk Management

The third tier of the three-tiered approach recommended in RG 1.177 involves the establishment of an overall CRMP to ensure that potentially risk-significant configurations resulting from maintenance and other operational activities are identified. The objective of the CRMP is to manage configuration-specific risk by appropriate scheduling of plant activities and/or appropriate compensatory measures. This objective is met by licensee programs to comply with the requirements of paragraph (a)(4) of the Maintenance Rule (10 CFR 50.65) to assess and manage risk resulting from maintenance activities, and by the TSs requiring risk assessments and management using (a)(4) processes if no maintenance is in progress. These programs can support licensee decision making regarding the appropriate actions to manage risk whenever a risk-informed TS is entered. Since the 10 CFR 50.65(a)(4) guidance (Reference 8) does not currently address seismic risk, licensees adopting this change must ensure that the proposed LCO 3.0.8 is considered with respect to other plant maintenance activities and integrated into the existing 10 CFR 50.65(a)(4) process whether the process is invoked by a TS or (a)(4) itself.

### 3.1.4 Adoption of TSTF-6

TS LCO 3.0.1 for WBN Unit 1 only contains LCO 3.0.2 as an exception. The licensee proposed to add LCO 3.0.7 as an exception in LCO 3.0.1 for WBN Unit 1 in accordance with TSTF-6, Revision 1. TSTF-6, Revision 1, amended an inadvertent error in TSTF-6, Revision 0, by not referencing LCO 3.0.7 as an exception in LCO 3.0.1. This change is administrative in nature and corrects LCO 3.0.1 for WBN Unit 1 to accurately show that LCO 3.0.7 is an exception to LCO 3.0.1.

## 3.2 Summary and Conclusions

The option to relocate the snubbers to a licensee-controlled document, as part of the conversion to improved STSs, has resulted in non-uniform and inconsistent treatment of snubbers. Some potential undesirable consequences of this inconsistent treatment of snubbers are:

- Performance of testing during crowded windows when the supported system is inoperable with the potential to reduce the snubber testing to a minimum since the relocated snubber requirements are controlled by the licensee;

- Performance of testing during crowded windows when the supported system is inoperable with the potential to increase the unavailability of safety systems; or,
- Performance of testing and maintenance on snubbers affecting multiple trains of the same supported system during the 7 hours allotted before entering MODE 3 under LCO 3.0.3.

To remove the inconsistency from the WBN TSs, TVA proposed to adopt TSTF-372, Revision 4, which is a risk-informed TS change that introduces a delay time before entering the actions for the supported equipment when one or more snubbers are found inoperable or removed for testing. The delay time will provide needed flexibility in the performance of maintenance and testing during power operation and at the same time will enhance overall plant safety by (1) avoiding unnecessary unscheduled plant shutdowns, thus, minimizing plant transition and realignment risks; (2) avoiding reduced snubber testing, thus, increasing the availability of snubbers to perform their supporting function; (3) performing most of the required testing and maintenance during the delay time when the supported system is available to mitigate most challenges, thus, avoiding increases in safety system unavailability; and (4) providing explicit risk-informed guidance in areas in which that guidance currently does not exist, such as the treatment of snubbers impacting more than one redundant train of a supported system.

The risk impact of the proposed TS changes under TSTF-372 was assessed following the three-tiered approach recommended in RG 1.177. A simplified bounding risk assessment was performed to justify the proposed TS changes. This bounding assessment assumes that the risk increase associated with the proposed addition of LCO 3.0.8 to the TSs is associated with accident sequences initiated by a seismically-induced LOOP event with concurrent loss of all safety system trains supported by the out-of-service snubbers. In the case of snubbers associated with more than one train, it is assumed that all affected trains of the supported system are failed. This assumption was introduced to allow the performance of a simple bounding risk assessment approach with application to all plants and was selected due to the lack of detailed plant-specific seismic risk assessments for most plants and the lack of fragility data for piping when one or more supporting snubbers are inoperable. The impact from the addition of the proposed LCO 3.0.8 to the TSs on defense-in-depth was also evaluated in conjunction with the risk assessment results.

Based on this integrated evaluation, the staff concludes that the proposed addition of LCO 3.0.8 to the WBN TSs would lead to insignificant risk increases, if any. Indeed, this conclusion is true without taking any credit for the removal of potential undesirable consequences associated with the current inconsistent treatment of snubbers, such as the effects of avoiding a potential reduction in the snubber testing frequency and increased safety system unavailability.

Consistent with the staff's approval and inherent in the implementation of TSTF-372, TVA, in implementing LCO 3.0.8, must, as applicable, operate in accordance with the following stipulations:

1. Appropriate plant procedures and administrative controls will be used to implement the following Tier 2 Restrictions.

- a) At least one AFW train (including a minimum set of supporting equipment required for its successful operation) not associated with the inoperable snubber(s), must be available when LCO 3.0.8a is used at PWR plants.

The licensee's assessment of Stipulation 1(a):

"Stipulations 1(a) and 1(b) are incorporated in the associated TS Bases for LCO 3.0.8. When this proposed amendment is approved, associated plant procedures will be revised to include these requirements."

- b) At least one AFW train (including a minimum set of supporting equipment required for its successful operation) not associated with the inoperable snubber(s), or some alternative means of core cooling (e.g., F&B, fire water system or "aggressive secondary cooldown" using the steam generators) must be available when LCO 3.0.8b is used at PWR plants.

The licensee's assessment of Stipulation 1(b):

"Stipulations 1(a) and 1(b) are incorporated in the associated TS Bases for LCO 3.0.8. When this proposed amendment is approved, associated plant procedures will be revised to include these requirements."

- c) LCO 3.0.8b cannot be used by West Coast PWR plants with no F&B capability when a snubber, whose non-functionality would disable more than one train of AFW in a seismic event of magnitude up to the plant's SSE, is inoperable.

The licensee's assessment of Stipulation 1(c):

"Stipulation 1(c) is applicable only to West Coast PWR plants; therefore, it is not applicable to WBN Units 1 and 2."

- d) Boiling-water reactor (BWR) plants must verify, every time the provisions of LCO 3.0.8 are used, that at least one success path, involving equipment not associated with the inoperable snubber(s), exists to provide makeup and core cooling needed to mitigate LOOP accident sequences.

The licensee's assessment of Stipulation 1(d):

"Stipulation 1(d) is applicable only to BWR plants; therefore, it is not applicable to WBN Units 1 and 2."

- e) Every time the provisions of LCO 3.0.8 are used licensees will be required to confirm that at least one train (or subsystem) of systems supported by the inoperable snubbers would remain capable of performing their required safety or support functions for postulated design loads other than seismic loads. LCO 3.0.8 does not apply to non-seismic snubbers. In addition, a record of the design function of the inoperable snubber (i.e., seismic vs. non-seismic), implementation of any applicable

Tier 2 restrictions, and the associated plant configuration shall be available on a recoverable basis for staff inspection.

The licensee's assessment of Stipulation 1(e):

"Regarding Stipulation 1(e), the revised Bases state that every time the provisions of LCO 3.0.8 are used, WBN will confirm that at least one train (or subsystem) of systems supported by the inoperable snubbers will remain capable of performing their required safety or support functions for postulated design loads other than seismic loads.

"Item 1(e) of the model SE, Section 3.2, contains the statement 'LCO 3.0.8 does not apply to non-seismic snubbers.' This statement is not specifically addressed in the implementation process of the TSTF; therefore, TVA proposes to include this statement in the LCO 3.0.8 Bases (see Attachments 6 and 7 of this submittal). Further guidance associated with the intent of this statement, as discussed in Section 3.0 of the model SE and in TSTF-IG-05-03, Implementation Guidance for TSTF-372, Revision 4, 'Addition of LCO 3.0.8, Inoperability of Snubbers,' is also included in the Bases."

2. When the licensee implements the provisions of LCO 3.0.8 for snubbers, which include delay times to enter the actions for the supported equipment when one or more snubbers are out of service for maintenance or testing, it must be done in accordance with an overall CRMP to ensure that potentially risk-significant configurations resulting from maintenance and other operational activities are identified and avoided, as discussed in the proposed TS Bases. This objective is met by licensee programs to comply with the requirements of paragraph (a)(4) of the Maintenance Rule, 10 CFR 50.65, to assess and manage risk resulting from maintenance activities or when this process is invoked by LCO 3.0.8 or other TSs. These programs can support licensee decision-making regarding the appropriate actions to manage risk whenever a risk-informed TS is entered. Since the 10 CFR 50.65(a)(4) guidance, the revised (May 2000) Section 11 of NUMARC 93-01, does not currently address seismic risk, licensees adopting this change must ensure that the proposed LCO 3.0.8 is considered in conjunction with other plant maintenance activities and integrated into the existing 10 CFR 50.65(a)(4) process. In the absence of a detailed seismic PRA, a bounding risk assessment, such as utilized in this SE, shall be followed.

The licensee's assessment of Stipulation 2:

"Stipulation 2 of the NRC model SE directs that decision making must ensure that the proposed LCO 3.0.8 and seismic risk is considered in conjunction with maintenance activities. The revised TS Bases for LCO 3.0.8 provide guidance and details on how to implement the new requirements. LCO 3.0.8 requires that risk be managed and assessed. The revised Bases also state that while the Industry and NRC guidance on implementation of 10 CFR 50.65(a)(4), the Maintenance Rule, does not address seismic risk, LCO 3.0.8 should be considered with respect to other plant maintenance activities, and integrated into the existing Maintenance Rule process to the extent possible so that

maintenance on any unaffected train or subsystem is properly controlled, and emergent issues are properly addressed. The risk assessment need not be quantified, but may be a qualitative assessment of the vulnerability of systems and components when one or more snubbers are not able to perform their associated support function. Finally, TVA has a Bases Control Program (TS 5.5.14) consistent with Section 5.5 of the applicable vendor's standard TS.

"Additionally, LCO 3.0.7 is being added as an exception in LCO 3.0.1 for WBN Unit 1 in accordance with TSTF-6, Revision 1, which corrected an inadvertent error in TSTF-6 Revision 0 by not referencing LCO 3.0.7 as an exception in LCO 3.0.1.

"The proposed TS Bases changes are consistent with those described in TSTF-372 Revision 4, except that the specific restrictions identified in the NRC model SE dated May 4, 2005, are added to the proposed new TS Bases for LCO 3.0.8. These variations do not affect the proper application of TSTF-372."

In its submittal, the licensee stated that it has reviewed the NRC staff's evaluation, as well as the information provided to support TSTF-372, and has concluded that the justifications presented in the TSTF proposal and the NRC staff model SE are applicable to WBN and justify these amendments. Based on its own review, the NRC staff agrees. Therefore, the NRC staff concludes that the proposed TS changes for WBN are acceptable.

Based on the above, the NRC staff concludes that the proposed LCO 3.0.8, which will be in Section 3.0 of the TSs on LCO applicability, properly defines the rules and practices for the affected support LCOs for when one or more snubbers are unable to perform their associated support function(s). Therefore, the NRC staff further concludes that the proposed LCO meets the requirements of 10 CFR 50.36.

With the addition of LCO 3.0.8 to Section 3.0 of the TSs, there will be another LCO in that section, besides LCO 3.0.2 and LCO 3.0.7, that explains, in this case for snubbers, when LCOs do not have to be declared not met. Because of this, LCO 3.0.8 has to be listed in LCO 3.0.1 of Section 3.0 of the TSs. This is an administrative change that does not change any requirements in the TSs and is needed to identify the exceptions to TS 3.0.1. Based on these considerations, the NRC staff concludes that the addition of LCO 3.0.8 to LCO 3.0.1 meets 10 CFR 50.36, and is, therefore, acceptable.

In addition, adding LCO 3.0.7, as discussed in Section 3.1.4 of this SE, as an exception in LCO 3.0.1 for WBN Unit 1 in accordance with TSTF-6, Revision 1, is administrative in nature and corrects an error in TSTF-6, Revision 0. NRC staff concludes that the addition of LCO 3.0.7 to LCO 3.0.1 meets 10 CFR 50.36, and is, therefore, acceptable.

The licensee's application made a verification in Section 3.2, "Verification and Commitments," as follows:

"As discussed in the notice of availability published in the *Federal Register* (70 FR 23252) on May 4, 2005, for this TS improvement, plant-specific verifications were performed as follows:

“TVA has established TS Bases for LCO 3.0.8 that provide guidance and details on how to implement the new requirements. LCO 3.0.8 requires that risk be managed and assessed. The Bases also state that while the Industry and NRC guidance on implementation of 10 CFR 50.65(a)(4), the Maintenance Rule, does not address seismic risk, LCO 3.0.8 should be considered with respect to other plant maintenance activities, and integrated into the existing Maintenance Rule process to the extent possible that maintenance on any unaffected train or subsystem is properly controlled, and emergent issues are properly addressed. The risk assessment need not be quantified, but may be a qualitative assessment of the vulnerability of systems and components when one or more snubbers are not able to perform their associated support function. Finally, TVA has a Bases Control Program (TS 5.6) consistent with Section 5.5 of the STS.”

The licensee’s application also included a commitment in Attachment 5, “List of Regulatory Commitments,” as follows:

TVA will establish Technical Specification Bases for LCO 3.0.8 as adopted with the applicable license amendment due within 45 days of issuance of amendment.

The NRC staff finds the licensee’s regulatory verification and commitment acceptable.

#### 4.0 STATE CONSULTATION

In accordance with the Commission’s regulations, the Tennessee State official was notified of the proposed issuance of the amendments. The State official had no comments.

#### 5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (81 FR 83878, November 22, 2016). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

#### 6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission’s regulations, and (3) the issuance of the

amendments will not be inimical to the common defense and security or to the health and safety of the public.

## 7.0 REFERENCES

1. TSTF-372, Revision 4, "Addition of LCO 3.0.8, Inoperability of Snubbers," April 23, 2004 (ADAMS Accession No. ML041200567).
2. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," USNRC, July 1998 (ADAMS Accession No. ML003740133).
3. Regulatory Guide 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," USNRC, August 1998 (ADAMS Accession No. ML003740176).
4. Budnitz, R. J., et al., "An Approach to the Quantification of Seismic Margins in Nuclear Power Plants," NUREG/CR-4334, Lawrence Livermore National Laboratory, July 1985 (ADAMS Accession No. ML090500182).
5. Advanced Light Water Reactor Utility Requirements Document, Volume 2, ALWR Evolutionary Plant, PRA Key Assumptions and Groundrules, Electric Power Research Institute, August 1990.
6. Bier V. M., et al., "Development and Application of a Comprehensive Framework for Assessing Alternative Approaches to Snubber Reduction," International Topical Conference on Probabilistic Safety Assessment and Risk Management PSA '87, Swiss Federal Institute of Technology, Zurich, August 30 - September 4, 1987.
7. NUREG-1488, "Revised Livermore Seismic Hazard Estimates for Sixty-Nine Nuclear Power Plant Sites East of the Rocky Mountains," April 1994 (ADAMS Accession No. ML052640591).
8. Nuclear Energy Institute, Revised Section 11 of Revision 2 of NUMARC 93-01, May 2000.
9. Regulatory Guide 1.160, Revision 3, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," May 2012 (ADAMS Accession No. ML113610098).

Contributors: C. Tilton

Date: February 23, 2017



**SUBJECT: WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2 – ISSUANCE OF AMENDMENTS REGARDING TECHNICAL SPECIFICATIONS CHANGE TO ADD LIMITING CONDITION FOR OPERATION 3.0.8 ON THE INOPERABILITY OF SNUBBERS (CAC NOS. MF7549 AND MF7550) DATED FEBRUARY 23, 2017**

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