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

June 19, 2018

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

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 - ISSUANCE OF AMENDMENT RE: TECHNICAL SPECIFICATION CHANGES TO PROVIDE ACTIONS FOR EMERGENCY FEEDWATER PUMP INOPERABILITY CONSISTENT WITH NUREG-1432 (CAC NO. MG0016; EPID L-2017-LLA-0268)

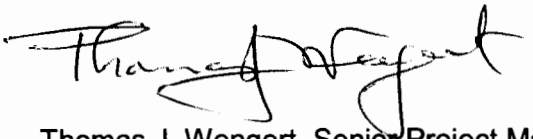
Dear Sir or Madam:

The U.S. Nuclear Regulatory Commission (NRC, the Commission) has issued the enclosed Amendment No. 310 to Renewed Facility Operating License No. NPF-6 for Arkansas Nuclear One, Unit 2 (ANO-2). The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated July 17, 2017.

The amendment establishes Actions and Allowable Outage Times in ANO-2 TS 3.7.1.2, "Emergency Feedwater System," for several combinations of inoperable Emergency Feedwater (EFW) trains consistent with NUREG-1432, "Standard Technical Specifications - Combustion Engineering Plants," Revision 4. Revision 4 of NUREG-1432 includes changes incorporated by Technical Specifications Task Force (TSTF)-340, "Allow 7 Day Completion Time for a Turbine-Driven AFW [Auxiliary Feedwater] Pump Inoperable," Revision 3 and TSTF-412, "Provide Actions for One Steam Supply to Turbine Driven AFW/EFW Pump Inoperable," Revision 3.

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

Sincerely,



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

Docket No. 50-368

Enclosures:
1. Amendment No. 310 to NPF-6
2. Safety Evaluation

cc: Listserv

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

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-368

ARKANSAS NUCLEAR ONE, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 310
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 July 17, 2017, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this license amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-6 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 310, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications

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

FOR THE NUCLEAR REGULATORY COMMISSION

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

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

Date of Issuance: June 19, 2018

ATTACHMENT TO LICENSE AMENDMENT NO. 310

RENEWED FACILITY OPERATING LICENSE NO. NPF-6

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-368

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

Renewed Facility Operating License

REMOVE	INSERT
-3-	-3-

Technical Specifications

REMOVE	INSERT
3/4 7-5	3/4 7-5
3/4 7-6	3/4 7-6

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

(5) EOI, pursuant to the Act and 10 CFR Parts 30, 40 and 70 to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(6) EOI, pursuant to the Act and 10 CFR Parts 30 and 70 to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to conditions specified in the following Commission regulations in 10 CFR Chapter I; Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

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

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 310, are hereby incorporated in the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications.

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

(3) Additional Conditions

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

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

EMERGENCY FEEDWATER (EFW) SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.1.2 Two EFW trains shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3

ACTIONS:[1]

NOTE 1: Specification 3.0.4.b is not applicable.

NOTE 2: Only applicable if MODE 2 has not been entered following refueling.

NOTE 3: Not applicable when the turbine-driven EFW train is inoperable solely due to one inoperable steam supply.

NOTE 4: LCO 3.0.3 and all other LCO ACTIONS requiring MODE changes are suspended until one EFW train is restored to OPERABLE status.

a. With the turbine-driven EFW train inoperable in MODE 3 following refueling[2], OR with the turbine-driven EFW train inoperable due to one inoperable steam supply, restore the turbine-driven EFW train to OPERABLE status within 7 days.

b. With one EFW train inoperable for reasons other than ACTION a, restore the inoperable train to OPERABLE status within 72 hours.

c. With the turbine-driven EFW train inoperable due to one inoperable steam supply AND the motor-driven EFW train inoperable, restore either the steam supply to the turbine-driven train OR the motor-driven EFW train to OPERABLE status within 24 hours.

d. With ACTION a, b, or c not met, be in HOT SHUTDOWN within the next 12 hours.

e. With both EFW trains inoperable, immediately initiate action to restore one EFW train to an OPERABLE status.[3,4]

SURVEILLANCE REQUIREMENTS

4.7.1.2 Each EFW pump shall be demonstrated OPERABLE:

a At least once per 31 days by:

1. Verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. In accordance with the INSERVICE TESTING PROGRAM by:

1. Verifying the developed head of each EFW pump at the flow test point is greater than or equal to the required developed head. This surveillance requirement is not required to be performed for the turbine-driven EFW pump until 24 hours after exceeding 700 psia in the steam generators.

c At least once per 18 months by:

1. Verifying that each automatic valve in the flow path actuates to its correct position on actual or simulated MSIS and EFAS.

2. Verifying each EFW pump starts automatically on an actual or simulated EFAS.

d. By verifying proper alignment of the required EFW flow paths by verifying flow from the condensate storage tank to each steam generator. This SR is required to be verified prior to entering MODE 2 whenever plant has been in MODES 4, 5, 6, or defueled for > 30 days.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 310 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-6

ENTERGY OPERATIONS, INC.

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-368

1.0 INTRODUCTION

By application dated July 17, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17198F356), Entergy Operations, Inc. (Entergy, the licensee), requested changes to the Technical Specifications (TSs) for Arkansas Nuclear One, Unit 2 (ANO-2).

The proposed changes would establish Actions and Allowable Outage Times in ANO-2 TS 3.7.1.2, "Emergency Feedwater System," for several combinations of inoperable emergency feedwater (EFW) trains consistent with NUREG-1432, "Standard Technical Specifications - Combustion Engineering Plants," Revision 4, Volume 1, Specifications (ADAMS Accession No. ML12102A165). Revision 4 of NUREG-1432 includes changes incorporated by Technical Specifications Task Force (TSTF)-340, "Allow 7 Day Completion Time for A Turbine-Driven AFW [Auxiliary Feedwater] Pump Inoperable" Revision 3 and TSTF-412, "Provide Actions for One Steam Supply to Turbine Driven AFW/EFW Pump Inoperable," Revision 3. The availability of TSTF-412 was announced in the *Federal Register* on July 17, 2007 (72 FR 39089), as part of the consolidated line item improvement process.

Approved TSTF Travelers are generic changes to the Improved Standard Technical Specifications (STS) that may be adopted by facilities meeting the conditions associated with the change.

2.0 REGULATORY EVALUATION

2.1. Description of Auxiliary Feedwater System

The ANO-2 nuclear steam supply system is a Combustion Engineering (CE) design with two steam generators (SGs). The EFW system consists of one turbine-driven EFW pump, one motor-driven EFW pump, and associated piping, valves, and instrumentation. The steam supply for the turbine-driven EFW pump may be drawn from either or both SGs, with a normally-open alternating current (AC) motor-operated valve in each line capable of isolating

the turbine-driven pump steam supply line from each SG. Near the turbine-driven pump, the steam supply line divides to serve two steam admission valves, a bypass valve and a full-flow valve. These steam admission valves are normally closed Channel 2 (Green) direct current motor-operated valves. The motor-driven EFW pump is powered from Channel 1 (Red) of the AC electrical distribution system. Each pump delivers EFW flow to either or both SGs.

In addition to the two safety-related trains of EFW described above, the EFW system includes a nonsafety-related AFW pump that may be used to supply water to the SGs. The AFW pump discharge may be aligned to the discharge of the main feedwater pumps or the discharge of either EFW pump. The AFW pump can supply feedwater sufficient for heat loads equivalent to approximately 4 percent of full power at maximum SG pressure.

The ANO-2 EFW system is described in Sections 7.3.1 and 10.4.9 of the ANO-2 Safety Analysis Report (SAR). The EFW system assures a sufficient feedwater supply to the SGs to remove energy stored in the core and primary coolant when the normal feedwater system is not available and in some other circumstances. The EFW pumps are designed to start automatically on an emergency feedwater actuation signal (EFAS) or a diverse emergency feedwater actuation signal (DEFAS). The EFAS is generated based on SG level and SG pressure, and automatically initiates EFW flow to intact SGs based on the level and pressure indications. The DEFAS signal is generated based on inputs indicating low-low SG level and actuation of the diverse scram system for protection against anticipated transients without scram. The ANO-2 SAR credits the EFW system in response to a steamline break accident, a loss-of-coolant accident through a small break, and a loss of main feedwater. In the unlikely event of failure of both safety-related EFW trains, the AFW pump can be manually actuated to supply water to the SGs provided nonsafety-related electric power is available to the pump. However, the AFW pump is not credited to respond to design basis accidents.

2.2 Licensee's Proposed Changes

Entergy proposed to modify ANO-2 TS 3.7.1.2, "Emergency Feedwater System," to add entry Conditions and associated Required Actions to be consistent with TS 3.7.5, "Auxiliary Feedwater (AFW) System," included in Revision 4 of NUREG-1432. The licensee provided the following summary of the resulting Conditions and Required Actions for ANO-2 TS 3.7.1.2:

1. The current ANO-2 TS Action for single EFW train inoperability is maintained, consistent with Condition B of NUREG-1432.

2. Actions are added to address a condition where the turbine-driven EFW pump is inoperable solely as a result of one of its two steam supply valves being inoperable, or if this pump is inoperable in Mode 3, consistent with Condition A of NUREG-1432.

3. An Action is added to address a condition where the turbine-driven EFW pump is inoperable solely as a result of one of its two steam supply valves being inoperable AND the motor-driven EFW pump is inoperable simultaneously, consistent with Condition C of NUREG-1432.

4. The plant shutdown requirement of the current ANO-2 TS Action is separated into an individual Action requiring plant shutdown if any of the above Actions are not met, consistent with Condition D of NUREG-1432.

5. An Action is added to address both EFW trains being inoperable simultaneously, consistent with Condition E of NUREG-1432.

The proposed changes also include editorial changes to the title and limiting condition for operation (LCO) of ANO-2 TS 3.7.1.2. The licensee also proposed conforming changes to bring surveillance testing requirements in alignment with the STS. The ANO-2 TSs were modeled after an earlier version of the STS and, therefore, are not consistent with the standard format of the current STS. Thus, the proposed changes include minor deviations from the STS necessary to maintain consistency with the non-standard format of the ANO-2 TSs. These deviations include continued use of the classification of "Actions" to address the information classified in the current STS as "Conditions," "Required Actions," and "Completion Times."

2.3 Regulatory Review

The proposed license amendment involves a change to the content of the TSs. The U.S. Nuclear Regulatory Commission (NRC) staff reviews proposed TS changes for compliance with applicable regulations and conformance with associated regulatory guidance.

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.36(b) states, in part: "The technical specifications will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to § 50.34." As stated in 10 CFR 50.34(a), "Contents of applications; technical information," the General Design Criteria (GDC) of Appendix A to 10 CFR Part 50 establish minimum requirements for the principal design criteria for water-cooled nuclear power plants similar in design to plants for which construction permits have previously been issued by the Commission. Pursuant to 10 CFR 50.34(a), the facility's preliminary safety analysis report includes a description of the relation of the design bases to the principal design criteria. In addition, 10 CFR 50.36(c)(2) states, in part: "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."

Section 3.1.4 of the ANO-2 SAR includes the following discussion addressing GDC 34, "Residual Heat Removal" and its relationship to the EFW system design basis:

> CRITERION 34 – RESIDUAL HEAT REMOVAL
>
> A system to remove residual heat shall be provided. The system safety function shall be to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the RCPB [Reactor Coolant Pressure Boundary] are not exceeded.
>
> Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities, shall be provided to assure that for onsite electric power system operation (assuming off-site power is not available) and for off-site electric power system operation (assuming onsite power is not available) the system safety function can be accomplished assuming a single failure.

Response

Residual heat removal capability is provided by the shutdown cooling system for reactor coolant temperature less than 275 °F [degrees Fahrenheit]. For temperatures greater than 275 °F, this function is provided by the steam generators. The design incorporates sufficient redundancy, interconnections, leak detection, and isolation, assuming failure of a single active component. Within appropriate design limits, either system will remove fission product decay heat at a rate such that specified acceptable fuel design limits and the design conditions of the RCPB will not be exceeded.

The Shutdown Cooling (SDC) system and the steam generator auxiliaries are designed to operate either from off-site power or from onsite power sources.

The ANO-2 SAR references Section 10 for further discussion related to the power conversion system interface with the SGs and use of the system for residual heat removal.

Guidance for NRC staff review of TSs is contained in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water] Edition," Section 16.0, Revision 3, "Technical Specifications" (ADAMS Accession No. ML100351425). The staff has prepared STS for each of the LWR nuclear steam supply systems and associated balance-of-plant equipment systems. The guidance specifies that the staff reviews whether the content and format of proposed TSs are consistent with the applicable STS. Where TS provisions depart from the reference TSs, the staff determines whether the proposed differences are justified by uniqueness in plant design or other considerations. The applicable current STS for ANO-2 are contained in NUREG-1432, Revision 4.

3.0 TECHNICAL EVALUATION

The model STS 3.7.5 included in NUREG-1432, Revision 4, is consistent with TSTF-340, Revision 3. The NRC documented its approval of TSTF-340, Revision 3, in a letter from William D. Beckner (NRC) to James Davis (Nuclear Energy Institute), dated March 16, 2000 (ADAMS Accession No. ML003694199). This traveler revised STS 3.7.5 to extend Condition A Completion Time to 7 days to restore an inoperable turbine-driven AFW steam supply, and to expand Condition A by adding an OR statement and a NOTE in the Condition. The added statement states, "One turbine driven AFW pump inoperable in MODE 3 following refueling," and the NOTE states, "Only applicable if MODE 2 has not been entered following refueling." This change is generically applicable to all turbine-driven AFW or EFW pumps because of the low decay heat prior to entry into Mode 2, the availability of the motor-driven AFW or EFW pump train, and the low probability of an event requiring the use of the turbine-driven pump train.

The model STS 3.7.5 included in NUREG-1432, Revision 4, is also consistent with TSTF-412, Revision 3, and the STS is configured for a CE plant with a three-train AFW system consisting of one turbine-driven AFW pump and two motor-driven pumps. Plant AFW systems often consist of three pumps, typically two motor-driven pumps and one turbine-driven pump configured into three trains. The capacity of the AFW pumps varies by plant, typically with the turbine-driven pumps having the capacity to remove necessary heat for any design basis accident or event requiring feedwater flow to the SGs and the motor-driven pumps having between half the capacity and the full capacity of the turbine-driven pump. Motor-driven AFW pumps are typically powered from an independent Class 1E power supply, and each pump feeds one or more SGs. Turbine-driven AFW pumps receive all necessary steam flow from

either or both connected SGs and provide the required AFW flow to all SGs. The model safety evaluation (SE) for TSTF-412, Revision 3, published in the *Federal Register* on July 17, 2007 (72 FR 39089), was based on the most common AFW system configuration consisting of two motor-driven pumps and one turbine-driven pump.

The ANO-2 EFW system configuration differs from the configurations used for the model TS 3.7.5 in NUREG-1432, Revision 4, and the configuration considered for the model SE for TSTF-412, Revision 3. The ANO-2 EFW system consists of two EFW pumps, with one full-capacity turbine-driven pump and one full-capacity motor-driven pump. Both ANO-2 EFW pumps deliver flow to one or both SGs. The capability of the ANO-2 EFW system is similar to the configuration considered for the TSTF-412 model SE, when the two motor-driven pumps have less than full capacity in that either the turbine-driven pump alone or all installed motor-driven pumps are capable of delivering all necessary EFW flow for the full spectrum of design basis accidents and events. The distinction between the ANO-2 configuration and the TSTF-412 configuration is the probability and consequences of a single failure of a motor-driven pump. The ANO-2 motor-driven train would lose the capacity to provide any EFW flow, while the TSTF-412 configuration would lose the capability to provide adequate EFW flow for most design basis events, only retaining sufficient capability to provide adequate EFW flow for a small spectrum of events. In addition, the commonalities in design and operation would increase the probability of failure of the remaining motor-driven pump when one is inoperable (common cause failure). On balance, the NRC staff concluded that the model SE prepared for TSTF-412, Revision 3, remains generally applicable to the proposed ANO-2 TS 3.7.1.2.

The NRC staff developed the following evaluation of each proposed change to ANO-2 TS 3.7.1.2 as listed in Attachment 1 to the license amendment request:

TS 3.7.1.2 Title and LCO 3.7.1.2

The licensee proposed adding the acronym "(EFW)" to the TS title and use the acronym throughout the LCO 3.7.1.2 text. The licensee also modified LCO 3.7.1.2 to state only: "Two EFW trains shall be OPERABLE." The NRC staff considers the title change editorial in nature and, therefore, acceptable. The change to the LCO text has no impact on the interpretation of the LCO because the transition from "Two emergency feedwater pumps and associate flow paths" to "Two EFW trains" does not change the scope of equipment encompassed by the LCO. Likewise, because the TS definition of "operable" encompasses all required support equipment to also be operable, the deletion of the following text included at the end of the LCO does not change the requirements for EFW train operability:

a. One motor driven pump capable of being powered from an OPERABLE emergency bus, and

b. One turbine driven pump capable of being powered from an OPERABLE steam supply system.

Therefore, the proposed changes to the TS 3.7.1.2 title and to LCO 3.7.1.2 are acceptable.

LCO 3.7.1.2 Applicability

The applicability of TS LCO 3.7.1.2 remains unchanged, and the LCO applies in Modes 1, 2, and 3. This differs from the STS 3.7.5 in NUREG-1432, Revision 4, in that the STS includes, in brackets, a statement that the LCO also applies in Mode 4 when steam generator is relied upon for heat removal. The NRC staff used brackets to indicate plant-specific information that may not apply to all plants sharing the same nuclear steam supply system vendor (e.g., Combustion Engineering). The licensee determined that incorporation of the Mode 4 applicability statement was unnecessary for ANO-2 because it would be redundant to the existing requirements of ANO-2 TS 3.4.1.3, "Reactor Coolant System - Shutdown," and LCO 3.4.1.3, which requires that either a reactor coolant loop with its associated SG or a shutdown cooling loop be operable and in operation. When the SG is required to be operable, an EFW train must also be operable to supply feedwater. Regardless, the expansion to Mode 4 would be beyond the current applicability. Therefore, the unchanged applicability is acceptable. Since the applicability is unchanged, the LCO statements and Conditions of STS 3.7.5 applicable to operation in Mode 4 were not adopted because they would not be applicable to ANO-2 operation.

LCO 3.7.1.2 Actions

As described in Section 2.2 of this SE, the classification of "Actions" in the ANO-2 TSs encompasses the information contained in the current STS classifications of "Conditions," "Required Actions," and "Completion Times." The current ANO-2 LCO 3.7.1.2 contains a single Action modified by a single note, with the note listed above the specific action. The licensee proposed a revised "Actions" section containing five Actions preceded by four notes.

The licensee proposed designating the existing note as Note 1, which states that "Specification 3.0.4.b [(i.e., completion of a risk assessment prior to mode changes)] is not applicable" to any of the Actions. This statement is consistent with the STS and is acceptable.

Action a

The licensee proposed adding a new Action a, which states:

> With the turbine-driven EFW train inoperable in MODE 3 following refueling[2], OR with the turbine-driven EFW train inoperable due to one inoperable steam supply, restore the turbine-driven EFW train to OPERABLE status within 7 days.

The superscript "2" after the word "refueling" refers to new Note 2, which states: "Only applicable if MODE 2 has not been entered following refueling." The effect of new Action a. and associated Note 2 is equivalent to Condition A and the associated Required Action and Completion Time for STS 3.7.5 in NUREG-1432, Revision 4. The bases for STS 3.7.5, in NUREG-1432, Revision 4, Volume 2 (ADAMS Accession No. ML12102A169), provide the following justification for accepting the Condition, Required Action, and Completion Time:

a. For the inoperability of the turbine driven AFW pump due to one inoperable steam supply, the 7 day Completion Time is reasonable since there is a redundant steam supply line for the turbine driven pump and the turbine driven train is still capable of performing its specified function for most postulated events.

b. For the inoperability of a turbine driven AFW pump while in MODE 3 immediately subsequent to a refueling outage, the 7 day Completion Time is reasonable due to the minimal decay heat levels in this situation.

c. For both the inoperability of the turbine driven pump due to one inoperable steam supply and an inoperable turbine driven AFW pump while in MODE 3 immediately following a refueling outage, the 7 day Completion Time is reasonable due to the availability of redundant OPERABLE motor driven AFW pumps; and due to the low probability of an event requiring the use of the turbine driven AFW pump.

The NRC staff reviewed these bases and determined that the bases are generic and applicable to the ANO-2 EFW system. Therefore, the proposed Action a is acceptable.

Action b

The licensee proposed to rename the existing ANO-2 EFW TS Action for one inoperable EFW pump as Action b and modify the Action to be consistent with Condition B of STS 3.7.5. The licensee proposed the following specific changes (new text is underlined and deleted text is stricken out):

> With one EFW~~emergency feedwater~~ train~~pump~~ inoperable for reasons other than ACTION a, restore the inoperable train~~pump~~ to OPERABLE status within 72 hours.

This change is consistent with the STS construction with respect to train-orientation and use of the acronym "EFW" for the system name. The exclusion of the condition described in Action a is consistent with STS 3.7.5, Condition B. The specified Action to restore the inoperable train to operable status within 72 hours is consistent with the existing ANO-2 EFW TS Action and the Required Action and Completion Time of STS 3.7.5, Condition B. Therefore, the change is acceptable.

Action c

The licensee proposed a new Action c applicable when the turbine-driven EFW train is inoperable due to one inoperable steam supply and the motor-driven EFW train is inoperable. The action specifies completion of either of the following two required actions within 24 hours: (1) restore of the affected steam supply to the turbine-driven EFW train to operable status; or (2) restore the inoperable motor driven EFW train to operable status. The licensee proposed the following text for Action c:

> With the turbine-driven EFW train inoperable due to one inoperable steam supply AND the motor-driven EFW train inoperable, restore either the steam supply to the turbine-driven train OR the motor-driven EFW train to OPERABLE status within 24 hours.

As discussed in the model SE for TSTF-412, Revision 3, the proposed 24-hour Completion Time is applicable to plants that may provide insufficient flow to the SGs to satisfy accident analyses assumptions if a main steamline break (MSLB) or feedwater line break (FLB) were to occur that renders the remaining steam supply to the turbine-driven AFW pump inoperable (a concurrent single failure is not assumed). Insufficient feedwater flow could result at plants with

three AFW pumps if, for example, the single remaining operable AFW train does not have sufficient capacity to satisfy accident analyses assumptions or the operable AFW train only feeds the faulted SG (i.e., the SG that is aligned to the operable steam supply for the turbine-driven AFW pump). (This would typically apply to plants with two motor-driven EFW pumps when each motor-driven AFW pump delivers less than 100 percent of the required flow.) In accordance with TSTF-412, Revision 3, a 48-hour Completion Time would be applicable when the remaining operable motor-driven AFW train is capable of providing sufficient feedwater flow in accordance with accident analyses assumptions. (This would typically apply to plants when the remaining operable AFW pump delivers greater than or equal to 100 percent of the required flow.)

The STS typically allow a 72-hour or longer Completion Time for Conditions where the remaining operable equipment is able to mitigate postulated accidents without assuming a concurrent single active failure. For TSTF-412, Revision 3, the 24-hour Completion Time applies to the situation where the turbine-driven AFW train would be able to deliver adequate flow for most postulated events, and would only be challenged by an MSLB or FLB that renders the remaining operable steam supply to the turbine-driven EFW pump inoperable. The selection of 24 hours for the Completion Time is based on the remaining operable steam supply to the turbine-driven AFW pump and the continued functionality of the turbine-driven AFW train, the remaining operable motor-driven AFW train, and the low likelihood of an event occurring during this 24-hour period that would challenge the capability of the AFW system to provide adequate feedwater to the SGs. The proposed Completion Time for this particular situation is consistent with what was approved for Waterford Steam Electric Station, Unit 3 by License Amendment No. 173 for a similar Condition (ADAMS Accession No. ML012840538), and it is consistent with the STS in that the proposed Completion Time is much less than the 72 hours that is allowed for the situation where full accident mitigation capability is maintained. Therefore, the NRC staff agreed that the proposed 24-hour Completion Time would be acceptable for this particular situation.

The situation defined by proposed Action c at ANO-2 differs from that considered for TSTF-412 because ANO-2 has only one motor-driven EFW train and there would be no remaining operable motor-driven EFW train. However, in the analysis described above, the remaining operable motor-driven train is not credited with the capability to deliver adequate flow to the SGs, and the turbine-driven train is relied upon to deliver adequate flow for all design basis accidents and events other than the small subset of events that render the lone operable steam supply to the turbine-driven pump inoperable. Therefore, the analysis for the 24-hour Completion Time from the TSTF-412, Revision 3 model SE, also applies to the situation at ANO-2 when proposed Action c is applicable.

When conditions warrant that proposed Action c be entered at ANO-2, the turbine-driven EFW pump train with one inoperable steam supply would be capable of delivering adequate EFW flow to satisfy accident analysis assumptions for the full spectrum of design basis accidents other than the few low-probability events that would render the remaining steam supply inoperable. The events for which adequate feedwater flow would not be available in this condition are events resulting in loss of pressure boundary integrity affecting the SG that is delivering steam to the operable steam supply line; these events are of sufficiently low probability that the appropriate action is to shut down the reactor after some short time rather than continue to operate at power indefinitely while attempting to restore greater EFW capability (which is the required action when sufficient EFW flow is unavailable for more frequent occurrences such as a loss of main feedwater flow). A shutdown action is appropriate because the remaining capability of the turbine-driven EFW pump would provide sufficient EFW flow for

transients that could be induced by shutdown of the reactor, such as a loss of main feedwater. Apart from the condition under which the plant would be shut down, the proposed required action to restore one EFW train to full operability would restore the capability to deliver adequate EFW flow for the full spectrum of design basis accidents and events. As addressed in the model SE for TSTF-412, Revision 3, the proposed 24 hour Completion Time for implementing either Required Action is commensurate with the remaining capability to deliver adequate EFW flow for all but a small subset of events that would render the remaining operable steam supply inoperable. In addition, the proposed Action c is consistent with the intent of STS 3.7.5, Condition C, presented in NUREG-1432, Revision 4. Therefore, the proposed new Action c is acceptable.

Action d

The licensee proposed a new Action d that applies when the Required Actions and associated Completion Times of Actions a, b, or c have not been met and retains a portion of the existing Action specifying placement of the unit in a Mode 4 end state where LCO 3.7.1.2 is not applicable. The licensee proposed the following text for Action d (new text is underlined and deleted portions of the existing text are stricken out):

> With ACTION a, b, or c not met, ~~or~~ be in HOT SHUTDOWN within the next 12 hours.

Proposed Action d is consistent with applicable portions of the entry conditions specified for Condition D of STS 3.7.5 from NUREG-1432, Revision 4. However, the proposed Action d does not include the STS 3.7.5, Condition D bracketed entry condition of "[OR [Two] AFW trains inoperable in MODE 1, 2, or 3 for reasons other than Condition C.]," because this bracketed entry condition is not applicable to ANO-2 since Condition E would apply instead at facilities with only two EFW trains.

Proposed Action d is consistent with the Mode 4 (Hot Shutdown) end state specified for Condition D of STS 3.7.5 in NUREG-1432, Revision 4. However, the proposed Action differs from the Required Actions and Completion Times specified for Condition D of STS 3.7.5 in NUREG-1432, Revision 4. The Required Actions and Completion Times associated with this Condition requires the plant to be in Mode 3 in 6 hours and in Mode 4 in [18] hours. The licensee chose to maintain the existing required entry into Hot Shutdown within 12 hours without an intermediate Completion Time for entry into Mode 3 in order to maintain consistency with other ANO-2 TS LCOs with applicability in only Modes 1, 2, and, 3. The 12-hour time to reach the Hot Shutdown end state is conservative with respect to the bracketed 18-hour end state Completion Time for Condition D of STS 3.7.5, and, as a practical matter, the necessary preparations and cooldown time for transition from Mode 3 to Mode 4 within 12 hours would result in entry into Mode 3 within approximately 6 hours. Therefore, this proposed deviation from STS 3.7.5 is acceptable.

Action e

The licensee proposed a new Action e that applies when both the turbine-driven EFW train is inoperable for reasons other than an inoperable steam supply and the motor-driven EFW train is inoperable. The licensee proposed the following text for Action e:

> With both EFW trains inoperable, immediately initiate action to restore one EFW train to an OPERABLE status.[3,4]

The superscripts "3" and "4" at the end of the Action refer to new Note 3 and new Note 4, respectively. Note 3 states: "Not applicable when the turbine-driven EFW train is inoperable solely due to one inoperable steam supply." Note 4 states: "LCO 3.0.3 and all other LCO ACTIONS requiring MODE changes are suspended until one EFW train is restored to OPERABLE status." The effect of new Action e and associated Notes 3 and 4 is equivalent to Condition E and the associated Required Action and Completion Time for STS 3.7.5 in NUREG-1432, Revision 4.

Action e applies to the condition where two EFW trains are inoperable in MODE 1, 2, or 3, which is similar to new Action c because both the turbine-driven and motor-driven EFW trains are inoperable. However, new Action c limits its applicability to the condition where the turbine-driven EFW train is inoperable solely due to one inoperable steam supply. The licensee proposed the addition of Note 3 to Action e to clearly differentiate Action e from Action c. As a clarification, the NRC staff considers the addition of Note 3 editorial in nature, and, therefore, acceptable.

Action e represents a seriously degraded state where no safety-related means of delivering feedwater to the SGs may be available to support decay heat removal and cooldown in Modes 1, 2, or 3. This state is identical to the state described in the bases for Condition E of STS 3.7.5. Action to immediately restore one EFW train to operable status is commensurate with the seriousness of the situation. Note 4 is effectively identical to the Note incorporated into Required Action E.1 of STS 3.7.5. These Notes serve to block forced entry into transient conditions that could further degrade the safety of the facility. Therefore, proposed Action e and associated Note 4 are acceptable.

Surveillance Requirements

Other than editorial changes to replace "emergency feedwater" with "EFW," delete a continuation statement, and locate all surveillance requirements (SRs) on one page, the licensee proposed two minor changes to the EFW system SRs. The licensee proposed the minor changes to improve consistency with the STS SRs.

The licensee proposed modifying ANO-2 SR 4.7.1.2.c.1, which specifies periodic verification that each automatic valve in the EFW flow path actuates to its correct position, by replacing the modifying phrase "on MSIS or EFAS test signals" with the phrase "on actual or simulated MSIS and EFAS." The addition of the words "actual or simulated" allows actual system actuations to be credited toward completion of the surveillance. The replacement of "or" with "and" ensures the intent of the TS is met by verifying the associated EFW valves appropriately actuate on both a Main Steam Isolation Signal (MSIS) and an Emergency Feedwater Actuation Signal (EFAS). The deletion of the words "test signals" removes redundancy because the acronyms MSIS and EFAS include the word "signal." These changes improve the consistency of ANO-2 SR 4.7.1.2.c.1 with STS SR 3.7.5.3, and, therefore, are acceptable.

The licensee also proposed modifying ANO-2 SRs 4.7.1.2.c.2 and 4.7.1.2.c.3 by combining the two EFW pump surveillance tests into SR 4.7.1.2.c.2 using wording consistent with STS SR 3.7.5.4. Existing ANO-2 SRs 4.7.1.2.c.2 and 4.7.1.2.c.3 require verification that the motor-driven EFW pump automatically starts and the turbine-driven EFW pump steam supply motor operated valve automatically opens, respectively, upon receipt of an EFAS test signal. The proposed change would combine these two SRs into a single ANO-2 SR 4.7.1.2.c.2 that requires verification that "...each EFW pump starts automatically on an actual or

simulated EFAS." The change to specify that each pump starts on an EFAS removes potential ambiguity. These changes improve the consistency of ANO-2 SR 4.7.1.2.c.2 with STS SR 3.7.5.4 and, therefore, are acceptable.

Summary of Technical Evaluation

The proposed changes are consistent with NRC practices and policies as generally reflected in the STS and as reflected by applicable precedents that have been approved. The NRC staff concludes that the requirements of 10 CFR 50.36(c)(2) continue to be met, because the minimum performance level of equipment needed for safe operation of the facility as specified in ANO-2 TS LCO 3.7.1.2 remains unchanged and appropriate remedial measures are specified if the LCO is not met. The changes to ANO-2 TS LCO 3.7.1.2 and TS SR 4.7.1.2 are consistent with the guidance of Section 16.0 of NUREG-0800, in that the proposed changes are generally consistent with the STS incorporated in NUREG-1432, with allowances for design differences present at ANO-2. Therefore, the NRC staff has determined that the proposed changes to the ANO-2 TSs are 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 on May 14, 2018. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. 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, published in the *Federal Register* on October 10, 2017 (82 FR 47036), and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

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

Principal Contributor: S. Jones, NRR

Date: June 19, 2018

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 - ISSUANCE OF AMENDMENT RE: TECHNICAL SPECIFICATION CHANGES TO PROVIDE ACTIONS FOR EMERGENCY FEEDWATER PUMP INOPERABILITY CONSISTENT WITH NUREG-1432 (CAC NO. MG0016; EPID L-2017-LLA-0268) DATED JUNE 19, 2018

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