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

February 26, 2018

ANO Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
N-TSB-58
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 - ISSUANCE OF AMENDMENT TO ADOPT TSTF- 427, "ALLOWANCE FOR NON TECHNICAL SPECIFICATION BARRIER DEGRADATION ON SUPPORTED SYSTEM OPERABILITY" (CAC NO. MG0131; EPID L-2017-LLA-0302)

Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 309 to Renewed Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit 2. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated August 14, 2017.

The amendment revises TS requirements for unavailable barriers by adding Limiting Condition for Operation 3.0.9, which allows a delay time for entering a supported system TS, when the inoperability is solely due to an unavailable barrier. The change is consistent with Technical Specification Task Force (TSTF)-427, Revision 2, "Allowance for Non Technical Specification Barrier Degradation Supported System OPERABILITY."

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.

Sincerely,

Thomas J. Wengert, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosures:
1. Amendment No. 309 to NPF-6
2. Safety Evaluation

cc: Listserv

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

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 309
Renewed License No. NPF-6

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee), dated August 14, 2017, 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 license 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 Renewed Facility Operating License No. NPF-6 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 309, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications

3. The license amendment is effective as of its date of issuance and shall be implemented within 90 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License No. NPF-6
and Technical Specifications

Date of Issuance: February 26, 2018

ATTACHMENT TO LICENSE AMENDMENT NO. 309

RENEWED FACILITY OPERATING LICENSE NO. NPF-6

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-368

Replace the following pages of the Renewed Facility Operating License No. NPF-6 and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Renewed Facility Operating License

REMOVE	INSERT
-3-	-3-

Technical Specifications

REMOVE	INSERT
3/4 0-1	3/4 0-1
3/4 0-1a	3/4 0-1a
---	3/4 0-1b

(4) EOI, pursuant to the Act and 10 CFR Parts 30, 40 and 70 to receive, possess and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) EOI, 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 or instrument calibration or associated with radioactive apparatus or components; and

(6) EOI, pursuant to the Act and 10 CFR Parts 30 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 renewed license shall be deemed to contain and is subject to conditions specified in the following Commission regulations in 10 CFR Chapter I; Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; 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

EOI is authorized to operate the facility at steady state reactor core power levels not in excess of 3026 megawatts thermal. Prior to attaining this power level EOI shall comply with the conditions in Paragraph 2.C.(3).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 309, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications.

Exemptive 2nd paragraph of 2.C.2 deleted per Amendment 20, 3/3/81.

(3) Additional Conditions

The matters specified in the following conditions shall be completed to the satisfaction of the Commission within the stated time periods following issuance of the renewed license or within the operational restrictions indicated. The removal of these conditions shall be made by an amendment to the renewed license supported by a favorable evaluation by the Commission.

2.C.(3)(a) Deleted per Amendment 24, 6/19/81.

3/4 LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

3/4.0 APPLICABILITY

LIMITING CONDITION FOR OPERATION

3.0.1 Limiting Conditions for Operation (LCO) and ACTION requirements shall be applicable during the OPERATIONAL MODES or other conditions specified for each specification, except as provided in LCO 3.0.2, LCO 3.0.8, and LCO 3.0.9.

3.0.2 Adherence to the requirements of the Limiting Condition for Operation and/or associated ACTION within the specified time interval shall constitute compliance with the specification, except as provided in Specification 3.0.6. In the event the Limiting Condition for Operation is restored prior to expiration of the specified time interval, completion of the ACTION statement is not required.

3.0.3 In the event a Limiting Condition for Operation and/or associated ACTION requirements cannot be satisfied because of circumstances in excess of those addressed in the specification within 1 hour, action shall be initiated to place the unit in a mode in which the specification does not apply by placing it, as applicable, in at least HOT STANDBY within 6 hours, in at least HOT SHUTDOWN within the next 6 hours, and in at least COLD SHUTDOWN within the following 24 hours unless corrective measures are completed that permit operation under the permissible ACTION statements for the specified time interval as measured from initial discovery or until the reactor is placed in a MODE in which the specification is not applicable. Exceptions to these requirements shall be stated in the individual specification.

3.0.4 When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:

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;

b. After performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate; exceptions to this Specification are stated in the individual Specifications, or

c. When an allowance is stated in the individual value, parameter, or other Specification.

This specification shall not prevent changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONs or that are part of a shutdown of the unit.

LIMITING CONDITION FOR OPERATION

3.0.5 When a system, subsystem, train, component or device is determined to be inoperable solely because its emergency power source is inoperable, or solely because its normal power source is inoperable, it may be considered OPERABLE for the purpose of satisfying the requirements of its applicable Limiting Condition for Operation, provided: (1) its corresponding normal or emergency power source is OPERABLE; and (2) all of its redundant system(s), subsystem(s), train(s), component(s), and device(s) are OPERABLE, or likewise satisfy the requirements of this specification. Unless both conditions (1) and (2) are satisfied within 2 hours, action shall be initiated to place the unit in a MODE in which the applicable Limiting Condition for Operation does not apply by placing it, as applicable, in at least HOT STANDBY within 6 hours, in at least HOT SHUTDOWN within the next 6 hours, and in at least COLD SHUTDOWN within the following 24 hours. This specification is not applicable in MODES 5 or 6.

3.0.6 Equipment removed from service or declared inoperable to comply with ACTIONS may be returned to service under administrative control solely to perform testing required to demonstrate its OPERABILITY or the OPERABILITY of other equipment. This is an exception to LCO 3.0.2 for the system returned to service under administrative control to perform the testing required to demonstrate OPERABILITY.

3.0.7 To be used later.

3.0.8 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.

3.0.9 When one or more required barriers are unable to perform their related support function(s), any supported system LCO(s) are not required to be declared not met solely for this reason for up to 30 days provided that at least one train or subsystem of the supported system is OPERABLE and supported by barriers capable of providing their related support function(s), and risk is assessed and managed. This specification may be concurrently applied to more than one train or subsystem of a multiple train or subsystem supported system provided at least one train or subsystem of the supported system is OPERABLE and the barriers supporting each of these trains or subsystems provide their related support function(s) for different categories of initiating events.

LIMITING CONDITION FOR OPERATION

3.0.9 (continued)

If the required OPERABLE train or subsystem becomes inoperable while this specification is in use, it must be restored to OPERABLE status within 24 hours or the provisions of this specification cannot be applied to the trains or subsystems supported by the barriers that cannot perform their related support function(s).

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

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 309 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By application dated August 14, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17226A210), Entergy Operations, Inc. (Entergy, the licensee) requested changes the Arkansas Nuclear One, Unit 2 (ANO-2), Technical Specifications (TSs). The proposed changes would revise TS requirements for unavailable barriers by adding Limiting Condition for Operation (LCO) 3.0.9. The new LCO allows a delay time for entering a supported system TS when the inoperability is solely due to an unavailable barrier, if the risk is assessed and managed. The postulated initiating events, which may require a functional barrier, are limited to those with low frequencies of occurrence, and the overall TS system safety function would still be available for the majority of anticipated challenges.

The change is consistent with Technical Specification Task Force (TSTF), TSTF-427, Revision 2, "Allowance for Non Technical Specification Barrier Degradation Supported System OPERABILITY" (ADAMS Accession No. ML061240055). The availability of this TS improvement was published in the *Federal Register* on October 3, 2006 (71 FR 58444), as part of the Consolidated Line Item Improvement Process. This safety evaluation (SE) follows the model SE published in the October 3, 2006, *Federal Register* Notice.

2.0 REGULATORY EVALUATION

In Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36, "Technical specifications," the U.S. Nuclear Regulatory Commission (NRC, the Commission) established its regulatory requirements related to the content of 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 part, in 10 CFR 50.36(c)(2)(i), the "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 until the condition can be met."

TS Section 3.0, for LCO and SR Applicability, provides details or ground rules for complying with the LCOs.

Barriers are doors, walls, floor plugs, curbs, hatches, installed structures or components, or other devices, not explicitly described in the TSs that support the performance of the functions of systems described in the TSs. For purposes of this TS LCO, the term "barrier" refers to one or more devices which protect one train of a safety system from a given initiating event. A "degraded barrier" refers to a barrier that has been found to be degraded and must be repaired, or to a barrier that is purposefully removed or reconfigured to facilitate maintenance activities. As stated in Nuclear Energy Institute (NEI) 04-08, "Risk-Informed Technical Specifications Initiative 7a, Allowance for Non-Technical Specification Barrier Degradation on Supported System OPERABILITY (TSTF-427), Industry Implementation Guidance," March 2006 (ADAMS Accession No. ML061220426), LCO 3.0.9 specifically does not apply to fire barriers, snubbers, barriers which support ventilation systems or non-TS systems, or barriers which support TS systems where the unavailability of the barrier does not render the supported system inoperable.

Some TS-required systems may require one or more functional barriers in order to perform their intended function(s) for certain initiating events for which the barriers provide some protective support function. For example, there are barriers to protect systems from the effects of internal flooding, such as floor plugs and retaining walls, and barriers are used to protect equipment from steam impingement in case of high energy line breaks. Barriers are also used to protect systems against missiles, either internally generated, or generated by external events.

Barriers are not explicitly described in the TSs, but are required to be capable of performing their required support function by the definition of OPERABILITY for the supported system which is described in the TSs. Therefore, under the current Standard Technical Specifications, the supported system must be declared inoperable when the related barrier(s) are unavailable. However, the magnitude of plant risk associated with the barrier which cannot perform its related support function is much less than the risk associated with direct unavailability of the supported system, since barriers are only required for specific, low-frequency initiating events.

Some potential undesirable consequences of the current TS requirements include:

1. When maintenance activities on the supported TS system require removal and restoration of barriers, the time available to complete maintenance and perform system restoration and testing is reduced by the time spent maneuvering the barriers within the time constraints of the supported system LCO;

2. Restoration of barriers following maintenance may be given a high priority due to time restraints of the existing supported system LCO, when other activities may have a greater risk impact and should therefore be given priority; and

3. Unnecessary plant shutdowns may occur due to discovery of degraded barriers, which require more time than provided by the existing supported system LCO to complete repairs and restoration of the barrier.

To improve the treatment of unavailable barriers and enhance safety, the TSTF proposed a risk-informed TS change that introduces a delay time before entering the actions for the supported equipment, when one or more barriers are found to be degraded, or are removed or reconfigured to support maintenance activities, if risk is assessed and managed. Such a time delay will provide needed flexibility in the performance of maintenance and at the same time will enhance overall plant safety by:

1. Performing system maintenance and restoration activities, including post-maintenance testing, within the existing TS LCO time, and allowing barrier removal and restoration to be performed outside of the TS LCO, providing more time for the safe conduct of maintenance and testing activities on the supported TS system;

2. Requiring barrier removal and restoration activities to be assessed and prioritized based on actual plant risk impacts; and

3. Avoiding unnecessary unscheduled plant shutdowns and thus minimizing plant transition and realignment risks.

3.0 TECHNICAL EVALUATION

3.1 Proposed TS Changes

Current LCO 3.0.1 states:

> Limiting Conditions for Operation (LCO) and ACTION requirements shall be applicable during the OPERATIONAL MODES or other conditions specified for each specification, except as provided in LCO 3.0.2 and LCO 3.0.8.

Revised LCO 3.0.1 would state:

> Limiting Conditions for Operation (LCO) and ACTION requirements shall be applicable during the OPERATIONAL MODES or other conditions specified for each specification, except as provided in LCO 3.0.2, LCO 3.0.8, and LCO 3.0.9.

The proposed change adds new LCO 3.0.9 to the TSs. LCO 3.0.9 allows licensees to delay declaring an LCO not met for equipment supported by barriers unable to perform their associated support function, when risk is assessed and managed. The licensee proposed adding new LCO 3.0.9, which states:

> When one or more required barriers are unable to perform their related support function(s), any supported system LCO(s) are not required to be declared not met solely for this reason for up to 30 days provided that at least one train or subsystem of the supported system is OPERABLE and supported by barriers capable of providing their related support function(s), and risk is assessed and managed. This specification may be concurrently applied to more than one train or subsystem of a multiple train or subsystem supported system provided at least one train or subsystem of the supported system is OPERABLE and the barriers supporting each of these trains or subsystems provide their related support function(s) for different categories of initiating events.

If the required OPERABLE train or subsystem becomes inoperable while this specification is in use, it must be restored to OPERABLE status within 24 hours or the provisions of this specification cannot be applied to the trains or subsystems supported by the barriers that cannot perform their related support function(s).

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

3.2 Background

The industry submitted TSTF-427, Revision 2, in support of the proposed TS change. This submittal documents a risk-informed analysis of the proposed TS change. Probabilistic risk assessment (PRA) methods 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 unavailable barriers at nuclear power plants. The industry also submitted implementation guidance NEI 04-08. This submittal provides detailed guidance on assessing and managing risk associated with unavailable barriers. This is in accordance with guidance provided in Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," July 1998 (ADAMS Accession No. ML003740133), and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," August 1998 (ADAMS Accession No. ML003740176).

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:

1. 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 (ΔCDF) and the average yearly large early release frequency (ΔLERF) and (2) by the incremental conditional core damage probability (ICCDP) and the incremental conditional large early release probability (ICLERP). The assessed ΔCDF and ΔLERF 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 in RG 1.177, which provide assurance that the plant risk does not increase unacceptably during the period the equipment is taken out of service.

2. 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.

3. 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 risk assessment was performed to justify the proposed addition of LCO 3.0.9 to the ANO-2's TSs. This approach was necessitated by: (1) the general nature of the proposed TS change (i.e., it applies to all plants and is associated with an undetermined number of barriers that are not able to perform their function); and (2) the lack of detailed modeling in most plant-specific PRAs which do not include passive structures such as barriers.

The simplified risk assessment considers three different parameters:

1. The length of time the affected barrier is unavailable,

2. The initiating event frequency for which the affected barrier is designed to mitigate, and

3. The importance to CDF (or LERF) of the TS equipment (train, subsystem, or component) for which the affected barrier is designed to protect, measured by the risk achievement worth (RAW) of the equipment.

The ICCDP can be calculated based on the following equation:

$$ICCDP = \left[\frac{T_C}{8766} \times \frac{IE_i}{IE_T}\right] \times \left[\left(RAW_j \times CDF_{base}\right) - CDF_{base}\right]$$

Where:

- T_c is the time the barrier is unavailable (hours),

- $T_c/8766$ is therefore the fraction of the year during which the barrier is unavailable,

- IE_i/IE_T is the ratio of the initiating event frequency for which the affected barrier is designed to mitigate, IE_i, and the total initiating event frequency, IE_T,

- RAW_j is the risk achievement worth of the component(s) for which the barrier provides protection, and

- CDF_{base} is the baseline CDF (per year).

ICLERP also may be similarly determined, using baseline LERF and RAW values with respect to LERF. It is assumed that the magnitude of the LERF risk resulting from the barrier unable to perform its related support function would be generally at least one order of magnitude less than the corresponding CDF risk. Containment bypass scenarios, which are typically the significant contributors to LERF, would not be uniquely affected by application of LCO 3.0.9, and initiating events, which would be significant LERF contributors, such as steam generator tube rupture

and interfacing systems loss-of-coolant accident (LOCA), are not typically associated with barriers within the scope of LCO 3.0.9. Therefore, the assumption regarding LERF risk is reasonable and acceptable for the generic risk evaluation, provided that LERF risk impacts are considered on a plant-specific basis for unavailable barriers, as described in Section 3.3.3 of this safety evaluation (SE).

The relevant initiating events (i.e., events for which barriers subject to LCO 3.0.9 provide protection) are:

- internal and external floods,
- high energy line breaks,
- feedwater line breaks,
- LOCA (small, medium, and large),
- tornados and high winds, and
- turbine missiles.

Generic frequencies for most of these initiating events were obtained from NUREG/CR-5750, "Rates of Initiating Events at U.S. Nuclear Power Plants: 1987 – 1995," February 1999 (ADAMS Accession No. ML070580080). For external floods, turbine missiles, and tornados, other industry source documents were referenced. The most limiting (highest frequency) initiating event was obtained for a high energy line break from NUREG/CR-5750, with a frequency of 9.1E-3 per year. The risk assessment is, therefore, based on this limiting frequency, and the proposed methodology to apply LCO 3.0.9 is similarly restricted to barriers protecting against initiating events whose total frequency is no more than 9.1E-3 per year.

3.3 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 3.0.9 to the TS are summarized and evaluated in the following Sections 3.3.1 to 3.3.3 of this SE.

3.3.1 Risk Impact

The bounding risk assessment approach, described in Section 3.2 of this SE, was developed for a range of plant baseline CDF values and for a range of protected component RAW values. The maximum allowable 30-day outage time was used. The results are summarized below in Table 1.

Table 1 - Risk Assessment Results for a Postulated 30-Day Barrier Outage.

Baseline CDF = 1E-6 per year

RAW	ICCDP	ICLERP
2	7.5E-10	7.5E-11
10	6.7E-09	6.7E-10
50	3.7E-08	3.7E-09
100	7.4E-08	7.4E-09

Baseline CDF = 1E-5 per year

RAW	ICCDP	ICLERP
2	7.5E-09	7.5E-10
10	6.7E-08	6.7E-09
50	3.7E-07	3.7E-08
100	7.4E-07	7.4E-08

Baseline CDF = 1E-4 per year

RAW	ICCDP	ICLERP
2	7.5E-08	7.5E-09
10	6.7E-07	6.7E-08
50	3.7E-06	3.7E-07
100	7.4E-06	7.4E-07

The above results represent a sensitivity analysis covering the expected range of plant baseline CDF values and component RAW values. The most limiting configurations involving very high risk components (RAW > 10) would not be anticipated to occur for most planned maintenance activities.

The calculations conservatively assume the most limiting (highest frequency) initiating event and the longest allowable outage time (30 days). Occurrence of the initiating event during unavailability of the barrier is conservatively assumed to directly fail the protected equipment; no credit is taken for event-specific circumstances which may result in the equipment remaining functional even with the barrier unavailable. (For example, a barrier required to protect equipment from steam impingement for high energy line breaks may only be required for breaks occurring in specific locations and orientations relative to the protected equipment, and only for large size breaks.) No credit is taken for avoided risk, identified in Section 2.0 of this SE.

The risk assessment results of Table 1 were compared to guidance provided in the revised Section 11 of NUMARC 93-01, Revision 2, "Nuclear Energy Institute, Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," April 1996 (ADAMS Accession No. ML101020415), endorsed by RG 1.160, Revision 3, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," May 2012 (ADAMS Accession No. ML113610098),[1] for implementing the requirements of paragraph (a)(4) of the Maintenance Rule, 10 CFR 50.65. Guidance regarding the acceptability of conditional risk increase in terms of CDF for a planned configuration is provided. This guidance states that a specific configuration that is associated with a CDF higher than 1E-3 per year should not normally be entered voluntarily. The NRC staff notes that the higher risk configurations documented in Table 1 would exceed this guidance, and therefore, would not be permitted to be entered voluntarily. For example, with a baseline CDF of 1E-4 per year, a component with a RAW greater than 10 would exceed the 1E-3 per year criteria. Therefore, the sensitivity analyses

[1] The availability of this TS improvement was published in the *Federal Register* on October 3, 2006 (71 FR 58444), as part of the Consolidated Line Item Improvement Process and referenced in RG 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants," May 2000 (ADAMS Accession No. ML003699426). However, RG 1.182 has been superseded by RG 1.160, Revision 3.

presented in Table 1 are understood to include higher risk configurations which would not be permitted under the guidance of NUMARC-93-01.

TSTF-427, Revision 2, provides guidance on specific plant configuration associated with ICCDP and ICLERP values, as noted in Table 2 below.

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

ΔR_{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 barrier outage configurations, the conservatively assessed ICCDP and ICLERP values are within the limits for what is recommended as the threshold for the "normal work controls" region.

As stated in the implementation guidance for LCO 3.0.9 (NEI 04-08), plants are required to commit to the guidance of NUMARC 93-01, Section 11, and, therefore, the above limits would be applicable. Plant configurations including out-of-service barriers may, therefore, be entered voluntarily if supported by the results of the risk assessment required by 10 CFR 50.65(a)(4), and by LCO 3.0.9.

RG 1.177 provides guidance of 5E-7 ICCDP probability and 5E-8 ICLERP as the limit for a TS allowed outage time. As shown in Table 1, the guidance is met for the typically anticipated configurations, unless either the baseline CDF for the plant approaches 1E-4 per year or the RAW of the protected components is well above 10. Such configurations may exceed the criteria described in NUMARC 93-01 (Table 2) and would not be voluntarily entered. Such configurations are not expected to be frequently encountered, and may be addressed on a case-by-case plant-specific basis by limiting the allowed outage time and by implementing plant-specific risk management actions, as per the implementing guidance NEI 04-08.

RG 1.174 provides guidance of 1E-5 per year ΔCDF and 1E-6 per year ΔLERF. The ICCDP calculations demonstrated that each individual 30-day barrier outage is anticipated to be low risk. Although there is no explicit limit on the number of times per year that LCO 3.0.9 may be applied, even assuming barrier outages occurred continuously over the entire year, the risk incurred would still be anticipated to be below the limits of the guidance.

The NRC staff concludes that the risk assessment results support the proposed addition of LCO 3.0.9 to the ANO-2 TSs. The risk increases associated with this TS change 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.

3.3.2 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.

When the proposed LCO 3.0.9 is applied, at least one train or subsystem is required to be operable with required barriers in place, such that this train or subsystem would be available to provide mitigation of the initiating event. The proposed LCO 3.0.9 may be applied to multiple trains of the same system only for barriers which provide protection for different initiating events, such that at least one train or subsystem is available to provide mitigation of the initiating event. The use of LCO 3.0.9 for barriers, which protect all trains or subsystems from a particular initiating event, is not permitted. Therefore, potentially high-risk configurations involving a loss of function required for mitigation of a particular initiating event are avoided by the restrictions imposed on applicability of LCO 3.0.9.

LCO 3.0.9 also addresses potential emergent conditions where unplanned failures or discovered conditions may result in the unavailability of a required train or subsystem for a particular initiating event. Such conditions may result during application of LCO 3.0.9 from equipment failure on the operable train, such that all trains of a TS system are not protected from the same initiating event. In such cases, a 24-hour allowed time is provided to restore the conditions to permit continued operation with unavailable barriers, after which the applicability of LCO 3.0.9 ends, and the supported system LCO becomes effective. This allowed time is provided so that emergent conditions with low risk consequences may be effectively managed, rather than requiring immediate exit of LCO 3.0.9 and the potential for an unplanned plant shutdown.

A limit of 30 days is applied to the LCO 3.0.9 allowed outage time for each barrier, after which the barrier must be restored to an available status, or the supported system TS must be applied. This 30-day backstop applies regardless of the risk level calculated, and provides assurance that installed plant barriers will be maintained available over long periods of time, and that the application of LCO 3.0.9 will not result in long-term degradation of plant barriers.

The NRC staff concludes that the restrictions on the applicability of LCO 3.0.9 assuring that one safety train remains available to mitigate the initiating event, along with the 30-day limit applicable to each barrier, assure that potentially high-risk configurations are avoided in accordance with the guidance provided in RGs 1.174 and 1.177.

3.3.3 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 LCO 3.0.9 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.

The implementation guidance for LCO 3.0.9 (NEI 04-08) requires that the allowed outage time determination for an unavailable barrier be performed using the plant-specific configuration. Further, the risk determinations are to be updated whenever emergent conditions occur. These requirements assure that the configuration-specific risk associated with unavailable barriers is assessed and managed prior to entry into LCO 3.0.9 and during its applicability as conditions change.

These evaluations for the unavailable barrier are performed as part of the assessment of plant risk required by 10 CFR 50.65(a)(4). The numerical guidance identified in Table 2 is applicable to implementation of LCO 3.0.9, using the results of the configuration-specific risk assessment which addresses the risk impact of the unavailable barrier along with all other out-of-service components and plant alignments.

Risk management actions are required to be considered when the calculated risk exceeds specific thresholds per NUMARC 93-01 Section 11, as identified in Table 2. Additional guidance on risk management actions are provided in the implementation guidance for LCO 3.0.9.

The allowed outage time for a barrier is calculated based on an ICCDP limit of 1E-6. This is the NUMARC 93-01, Section 11 guidance for applicability of normal work controls, and is conservatively lower than the guidance of 1E-5 for voluntary maintenance activities. The use of 1E-6 will result in conservatively short allowed outage times for barriers compared to allowed times for other maintenance activities.

If the scope of the PRA model used to support the plant-specific CRMP does not include the initiating event for which a barrier provides protection, then LCO 3.0.9 applicability is limited to one barrier on a single train. Multiple barriers for such initiating events may not be unavailable under LCO 3.0.9, and in such situations, the LCO(s) associated with the protected components would be applicable. Applicability of LCO 3.0.9 to the single barrier for an initiating event that is not modeled in the plant PRA is acceptable based on the generic risk analysis provided by TSTF-427, Revision 2, as described in Section 3.2 of this SE.

Assessment of the LERF risk impact on an unavailable barrier is required to be performed in accordance with NUMARC 93-01, Section 11. If an unavailable barrier provides protection to equipment which is relevant to the containment function, or which protects equipment from the effects of an initiating event which is a contributor to LERF, then applicability of LCO 3.0.9 must be limited to that one barrier unless a quantified assessment of LERF is performed.

The NRC staff concludes that the risk evaluations necessary to support the applicability of LCO 3.0.9 appropriately consider the risk from unavailable barriers in an integrated manner based on the overall plant configuration. Therefore, potentially high-risk configurations can be identified and managed in accordance with the guidance provided in RGs 1.174 and 1.177.

3.4 Summary and Conclusions

The unavailability of barriers which protect TS-required components from the effects of specific initiating events is typically a low-risk configuration which should not require that the protected components be immediately declared inoperable. The current TSs require that when such barriers are unavailable, the protected component LCO is immediately entered. Some potential undesirable consequences of the current TS requirements include:

1. When maintenance activities on the supported TS system requires removal and restoration of barriers, the time available to complete maintenance and perform system restoration and testing is reduced by the time spent maneuvering the barriers within the time constraints of the supported system LCO;

2. Restoration of barriers following maintenance must be given a high priority due to time restraints of the existing supported system LCO, when other more risk-important activities may have a greater risk impact and should therefore be given priority; and

3. Unnecessary plant shutdowns may occur due to discovery of degraded barriers which may require more than the existing supported system LCO time to complete repairs and restoration.

To remove the overly restrictive requirements in the treatment of barriers, the licensee is proposing a risk-informed TS change which introduces a delay time before entering the actions for the supported equipment when one or more barriers are found degraded or removed to facilitate planned maintenance activities. Such a delay time will provide needed flexibility in the performance of maintenance during power operation and at the same time will enhance overall plant safety by: (1) performing system maintenance and restoration activities, including post-maintenance testing, within the existing TS LCO time, and allowing barrier removal and restoration to be performed outside of the TS LCO, providing more time for the safe conduct of maintenance and testing activities on the supported system; (2) requiring barrier removal and restoration activities to be assessed and prioritized based on actual plant risk impacts; and (3) avoiding unnecessary unscheduled plant shutdowns, thus minimizing plant transition and realignment risks.

The risk impact of the proposed TS changes 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 was selected due to the lack of detailed plant-specific risk models for most plants which do not include failure modes of passive structures such as barriers. The impact from the addition of the proposed LCO 3.0.9 to the TSs on defense-in-depth was also evaluated in conjunction with the risk assessment results.

Based on this integrated evaluation, which is bounding for ANO-2, the NRC staff concludes that the proposed addition of LCO 3.0.9 to the TSs would lead to insignificant risk increases as stipulated by RG 1.177 and depicted in Table 1 above. This conclusion is true without taking any credit for the removal of potential undesirable consequences associated with the current conservative treatment of barriers. Therefore, the proposed change provides adequate protection of public health and safety and is acceptable, provided the conditions set forth below are satisfied.

Consistent with the NRC staff's approval and inherent in the implementation of TSTF-427, Revision 2, the licensee agreed to implement LCO 3.0.9 by operating in accordance with the following stipulations:

1. The licensee committed to the guidance of NUMARC 93-01, Section 11, which provides guidance and details on the assessment and management of risk during maintenance.

2. The licensee stated that procedures will be revised to ensure that the risk assessment and management process described in NEI 04-08 is used whenever a barrier is considered unavailable and the requirements of LCO 3.0.9 are to be applied. This would 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.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Arkansas State official was notified of the proposed issuance of the amendment on February 1, 2018. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes 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 amendment involves 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 amendment involve no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on October 24, 2017 (82 FR 49237). Accordingly, the amendment meets 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 amendment.

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

Principal Contributor: T. Sweat, NRR

Date: February 26, 2018

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 - ISSUANCE OF AMENDMENT TO ADOPT TSTF- 427, "ALLOWANCE FOR NON TECHNICAL SPECIFICATION BARRIER DEGRADATION ON SUPPORTED SYSTEM OPERABILITY" (CAC NO. MG0131; EPID L-2017-LLA-0302) DATED FEBRUARY 26, 2018

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