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

March 31, 2015

Vice President, Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT NO. 2 - ISSUANCE OF AMENDMENT RE: REVISE TECHNICAL SPECIFICATIONS END STATES (TAC NO. MF1199)

Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (NRC, the Commission) has issued the enclosed Amendment No. 301 to Renewed Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit No. 2 (ANO-2). The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated March 26, 2013, as supplemented by letters dated December 12, 2013, and May 12, August 19, October 22, and December 5, 2014.

The amendment modifies the ANO-2 TS requirements for end states associated with the implementation of the NRC-approved Topical Report (TR) NPSD-1186, Revision 0, "Technical Justification for the Risk Informed Modification to Selected Required Action End States for CEOG [Combustion Engineering Owners Group] Member PWRs [Pressurized-Water Reactors]," as well as Required Actions revised by a specific Note in TS Task Force (TSTF) change traveler TSTF-422, Revision 2, "Change in Technical Specifications End States (CE NPSD-1186)."

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

Andrea E. George, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosures:
1. Amendment No. 301 to NPF-6
2. Safety Evaluation

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

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 301
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 March 26, 2013, as supplemented by letters dated December 12, 2013, and May 12, August 19, October 22, and December 5, 2014, 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.

Enclosure 1

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. 301, 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. In addition, the licensee shall incorporate the two commitments listed in Section 3.6 of the safety evaluation associated with this amendment in the next periodic update of the Arkansas Nuclear One, Unit No. 2 Safety Analysis Report, in accordance with 10 CFR 50.71(e).

FOR THE NUCLEAR REGULATORY COMMISSION

E. R. Oesterle for M. Markley

Michael T. Markley, Chief
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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

Date of Issuance: March 31, 2015

ATTACHMENT TO LICENSE AMENDMENT NO. 301

RENEWED FACILITY OPERATING LICENSE NO. NPF-6

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.

Operating License

REMOVE	INSERT
-3-	-3-

Technical Specifications

REMOVE	INSERT
3/4 3-14	3/4 3-14
3/4 3-15	3/4 3-15
---	3/4 3-15a
3/4 3-26	3/4 3-26
---	3/4 3-26a
3/4 4-2a	3/4 4-2a
3/4 6-4	3/4 6-4
3/4 6-6	3/4 6-6
3/4 6-10	3/4 6-10
3/4 6-14	3/4 6-14
3/4 6-16	3/4 6-16
3/4 7-15	3/4 7-15
3/4 7-17	3/4 7-17
3/4 8-1	3/4 8-1
3/4 8-1a	3/4 8-1a
3/4 8-2	3/4 8-2
3/4 8-2a	3/4 8-2a
3/4 8-8	3/4 8-8

(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) <u>Maximum Power Level</u>

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) <u>Technical Specifications</u>

The Technical Specifications contained in Appendix A, as revised through Amendment No. 301, 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) <u>Additional Conditions</u>

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.

TABLE 3.3-3 (Continued)

TABLE NOTATION

(a) Trip function may be bypassed in this MODE when pressurizer pressure is below 400 psia; bypass shall be automatically removed before pressurizer pressure exceeds 500 psia.

(b) An SIAS signal is first necessary to enable CSAS logic.

(c) Remote manual not provided for RAS. These are local manuals at each ESF auxiliary relay cabinet.

ACTION STATEMENTS

ACTION 9 – With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

ACTION 10 – With the number of channels OPERABLE one less than the Total Number of Channels, operation in the applicable MODES may continue provided the inoperable channel is placed in the bypassed or tripped condition within 1 hour. If the inoperable channel is bypassed for greater than 48 hours, the desirability of maintaining this channel in the bypassed condition shall be reviewed as soon as possible but no later than the next regularly scheduled OSRC meeting in accordance with the Quality Assurance Program Manual (QAPM). The channel shall be returned to OPERABLE status prior to startup following the next COLD SHUTDOWN.

If an inoperable Steam Generator ΔP or RWT Level – Low channel is placed in the tripped condition, remove the inoperable channel from the tripped condition within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 30 hours.

With a channel process measurement circuit that affects multiple functional units inoperable or in test, bypass or trip all associated functional units as listed below.

Process Measurement Circuit	Functional Unit Bypassed
1. Containment Pressure – NR	Containment Pressure – High (RPS) Containment Pressure – High (ESFAS) Containment Pressure – High-High (ESFAS)
2. Steam Generator 1 Pressure	Steam Generator 1 Pressure – Low Steam Generator 1 ΔP (ESFAS 1) Steam Generator 2 ΔP (ESFAS 2)
3. Steam Generator 2 Pressure	Steam Generator 2 Pressure – Low Steam Generator 1 ΔP (ESFAS 1) Steam Generator 2 ΔP (ESFAS 2)

ACTION 10 (continued)

Process Measurement Circuit	Functional Unit Bypassed
4. Steam Generator 1 Level	Steam Generator 1 Level – Low Steam Generator 1 ΔP (EFAS 1)
5. Steam Generator 2 Level	Steam Generator 2 Level – Low Steam Generator 2 ΔP (EFAS 2)

ACTION 11 – With the number of channels OPERABLE one less than the Minimum Channels OPERABLE requirement, operation in the applicable MODES may continue provided the following conditions are satisfied:

a. Verify that one of the inoperable channels has been bypassed and place the other inoperable channel in the tripped condition within 1 hour, and

b. All functional units affected by the bypassed/tripped channel shall also be placed in the bypassed/tripped condition as listed below:

Process Measurement Circuit	Functional Unit Bypassed/Tripped
1. Containment Pressure – NR	Containment Pressure – High (RPS) Containment Pressure – High (ESFAS) Containment Pressure – High-High (ESFAS)
2. Steam Generator 1 Pressure	Steam Generator 1 Pressure – Low Steam Generator 1 ΔP (EFAS 1) Steam Generator 2 ΔP (EFAS 2)
3. Steam Generator 2 Pressure	Steam Generator 2 Pressure – Low Steam Generator 1 ΔP (EFAS 1) Steam Generator 2 ΔP (EFAS 2)
4. Steam Generator 1 Level	Steam Generator 1 Level – Low Steam Generator 1 ΔP (EFAS 1)
5. Steam Generator 2 Level	Steam Generator 2 Level – Low Steam Generator 2 ΔP (EFAS 2)

If an inoperable Steam Generator ΔP or RWT Level - Low channel is placed in the tripped condition, remove the inoperable channel from the tripped condition within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 30 hours.

Operation in the applicable MODES may continue until the performance of the next required CHANNEL FUNCTIONAL TEST. Subsequent operation in the applicable MODES may continue if one channel is restored to OPERABLE status and the provisions of ACTION 10 are satisfied.

TABLE 3.3-3 (Continued)

TABLE NOTATION

ACTION 12 – With the number of OPERABLE channels one less than the Minimum Channels OPERABLE, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

ACTION 13 – With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours; however, one channel may be bypassed for up to 1 hour for surveillance testing provided the other channel is OPERABLE. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

TABLE 3.3-6 (Continued)

TABLE NOTATION

ACTION 13 – With the number of channels OPERABLE less than required by the Minimum Channels OPERABLE requirement, perform area surveys of the monitored area with portable monitoring instrumentation at least once per 24 hours.

ACTION 16 – With the number of OPERABLE channels one less than the Minimum Channels OPERABLE requirement, complete the following:

a. If performing CORE ALTERATIONS or moving irradiated fuel within the reactor building, secure the containment purge system or suspend CORE ALTERATIONS and movement of irradiated fuel within the reactor building.

b. If a containment PURGE is in progress, secure the containment purge system.

c. If continuously ventilating, verify the SPING monitor operable or perform the ACTIONS of the Offsite Dose Calculation Manual, Appendix 2, Table 2.2-1, or secure the containment purge system.

ACTION 17 – In MODE 1, 2, 3, or 4, with no channels OPERABLE, within 1 hour initiate and maintain operation of the control room emergency ventilation system (CREVS) in the recirculation mode of operation or be in HOT STANDBY within the next 6 hours and HOT SHUTDOWN in the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

ACTION 18 – With the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, (1) either restore the inoperable channel to OPERABLE status within 7 days or (2) prepare and submit a Special Report to the NRC within 30 days following the event, outlining the action taken, the cause of the inoperability, and the plans and schedule for restoring the system to OPERABLE status. With both channels inoperable, initiate alternate methods of monitoring the containment radiation level within 72 hours in addition to the actions described above.

ACTION 19 – With the number of OPERABLE Channels less than required by the Minimum Channels OPERABLE requirements, initiate the preplanned alternate method of monitoring the appropriate parameter(s), within 72 hours, and:

1) either restore the inoperable Channel(s) to OPERABLE status within 7 days of the event, or

2) prepare and submit a Special Report to the NRC within 14 days following the event outlining the action taken, the cause of the inoperability and the plans and schedule for restoring the system to OPERABLE status.

TABLE 3.3-6 (Continued)

TABLE NOTATION

ACTION 20 – In MODE 1, 2, 3, or 4 with the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, within 7 days restore the inoperable channel to OPERABLE status or initiate and maintain the CREVS in the recirculation mode of operation. Otherwise, be in HOT STANDBY within the next 6 hours and HOT SHUTDOWN in the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

ACTION 21 - During handling of irradiated fuel with one or two channels inoperable, immediately place one OPERABLE CREVS train in the emergency recirculation mode or immediately suspend handling of irradiated fuel.

REACTOR COOLANT SYSTEM

SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.4.1.3 a. At least two of the coolant loops listed below shall be OPERABLE:

1. Reactor Coolant Loop (A) and its associated steam generator and at least one associated reactor coolant pump.
2. Reactor Coolant Loop (B) and its associated steam generator and at least one associated reactor coolant pump.
3. Shutdown Cooling Loop (A) #.
4. Shutdown Cooling Loop (B) #.

b. At least one of the above coolant loops shall be in operation.*

APPLICABILITY: Modes 4 and 5.

ACTION:

a. With less than the above required coolant loops OPERABLE, immediately initiate corrective action to return the required coolant loops to OPERABLE status as soon as possible and initiate action to make at least one steam generator available for decay heat removal via natural circulation. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

b. With no coolant loop in operation, suspend all operations involving a reduction in boron concentration of the Reactor Coolant System and immediately initiate corrective action to return the required coolant loop to operation.

SURVEILLANCE REQUIREMENTS

4.4.1.3.1 The required shutdown cooling loop(s) shall be determined OPERABLE per the Inservice Testing Program.

4.4.1.3.2 The required reactor coolant pump(s), if not in operation, shall be determined to be OPERABLE once per 7 days by verifying correct breaker alignments and indicated power availability.

4.4.1.3.3 The required steam generator(s) shall be determined OPERABLE by verifying the secondary side water level to be ≥ 23% indicated level at least once per 12 hours.

4.4.1.3.4 At least one coolant loop shall be verified to be in operation and circulating reactor coolant at least once per 12 hours.

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* All reactor coolant pumps and decay heat removal pumps may be de-energized for up to 1 hour provided (1) no operations are permitted that would cause dilution of the reactor coolant system boron concentration, and (2) core outlet temperature is maintained at least 10°F below saturation temperature.

The normal or emergency power source may be inoperable in Mode 5.

CONTAINMENT AIR LOCKS

LIMITING CONDITION FOR OPERATION

3.6.1.3 Each containment air lock shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one containment air lock door inoperable in one or more containment air locks[1,2]:

   1. Verify that at least the OPERABLE air lock door is closed in the affected air lock within one hour and either restore the inoperable air lock door to OPERABLE status within 24 hours or lock the OPERABLE air lock door closed[3].

   2. Operation may then continue provided that the OPERABLE air lock door is verified to be locked closed at least once per 31 days.

b. With the containment air lock interlock inoperable in one or more containment air locks[1]:

   1. Verify that at least one OPERABLE air lock door is closed in the affected air lock within one hour and restore the inoperable air lock interlock to OPERABLE status within 24 hours or lock an OPERABLE air lock door closed[4].

   2. Operation may then continue provided that the OPERABLE air lock door is verified to be locked closed at least once per 31 days.

c. With one or more air locks inoperable for reasons other than those addressed in ACTION a. or b.:

   1. Immediately initiate action to evaluate overall containment leakage per LCO 3.6.1.2.

   2. Verify that at least one door in the affected air lock is closed within one hour and restore the affected air lock to OPERABLE status within 24 hours.

Otherwise, be in at least HOT STANDBY within the next six hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

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[1] Separate ACTION entry is allowed for each air lock.

[2] With both air locks inoperable, entry and exit is permissible for seven days under administrative controls.

[3] Entry and exit is permissible to perform repairs on the affected air lock components.

[4] Entry and exit is permissible under the control of a dedicated individual.

INTERNAL PRESSURE AND AIR TEMPERATURE

LIMITING CONDITION FOR OPERATION

3.6.1.4 The combination of containment internal pressure and average air temperature shall be maintained within the region of acceptable operation shown on Figure 3.6-1.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With the point defined by the combination of containment internal pressure and average air temperature outside the region of acceptable operation shown on Figure 3.6-1, restore the combination of containment internal pressure and average air temperature to within the above limits within 1 hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

SURVEILLANCE REQUIREMENTS

4.6.1.4 The primary containment internal pressure and average air temperature shall be determined to be within the limits at least once per 12 hours. The containment average air temperature shall be the temperature of the air in the containment HVAC common return air duct upstream of the fan/cooler units.

CONTAINMENT SYSTEMS

3/4.6.2 DEPRESSURIZATION, COOLING, AND pH CONTROL SYSTEMS

CONTAINMENT SPRAY SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.1 Two independent containment spray systems shall be OPERABLE with each spray system capable of taking suction from the RWT on a Containment Spray Actuation Signal (CSAS) and automatically transferring suction to the containment sump on a Recirculation Actuation Signal (RAS). Each spray system flow path from the containment sump shall be via an OPERABLE shutdown cooling heat exchanger.

APPLICABILITY: MODES 1, 2, and 3.

ACTION:

With one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.1 Each containment spray system shall be demonstrated OPERABLE:

a. At least once per 31 days by:

1. Verify each containment spray manual, power operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in the correct position.

2. Verifying that the system piping is full of water from the RWT to at least elevation 505' (equivalent to > 12.5% indicated narrow range level) in the risers within the containment.

b. Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head when tested pursuant to the Inservice Testing Program.

CONTAINMENT SYSTEMS

CONTAINMENT COOLING SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.3 Two independent containment cooling groups shall be OPERABLE with two operational cooling units in each group.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one group of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore the inoperable group of cooling units to OPERABLE status within 7 days.

b. With two groups of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore at least one group of cooling units to OPERABLE status within 72 hours. Restore both above required groups of cooling units to OPERABLE status within 7 days of initial loss.

c. With one group of the above required containment cooling units inoperable and one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours. Restore the inoperable group of containment cooling units to OPERABLE status within 7 days of initial loss.

Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

3/4.6.3 CONTAINMENT ISOLATION VALVES

LIMITING CONDITION FOR OPERATION

3.6.3.1 Each containment isolation valve shall be OPERABLE.*

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With one or more isolation valve(s) inoperable, maintain at least one isolation valve OPERABLE in each affected penetration that is open and either:

a. Restore the inoperable valve(s) to OPERABLE status within 4 hours, or

b. Isolate each affected penetration within 4 hours by use of at least one deactivated automatic valve secured in the isolation position, or

c. Isolate the affected penetration within 4 hours by use of at least one closed manual valve or blind flange; or

d. Be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

SURVEILLANCE REQUIREMENTS

4.6.3.1.1 Each containment isolation valve shall be demonstrated OPERABLE prior to returning the valve to service after maintenance, repair or replacement work is performed on the valve or its associated actuator, control or power circuit by performance of a cycling test and verification of isolation time.

* Locked or sealed closed valves may be opened on an intermittent basis under administrative control.

3/4.7.3 SERVICE WATER SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.3.1 At least two independent service water loops shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

With only one service water loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

SURVEILLANCE REQUIREMENTS

4.7.3.1 At least two service water loops shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power operated or automatic) servicing safety related equipment that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. At least once per 18 months during shutdown, by verifying that each automatic valve servicing safety related equipment actuates to its correct position on CCAS, MSIS and RAS test signals.

3/4.7.6 CONTROL ROOM EMERGENCY VENTILATION AND AIR CONDITIONING SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.6.1 Two independent control room emergency ventilation and air conditioning systems shall be OPERABLE. (Note 1)

APPLICABILITY: MODES 1, 2, 3, 4, or during handling of irradiated fuel.

ACTION:

MODES 1, 2, 3, and 4

a. With one control room emergency air conditioning system (CREACS) inoperable, restore the inoperable system to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

b. With one control room emergency ventilation system (CREVS) inoperable for reasons other than ACTION d, restore the inoperable system to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

c. With one CREVS inoperable for reasons other than ACTION d and one CREACS inoperable, restore the inoperable CREVS to OPERABLE status within 7 days and restore the inoperable CREACS to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

d. With one or more CREVS inoperable due to an inoperable CRE boundary:

   1. Immediately initiate action to implement mitigating actions, and

   2. Verify mitigating actions ensure CRE occupant exposures to radiological, chemical, and smoke hazards will not exceed limits within 24 hours, and

   3. Restore the CRE boundary to OPERABLE status within 90 days

   Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

e. With two CREVS inoperable for reasons other than ACTION d or with two CREACS inoperable, enter Specification 3.0.3.

Note 1: The control room envelope (CRE) boundary may be open intermittently under administrative controls.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system and

b. Two separate and independent diesel generators each with:

1. A day fuel tank containing a minimum volume of 300 gallons of fuel,

2. A separate fuel storage system, and

3. A separate fuel transfer pump.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

NOTE: Specification 3.0.4.b is not applicable to diesel generators.

a. With one offsite A.C. circuit of the above required A.C. electrical power sources inoperable, perform the following:

1. Demonstrate the OPERABILITY of the remaining offsite A.C. circuit by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter, and

2. Restore the offsite A.C. circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN. Startup Transformer No. 2 may be removed from service for up to 30 days as part of a preplanned preventative maintenance schedule. The 30-day allowance may be applied not more than once in a 10-year period.

LIMITING CONDITION FOR OPERATION

b. With one diesel generator of the above required A.C. electrical power source inoperable, perform the following:

   1. Demonstrate the OPERABILITY of both the offsite A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter, and

   2. Demonstrate the OPERABILITY of the remaining OPERABLE diesel generator within 24 hours by:

      i. Determining the OPERABLE diesel generator is not inoperable due to a common cause failure, or

      ii. Perform Surveillance Requirement 4.8.1.1.2.a.4 unless:

         a. The remaining diesel generator is currently in operation, or

         b. The remaining diesel generator has been demonstrated OPERABLE within the previous 24 hours, and

   3. Restore the diesel generator to OPERABLE status within 14 days (See Note 1) or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Note 1 - If the Alternate A.C. Diesel Generator (AACDG) is determined to be inoperable during this period, then a 72 hour restoration period is applicable until either the AACDG or the diesel generator is returned to operable status (not to exceed 14 days from the initial diesel generator inoperability).

c. With one offsite A.C. circuit and one diesel generator of the above required A.C. electrical power sources inoperable, perform the following:

1. Demonstrate the OPERABILITY of the remaining offsite A.C. circuit by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter; and,

2. If the diesel generator became inoperable due to any cause other than preplanned preventive maintenance or testing, then

i. Demonstrate the OPERABILITY of the remaining OPERABLE diesel generator by performing Surveillance Requirement 4.8.1.1.2.a.4 within 8 hours except when:

a. The remaining diesel generator is currently in operation, or

b. The remaining diesel generator has been demonstrated OPERABLE within the previous 8 hours, and

3. Restore at least one of the inoperable sources to OPERABLE status within 12 hours, and

4. Restore the remaining inoperable A.C. Source to an OPERABLE status (Offsite A.C. Circuit within 72 hours or Diesel Generator within 14 days (see b.3, Note 1)) based on the time of the initiating event that caused the inoperability.

Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

d. With two offsite A.C. circuits of the above required A.C. electrical power sources inoperable, perform the following:

1. Perform Surveillance Requirement 4.8.1.1.2.a.4 on the diesel generators within the next 8 hours except when:

i. The diesel generators are currently in operation, or

ii. The diesel generators have been demonstrated OPERABLE within the previous 8 hours, and

2. Restore one of the inoperable offsite A.C. circuits to OPERABLE status within 24 hours, and

3. Restore both A.C. circuits within 72 hours of the initiating event,

Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

LIMITING CONDITION FOR OPERATION

e. With two diesel generators of the above required A.C. electrical power sources inoperable, perform the following:

   1. Demonstrate the OPERABILITY of the two offsite A.C. circuits by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter, and

   2. Restore one of the inoperable diesel generators to OPERABLE status within 2 hours, and

   3. Restore the remaining inoperable diesel generator within 14 days (see b.3, Note 1) of the initiating event.

   Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

DC SOURCES – OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 The Train A and Train B DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one of the required full capacity chargers inoperable:

   i. Restore the battery terminal voltage to greater than or equal to the minimum established float voltage within 2 hours, and

   ii. Verify battery float current ≤ 2 amps once per 12 hours.

b. With one DC electrical power subsystem inoperable for reasons other than ACTION 'a' above, restore the inoperable DC electrical power subsystem to OPERABLE status within 2 hours.

Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

SURVEILLANCE REQUIREMENTS

4.8.2.3.1 At least once per 7 days by verifying that the battery terminal voltage is greater than or equal to the minimum established float voltage.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 301 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT NO. 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By application dated March 26, 2013 (Reference 1), as supplemented by letters dated December 12, 2013, and May 12, August 19, October 22, and December 5, 2014 (References 2, 3, 4, 5, and 6, respectively), Entergy Operations, Inc. (Entergy, the licensee), submitted a license amendment request (LAR) to the U.S. Nuclear Regulatory Commission (NRC), which requested changes to the Technical Specifications (TSs) for Arkansas Nuclear One, Unit No. 2 (ANO-2).

The LAR proposed to adopt TS Task Force (TSTF) change Traveler TSTF-422, Revision 2, "Change in Technical Specifications End States (CE NPSD-1186)" (Reference 7). The supplemental letters dated December 12, 2013, and May 12, August 19, October 22, and December 5, 2014, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 23, 2013 (78 FR 44172).

TSTF-422 incorporates Topical Report (TR) NPSD-1186, Revision 0, "Technical Justification for the Risk Informed Modification to Selected Required Action End States for [Combustion Engineering Owners Group (CEOG)] Member [Pressurized-Water Reactors (PWRs)]," dated October 2001 (Reference 8). The licensee stated that the LAR is consistent with the Notice of Availability of TSTF-422 announced in the *Federal Register* on April 7, 2011 (76 FR 19510).

TSTF-422 is one of the industry's initiatives developed under the Risk Management Technical Specifications program. The purpose of risk-informed TS changes is to maintain or improve safety while reducing unnecessary burden and to make TS requirements consistent with the Commission's other risk-informed regulatory requirements.

Enclosure 2

Revision 4 of NUREG-1432, Volume 1, "Standard Technical Specifications, Combustion Engineering Plants" (STS), issued April 2012 (Reference 9), defines six operational modes. Of specific relevance to TSTF-422 are Modes 4 and 5:

- Mode 1 – Power operation. The reactor is critical and thermal power is greater than 5 percent of the rated thermal power.
- Mode 2 – Startup. The reactor is critical and thermal power is less than or equal to (≤) 5 percent of the rated thermal power.
- Mode 3 – Hot Standby. Reactor coolant system (RCS) temperature is above 300 degrees Fahrenheit (°F) (TS-specific) and RCS pressure that can range up to power operation pressure. Shutdown cooling (SDC) systems can sometimes be operated in the lower range of Mode 3 temperature and pressure.
- Mode 4 – Hot Shutdown. RCS temperature can range from the lower value of Mode 3 to the upper value of Mode 5. Pressure is generally (but not always) low enough for SDC system operation.
- Mode 5 – Cold Shutdown. RCS temperature is below 200 °F and RCS pressure is consistent with operation of the SDC system.
- Mode 6 – Refueling. Operation is in Mode 6 if one or more reactor vessel head bolts have been de-tensioned. RCS temperature is below 200 °F and RCS pressure is generally equal to containment pressure.

TR NPSD-1186 identifies and evaluates new TS required action end states for a number of TS limiting conditions for operation (LCOs), using a risk-informed approach. An end state is a condition (usually an operational mode, as discussed below) that the reactor must be placed in if the TS required action(s) cannot be met. The end states are currently defined based on placing the unit into a mode or condition in which the TS LCO is not applicable. Mode 5 is the current end state for LCOs that are applicable in Modes 1 through 4. The risk of the transition from Mode 1 to Modes 4 or 5 depends on the availability of alternating current (AC) sources. During the transition from Mode 4 to Mode 5, there is an increased potential for loss of SDC and loss of inventory events. Decay heat removal following a loss-of-offsite power event in Mode 5 is dependent on AC power for SDC. However, in Mode 4, the turbine-driven auxiliary feedwater pump will be available.

Therefore, transitioning to Mode 5 is not always the appropriate end state from a risk perspective. Thus, for specific TS conditions, TR NPSD-1186 justifies Mode 4 as an acceptable alternate end state, rather than Mode 5. The proposed change to the TSs will allow time to perform short-duration repairs, which currently necessitate exiting the original mode of applicability. The Mode 4 TS end state is applied, and risk is assessed and managed in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants." Modified end states are limited to conditions where: (1) entry into the shutdown mode is for a short interval, (2) entry is initiated by inoperability of a single train of equipment or a restriction on a plant operational parameter, unless otherwise stated in the applicable TS, and (3) the primary purpose is to correct the initiating condition and return to power operation as soon as is practical.

2.0 REGULATORY EVALUATION

In 10 CFR 50.36, "Technical specifications," the Commission established its regulatory requirements related to the content of TS. Pursuant to 10 CFR 50.36(c), 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.

The regulation at 10 CFR 50.36(c)(2)(i), states, in part, that

> 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.

The regulation at 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," requires that the reactor be provided with an emergency core cooling system (ECCS) designed so that its calculated cooling performance following postulated loss-of-coolant accidents (LOCAs) conforms to the criteria set forth in 10 CFR 50.46(b).

NRC Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated July 1998 (Reference 10), describes a risk-informed approach acceptable to the NRC for assessing the nature and impact of proposed permanent licensing-basis changes by considering engineering issues and applying risk insights. This regulatory guide also provides risk acceptance guidelines for evaluating the results of such evaluations. RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," dated August 1998 (Reference 11), describes an acceptable risk-informed approach specifically for assessing proposed permanent allowed outage time (AOT) and surveillance test interval TS changes. This RG also provides risk acceptance guidelines for evaluating the results of such assessments. RG 1.177 identifies a three-tiered approach for the licensee's evaluation of the risk associated with a proposed Completion Time (CT) TS change. The risk assessment provided in TR NPSD-1186, was done in accordance with RG 1.174 and RG 1.177.

TR NPSD-1186 states, in part, that

> ...preventing plant challenges during shutdown conditions has been, and continues to be, an important aspect of ensuring safe operation of the plant. Past events demonstrate that risk of core damage associated with entry into, and operation in, shutdown cooling is not negligible and should be considered when a plant is required to shutdown. Therefore, the TS should encourage plant

operation in the steam generator heat removal mode whenever practical, and require SDC entry only when it is a risk beneficial alternative to other actions.

Most of today's TSs and the design basis analyses were developed under the perception that putting a plant in cold shutdown would result in the safest condition and the design basis analyses would bound credible shutdown accidents. In the late 1980s and early 1990s, the NRC and licensees recognized that this perception was incorrect and took corrective actions to improve shutdown operation. At the same time, STSs were developed and many licensees improved their TS. Since enactment of a shutdown rule was expected, almost all TS changes involving power operation, including a revised end state requirement, were postponed (e.g., the Final Policy Statement on TS Improvements). However, in the mid-1990s, the Commission decided a shutdown rule was not necessary in light of industry improvements.

Controlling shutdown risk encompasses control of conditions that can cause potential initiating events and responses to those initiating events that do occur. Initiating events are a function of equipment malfunctions and human error. Responses to events are a function of plant sensitivity, ongoing activities, human error, defense-in-depth, and additional equipment malfunctions.

In practice, the risk during shutdown operations is often addressed via voluntary actions and application of 10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants." Section 50.65(a)(4) states, in part, that:

> Before performing maintenance activities...the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. The scope of the assessment may be limited to structures, systems, and components that a risk-informed evaluation process has shown to be significant to public health and safety.

RG 1.182, "Assessing and Managing Risk before Maintenance Activities at Nuclear Power Plants," dated May 2000 (Reference 12), provides guidance on implementing the provisions of 10 CFR 50.65(a)(4) by endorsing the revised Section 11 (published separately on February 22, 2000) of Nuclear Management and Resources Council (NUMARC) 93-01, Revision 2, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," April 1996. That section was subsequently incorporated into Revision 3 of NUMARC 93-01, July 2000 (Reference 13). However, Revision 3 has not yet been formally endorsed by the NRC.

Withdrawal of RG 1.182

During its review of the licensee's application, the NRC staff noted that RG 1.182 had been withdrawn because it was redundant due to the inclusion of its subject matter in Revision 3 of RG 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," dated May 2012 (Reference 14). A notice of withdrawal of RG 1.182 was published in the *Federal Register* on November 27, 2012 (77 FR 70846). The *Federal Register* notice stated that withdrawal of RG 1.182 neither altered any prior or existing licensing commitments based on its use, nor constituted backfitting as defined in 10 CFR 50.109 (the Backfit Rule) and was not otherwise inconsistent with the issue finality provisions in 10 CFR Part 52.

In addition, the NRC staff observed that RG 1.160 endorsed Revision 4A of NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," dated April 2011 (Reference 15). NUMARC 93-01 provides methods that are acceptable to the NRC staff for complying with the provisions of 10 CFR 50.65. The model safety evaluation (SE) for TSTF-422, Revision 2 (Reference 16), currently refers to the guidance in Revision 2 of NUMARC 93-01.

By letter dated August 4, 2014 (Reference 17), the NRC staff made a request for information (RAI) in which it requested that Entergy confirm that ANO-2's current licensing basis adheres to the RG 1.160 guidance, confirm its commitment to the updated version of NUMARC 93-01, and confirm that the topical reports supporting its LAR comply with NUMARC 93-01, Section 11 (Reference 13).

In its supplemental letter dated August 19, 2014 (Reference 4), Entergy responded to the NRC staff's RAI as follows:

> Entergy committed ANO-1 and ANO-2 to follow the guidance established in TSTF-IG-07-01, Revision 1, "Implementation Guidance for TSTF-431, Revision 3, 'Change in Technical Specifications End States,' BAW-2441-A" [(Reference 18)], and WCAP-16364-NP, Revision 2, "Implementation Guidance for Risk Informed Modification to Selected Required Action End States at Combustion Engineering [Nuclear Steam Supply System (NSSS)] Plants (TSTF-422)" [(Reference 19)], respectively, as part of the original LARs.... Both guidance documents require plants adopting the end states TSTFs to commit to the guidance contained in Section 11 of NUMARC 93-01, Revision 3, for assessing risk associated with maintenance activities. RG 1.182 is referenced in both guidance documents only to state that RG 1.182 endorses NUMARC 93-01 as one acceptable approach to implement 10 CFR 50.65(a)(4), but is not otherwise mentioned.
>
> Topical Report BAW-2441, "Risked Informed Justification for LCO End State Changes," and the associated NRC SE do not reference RG 1.160, RG 1.182, or NUMARC 93-01, but do require a program be established to address 10 CFR 50.65(a)(4) Maintenance Rule aspects with respect to risk management. Similar to the aforementioned guidance for Combustion Engineering (CE) plants, Topical Report CENSPD-1186, "Technical Justification for the Risk Informed Modification to Selected Required Action End States for CEOG Member PWRs," and its associated NRC SE [, dated July 17, 2001 (Reference 20)], references RG 1.182 with regard to its endorsement of [NUMARC] 93-01. Both Revisions 2 and 3 of the NUMARC are mentioned in the CE report. NUMARC 93-01, Revision 4A, incorporated additional guidance related to fire risk, equipment to be scoped in the Maintenance Rule, and the definition of "availability" was modified. The guidance included in RG 1.160, Revision 3, and NUMARC 93-01, Revision 4A, built upon and/or enhanced that provided in RG 1.182 or in previous revisions to the NUMARC; therefore, application of RG 1.160, Revision 3, and NUMARC 93-01, Revision 4A, does not result in inconsistencies with the intent of the topical reports, supporting topical report SEs, or the aforementioned TSTF end state implementation guidance.

Entergy fleet procedure EN-DC-203, "Maintenance Rule Program", currently references NUMARC 93-01 and RG 1.160 as the base guidance documents for implementation of the Maintenance Rule at Entergy sites, which includes ANO-1 and ANO-2. Furthermore, the industry committed [...] through the Nuclear Energy Institute (NEI) to implement RG 1.160, Revision 3, which endorses NUMARC 93-01, Revision 4A. As a result, Entergy fleet procedure EN-OU-108, "Shutdown Safety Management Program (SSMP)," was revised with reference to [NUMARC] 93-01 to include qualitative risk guidance and risk management actions (RMAs), such as those applicable to fire-related features which become unavailable during shutdown operational modes. ANO procedure COPD-024, "Risk Assessment Guidelines," was also revised to include comprehensive guidance related to fire risks and RMAs, and specifically discusses the guidance contained in NUMARC 93-01, Revision 4A.

The ANO end state LARs committed to Section 11 of NUMARC 93-01, Revision 3, with regard to assessing risk in support of the new Mode 4 end states delineated in the subject TSTFs. As stated previously, the ANO LARs also committed to the respective implementation guidance documents, which refer to Revision 3 of the NUMARC. Although the ANO Maintenance Rule program is currently based on [NUMARC] 93-01, Revision 4A, the aforementioned commitments are updated to reflect the intended guidance."

The licensee included, in Attachment 1 of its supplement dated August 19, 2014, an updated table of regulatory commitments regarding the LAR, which contains the revised regulatory commitments discussed in the licensee's RAI response above. Based on its review of the information provided by the licensee, and the licensee's commitment to utilize NUMARC 93-01, Revision 4A, the NRC staff concludes that the licensee's response has adequately addressed the NRC staff's concern. This regulatory commitment has been escalated to an obligation, and is required to be incorporated into the ANO-2 Safety Analysis Report (SAR) in the next update pursuant to 10 CFR 50.71(e). Please see Section 3.6 of this SE for further discussion of regulatory commitments.

3.0 TECHNICAL EVALUATION

3.1 Proposed TS Changes

In its LAR, as supplemented, the licensee proposed the following TS changes:

TS Table 3.3-3, Engineered Safety Feature Actuation System Instrumentation

Current TS Table 3.3-3 Action 9 states:

> ACTION 9 – With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and exit the MODE(s) of Applicability within the following 30 hours.

Revised TS Table 3.3-3 Action 9 would state:

> ACTION 9 – With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS Table 3.3-3 Action 12 states:

> ACTION 12 – With the number of OPERABLE channels one less than the Minimum Channels OPERABLE, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 30 hours.

Revised TS Table 3.3-3 Action 12 would state:

> ACTION 12 – With the number of OPERABLE channels one less than the Minimum Channels OPERABLE, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS Table 3.3-3 Action 13 states:

> ACTION 13 – With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and exit the MODE(s) of

Applicability within the following 30 hours; however, one channel may be bypassed for up to 1 hour for surveillance testing provided the other channel is OPERABLE.

Revised TS Table 3.3-3 Action 13 would state:

ACTION 13 – With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours; however, one channel may be bypassed for up to 1 hour for surveillance testing provided the other channel is OPERABLE. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

TS Table 3.3-6, Radiation Monitoring Instrumentation

Current TS Table 3.3-6 Action 17 states:

ACTION 17 – In MODE 1, 2, 3, or 4, with no channels OPERABLE, within 1 hour initiate and maintain operation of the control room emergency ventilation system (CREVS) in the recirculation mode of operation or be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN in the following 30 hours.

Revised TS Table 3.3-6 Action 17 would state:

ACTION 17 – In MODE 1, 2, 3, or 4, with no channels OPERABLE, within 1 hour initiate and maintain operation of the control room emergency ventilation system (CREVS) in the recirculation mode of operation or be in HOT STANDBY within the next 6 hours and HOT SHUTDOWN in the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS Table 3.3-6 Action 20 states:

ACTION 20 – In MODE 1, 2, 3, or 4 with the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, within 7 days restore the inoperable channel to OPERABLE status or initiate and maintain the CREVS in the recirculation mode of operation. Otherwise, be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN in the following 30 hours.

Revised TS Table 3.3-6 Action 20 would state:

ACTION 20 – In MODE 1, 2, 3, or 4 with the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, within 7 days restore the inoperable channel to OPERABLE status or initiate and maintain the CREVS in the recirculation mode of operation. Otherwise, be in HOT STANDBY within the next 6 hours and HOT SHUTDOWN in the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

<u>TS 3.4.1.3, Reactor Coolant System – Shutdown</u>

Current TS LCO 3.4.1.3 Action a states:

a. With less than the above required coolant loops OPERABLE, immediately initiate corrective action to return the required coolant loops to OPERABLE status as soon as possible; be in COLD SHUTDOWN within 20 hours.

Revised TS LCO 3.4.1.3 Action a would state:

a. With less than the above required coolant loops OPERABLE, immediately initiate corrective action to return the required coolant loops to OPERABLE status as soon as possible and initiate action to make at least one steam generator available for decay heat removal via natural circulation. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

<u>TS 3.6.1.3, Containment Systems – Containment Air Locks</u>

Current TS LCO 3.6.1.3 Actions a.3, b.3, and c.3, which state, "Otherwise, be in at least HOT STANDBY within the next six hours and in COLD SHUTDOWN within the following 30 hours," would be deleted.

In addition, the revised TS LCO 3.6.1.3 Actions would be modified by adding the following statement below the numbered action items:

> Otherwise, be in at least HOT STANDBY within the next six hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

<u>TS 3.6.1.4, Containment Systems – Internal Pressure and Air Temperature</u>

Current TS LCO 3.6.1.4 Action states:

> With the point defined by the combination of containment internal pressure and average air temperature outside the region of acceptable operation shown on Figure 3.6-1, restore the combination of containment internal pressure and average air temperature to within the above limits within 1 hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.6.1.4 would state:

> With the point defined by the combination of containment internal pressure and average air temperature outside the region of acceptable operation shown on Figure 3.6-1, restore the combination of containment internal pressure and average air temperature to within the above limits within 1 hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

<u>TS 3.6.2.1, Containment Systems - Containment Spray System</u>

Current TS LCO 3.6.2.1 Action, with its associated Note 1, state:

> With one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours (Note 1) or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.
>
> Note 1: For fuel cycles 19 and 20, each train of the containment spray system may be removed from service for up to 7 days or one train may be removed from service two times. The 7-day allowance may be applied only twice.

Revised TS LCO 3.6.2.1 Action, with Note 1 deleted, would state:

> With one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

<u>TS 3.6.2.3, Containment Systems - Containment Cooling System</u>

Current TS LCO 3.6.2.3 Action a states:

> a. With one group of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore the inoperable group of cooling units to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.6.2.3 Action a would state:

> a. With one group of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore the inoperable group of cooling units to OPERABLE status within 7 days.

Current TS LCO 3.6.2.3 Action b states:

b. With two groups of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore at least one group of cooling units to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore both above required groups of cooling units to OPERABLE status within 7 days of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.6.2.3 Action b would state:

b. With two groups of the above required containment cooling units inoperable and both containment spray systems OPERABLE, restore at least one group of cooling units to OPERABLE status within 72 hours. Restore both above required groups of cooling units to OPERABLE status within 7 days of initial loss.

Current TS LCO 3.6.2.3 Action c states:

c. With one group of the above required containment cooling units inoperable and one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Restore the inoperable group of containment cooling units to OPERABLE status within 7 days of initial loss or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.6.2.3 Action c would state:

c. With one group of the above required containment cooling units inoperable and one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours. Restore the inoperable group of containment cooling units to OPERABLE status within 7 days of initial loss.

In addition, the revised TS LCO 3.6.2.3 Actions would be modified by adding the following statement below the numbered action items:

Otherwise, be in at least HOT STANDBY within the next six hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

TS 3.6.3.1, Containment Systems - Containment Isolation Valves

Current TS LCO 3.6.3.1 Action states, in part, that

> With one or more isolation valve(s) inoperable, maintain at least one isolation valve OPERABLE in each affected penetration that is open and either:
>
> d. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.6.3.1 Action would state, in part, that

> With one or more isolation valve(s) inoperable, maintain at least one isolation valve OPERABLE in each affected penetration that is open and either:
>
> d. Be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

TS 3.7.3.1, Plant Systems - Service Water System

Current TS LCO 3.7.3.1 Action states:

> With only one service water loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.7.3.1 Action would state:

> With only one service water loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

TS 3.7.6.1, Plant Systems - Control Room Emergency Ventilation and Air Conditioning System

Current TS LCO 3.7.6.1 Action a states:

> a. With one control room emergency air conditioning system (CREACS) inoperable, restore the inoperable system to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.7.6.1 Action a would state:

> a. With one control room emergency air conditioning system (CREACS) inoperable, restore the inoperable system to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in

HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS LCO 3.7.6.1 Action b states:

b. With one control room emergency ventilation system (CREVS) inoperable for reasons other than ACTION d, restore the inoperable system to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.7.6.1 Action b would state:

b. With one control room emergency ventilation system (CREVS) inoperable for reasons other than ACTION d, restore the inoperable system to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS LCO 3.7.6.1 Action c states:

c. With one CREVS inoperable for reasons other than ACTION d and one CREACS inoperable, restore the inoperable CREVS to OPERABLE status within 7 days and restore the inoperable CREACS to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.7.6.1 Action c would state:

c. With one CREVS inoperable for reasons other than ACTION d and one CREACS inoperable, restore the inoperable CREVS to OPERABLE status within 7 days and restore the inoperable CREACS to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS LCO 3.7.6.1 Action d would be revised by adding the following statement below the numbered action item:

Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

<u>TS 3.8.1.1, Electrical Power Systems – A.C. Sources</u>

Current TS LCO 3.8.1.1 Action a.2 states:

2. Restore the offsite A.C. circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD

SHUTDOWN within the following 30 hours. Startup Transformer No. 2 may be removed from service for up to 30 days as part of a preplanned preventative maintenance schedule. The 30-day allowance may be applied not more than once in a 10-year period.

Revised TS LCO 3.8.1.1 Action a.2 would state:

2. Restore the offsite A.C. circuit to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN. Startup Transformer No. 2 may be removed from service for up to 30 days as part of a preplanned preventative maintenance schedule. The 30-day allowance may be applied not more than once in a 10-year period.

Current TS LCO 3.8.1.1 Action b.3 states:

3. Restore the diesel generator to OPERABLE status within 14 days (See Note 1) or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.8.1.1 Action b.3 would state:

3. Restore the diesel generator to OPERABLE status within 14 days (See Note 1) or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS LCO 3.8.1.1 Action c.3 states:

3. Restore at least one of the inoperable sources to OPERABLE status within 12 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours, and

Revised TS LCO 3.8.1.1 Action c.3 would state:

3. Restore at least one of the inoperable sources to OPERABLE status within 12 hours, and

Current TS LCO 3.8.1.1 Action c.4 states:

4. Restore the remaining inoperable A.C. Source to an OPERABLE status (Offsite A.C. Circuit within 72 hours or Diesel Generator within 14 days (see b.3, Note 1)) based on the time of the initiating event that caused the inoperability or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.8.1.1 Action c.4 would state:

4. Restore the remaining inoperable A.C. Source to an OPERABLE status (Offsite A.C. Circuit within 72 hours or Diesel Generator within 14 days (see b.3, Note 1)) based on the time of the initiating event that caused the inoperability.

Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS LCO 3.8.1.1 Action d.2 states:

2. Restore one of the inoperable offsite A.C. circuits to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours, and

Revised TS LCO 3.8.1.1 Action d.2 would state:

2. Restore one of the inoperable offsite A.C. circuits to OPERABLE status within 24 hours, and

Current TS LCO 3.8.1.1 Action d.3 states:

3. Restore both A.C. circuits within 72 hours of the initiating event or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.8.1.1 Action d.3 would state:

3. Restore both A.C. circuits within 72 hours of the initiating event,

Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

Current TS LCO 3.8.1.1 Action e.2 states:

2. Restore one of the inoperable diesel generators to OPERABLE status within 2 hours or be in a least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours, and

Revised TS LCO 3.8.1.1 Action e.2 would state:

2. Restore one of the inoperable diesel generators to OPERABLE status within 2 hours, and

Current TS LCO 3.8.1.1 Action e.3 states:

> 3. Restore the remaining inoperable diesel generator within 14 days (see b.3, Note 1) of the initiating event or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.8.1.1 Action e.3 would state:

> 3. Restore the remaining inoperable diesel generator within 14 days (see b.3, Note 1) of the initiating event.
>
> Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

<u>TS 3.8.2.3, Electrical Power Systems – DC Sources - Operating</u>

Current TS LCO 3.8.2.3 Action b states:

> b. With one DC electrical power subsystem inoperable for reasons other than ACTION 'a' above, restore the inoperable DC electrical power subsystem to OPERABLE status within 2 hours.
>
> Otherwise, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Revised TS LCO 3.8.2.3 Action b would state:

> b. With one DC electrical power subsystem inoperable for reasons other than ACTION 'a' above, restore the inoperable DC electrical power subsystem to OPERABLE status within 2 hours.
>
> Otherwise, be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours. LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN.

3.2 <u>Licensee's Optional Variations and Changes from the Model Application</u>

In its LAR dated March 28, 2013, the licensee stated, in part, that

> Entergy is proposing variations or deviations from TR NPSD-1186, the TS changes described in the TSTF-422, Revision 2, or the NRC staff's model SE referenced in the *Federal Register* on April 7, 2011 (76 FR 19510), as part of the CLIIP Notice of Availability.

The licensee further stated that:

> Because the ANO-2 TSs have not been converted to the standard TSs (STS) of NUREG-1432, "Standard Technical Specifications – Combustion Engineering Plants" (on which TSTF-422 markups are based), the layout of the specifications, when compared to TSTF-422, may differ significantly in format. However, the technical differences are minor. In addition, ANO-2 is a "digital" plant and, therefore, only "digital" STSs are applicable.

The NRC staff provides an assessment of the licensee's Optional Changes and Variations (as listed in Section 2.2 of its LAR) in the applicable subsection of Section 3.4 of this SE, pertaining to the related TS requirement.

3.3 Risk Assessment

The objective of the risk assessment in TR NPSD-1186 (Reference 8) was to show that the risk changes due to changes in TS end states are either negative (i.e., a net decrease in risk) or neutral (i.e., no risk change). The TR documents a risk-informed analysis of the proposed TS changes. Probabilistic risk analysis (PRA) results and insights are used, in combination with results of deterministic assessments, to identify and propose changes in end states for all CE plants. This is consistent with guidance provided in RG 1.174 and RG 1.177. The three-tiered approach documented in RG 1.177 was followed. The first tier includes the assessment of the risk impact of the proposed change for comparison to acceptance guidelines consistent with the Commission's Safety Goal Policy Statement (RG 1.174). In addition, the first tier aims at ensuring that there are no time intervals associated with the implementation of the proposed TS end state changes during which there is an increase in the probability of core damage or large early release with respect to the current end states. The second tier addresses the need to preclude potentially high-risk configurations which could result if equipment is taken out of service during implementation of the proposed TS change. The third tier addresses the application of 10 CFR 50.65(a)(4) for identifying risk-significant configurations resulting from maintenance or other operational activities and taking appropriate compensatory measures to avoid such configurations.

The scope of the topical report and the associated NRC staff SE dated July 17, 2001 (Reference 20), were limited to identifying changes in end state conditions that excluded continued power operation as an acceptable end state, regardless of the risk. The Combustion Engineering Owners Group's (CEOG's) risk assessment approach was found by the NRC to be comprehensive and acceptable. In addition, the analyses show that the criteria of the three-tiered approach for allowing TS changes are met as explained below:

- Risk Impact of the Proposed Change (Tier 1): The risk changes associated with the proposed TS changes, in terms of mean yearly increases in core damage frequency (CDF) and large early release frequency (LERF), are risk neutral or risk beneficial. In addition, there are no time intervals associated with the implementation of the proposed TS end state changes during which there is an increase in the probability of core damage or large early release with respect to the current end states.

- Avoidance of Risk-Significant Configurations (Tier 2): The need for some restrictions and enhanced guidance was determined by the specific TS assessments, documented in WCAP-16364-NP, Revision 2, "Implementation Guidance for Risk Informed Modification to Selected Required Action End States at Combustion Engineering NSSS Plants (TSTF-422)," dated May 2010 (Reference 19). These restrictions and guidance are intended to (1) preclude preventive maintenance and operational activities on risk-significant equipment combinations, and (2) identify actions to exit expeditiously a risk-significant configuration should it occur. The licensees are expected to commit to following the implementation guidance in WCAP-16364-NP, Revision 2, and in its LAR, Attachment 2, the licensee provided a commitment to follow the guidance in WCAP-16364-NP. Based on the information provided by the licensee and the licensee's commitment to follow WCAP-16364-NP, the NRC staff concludes that the proposed restrictions and guidance are adequate for preventing risk-significant plant configurations. Because the NRC staff has relied upon this commitment in a conclusion of its SE, the commitment has been elevated to an obligation, and upon issuance of this amendment, is required to be incorporated into the ANO-2 SAR in the next update pursuant to 10 CFR 50.71(e). Please see Section 3.6 of this SE for more information on regulatory commitments.

- Configuration Risk Management (Tier 3): There are programs in place to comply with 10 CFR 50.65(a)(4) to assess and manage the risk from proposed maintenance activities. These programs can support licensee decision-making regarding the appropriate actions to control risk whenever a risk-informed TS is entered.

3.4 Addition of a NOTE Regarding Non-Applicability of LCO 3.0.4.a

LCO 3.0.4 states, in part, that:

> 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.

Changing the end states allows continued operation with the LCO not met, by removing the TS requirement to exit the LCO mode(s) of applicability. In this case, the requirements of LCO 3.0.4.a would apply unless otherwise stated. LCO 3.0.4.a allows entry into a mode or other specified condition in the Applicability with the LCO not met 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. Compliance with Required Actions that permit continued operation of the unit for an unlimited period of time in a mode or other specified condition provides an acceptable level of safety for continued operation. This is without regard to the status of the unit before or after the mode change. Therefore, in such cases, entry into a mode or other specified condition in the Applicability may be made in accordance with the provisions of the Required Actions.

Thus, implementing modified end states requires adding a Note to the affected Actions to prevent using the allowance of LCO 3.0.4.a when entering Mode 4 from Mode 5. This is done to avoid unit operation in a condition that should be prohibited by TS since LCO 3.0.4.a allows entry into a mode or other specified condition in the Applicability 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. Applying the allowance of LCO 3.0.4.a to modified end states was not analyzed in TR CE NPSD-1186; therefore, the NRC staff concludes that an appropriate limitation is applied by the addition of a Note to the affected TS Required Actions, which states that "LCO 3.0.4.a is not applicable when entering HOT SHUTDOWN."

3.5 Assessment of Proposed Changes

A brief description of the systems and components covered by the scope of TSTF-422 (Reference 7) and the NRC staff's evaluation of the proposed changes to the TSs are provided in the following paragraphs.

Optional Change and Variation numbers 1-3 in Section 2.2 of the LAR state, in part, that:

1. The STSs use terms such as "Required Action" and "Completion Time" where the ANO-2 TSs use equivalent terms of "Action" and "Allowed Outage Time." While the ANO-2 terms are maintained in the TSs for consistency, the STS and equivalent ANO-2 TS terms may be used interchangeably throughout this letter. These differences do not invalidate the applicability of TSTF-422 and the model SE to ANO-2.

2. Changes may have required the movement of information from one TS page to another. This difference does not invalidate the applicability of TSTF-422 and the model SE to ANO-2.

3. In general, the ANO-2 TSs use the Mode noun names (i.e., "Hot Shutdown" in lieu of "Mode 4"). The use of noun names does not invalidate the applicability of TSTF-422 and the model SE to ANO-2.

The NRC staff concludes that the above explanation/clarifications are administrative changes and variations, which do not affect the technical requirements and are, therefore, acceptable.

3.5.1 STS 3.5.4 - Refueling Water Storage Tank (RWST)

Optional Change and Variation number 8 in Section 2.2 of the LAR states,

> The ANO-2 TSs do not contain a separate Action for not meeting Refueling Water Tank (RWT) boron concentration and/or temperature limits. Adopting these Actions is beyond the scope of TSTF-422. Because the TSTF-422 changes are related only to these Actions, no TSTF-422 related changes are adopted for ANO-2 TS 3.5.4, "Refueling Water Tank.

The NRC staff's evaluation of a Mode 4 end-state for the systems discussed in this SE does not rely on an RWST system as part of the basis for acceptability. Therefore, not having an RWST system has no effect on the technical conclusions of this SE and is, therefore, acceptable.

3.5.2 TS LCO 3.3.2.1 – Engineered Safety Feature (ESF) Actuation System (ESFAS) Instrumentation

The ESFAS provides an automatic actuation of the ESFs which are required for accident mitigation. A set of two manual trip circuits is also provided, which uses the actuation logic and initiation logic circuits to perform the trip function.

LCO: Six channels of ESFAS matrix logic, four channels of ESFAS initiation logic, two channels of actuation logic and two channels of manual trip shall be operable for the safety injection (SI) actuation signal (SIAS), containment isolation actuation signal (CIAS), containment cooling actuation signal (CCAS), recirculation actuation signal (RAS), containment spray actuation signal (CSAS), main steam isolation signal (MSIS), and emergency feedwater actuation system EFAS-1 and EFAS-2. The LCO is applicable in Modes 1, 2, and 3 for all functions for all components and in Mode 4 for initiation logic, actuation logic, and manual trip for SIAS, CIAS, CCAS, and RAS.

Condition Requiring Entry into End State: The following ACTIONS, as specified in TS Table 3.3.3, are entered:

a. With an ESFAS instrumentation channel trip setpoint less conservative than the value shown in the Allowable Values column of Table 3.3-4, declare the channel inoperable and apply the applicable ACTION requirement of Table 3.3-3 until the channel is restored to OPERABLE status with the trip setpoint adjusted consistent with the Trip Setpoint value.

b. With an ESFAS instrumentation channel inoperable, take the ACTION shown in Table 3.3-3.

Regarding adoption of TSTF-422 related changes, the licensee proposes changes to the following specific Table 3.3-3 ACTIONS, which currently state:

> ACTION 9 - With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and exit the MODE(s) of Applicability within the following 30 hours.
>
> ACTION 12 - With the number of OPERABLE channels one less than the Minimum Channels OPERABLE, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 30 hours.
>
> ACTION 13 - With the number of OPERABLE channels one less than the Total Number of Channels, restore the inoperable channel to OPERABLE status within 48 hours or be in at least HOT STANDBY within the next 6 hours and exit the

MODE(s) of Applicability within the following 30 hours; however, one channel may be bypassed for up to 1 hour for surveillance testing provided the other channel is OPERABLE.

Proposed Modification for End State Required Actions: For ACTIONS 9, 12, and 13, modify the Mode 5 (Cold Shutdown) end state Required Action to allow component repair in Mode 4 (Hot Shutdown) of ESFAS instrumentation. Entry into Mode 4 is proposed within the following 6 hours of exiting Mode 3 (Hot Standby).

Assessment: The ANO-2 TS have not been converted to the STS of NUREG-1432, "Standard Technical Specifications – Combustion Engineering Plants" (on which TSTF-422 markups are based). The approved TSTF-422 markups require end state (Mode 4) entry within 12 hours of the LCO not being met. However, the licensee's proposed CT of 6 hours for entry into Mode 4 is consistent with the approved TSTF change since (a) the time limits of the ACTION requirements are applicable from the point in time there was a failure to meet an LCO, (b) the licensee's required action to be in at least HOT STANDBY (Mode 3) within the next 6 hours and proposed CT of the ACTION requiring to be in HOT SHUTDOWN (Mode 4) within the following 6 hours is additive to 12 hours which is equivalent to the approved TSTF-422's CT of 12 hours for the Mode 4 end state entry. Therefore, the NRC staff concludes that this differentiation between the licensee's proposed change and the approved TSTF-422 markup is acceptable.

In an RAI dated November 22, 2013 (Reference 21), the NRC staff requested that the licensee review the model SE for TSTF-422, Revision 2 (Reference 16), and determine that ANO-2 structures, systems, and components (SSCs) nomenclature is equivalent to those addressed in the NRC staff's SE, or discuss the differences, if any. The licensee's supplemental letter dated December 12, 2013 (Reference 2), provided a comparison of ANO-2's SSCs in relation to those evaluated in the NRC staff's model SE. Item 5 in the licensee's supplement provided the following explanation specific to ACTIONS 9, 12, and 13 stated above:

> Section 3.2.2 of the model SE discusses changes associated with Engineered Safeguards Features Actuation System (ESFAS) logic and manual trip parameters. ANO-2 design is as described in the model SE; however, the modes of applicability are more restrictive for ANO-2 in some instances, due to the older vintage TSs. The ANO-2 TSs have not been converted to the standard TSs (STS) of NUREG-1432, "Standard Technical Specifications – Combustion Engineering Plants," on which TSTF-422 markups are based. The STS does not require operability of the Main Steam Isolation Signal (MSIS) or Containment Spray Actuation Signal (CSAS) in Mode 4. The model SE recognizes the latter, noting that the Mode 4 end state may be applicable to utilities where CSAS is required to be operable in Mode 4. The basis established in the model SE for applying a Mode 4 end state to the Containment Cooling Actuation Signal (CCAS) equally applies to the CSAS function. Lower stored energy in the Reactor Coolant System (RCS) and less core heat generation result in minimal containment pressure response following a loss of coolant accident (LOCA) or main steam line break (MSLB), the magnitude of which would be less than the current design containment strength. Ample instrumentation is also available to the Operator to diagnose the onset of the event and to take appropriate mitigating actions (actuation of the containment fan coolers and/or sprays) prior

to a potential containment challenge. Note also that the ANO-2 Containment Spray system is not required to be operable in Mode 4 (Reference ANO-2 TS 3.6.2.1).

Likewise, the MSIS function is designed to limit the containment pressure increase following a MSLB. Therefore, the basis provided above with regard to containment pressure is applicable to the MSIS function. The MSIS function may also limit the extent of RCS cooldown following a MSLB. Such an event would require entry to Mode 5 in order to maintain the affected [steam generator] SG depressurized (effectively eliminating the RCS cooldown). Boron concentrations are elevated in Mode 4 to maintain the TS required shutdown margins and all control rods are generally inserted (except the possibility of shutdown banks being withdrawn for added protection), which ensure reactivity effects of the RCS cooldown are minimal.

Finally, the STS does not require MSIS or CSAS operability in Mode 4 for these same reasons. The STS Bases state:

> *In MODES 4, 5, and 6, automatic actuation of these Functions is not required because adequate time is available to evaluate plant conditions and respond by manually operating the ESF components if required. ESFAS Manual Trip capability is required in MODE 4 for SIAS, CIAS, CCAS, and RAS even though automatic actuation is not required. Because of the large number of components actuated by these Functions, ESFAS actuation is simplified by the use of the Manual Trip push buttons. CSAS, MSIS, and EFAS have relatively few components, which can be actuated individually if required in MODE 4, and the systems may be disabled or reconfigured, making system level Manual Trip impossible and unnecessary.*

Based on the above, application of the Mode 4 end state to the MSIS and CSAS functions is consistent with the STS and the basis provided in the model SE for the remaining ESFAS functions.

Finally, Section 3.2.2 of the model SE does not include reference to the diesel generator loss of voltage start functions. The STS contains these requirements in a separate specification (3.3.7). The equivalent Loss of Power function for ANO-2 is contained in the same TS Table 3.3-6 as the other ESFAS functions. Therefore, ANO-2 TS Table 3.3-6, Action 9, applies to the Loss of Power function as it does for the other ESFAS functions. In support of adopting the Mode 4 end state for those ESFAS functions described in the model SE, Action 9 has been modified accordingly. However, this has no impact on the ANO-2 Loss of Power function since this function is only required in Modes 1, 2, and 3. The current Action 9 wording would permit 30 hours to exit the mode of applicability (i.e., enter Mode 4) upon entry into Mode 3. The revised Action 9 requires entry into Mode 4 within 6 hours following entry into Mode 3. The Action 9 changes supporting adoption of TSTF-422 continue to require exiting the mode of applicability for the

> Loss of Power function by requiring entry into Mode 4. Because the proposed change is more restrictive than that currently associated with the Loss of Power function, the change is acceptable.

The primary objective of the ESFAS logic and manual trip in Mode 4 is to provide an SIAS to the operable high pressure safety injection (HPSI) train and CIAS to ensure containment isolation. For TS 3.5.3, "ECCS Subsystems - T_{avg} < 300°F" to be met, the manual trip and actuation logic associated with that train of HPSI must be available in Mode 4. No other Mode 4 restrictions are required. By including the actuation logic in Mode 4, the effort in establishing HPSI following a LOCA or other inventory loss event is minimized. Similarly, by requiring one CIAS manual trip and actuation relay group to be operable, the plant operating staff does not have to operate every containment penetration manually following an event that may lead to radiation releases to the containment.

At ANO-2, the CCAS is used to automatically actuate the containment heat removal systems (containment recirculation fan coolers) to prevent containment overpressurization during a range of accidents which release inventory to the containment, including large break LOCAs, small break LOCAs, or MSLBs, or feedwater line breaks inside containment. This signal is typically actuated by high containment pressure. Based on the lower stored energy in the RCS and lesser core heat generation, short-term containment pressure following a LOCA or MSLB would be less than the current design containment strength. Ample instrumentation is available to the operator to diagnose the onset of the event and to take appropriate mitigating actions (actuation of the containment fan coolers and/or sprays) prior to a potential containment threat.

Following a LOCA, the RAS is used to automatically perform the switchover from the SI mode of heat removal to the sump recirculation mode of heat removal. RAS times in Mode 4 are expected to be longer than those associated with Mode 1 and available instrumentation is sufficient to alert the operator to the need for switchover.

The TSTF-422, Revision 2, model SE states that since the SIAS and CIAS signals perform numerous actions, manual trip and actuation for these signals should be retained in Mode 4. In particular, the operability of a single train of HPSI is required in Mode 4. Therefore, the associated actuation circuit and manual trip circuit for SIAS should be maintained available so that automatic lineup of HPSI can be established following a LOCA. Both isolation valves in the appropriate containment penetrations are required to be operable during Mode 4. However, the large number of actions required to isolate these penetrations, given an event, indicates that an extended unavailability of CIAS is not desired.

Section 7.3.2.2.2 of the ANO-2 SAR, "ESFAS Equipment Design Criteria," provides the following details on the design of the ESFAS regarding single failure:

> The ESFAS is designed so that any single failure within the system shall not prevent proper protective action at the system level. No single failure will defeat more than one of the four protective channels associated with any one trip function. Section 7.3.1.1.2.4 describes a power source failure that impacts more than a single protective channel.

The following is an evaluation of the effects of specific single faults in the analog portion of the system:

A. A loss of signal in a measurement channel initiates channel trip action for the low pressurizer pressure, low steam generator water level and low steam generator pressure trips;

B. Shorting of the signal leads to each other has the same effect as a loss of signal. Shorting a lead to a voltage has no effect since the signal circuit is ungrounded;

C. Single grounds of the signal circuit have no effect. Periodic checking of the system will provide assurance that the circuit remains ungrounded.

ANO-2 is not permitted to have two actuation or manual trip paths inoperable at the same time. With one actuation or manual trip path always available, actuation will occur. With one trip path inoperable, the facility is required to transition to Mode 4, since it would no longer meet single failure criteria. On the basis of the evaluation above, and the information provided by the licensee, the NRC staff concludes that ANO2's ESF function is similar to that stated in the model SE for TSTF-422, Revision 2, and is, therefore, applicable under the TSTF-422, Revision 2 changes.

The NRC staff concludes, from a comparison of plant conditions, event response, and risk characteristics, including the discussions of Sections 3 and 4 of WCAP-16364-NP, Revision 2 (Reference 19), that there is no net benefit from requiring a Mode 5 end state as opposed to a Mode 4 end state.

3.5.3 STS 3.3.8 - Containment Purge Isolation Signal (CPIS)

In Optional Change and Variation number 5 in Section 2.2 of the LAR, the licensee stated that ANO-2 does not have a Containment Purge Isolation Signal (CPIS) specification (STS 3.3.8), and that containment purge valves are required to be closed with key removed from the Control Room handswitches in Modes 1, 2, 3, and 4 in accordance with ANO-2 TS 3.6.1.6, "Containment Ventilation System." Therefore, no TSTF-422 changes related to CPIS are incorporated into the ANO-2 TSs.

The NRC staff's evaluation of a Mode 4 end state for the systems discussed in this SE does not rely on a CPIS system as part of the basis for acceptability. Therefore, not having a CPIS system has no effect on the technical conclusions of this SE, and is, therefore, acceptable.

3.5.4 TS LCO 3.3.3.1 – MONITORING INSTRUMENTATION - RADIATION MONITORING INSTRUMENTATION

The OPERABILITY of the radiation monitoring channels ensures that (1) the radiation levels are continually measured in the areas served by the individual channels and (2) the alarm or automatic action is initiated when the radiation level trip setpoint is exceeded. The monitoring channels consists of manual trip, actuation logic, and radiation monitors for iodine/particulates and gases.

In Optional Change and Variation number 6 in Section 2.2 of the LAR, the licensee stated that the ANO-2 TSs do not contain a separate specification for the Control Room Isolation Signal (CRIS) function (STS 3.3.9). The ANO-2 Control Room is isolated upon receipt of high radiation signal from associated radiation monitors, which are included in ANO-2 TS 3.3.3.1, "Radiation Monitoring Instrumentation," and that Actions 17 and 20 of TS 3.3.3.1, associated with the corresponding ANO-2 TS Table 3.3-6, have been modified consistent with TSTF-422.

The NRC staff has reviewed the licensee's LAR, as supplemented, and concludes that the CRIS function is applicable under TSTF-422 and the model SE.

LCO: The radiation monitoring instrumentation channels shown in Table 3.3-6 shall be OPERABLE with their alarm/trip setpoints within the specified limits.

Condition Requiring Entry into End State: The following ACTIONS in TS Table 3.3-6 are relevant to the proposed changes:

> ACTION 17 – In MODE 1, 2, 3, or 4, with no channels OPERABLE, within 1 hour initiate and maintain operation of the control room emergency ventilation system (CREVS) in the recirculation mode of operation or be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN in the following 30 hours.
>
> ACTION 20 – In MODE 1, 2, 3, or 4 with the number of channels OPERABLE one less than required by the Minimum Channels OPERABLE requirement, within 7 days restore the inoperable channel to OPERABLE status or initiate and maintain the CREVS in the recirculation mode of operation. Otherwise, be in HOT STANDBY within the next 6 hours and COLD SHUTDOWN in the following 30 hours.

Proposed Modification for End State Required Actions: For ACTIONS 17 and 20, modify the Mode 5 (Cold Shutdown) end state required action to allow component repair in Mode 4 (Hot Shutdown) of ESFAS instrumentation. Entry into Mode 4 is proposed within the following 6 hours of exiting Mode 3 (Hot Standby).

Assessment: In its RAI dated November 22, 2013 (Reference 21), the NRC staff requested that the licensee review the model SE for TSTF-422, Revision 2, and determine that its TS specified systems, functions, and nomenclature is equivalent to those addressed in the assessment, or discuss the differences, if any. In its RAI response dated December 12, 2013 (Reference 2), the licensee discussed the comparison of its control room ventilation system radiation detectors to the model SE (specifically, Section 3.2.4), and provided information regarding the applicability of the system and its function to the model SE.

The licensee stated that the ANO-2 Control Room contains two channels of safety-related radiation detection consistent with that described in the model SE, however, the STS only require one channel to be operable, while the ANO-2 TSs requires both channels to be operable. The licensee further stated that as a result, the model SE specifically addresses a condition where no channels are operable and the Control Room has not been placed in the emergency ventilation mode of operation (equivalent to ANO-2 TS Table 3.3-6, Action 17).

Because, for the STS, only one channel is required to be operable, the model SE does not describe a scenario that would be applicable to ANO-2, where one channel is inoperable for greater than 7 days and the Control Room has not been placed in the emergency ventilation mode of operation in Modes 1, 2, 3, and 4 (ANO-2 TS Table 3.3-6, Action 20), or a condition where one or more channels is inoperable and the Control Room has not been placed in the emergency ventilation mode of operation during the movement of irradiated fuel (ANO-2 TS Table 3.3-6, Action 21).

The NRC staff concludes, based on information provided by the licensee, that the ANO-2 Control room ventilation system and associated radiation monitoring channels (under TS Table 3.3-6, Actions 17, 20, and 21) are consistent with the intent of and applicable to the adoption of TSTF-422.

In its RAI response dated December 12, 2013, the licensee also discussed the interaction between the control room ventilation system and the SIAS. The model SE states that the Control Room ventilation system is actuated by a SIAS, and WCAP-16364-NP, Revision 2 (Reference 19), recommends maintaining operability of the SIAS function for Control Room ventilation while operating in a Mode 4 end state. However, the licensee stated that the ANO-2 Control Room ventilation system does not receive an SIAS, but that following a valid SIAS, the containment building would be isolated when containment building pressure increases to the CIAS setpoint. The licensee further stated that Control Room radiation levels are not expected to change solely due to a LOCA; that radiation detection is relied upon to determine when conditions warrant isolation of the Control Room; and that since accident scenarios evolve at a much slower rate in Mode 4, sufficient time is available for operators to manually place the Control Room in the emergency ventilation mode of operation (all actions performed inside the Control Room).

Regarding the SIAS function, the model SE basis for acceptability of a Mode 4 end state is due to the lower energy contained in the RCS and the fact that any transient requiring SIAS or control room isolation progress more slowly in Mode 4 than when at power. Based on the evaluation above and the information provided by the licensee, the NRC staff concludes that the licensee's control room ventilation system, which deviates from the STS/model SE, is consistent with the intent of the model SE and TSTF-422, and is, therefore, applicable to TSTF-422.

The NRC staff reviewed Mode 4 versus Mode 5 operation for the TS Actions, with regard to Sections 3 and 4 of the NRC staff's SE for TR CE NPSD-1186, Revision 0 (Reference 20), and concludes that there is essentially no benefit in moving to Mode 5 under many conditions, including the variations from the model SE described by the licensee. Further, there is a potential benefit to remaining in Mode 4 on steam generator (SG) heat removal because additional risk benefits are realized by averting the risks associated with the transition to the SDC system.

The CEOG recommended and provided implementation guidance (Reference 19) stating that it would be prudent to minimize the unavailability of SIAS and alternate shutdown panel and/or remote shutdown capabilities during Mode 4 operation with CRIS unavailable. As stated in Reference 20, the NRC staff agreed with the CEOG's recommendation. Additionally, in its LAR, as supplemented, the licensee committed to following the implementation guidance contained in

WCAP-16364-NP, Revision 2 (Reference 19). Please see SE Section 3.6 for more discussion on regulatory commitments.

3.5.5 TS LCO 3.4.1.3 – Reactor Coolant System – Shutdown

An RCS loop consists of a hot leg, SG, crossover pipe between the SG and reactor coolant pump (RCP), the RCP, and a cold leg. Operationally, water carrying heat from the reactor flows from the reactor vessel into a hot leg, then either into a SG or an SDC system for heat removal, and then is returned to the reactor vessel via one or more cold legs. The flow rate must be sufficient to both cool the reactor core and ensure good boron mixing.

LCO: In MODES 4 and 5, at least two reactor coolant loops shall be operable. If the reactor coolant loops are not operable, the specification requires operability of two shutdown cooling loops.

Condition Requiring Entry into End State: ACTION a. of the LCO states, "With less than the above required coolant loops OPERABLE, immediately initiate corrective action to return the required coolant loops to OPERABLE status as soon as possible; be in COLD SHUTDOWN within 20 hours."

Proposed Modification for End State Required Actions: When RCS loops are unavailable with the inoperability of one train of SDC, but at least one SG heat removal path can be established, modify the TS to change the end state from Mode 5 to Mode 4 with RCS heat removal accomplished via the SGs.

Assessment: In its RAI dated November 22, 2013 (Reference 21), the NRC staff requested that the licensee review the model SE for TSTF-422, Revision 2, and determine that its TS specified systems, functions, and nomenclature is equivalent to those addressed in the assessment, or discuss the differences, if any. In its item 7 of its RAI response dated December 12, 2013 (Reference 2), the licensee discussed the applicability of the RCS loops during shutdown conditions to the TSTF-422 model SE, Section 3.2.7.

The licensee stated that the ANO-2 design is consistent with that described in the model SE, having four RCS cooling loops and two Shutdown Cooling (SDC) trains, two of which must be operable in Mode 4 (and Mode 5 for ANO-2). The licensee also stated that the ANO-2 TS 3.4.1.3 does not contain the STS recognition that cooldown to Mode 5 may be inappropriate when no SDC loop is operable, and that adoption of TSTF-422 would resolve this deficiency by permitting continued operation in Mode 4 while expediting action to establish at least one SG available for natural circulation cooling, regardless of what combination of cooling loops are inoperable. Additionally, if operating in Mode 5, the adoption of the TSTF-422 Note associated with TS LCO 3.0.4.a will prevent entry into Mode 4 when the required numbers of cooling loops are not operable.

TS LCO 3.4.1.3 requires that two loops consisting of any combination of RCS cooling loops or SDC trains shall be operable and at least one loop or train shall be in operation to provide forced flow in the RCS for decay heat removal and to mix boron. STS 3.4.1.3 addresses the condition when the two SDC loops are inoperable. In that condition, the NRC staff recognizes that cooldown to Mode 5 SDC operation may not be possible and that continued Mode 4 operation should be allowed until the condition can be exited. ANO-2 TS LCO 3.4.1.3.b and LCO 3.4.1.3, Required Action a. are concerned with the unavailability of forced circulation in two RCS loops and the inoperability of one train of SDC. Upon failure to satisfy the LCO, the current ANO-2 TS drives the plant to Mode 5.

The NRC staff concludes that the requested TS change reflects the risk of Mode 5 operation with one SDC loop train inoperable and two RCS loops not in operation. The adoption of the TSTF-422 change will allow heat removal to be achieved in Mode 4 using either SDC or, if available, the SGs with RCS/core heat removal driven by natural convection flows. Reactivity concerns are addressed by requiring natural circulation prior to RCP restart. Furthermore, if unavailability of RCS loops is due to single SDC train unavailability, staying in a state with minimal reliance on SDC is preferred (Mode 4) due to the diversity in RCS heat removal modes during Mode 4 operation.

3.5.6 TS LCO 3.6.1.3 – Containment Air Locks

Containment air locks provide a controlled personnel passage between outside and inside the containment building with an inner and outer doors/door-seals with a small compartment between the inner and outer doors. When operable, only one door can be opened at a time, thus providing a continuous containment building pressure boundary. The two doors provide redundant closures.

Each containment air lock forms part of the containment pressure boundary. As part of the containment, the air lock safety function is related to control of the containment leakage rate resulting from a design-basis accident. Thus, each air lock's structural integrity and leak tightness are essential to the successful mitigation of such an event.

LCO: Each containment air lock shall be OPERABLE in Modes 1, 2, 3, and 4.

Condition Requiring Entry into End State: Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours, when:

1. With one containment air lock door inoperable in one or more containment air locks, (ACTION a.) or,

2. With the containment air lock interlock inoperable in one or more containment air locks, (ACTION b.) or,

3. With one or more air locks inoperable for reasons other than those addressed in ACTION a. or b. (Action c.).

In Section 2.2 of the LAR, the licensee provided Optional Change and Variation number 9, which states, in part, that "For formatting purposes only, the shutdown statements (currently repeated three times) in ANO-2 TS 3.6.1.[3], "Containment Air Locks" (STS 3.6.2), [are] removed from each individual Action and inserted as a "cover all" at the end of all Actions," as part of the revised TS submitted for this LAR.

The NRC staff concludes that the proposed variation is an administrative in nature, and does not change the technical requirements. The proposed TS format change is, therefore, acceptable.

Proposed Modification for End State Required Actions: HOT SHUTDOWN (Mode 4) entry is proposed within the following 6 hours of expiration of the HOT STANDBY (Mode 3) Completion Time of 6 hours.

Assessment: The ANO-2 TS LCO 3.6.1.3 requirements apply to Modes 1, 2, 3, and 4. Operability of the containment air locks is defined to ensure that leakage rates (defined in TS 3.6.1.2, "Containment Leakage") will not exceed permissible values (controlled by the Containment Leakage Rate Testing Program in ANO-2 TS 6.5.16). These TS are entered when containment leakage is within limits, but some portion of the containment isolation function is impaired. The issue of concern for TS 3.6.1.3 is the appropriate action/end state for extended repair of an inoperable air lock where air lock doors are not functional. Changes to the TS are only requested for conditions when containment leakage is not expected to exceed that allowed in TS 3.6.1.2. For example, this means that the containment air locks must still be functional under expected conditions during Mode 4 operation.

The NRC staff addressed Mode 4 versus Mode 5 operation in Sections 3 and 4 of the SE for TR CE NPSD-1186, Revision 0 (Reference 20), and concludes that there is essentially no benefit in moving to Mode 5 under many conditions, including this condition. Further, there is a potential benefit to remaining in Mode 4 on SG heat removal because additional risk benefits are realized by averting the risks associated with the transition to the SDC system.

3.5.7 TS LCO 3.6.1.4 – Internal Pressure and Air Temperature

LCO: The combination of containment internal pressure and average air temperature shall be maintained within the region of acceptable operation shown on Figure 3.6-1 during Modes 1, 2, 3, and 4.

Condition Requiring Entry into End State: A Mode 5 (COLD SHUTDOWN) end state transition is required to be initiated when the combination of containment internal pressure and average air temperature is outside the region of acceptable operation shown on Figure 3.6-1, and the condition is not corrected within one hour.

Proposed Modification for End State Required Actions: Modify the TS ACTION to accommodate a Mode 4 (HOT SHUTDOWN) end state when the required actions are not completed in the specified time. Mode 4 entry is proposed at 6 hours.

Assessment: As noted in Section 2.2 of the LAR, Optional Change and Variation number 10, and in item 10 in the licensee's RAI response dated December 12, 2013 (Reference 2), the ANO-2 TSs differ from the STS in that the TSs for containment pressure and temperature are combined into one TS for ANO-2, whereas they are two separate TSs for the STS. The NRC staff concludes that this formatting difference is still consistent with the model SE for TSTF-422, Revision 2.

The upper limit on containment pressure in this LCO results from containment designed to respond to Mode 1 design-basis accidents while remaining well within the structural material elastic response capabilities. This effectively maintains the containment design pressure about a factor of two or more below the minimum containment failure pressure. Consequently, small containment pressure challenges at the design-basis pressure have a negligible potential of threatening containment integrity.

The vacuum lower limit on containment pressure is typically set in the plant design basis and ensures the ability of the containment to withstand an inadvertent actuation of the containment spray (CS) system. The model SE states that the lower limit is of particular concern to plants with steel shell containment designs. Plants with steel containment control the impact of inadvertent CS actuation via the use of vacuum breakers. According to Section 3.8 of the ANO-2 SAR, the containment is constructed of reinforced concrete which is pre-stressed by post-tensioned tendons in the cylinder and the dome. The ANO-2 containment design does not utilize vacuum breakers. The model SE, as well as WCAP-16364, states that all plants should secure one CS pump when entering this action statement for violation of low containment pressure limit for a period projected to exceed 1 day. As stated previously, the licensee has provided a regulatory commitment in its LAR, as supplemented, to follow the guidance in WCAP-16364 upon approval and implementation of the amendment. Please see Section 3.6 of this SE for more information on regulatory commitments.

The NRC staff has addressed Mode 4 versus Mode 5 operation in Sections 3 and 4 of the NRC SE for TR CE NPSD-1186, Revision 0 (Reference 20), and concludes that there is essentially no benefit in moving to Mode 5 under many conditions, including this condition. Further, there is a potential benefit to remaining in Mode 4 on SG heat removal because additional risk benefits are realized by averting the risks associated with the transition to the SDC system.

3.5.8 TS LCO 3.6.2.1 – Containment Spray System

The containment building at ANO-2 is provided with CS and containment cooling trains to control containment conditions following accidents which cause containment pressure or temperature transients (ANO-2 has two containment spray and two containment cooling trains, each containment cooling train containing two cooling units, same as for the model SE and STS). In its RAI response dated December 12, 2013 (Reference 2), the licensee stated that while the STS has a single TS for CS and containment cooling trains, "the two systems have separate specifications at ANO-2 (TSs 3.6.2.1 and 3.6.2.3), but the operability requirements and required actions are consistent with that of the STS."

The NRC staff concludes that the ANO-2 LCOs for CS and containment cooling trains differ only in format from the STS, and that there is no difference in the operability/technical requirements. The NRC staff concludes that this formatting difference does not invalidate the applicability of TSTF-422 to this LCO.

LCO: Two independent containment spray systems shall be OPERABLE with each spray system capable of taking suction from the RWT on a Containment Spray Actuation Signal (CSAS) and automatically transferring suction to the containment sump on a Recirculation Actuation Signal (RAS). Each spray system flow path from the containment sump shall be via an OPERABLE shutdown cooling heat exchanger.

Condition Requiring Entry into End State: LCO 3.6.2.1 ACTION requires with one containment spray system inoperable, restore the inoperable spray system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Proposed Modification for End State Required Actions: Modify ACTION statement to accommodate a Mode 4 end state.

In Section 2.2 of its LAR, the licensee provides Optional Change and Variation number 11, which states that the ANO-2 containment spray TS Applicability is Modes 1, 2, and 3 (i.e., Hot Shutdown is not a Mode of Applicability). The licensee stated that as a result, the TSTF-422 Note (as discussed in Section 3.4 of this SE) is not adopted for this TS.

The NRC staff concludes that the exclusion of the TSTF-422 Note (as discussed in Section 3.4 of this SE) in the LCO Action statement is acceptable since the ANO-2 TS already allows the licensee to enter in Mode 4 while one of the containment spray systems is inoperable.

The licensee further states that as part of the TS revisions for this LAR, it desires to remove the 7-day AOT for the Containment Spray Pumps as specified in the TS 3.6.2.1 Action Note 1. As stated in current Note 1, it only applied to ANO-2 operating cycles 19 and 20, and ANO-2 is currently in operating cycle 23. The licensee requested removal of this Note 1 in order to eliminate a possible human performance issue.

The NRC staff concludes that the deletion of Action Note 1 in TS LCO 3.6.2.1 is administrative in nature, as the applicable operating cycles are completed, and is, therefore, acceptable.

Assessment: The CS system and the containment cooling system (CCS) at ANO-2 provide post-accident cooling and mixing of the containment atmosphere; however, the CCS is not redundant to the CS system. Per the ANO-2 TS Bases, the CS system also provides a mechanism for removing iodine from the containment atmosphere and, therefore, the time requirements for restoring an inoperable CS system to OPERABLE status have been maintained consistent with those assigned to other inoperable ESF equipment.

The design basis of the CS system and CCS varies among the CEOG units. ANO-2 credits the CS system and CCS for containment pressure and temperature control and one of the CS systems for radioiodine removal, as discussed above. One train of CS is sufficient to effect radioiodine control and one train of CS and one train of CCS are sufficient to affect containment pressure and temperature control.

Design and operational limits (and consequently the TSs) are established based on Mode 1 analyses. Traditionally, these analyses and limits are applied to Modes 2, 3, and 4. Mode 1 analyses bound the other modes and confirm the adequacy of the containment cooling system to control containment pressure and temperature following limiting containment pipe breaks occurring at any mode. However, the resulting TS requirements generally become increasingly conservative as the lower temperature shutdown modes are traversed.

Inability to complete the repair of a single train of cooling equipment in the allotted AOT/CT presently requires transition to Mode 5. This end state transition was based on the expectation of low Mode 5 risks when compared to alternate operating states. As discussed in Sections 3 and 4 of the NRC's SE for TR CE NPSD-1186, Revision 0 (Reference 20), Mode 4 is a robust operating mode when compared to Mode 5.

Furthermore, when considering a potential Mode 4 containment challenge, the low stored energy and decay heat of the RCS (after 36 or 84 hours) support the proposed use of the containment cooling and radionuclide removal capability. Based on representative plant analyses performed in support of PRA containment success criteria, containment protection may be established via use of a single fan cooler. Qualitatively, a similar conclusion could be drawn for one train of CS. Consequently, in Mode 4, one train of containment coolers or one train of CS should provide adequate heat removal capability. Furthermore, for iodine removal, accidents initiated in Mode 4 should be adequately mitigated via one operable CS pump. Therefore, the 84 hours requested to transition to Mode 4 with one CS train inoperable allows additional time to restore the inoperable CS train and is reasonable when considering the relatively low driving force for a release of radioactive material from the RCS.

3.5.9 TS LCO 3.6.2.3 – Containment Cooling System

Please see the introduction to Section 3.5.8 of this SE for background information on the containment cooling system (CCS).

LCO: LCO 3.6.2.3: Two independent containment cooling groups shall be OPERABLE with two operational cooling units in each group.

Condition Requiring Entry into End State: When ACTION a., "With one group of the above required containment cooling units inoperable and both containment spray systems OPERABLE;" ACTION b., "With two groups of the above required containment cooling units inoperable and both containment spray systems OPERABLE;" or ACTION c., "With one group of the above required containment cooling units inoperable and one containment spray system inoperable," not met, be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Proposed Modification for End State Required Actions: Modify ACTION statement to accommodate a Mode 4 end state to require that is in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

Assessment:

As discussed in Section 3.5.8 of this SE, ANO-2 has separate TSs for the CS system and CCS.

The STS Bases state, in part, that

> The Containment Cooling System and Containment Spray System are Engineered Safety Feature (ESF) systems. They are designed to ensure that the heat removal capability required during the post-accident period can be attained.

> The Containment Spray System and the Containment Cooling System provide redundant methods to limit and maintain post-accident conditions to less than the containment design values.

ANO-2's CCS is required to ensure long-term containment integrity. According to the licensee's TS Bases, the operability of the ANO-2 CCS "ensures that 1) the containment air temperature will be maintained within limits during normal operation, and 2) adequate heat removal capacity is available when operated in conjunction with the containment spray systems during post-LOCA conditions." Hence, the design basis functions of the ANO-2 CCS are similar to those of the STS system.

Design and operational limits (and consequently the TSs) are established based on Mode 1 analyses. Traditionally, these analyses and limits are applied to Modes 2, 3, and 4. Mode 1 analyses bound the other modes and confirm the adequacy of the CCS to control containment pressure and temperature following limiting containment pipe breaks occurring at any mode. However, the resulting TS requirements generally become increasingly conservative as the lower temperature shutdown modes are traversed.

ANO's CS system is redundant to the CCS in providing post-accident cooling and mixing of the containment atmosphere; however, the CCS is not redundant to the CS system because the sprays have the additional function of iodine removal. As a result, the allowable out-of-service time requirements for the CCS have been appropriately adjusted. Inability to complete the repair of a single train of cooling equipment in the allotted AOT/CT presently requires transition to Mode 5. This end state transition was based on the expectation of low Mode 5 risks when compared to alternate operating states. As discussed in Sections 3 and 4 of the NRC's SE for TR CE NPSD-1186, Revision 0 (Reference 20), Mode 4 is a robust operating mode when compared to Mode 5.

Furthermore, when considering a potential Mode 4 containment challenge, the low stored energy and decay heat of the RCS (after 36 or 84 hours) support the proposed use of the containment cooling and radionuclide removal capability. Based on representative plant analyses performed in support of PRA containment success criteria, containment protection may be established via use of a single fan cooler. Qualitatively, a similar conclusion could be drawn for one train of CS. Consequently, in Mode 4, one train of containment coolers or one train of CS should provide adequate heat removal capability. Furthermore, for plants that credit CS for iodine removal, accidents initiated in Mode 4 should be adequately mitigated via one operable CS pump. Therefore, the 84 hours requested to transition to Mode 4 with one CS train inoperable allows additional time to restore the inoperable CS train and is reasonable when considering the relatively low driving force for a release of radioactive material from the RCS. Further, the CEOG states that the requested 36 hours to transition to Mode 4 with both trains of containment cooling inoperable is reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. It also recognizes that at least one train of CS is available as a backup system. Therefore, the NRC staff concludes that the proposed change is acceptable.

3.5.10 TS LCO 3.6.3.1 – Containment Isolation Valves (CIVs)

For systems that communicate with the containment atmosphere, two redundant isolation valves are provided for each line that penetrates containment. For systems that do not communicate with the containment atmosphere, at least one isolation valve is provided for each line.

LCO: Each CIV shall be OPERABLE in Modes 1, 2, 3, and 4.

Condition Requiring Entry into End State: TS 3.6.3.1 ACTION states,

> With one or more isolation valve(s) inoperable, maintain at least one isolation valve OPERABLE in each affected penetration that is open and either:
>
> a. Restore the inoperable valve(s) to OPERABLE status within 4 hours, or
>
> b. Isolate each affected penetration within 4 hours by use of at least one deactivated automatic valve secured in the isolation position, or
>
> c. Isolate the affected penetration within 4 hours by use of at least one closed manual valve or blind flange; or
>
> d. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Proposed Modification for End State Required Actions: Modify ACTION d. to accommodate a Mode 4 (HOT SHUTDOWN) end state to be with in the following 6 hours. There is no proposed change to ACTIONS a., b., and c.

Assessment: Operability of the CIVs ensures that containment leakage rates will not exceed permissible values. This LCO is entered when containment leakage is within limits but some portion of the containment isolation function is impaired (e.g., one valve in a two valve path inoperable or containment purge valves have leakage in excess of TS limits). The issue of concern in this TS is the appropriate action/end state for extended repair of an inoperable CIV when one CIV in a single line is inoperable.

The NRC staff has addressed Mode 4 versus Mode 5 operation in Sections 3 and 4 of the NRC's SE for TR CE NPSD-1186, Revision 0 (Reference 20), and concludes that there is essentially no benefit in moving to Mode 5 under many conditions, including this condition. Further, there is a potential benefit to remaining in Mode 4 on SG heat removal because additional risk benefits are realized by averting the risks associated with the transition to the SDC system.

3.5.11 TS LCO 3.7.3.1 – Service Water System

The operability of the service water (SW) system ensures that sufficient cooling capacity is available for continued operation of equipment during normal and accident conditions.

LCO: At least two independent service water loops shall be OPERABLE in Modes 1, 2, 3, and 4.

Condition Requiring Entry into End State: With only one service water loop OPERABLE, restore at least two loops to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

Proposed Modification for End State Required Actions: Modify ACTION statement to accommodate a Mode 4 end state with entry into HOT SHUTDOWN (Mode 4) within the following 6 hours from the HOT STANDBY (Mode 3) Condition.

Assessment: In its RAI response dated December 12, 2013 (Reference 2), regarding the SW system, the licensee stated that the ANO-2 design is consistent with the model SE discussion and the STS, having two loops which support the SDC heat exchangers and emergency suction to the Emergency Feedwater pumps, among many other components. The licensee further stated that SW also cools Component Cooling Water (CCW), which in turn cools the RCP seals, but is not the makeup source to CCW.

Based on the information provided by the licensee, the NRC staff concludes that the TSTF-422 end states revisions are applicable to ANO-2, since the service water system is consistent with the model SE and STS.

The primary function of the SW system is to remove heat from the CCW system. In this manner the SW system also supports the SDC system. At least one SW train must be operable to remove decay heat loads following a design basis accident. SW is also used to provide heat removal during normal operating and shutdown conditions. Two 100-percent capacity trains of SW are provided, which provides adequate SW flow assuring the worst single failure.

SW is required to support SDC when the plant is in Mode 4 on SDC or in Mode 5. Therefore, in conditions in which the other SW loop is inoperable, the one operable SW loop must continue to function. Operation in Mode 4 with the SGs available provides a decay heat removal path that is not directly dependent on SW, although there are some long-term concerns such as RCP seal cooling. Overall, the proposed Mode 4 TS end state generally results in plant conditions where reliance on the SW system is least significant. Because of additional considerations for the interaction between the SW system and the CCW system, Section 2.4, Table 2, "Good Practice/Considerations for Remaining in Mode 4," of WCAP-16364 contains guidance regarding the implementation of TSTF-422 for the SW system. In its LAR, as supplemented, the licensee provided a regulatory commitment to follow the guidance of WCAP-16364 once this amendment has been approved and implemented. For more discussion on regulatory commitments, please see Section 3.6 of this SE. Therefore, the NRC staff concludes that the proposed change is acceptable.

3.5.12 TS LCO 3.7.6.1 – Control Room Emergency Ventilation and Air Conditioning System (CREACS)

The CREACS is a shared system which provides a protected environment from which operators can control the unit following an uncontrolled release of radioactivity. The CREACS consists of two independent filter and fan trains, two independent actuation channels and the Control Room isolation dampers. The CREACS is an emergency system. Upon receipt of a unit specific high radiation signal, the control room envelope is isolated, the associated unit's normal control room ventilation system is shutdown, and the associated unit's CREACS is started.

In Section 2.2 of its LAR, the licensee provided Optional Change and Variation number 16, which states that the ANO-2 TS 3.7.6.1, "Control Room Emergency Ventilation and Air Conditioning System," is a single TS for two STSs: Control Room Emergency Air Cleanup System (STS 3.7.11) and the Control Room Emergency Air Temperature Control System (STS 3.7.12).

The NRC staff has determined that this difference is administrative in nature, and that the single ANO-2 TS contains the requirements of both STSs. Therefore, the NRC staff concludes that ANO-2 TS 3.7.6.1 is applicable for TSTF-422 and the model SE.

LCO: Two independent control room emergency ventilation and air conditioning systems shall be operable in Modes 1, 2, 3, 4 or during movement of irradiated fuel assemblies or movement of new fuel assemblies over irradiated fuel assemblies.

Condition Requiring Entry into End State: Transition to Mode 5 operation is required when the plant is in the following ACTION statements,

ACTION a.: when one CREACS train is inoperable or

ACTION b.: when one control room emergency ventilation system (CREVS) inoperable for reasons other than Action d., or

ACTION c.: when one CREVS inoperable for reasons other than ACTION d. and one CREACS inoperable, and not returned to service within the TS Completion Time of 7 days, or

ACTION d.: with one or more CREVS inoperable due to an inoperable CRE boundary.

Proposed Modification for End State Required Actions: Modify TS ACTIONS a., b., c. and d., to accommodate a Mode 4 (HOT SHUTDOWN) end state when the required actions are not completed in the specified time. The revised ACTIONS should state, "...be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours."

Assessment: The CREACS provides a protected environment from which operators can control the plant following an uncontrolled release of radioactivity, chemicals, or toxic gas. The CREVS is required to ensure continued control room habitability and ensure that control room temperature will not exceed equipment operability requirements following isolation of the control room. The current TS requires operability of CREACS and CREVS from Mode 1 through 4 to support operator response to a design basis accident. The CREACS and CREVS are needed to protect the control room in a wide variety of circumstances. Plant operation in the presence of degraded CREACS and CREVS should be based on placing the plant in a state which poses the lowest plant risk.

Outage planning should ensure that the plant staff is aware of the system inoperability, that respiratory units and control room pressurization systems are available, that operational and leakage pathways are properly controlled, and that alternate shutdown panels and local shutdown stations are available. Because of the importance of maintaining habitable conditions in the control room, additional considerations for remaining in Mode 4 within any portion of the CREACS inoperable can be found in Section 2.4, Table 2, "Good Practice/Considerations for Remaining in Mode 4," of WCAP-16364. In its LAR, as supplemented, the licensee provided a regulatory commitment to follow the guidance of WCAP-16364 once this amendment has been approved and implemented. For more discussion on regulatory commitments, please see Section 3.6 of this SE.

The NRC staff has addressed Mode 4 versus Mode 5 operation in Sections 3 and 4 of the NRC's SE for TR CE NPSD-1186, Revision 0 (Reference 20), and concludes that there is essentially no benefit in moving to Mode 5 under many conditions, including this condition. Further, there is a potential benefit to remaining in Mode 4 on SG heat removal because additional risk benefits are realized by averting the risks associated with the transition to the SDC system.

3.5.13 STS 3.6.5 - Containment Air Temperature

As stated in Section 3.5.6 of this SE, ANO-2 TS LCO 3.6.1.4, "Containment Pressure and Containment Air Temperature," are separate specifications in the STS (STS 3.6.4 and 3.6.5). The NRC staff's evaluation for ANO-2's TS LCO 3.6.1.4 is provided in Section 3.5.7 of this SE.

3.5.14 STS 3.6.11 - Shield Building

The ANO-2 TS do not have a Shield Building LCO. The NRC staff's evaluation of a Mode 4 end state for the ANO-2's systems discussed in this SE does not rely on the Shield Building as part of the technical basis for acceptance. Therefore, not having this LCO does not affect any of the NRC staff's conclusions in this SE.

3.5.15 STS 3.7.7 – Component Cooling Water (CCW) System

ANO-2 does not have a Component Cooling Water (CCW) specification (STS 3.7.7). The NRC staff's evaluation of a Mode 4 end state for the systems discussed in this SE does not rely on a CCW system as part of the basis for acceptability. Therefore, not having this LCO does not affect any of the NRC staff's conclusions in this SE.

3.5.16 STS 3.7.9 - Ultimate Heat Sink (UHS)

The ANO-2 Ultimate Heat Sink (Emergency Cooling Pond) does not include cooling towers, as specified in STS 3.7.9. The NRC staff's evaluation of a Mode 4 end state for the systems discussed in this SE does not rely on the need for UHS cooling towers as part of the basis for acceptability. Therefore, not having this LCO has no effect on the technical conclusions of this SE, and is, therefore, acceptable.

3.5.17 STS 3.7.10 - Emergency Chilled Water (ECW) System

ANO-2 does not have an Emergency Chilled Water (ECW) specification (STS 3.7.10) or system. The NRC staff's evaluation of a Mode 4 end state for the systems discussed in this SE does not rely on an ECW system as part of the basis for acceptability. Therefore, not having this LCO has no effect on the technical conclusions of this SE, and is, therefore, acceptable.

3.5.18 STS 3.7.12 – Control Room Emergency Air Temperature Control System

Section 3.5.12 of this SE discusses the combined single TS at ANO-2 (TS 3.7.6.1), which incorporates both STS 3.7.11 and 3.7.12. The NRC staff's evaluation for the applicability and acceptance of TSTF-422 to ANO-2 TS LCO 3.7.6.1, "Control Room Emergency Ventilation System (CREVS) and the Control Room Emergency Air Conditioning System (CREACS)," is provided in Section 3.5.12 of this SE.

3.5.19 STS 3.7.13 - ECCS Pump Room Exhaust Air Cleanup System (PREACS) and ESF Pump Room Exhaust and Cleanup System

ANO-2 does not have TS requirements associated with an Emergency Core Cooling System Pump Room Exhaust Air Cleanup System (STS 3.7.13). The NRC staff's evaluation of a Mode 4 end state for the systems discussed in this SE does not rely on an ECCS Pump Room Exhaust Air Cleanup System (PREACS) or ESF Pump Room Exhaust and Cleanup System as part of the basis for acceptability. Therefore, not having this system has no effect on the technical conclusions of this SE, and is, therefore, acceptable.

3.5.20 STS 3.7.15 - Penetration Room Emergency Air Cleanup System

ANO-2 does not have TS requirements associated with a Penetration Room Exhaust Air Cleanup System (STS 3.7.15). The NRC staff's evaluation of a Mode 4 end state for the systems discussed in this SE does not rely on a Penetration Room Emergency Air Cleanup System as part of the basis for acceptability. Therefore, not having this system has no effect on the technical conclusions of this SE, and is, therefore, acceptable.

3.5.21 TS LCO 3.8.1.1 – AC Sources

The ANO-2 Class 1E electrical power distribution system alternating current (AC) sources consist of the offsite power sources (preferred power sources, normal and alternate(s)), and the onsite standby power sources (Train A and Train B emergency diesel generators (EDGs)).

The following provides a general discussion of the requirements of General Design Criterion (GDC) 17, "Electric power systems," of Appendix A to 10 CFR Part 50. Section 3.1 of the ANO-2 SAR, "Conformance with [Atomic Energy Commission] AEC General Design Criteria," discusses the licensee's compliance with and commitment to GDC 17.

As required by GDC 17 of 10 CFR Part 50, Appendix A, the design of the ANO-2 AC electrical power system provides independence and redundancy. The onsite Class 1E AC distribution system is divided into redundant load groups (trains) so that the loss of any one group does not prevent the minimum safety functions from being performed. Each train has connections to two preferred offsite power sources and a single diesel generator. Offsite power is supplied to the unit switchyard(s) from the transmission network by two transmission lines. (An offsite circuit consists of all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite Class 1E ESF bus or buses.) From the switchyard(s), two electrically and physically separated circuits provide AC power, through step down station auxiliary transformers, to the 4.16 kiloVolt (kV) ESF buses.

Certain loads required for accident mitigation are started in a predetermined sequence in order to prevent overloading the transformer supplying offsite power to the onsite Class 1E distribution system. Within 1 minute after the initiating signal is received, all automatic and permanently connected loads needed to recover the unit or maintain it in a safe condition are started via the load sequencer.

In the event of a loss of power, the ESF electrical loads are automatically connected to the EDGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a design-basis accident such as a LOCA.

LCO: As a minimum, the following A.C. electrical power sources shall be OPERABLE:

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system and

b. Two separate and independent diesel generators each with:

    1. A day fuel tank containing a minimum volume of 300 gallons of fuel,

    2. A separate fuel storage system, and

    3. A separate fuel transfer pump.

Condition Requiring Entry into End State: Plant operators must bring the plant to Mode 5 within 30 hours following the sustained inoperability of either or both required offsite circuits, either or both required EDGs, or one required offsite circuit and one required EDG.

Proposed Modification for End State Required Actions: Modify ACTIONS a.2, b.3, c.3, d.2, and e.2 (and their associated last paragraphs, referred to as "shutdown statements"), to specify a Mode 4 end state on SG heat removal with a 6 hour entry time. The revised ACTIONS should state, "...or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours."

Assessment: In Section 2.2 of the LAR, the licensee provided Optional Change and Variation numbers 19 and 20. Number 19 discussed a change to the TS LCO 3.8.1.1, where the licensee requested, for formatting purposes only, to remove the shutdown statements currently repeated several times in ANO-2 TS LCO 3.8.1.1, Actions "c", "d", and "e," and insert a single shutdown statement at the end of each Action. The NRC staff has reviewed the TS changes, and concludes that this change is administrative in nature, has no impact on LCO Actions, and is consistent with the STS; therefore, the change is acceptable. Regarding the licensee's change number 20, the NRC staff notes that the licensee's LAR dated January 28, 2013, to adopt TSTF-500, Revision 2 (Reference 22), was approved and issued by Amendment No. 297 to Facility Operating License NPF-6 for ANO-2 on December 4, 2014 (Reference 23). In its supplement to the LAR dated October 22, 2014 (Reference 5), the licensee provided revised TS pages to reflect the approved TSTF-500 changes. The changes to the TS regarding

Amendment No. 297 do not have an impact on the applicability of the TSTF-422 changes, and, therefore, the NRC staff concludes that this variation does not invalidate the applicability of the TSTF-422 changes.

Entry into any of the Actions for TS LCO 3.8.1.1 for the AC power sources implies that the AC power sources have been degraded and the single failure protection for ESF equipment may be ineffective. Consequently, as specified by TS LCO 3.8.1.1, at present the plant operators must bring the plant to Mode 5 when the required action is not completed by the specified time for the associated condition.

During Mode 4 with the SGs available, plant risk is dominated by a loss of offsite power initiating event. If a loss-of-offsite power were to occur during degraded AC power system conditions, the number of redundant and diverse means available for removing heat from the RCS may vary, depending upon the cause of the degradation. If the LCO entry resulted from inoperability of both onsite AC sources (i.e., EDGs) followed by a loss-of-offsite power, a station blackout event will occur. For this event, the SG inventory may be sufficient for several hours of RCS cooling without feedwater, and the turbine-driven auxiliary feedwater pump, which does not rely on the AC power sources to operate, should be available if needed. Further, there should be time to start any available alternate AC power supplies, such as a station blackout diesel generator. In its supplement dated December 12, 2013 (Reference 2), under item 14, the licensee stated that ANO has a non-safety related station blackout diesel capable of supplying one safety related AC power train on both ANO units simultaneously. If the RCS conditions are such that the SGs are not available for RCS heat removal during Mode 4, then only the SDC system is available for RCS heat removal for non-station blackout events.

Table 2 of WCAP-16364 (Reference 19), "Good Practice/Considerations for Remaining in Mode 4," provides the following guidance for a Mode 4 end state associated with STS 3.8.1 (ANO TS LCO 3.8.1.1): (1) switchyard activities, other than those necessary to restore power, should be prohibited while AC power sources are degraded, and (2) in order to properly utilize the turbine-driven auxiliary feedwater pumps, the SG pressure should be maintained above the minimum recommended pressure required to operate the turbine-driven auxiliary feedwater system. In its LAR, as supplemented, the licensee provided a regulatory commitment to follow the guidance of WCAP-16364 upon approval and implementation of this amendment. Please see Section 3.6 of this SE for more information on regulatory commitments.

The NRC staff addressed Mode 4 versus Mode 5 operation in Sections 3 and 4 of the NRC's SE for TR CE NPSD-1186, Revision 0 (Reference 20), and concluded there is essentially no benefit in moving to Mode 5 under many conditions. Further, there is a potential benefit to remaining in Mode 4 on SG heat removal because additional risk benefits are realized by averting the risks associated with the transition to the SDC system. In the case of a degraded AC power capability, the likelihood of losing SDC is increased, and the NRC staff concludes that the plant should be placed in a condition (generally, Mode 4 with SG cooling) that maximizes the likelihood of avoiding a further plant upset of loss of RCS cooling.

3.5.22 TS LCO 3.8.2.3 – DC Sources – Operating

The direct current (DC) electrical power system at ANO-2 provides:

1. Normal and emergency DC electrical power for the AC emergency power system, emergency auxiliaries, and control and switching during all modes of operation,

2. Motive and control power to selected safety related equipment, and

3. Power to preferred AC vital buses (via inverters).

The DC electrical power system at ANO-2 consists of two independent and redundant safety-related Class 1E DC electrical power subsystems. Each subsystem consists of one battery, one battery charger, and all the associated control equipment and interconnecting cabling. Each subsystem additionally contains a spare battery charger, which provides backup service in the event that a battery charger is out of service. The backup charger on each subsystem can be switched in by operator action to replace the normal battery charger. Each charger is capable of supplying the normal DC load while maintaining the battery in a charged condition. As described in the ANO-2 SAR, each Class 1 E battery is sized to provide the maximum simultaneous combination of steady state loads and peak loads for the periods of the emergency duty cycle provided in Chapter 8, "Electric Power," of the SAR.

During normal operation, the 125-Volts direct current (VDC) load is powered from the battery chargers with the batteries floating on the system. In case of loss of normal power to the battery charger (which is powered from the safety related 480-Volts alternating current (VAC) source), the DC load is automatically powered from the station batteries.

LCO: The Train A and Train B DC electrical power subsystems shall be OPERABLE.

Condition Requiring Entry into End State: The plant operators must bring the plant to Mode 5 within 30 hours following the sustained inoperability of one DC electrical power subsystem for a period of 2 hours.

Proposed Modification for End State Required Actions: Modify Condition B to Mode 4, on SG heat removal, end state with a 6 hour entry requirement. The revised ACTION should state, ".....be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours."

Assessment: DC power sources have sufficient capacity for the steady state operation of the connected loads during Modes 1, 2, 3, and 4, while at the same time maintaining the battery banks fully charged. Each battery charger has sufficient capacity to restore the battery to its fully charged state within a specified time period while supplying power to connected loads. The DC sources are required to be operable during Modes 1, 2, 3, and 4 and connected to the associated DC buses. Mode 5 is the current end state for not restoring an inoperable DC electrical subsystem to operable status within 2 hours.

If a DC electrical power subsystem is inoperable during Mode 4, plant risk is dominated by loss-of-offsite power events. Such an event with concurrent failure of the unaffected EDG can progress to a station blackout. These events challenge the capability of the ESF systems to remove heat from the RCS. Entry into Mode 4 as the end state when an inoperable DC electrical power subsystem cannot be restored to operability within 2 hours provides the plant staff with several resources. For station blackout cases with one DC power source continuing to operate, the turbine-driven auxiliary feedwater pump is available for RCS heat removal when steam pressure is adequate. If this pump becomes unavailable, such as if the other DC sources were lost and the turbine-driven auxiliary feedwater pump could not be satisfactorily operated locally, the lack of RCS heat removal initiates a boil-down of the SG inventory. Boil-off of SG inventory and a certain amount of RCS inventory must both occur in order to uncover the core. Under this condition, the plant operators have significant time to accomplish repair and/or recovery of offsite or onsite power. For non-station blackout cases, the remaining auxiliary feedwater train(s) (motor and/or turbine-driven) are available for RCS heat removal if steam pressure is adequate, as long as the remaining DC power source continues to operate. Whether or not DC power remains, Mode 4 operation with an inoperable DC power source provides the plant operators with diverse means of RCS heat removal and significant time to perform repairs and recovery before the core is uncovered.

The NRC staff has addressed Mode 4 versus Mode 5 operation in Sections 3 and 4 of the NRC's SE for TR CE NPSD-1186, Revision 0 (Reference 20), and concludes that there is essentially no benefit in moving to Mode 5 under many conditions, including those applicable here. Further, there is a potential benefit to remaining in Mode 4 on SG heat removal because additional risk benefits are realized by averting the risks associated with the transition to the SDC system. In its LAR, as supplemented, the licensee provided a regulatory commitment to follow the guidance of WCAP-16364 (Reference 19) upon approval and implementation of this amendment. Please see Section 3.6 of this SE for more information on regulatory commitments. WCAP-16364 is an implementation guide for TSTF-422, Revision 2, which contains compensatory actions and considerations for remaining in Mode 4.

3.5.23 <u>STS 3.8.7-Inverters – Operating</u>

ANO-2 does not have TS requirements associated with Inverters (STS 3.8.7). The NRC staff's evaluation of a Mode 4 end state for the systems discussed in this SE does not rely on the availability of the Inverter system as part of the basis for acceptability. Therefore, not having this system has no effect on the technical conclusions of this SE, and is, therefore, acceptable.

3.6 <u>Regulatory Commitments</u>

In its LAR dated March 26, 2013, the licensee provided regulatory commitments regarding implementation of TSTF-422, Revision 2. In its supplemental letter dated August 19, 2014 (Reference 4), the licensee provided a revised list of regulatory commitments regarding NUMARC 93-01 (Reference 13) and WCAP-16364-NP, Revision 2 guidance (Reference 19), as follows:

- Entergy will follow the guidance established in Section 11 of NUMARC 93-01, "Industry Guidance for Monitoring the Effectiveness of

Maintenance at Nuclear Power Plants," Nuclear Management and Resource Council, Revision 4A, April 2011.

- Entergy will follow the guidance established in WCAP-16364-NP, Revision 2, "Implementation Guidance for Risk Informed Modification to Selected Required Action End States at Combustion Engineering NSSS Plants (TSTF-422)," dated May 2010, with the exception that Section 11 of NUMARC 93-01, Revision 4A, will be utilized to meet 10 CFR 50.65(a)(4) requirements in lieu of NUMARC 93-01, Revision 3.

As discussed in Section 4.4.1 of the NRC's Office of Nuclear Reactor Regulation (NRR) Office Instruction LIC-101, Revision 4, "License Amendment Review Procedures" (Reference 24), since commitments made by a licensee in support of a license amendment are not legally binding, the NRC staff's SE should not rely on commitments as a basis for any part of the NRC staff's approval of a proposed amendment. However, the staff may rely on a commitment if it is escalated into an obligation (e.g., license condition) or subsequently incorporated into a mandated licensing basis document (e.g., SAR). As discussed in this SE, the NRC staff has relied, in part, on the above commitments as part of the NRC staff's acceptance of the proposed amendment. Consistent with the guidance in NRR Office Instruction LIC-101, these actions, originally proposed as regulatory commitments, have been elevated to amendment implementation requirements for incorporation into the ANO-2 SAR. As such, the NRC staff has added the following words as a condition of the amendment (found on the implementation requirements section of the amendment issuance authority page) to ensure that the SAR is revised as part of the amendment implementation:

> The license amendment is effective as of its date of issuance and shall be implemented within 90 days from the date of issuance. In addition, the licensee shall incorporate the two commitments listed in Section 3.6 of the safety evaluation associated with this amendment in the next periodic update of the Arkansas Nuclear One, Unit No. 2 Safety Analysis Report, in accordance with 10 CFR 50.71(e).

The NRC staff notes that, following incorporation of the commitments listed above into the ANO-2 SAR, future changes will be subject to the provisions of 10 CFR 50.59.

3.7 TS Bases Changes

In the LAR, as supplemented, the licensee identified changes to the TS Bases for the proposed amendment. In identifying changes to the TS Bases, the licensee is not requesting that the NRC approve these changes to the TS Bases. The identified changes to the TS Bases are controlled by the licensee under TS 6.5.14, "Technical Specifications (TS) Bases Control Program," which states, in part, that:

> Licensees may make changes to Bases without prior NRC approval provided the changes do not require either of the following:
>
> 1. A change in the TS incorporated in the license or

2. A change to the updated SAR or Bases that requires NRC approval pursuant to 10 CFR 50.59.

3.8 Summary

The NRC staff has reviewed Entergy's proposed adoption of TSTF-422, Revision 2, to modify certain of the ANO-2 TS requirements to permit an end state of hot shutdown Mode 4 with the implementation of TR NPSD-1186-A, and concludes that the proposed changes are consistent with the approved topical report, and are, therefore, acceptable.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the 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 involves no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on July 23, 2013 (78 FR 44172). 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.

7.0 REFERENCES

1. Browning, J. G., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "License Amendment Request, Adoption of Technical Specification Task Force (TSTF)-422, Revision 2, 'Change In Technical Specifications End States (CE NPSD-1186),'" March 26, 2013 (ADAMS Accession No. ML13085A283).

2. Browning, J. G., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information, Adoption of Technical Specification

Task Force (TSTF)-422, Revision 2, 'Change in Technical Specifications End States (CE NPSD-1186),'" December 12, 2013 (ADAMS Accession No. ML13347B235).

3. Browning, J. G., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "License Amendment Request Supplemental, Adoption of Technical Specification Task Force (TSTF)-422, Revision 2, 'Change in Technical Specifications End States (CE NPSD-1186),'" May 12, 2014 (ADAMS Accession No. ML14132A344).

4. Browning, J. G., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information, Adoption of Technical Specification Task Force (TSTF)-431, Revision 3 (ANO-1), and Adoption of TSTF-422, Revision 2 (ANO-2) Regarding Technical Specification End States," August 19, 2014 (ADAMS Accession No. ML14231A370).

5. Browning, J. G., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "License Amendment Request Supplemental, Adoption of Technical Specification Task Force (TSTF)-422, Revision 2, 'Change in Technical Specifications End States (CE NPSD-1186),'" October 22, 2014 (ADAMS Accession No. ML14295A333).

6. Browning, J. G., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "License Amendment Request Supplemental, Adoption of Technical Specification Task Force (TSTF)-422, Revision 2, 'Change in Technical Specifications End States (CE NPSD-1186),'" December 5, 2014 (ADAMS Accession No. ML14339A406).

7. Technical Specifications Task Force (TSTF) Change Traveler TSTF-422, Revision 2, "Change in Technical Specification States: CE-NSPD-1186, Risk Informed Technical Specification Task Force," December 22, 2009 (ADAMS Accession No. ML093570241).

8. Combustion Engineering Owners Group/Westinghouse Electric Company, LLC, Topical Report (TR) CE NPSD-1186-A, Revision 0, "Technical Justification for the Risk-Informed Modification to Selected Required Action End States for CEOG PWRs," October 2001 (ADAMS Accession No. ML110410539).

9. U.S. Nuclear Regulatory Commission, NUREG-1432, Revision 4, Volume 1, "Standard Technical Specifications, Combustion Engineering Plants," April 2012 (ADAMS Accession No. ML12102A165).

10. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decision Making on Plant Specific Changes to the Licensing Basis," July 1998 (ADAMS Accession No. ML003740133).

11. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.177, "An Approach for Pant Specific Risk-Informed Decision Making: Technical Specifications," August 1998 (ADAMS Accession No. ML003740176).

12. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.182, "Assessing and Managing Risk before Maintenance Activities at Nuclear Power Plants," May 2000 (ADAMS Accession No. ML003740117).

13. Nuclear Energy Institute, NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," July 2000 (ADAMS Accession No. ML131500684); Section 11, "Assessment of Risk Resulting from Performance of Maintenance Activities," February 22, 2000 (ADAMS Accession No. ML003704489).

14. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.160, Revision 3, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," May 2012 (ADAMS Accession No. ML113610098).

15. Nuclear Energy Institute, NUMARC 93-01, Revision 4A, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Section 11, "Assessment of Risk Resulting from Performance of Maintenance Activities," April 2011 (ADAMS Accession No. ML11116A198).

16. U.S. Nuclear Regulatory Commission, "Model Safety Evaluation for Plant-Specific Adoption of Technical Specifications Task Force Traveler TSTF-422, Revision 2, 'Change in Technical Specifications End States, (CE NPSD-1186),' for Combustion Engineering Pressurized Water Reactor Plants Using the Consolidated Line Item Improvement Process," March 22, 2011 (ADAMS Accession No. ML103270197).

17. Bamford, P. J., U.S. Nuclear Regulatory Commission, letter to Entergy Operations, Inc., Arkansas Nuclear One, Unit Nos. 1 and 2 - Request for Additional Information Regarding License Amendment Requests to Adopt Changes to Technical Specification End States (TAC Nos. MF1182 and MF1199)," August 4, 2014 (ADAMS Accession No. ML14209A627).

18. Yates, B., Messina, J., Millar, D., Gambrell, R., Technical Specifications Task Force, "TSTF-IG-07-01, 'Implementation Guidance for TSTF-431, Revision 1, Change in Technical Specifications End States (BAW-2441)," April 10, 2007 (ADAMS Accession No. ML071000281).

19. WCAP-16364-NP, Revision 2, "Implementation Guidance for Risk Informed Modification to Selected Required Action End States at Combustion Engineering NSSS Plants (TSTF-422)," May 2010 (ADAMS Accession No. ML102500295).

20. Richards, S. A., U.S. Nuclear Regulatory Commission, letter to Richard Bernier, CE Owners Group, "Safety Evaluation of CE NPSD-1186, Rev. 00, 'Technical Justification for the Risk-Informed Modification to Selected Required Action End States for CEOG Member PWRs' TAC No. MA8858,'" July 17, 2001 (ADAMS Accession No. ML011980047).

21. Kalyanam, K., U.S. Nuclear Regulatory Commission, e-mail to D. Bice, Entergy Operations Inc., "RAI related to the adoption of (TSTF)-422, Revision 2 (TAC No. MF1199)," November 22, 2013 (ADAMS Accession No. ML13326A345).

22. Browning, J. G., Entergy Operations, Inc., letter to U.S. Nuclear Regulatory Commission, "Arkansas Nuclear One, Unit 2 – License Amendment Request – Adoption of Technical

Specification Task Force (TSTF)-500, Revision 2 'DC Electric Rewrite – Update to TSTF-360,'" January 28, 2013 (ADAMS Accession No. ML13029A770).

23. George, A. E., U.S. Nuclear Regulatory Commission, letter to U.S. Nuclear Regulatory Commission, "Arkansas Nuclear One, Unit 2 – Issuance of Amendment No. 297, Adoption of Technical Specifications Task Force (TSTF-500, Revision 2, 'DC Electric Rewrite – Update to TSTF-360," December 4, 2014 (ADAMS Accession No. ML14302A015).

24. U.S. Nuclear Regulatory Commission, NRR Office Instruction LIC-101, Revision 4, "License Amendment Review Procedures," May 25, 2012 (ADAMS Accession No. ML113200053).

Principal Contributor: R. Grover, NRR/DSS/STSB

Date: March 31, 2015

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/

Andrea E. George, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-368

Enclosures:
1. Amendment No. 301 to NPF-6
2. Safety Evaluation

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ADAMS Accession No. ML15068A319 ***via memo**

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