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601-368-5516

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10 CFR 50.90

September 17, 2026

ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: License Amendment Request
Allowance to Eliminate Movement of Control Element Assembly 29 from
Surveillance Requirement 4.1.3.1.2 for the Remainder of Cycle 32

Arkansas Nuclear One, Unit 2
NRC Docket No. 50-368
Renewed Facility Operating License No. NPF-6

Pursuant to 10 CFR 50.90, Entergy Operations, Inc. (Entergy) requests an amendment to the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TS) to exclude exercising Control Element Assembly (CEA) 29 for the remainder of operating Cycle 32, currently scheduled to end in September of 2027. The proposed amendment would modify a Note to Surveillance Requirement (SR) 4.1.3.1.2 such that CEA 29 may be excluded from performance of the surveillance for the remainder of Cycle 32. The proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c).

This amendment is necessary due to a failure of the pull-down coil in the CEA 29 coil stack, located atop the reactor vessel closure head. The pull-down coil pulls the upper gripper down during CEA movement. This failure occurred on June 8, 2026, during a plant power reduction. As a result, a temporary modification (T-mod) was installed to allow the CEA to be withdrawn as power was restored to 100%.

CEA 29 remains trippable and capable of fully inserting into the core upon reactor trip. This configuration is allowed indefinitely by TS 3.1.3.1 Condition B.

Movement of the CEA without a functional pull-down coil risks dropping or ratcheting the CEA. If the CEA were to drop into the core, it would create a reactivity transient requiring a power reduction and potentially a plant shutdown if the CEA could not be safely recovered. Ratcheting of the CEA could cause damage to the mating surfaces of the gripper and/or the CEA shaft, foreign material generation in the drive mechanism affecting CEA motion, or a reactivity transient. Therefore, Entergy requests CEA 29 not be exercised during the remaining performances of SR 4.1.3.1.2, which will permit entry into refueling outage 2R32 when repairs can be completed. 2R32 is currently scheduled to commence in September of 2027.

The enclosure provides the description and supporting assessment for the proposed revision to SR 4.1.3.1.2 to allow CEA-29 to be excluded from further exercising, as discussed above. Attachment 1 to the enclosure contains the mark-ups of the affected Technical Specification pages. Attachment 2 of the enclosure contains the clean, retyped Technical Specification pages.

An environmental impact statement and an environmental assessment are not required in connection with the proposed amendment.

This letter contains no new regulatory commitments.

The next performance of SR 4.1.3.1.2, after applying a 25% allowance permitted by SR 4.0.2, is required by December 16, 2026. Entergy requests approval of the proposed license amendment by December 3, 2026, with the amendment being implemented immediately on approval and no later than December 16, 2026.

In accordance with 10 CFR 50.91, "Notice for Public Comment; State Consultation," Entergy is notifying the State of Arkansas of this amendment request by transmitting a copy of this letter and enclosures to the designated State Official.

If there are any questions or if additional information is needed, please contact Phil Couture, Sr. Manager, Fleet Regulatory Assurance at 601-368-5102.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on September 17, 2026.

Sincerely,

Digitally signed by Jeff Hardy
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Jeff Hardy

JAH/mar

Enclosure: Evaluation of Proposed Change

Attachments: 1. Technical Specification Page Markups
2. Technical Specification Pages Retyped

- References:
- 1) NRC Letter to Entergy, "Arkansas Nuclear One, Unit 2 - Issuance of Amendment to Exclude Exercise of Control Element Assembly 4 with Respect to Surveillance Requirement 4.1.3.1.2 for the Remainder of Cycle 26 (Exigent Circumstances)" (2CNA011803) (ML18011A064), dated January 18, 2018
 - 2) NRC Letter to Entergy, "Arkansas Nuclear One, Unit 2 - Issuance of Amendment RE: Revise Technical Specifications Surveillance Requirement to Eliminate Movement of Control Element Assembly 18 for the Remainder of Operating Cycle 24" (2CNA041502) (ML15096A381), dated April 29, 2015

cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – Arkansas Nuclear One
NRC Project Manager – Arkansas Nuclear One
Designated Arkansas State Official

Enclosure

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Evaluation of Proposed Change

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Evaluation of Proposed Change

1.0 SUMMARY DESCRIPTION

The proposed amendment would modify Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specification (TS) Surveillance Requirement (SR) 4.1.3.1.2 to exclude exercise of Control Element Assembly (CEA) 29 for the remainder of operating Cycle 32, currently scheduled to end in September of 2027. The SR requires that each CEA not fully inserted in the core shall be determined to be operable by movement of at least five inches in any one direction in accordance with the Surveillance Frequency Control Program (SFCP). The current frequency of the SR according to the SFCP is 184 days. The proposed amendment would modify a Note to Surveillance Requirement (SR) 4.1.3.1.2 such that CEA 29 may be excluded from SR performance for the remainder of Cycle 32.

Attachment 1 of this Enclosure provides a markup page of the existing TS which shows the proposed change. Attachment 2 of this Enclosure provides a retyped TS page with the proposed change incorporated. Because the Note is self-explanatory and because the exception will only be applicable until the end of Cycle 32, no changes to the associated TS Bases are proposed at this time.

2.0 DETAILED DESCRIPTION

2.1 CEAs

The ANO-2 CEAs are clustered into groups of five "fingers" sharing a common Control Element Drive Mechanism (CEDM). Four fingers are assembled in a 4.05-inch square array around the fifth central finger. The individual fingers in a CEA are spaced to enter the CEA guide tubes in the corresponding fuel assembly. The fuel assembly structure is designed to guide the CEAs. This design results in relatively free movement of the CEAs.

ANO-2 has 81 CEAs that are used for reactivity control. The CEAs are divided into nine groups, of which two are Shutdown Groups designated Groups A and B, six are Regulating Groups designated Groups 1 through 6, and one group is designated as Group P (similar to a regulating group). CEA 29 is in Group P. The shutdown groups are the first withdrawn during startup and the last inserted during a planned shutdown. During a reactor startup, Groups 1 through 5 must then be withdrawn in a prescribed sequence and with the prescribed overlap. Groups 6 and P are the last groups to be withdrawn during reactor startup. During power operations, insertion of Groups 1 through 5 and Shutdown Banks A and B is prohibited except to complete performance of the SR 4.1.3.1.2 CEA exercise test. Groups 6 and P are used during power operation to control Axial Shape Index (ASI) in accordance with the reactivity plan.

An Adverse Condition Monitoring and Contingency Plan (ACMP) has been developed to provide guidance to operations concerning operation and monitoring of CEA 29 while this condition exists. Contingency actions include:

1. Briefing of the condition to control room operators on their first day back.
2. Brief placing Subgroup 7 on the CEDM hold bus on their first day back.

3. Minimize the use of Group P CEAs when controlling ASI or reactor power.

The ACMP also contains supplementary guidance for potential conditions, including limits associated with insertion amounts for ASI control and reactor power as well as voltage monitoring for CEA 29 should movement be required.

2.2 Control Element Drive Mechanism Control System (CEDMCS)

CEDMCS performs the following functions:

- Add large amount of negative reactivity when the Reactor Trip Circuit Breakers (RTCBs) are opened via commands from the Reactor Protection System Trip paths.
- Provide for rapid insertion of CEAs when a secondary plant load rejection occurs.
- Provide a stable and controlled approach to criticality during plant startup from Mode 3 to Mode 2.
- Provide for reactivity control at all power levels and Axial Shape Index (ASI) control at higher power levels ($> 15\%$). The extent of CEA motion for ASI control varies over core life.
- Provide for "Cocked Rod" Protection during plant heatup and cooldown (Shutdown Banks A and B fully withdrawn to provide immediately large insertion of negative reactivity if needed).
- Permit exercise of each CEA as required by TS SR 4.1.3.1.2.

The CEDMCS is an electromechanical device that uses induced magnetic fields to operate a mechanism for moving a CEA. The pressure housings for the CEDMs are threaded onto nozzles on the Reactor Vessel head and seal welded. A hollow, grooved drive shaft extends through the drive mechanism to the top of the control element assembly. Latches in the drive unit engage the grooves on the CEA extension shaft and provide means for lifting, holding, and inserting the CEA. Coils mounted in a coil stack assembly slide over the mechanism pressure housing and rest upon a locating shoulder. These coils provide the magnetic flux that operates the mechanical parts of the drive within the pressure housing. Linear motion of these parts causes operation of latching devices, which translate the motion of the parts to the CEDMCS drive shaft. Holding and moving the CEA occurs when power is sequentially applied to the coils. Each mechanism has five electrical coils. Power to these coils is controlled by the CEDMCS. The coils and external electrical components are cooled by forced airflow from the CEDMCS cooling units.

The proper sequencing of each coil causes withdrawal and insertion of the CEA. A reactor trip is accomplished by rapid insertion of the CEAs when the CEDMCS coils are de-energized. When this happens, the latches are disengaged from the drive shaft, and the CEAs fully insert into the core by means of gravity.

The coil designations from top (of stack) to bottom are as follows:

Lift Coil (LC)
Upper Gripper Coil (UGC)
Pull-down Coil (PDC)
Load Transfer Coil (LTC)
Lower Gripper Coil (LGC)

Withdrawal or insertion of CEAs is accomplished by applying programmed voltage levels, in the proper sequence, to the five CEDM coils. There are three possible states for each coil:

- High voltage ($\sim 140 \pm 5$ VDC) to quickly energize the coil,
- Low voltage ($\sim 33.5 \pm 3.5$ VDC) to maintain the coil energized, or
- Off

The initial condition of a CEA prior to receiving a motion command is the "holding" mode. In this mode the UGC is energized at low voltage engaging the Upper Gripper latch within the drive shaft. During normal plant operation when conditions do not require CEA movement, all 81 CEAs will be in the "holding" mode with the UGC energized at low voltage.

During performance of CEA maintenance activities, the subgroup containing the CEA on which the maintenance is to be performed is placed on a Hold Bus. The purpose of the Hold Bus is to allow maintenance to be performed on an individual subgroup without dropping the associated CEAs. This is accomplished by placing an alternate low voltage supply in parallel with, and downstream of, the normal low voltage supply. Once a subgroup has been placed on the Hold Bus, its normal power may be de-energized. The CEAs will remain in place due to the voltage applied to the UGCs; however, the associated CEAs cannot be manually inserted or withdrawn while on the Hold Bus. Only one subgroup can be assigned to the Hold Bus at a time. If a reactor trip signal is received while a subgroup is assigned to the Hold Bus, the Hold Bus is de-energized and all CEAs within the subject subgroup, as well as the remaining CEAs, will insert into the core.

The CEDMCS is described in Sections 4.2.3 and 7.2.1 of the ANO-2 Safety Analysis Report (SAR).

2.3 Current TS Requirements

SR 4.1.3.1.2 requires that each CEA not fully inserted in the core shall be determined to be operable by movement of at least 5 inches in any one direction in accordance with the Surveillance Frequency Control Program. The current frequency for SR 4.1.3.1.2 is 184 days.

2.4 Reason for the Proposed Change

This amendment is necessary due to a failed pull-down coil (PDC) for CEA 29, located atop the Reactor Vessel head, which is used during CEA motion to pull the upper gripper down into position after it has repositioned. This failure was identified during a plant power maneuver to isolate part of the main condenser to repair a tube leak. As a result, a temporary modification (T-mod) was installed to allow the CEA to be withdrawn as power was restored to 100% following condenser maintenance.

While withdrawing Group P in Manual Group Mode for ASI control following a plant power reduction, operators received a Minor CEA Deviation alarm. CEA 29 was approximately four inches low relative to the group. The CEA would not move in either Manual Individual or Manual Group Mode, and the pulse counter did not change during these attempts. The control cabinet showed a motion failure alarm and the lower gripper engaged light remained lit. The condition was documented in a condition report and tracked as an emergent issue.

The inability to move CEA 29 was caused by an open circuit condition in the pull-down coil within the CEDM coil stack. The specific cause of the open circuit has not been identified. A work order has been developed for performance during a forced outage or the next refueling outage to troubleshoot and correct the cause. An Equipment Failure Evaluation (EFE) was performed and identified three likely causes:

1. Failed or degraded connection
2. Damaged cable
3. Failed pull-down coil

The Automatic CEDM Timing Modules (ACTMs) in the CEDM Control System (CEDMCS) use Hall effect transducers to sense coil current. This feedback allows the ACTM to confirm coil presence and proper actuation timing. If the ACTM does not receive the required current feedback during a movement command, it will perform four more successive motion attempts. If all attempts fail, a motion failure alarm is generated. The alarm clears automatically once successful motion occurs. The ACTM also provides protective functions, including automatic transfers between upper and lower gripper coils and a freeze mode that energizes both grippers to prevent rod drop, based on current feedback.

Because the pull-down coil for CEA 29 has an open circuit, the ACTM received no current feedback and could not progress the motion sequence, resulting in a failed movement command. To restore motion capability, a substitute coil was installed by installing an emergency temporary modification. After installation, operations and engineering evaluated CEA 29 and determined it to be operable with compensatory measures. Operability was supported by verified motion in both Manual Individual and Manual Group modes, as well as successful Group P movement to the Upper Electrical Limit. Operators determined CEA 29 to be movable, trippable, aligned with Group P, and capable of performing its credited function. The compensatory measures are the temporary modification and continued operator monitoring.

The temporary modification installed a substitute pull-down coil in the CEDMCS cabinet to simulate current feedback from the pull-down coil, enabling the ACTM to complete its motion sequence. The modification does not alter system logic or ACTM protective functions. The

setup was tested in the Instrumentation and Control (I&C) maintenance shop using a standalone coil and produced satisfactory results.

The pull-down coil's normal function is to assist gravity in returning the upper gripper assembly after lift-coil de-energization, which improves CEA speed. It energizes briefly during each motion sequence and does not perform any gripping or holding functions. Because the substitute coil is electrically connected but not located on the CEA 29 coil stack, it provides electrical feedback but no mechanical assistance.

Without a functioning pull-down coil, CEA 29 moves slightly slower than the other Group P CEAs due to minor differences between the substitute coil and the original coil. This can cause small CEA position deviations, requiring operators to pause and realign CEAs using Manual Individual mode. The temporary modification does not alter ACTM logic, rod drop protection, or ratcheting protection - all protective functions remain fully functional. Post maintenance testing after installation of the temporary modification verified proper motion in both Manual Individual and Manual Group modes.

Because the temporary modification does not alter system logic or ACTM protective functions, it does not introduce additional control system risk. Nonetheless, the installation challenges observed during the first temporary modification installation indicate that there is a possibility that motion commands could result in a CEA drop or ratchet under certain conditions. A failed motion attempt could render CEA 29 immobile and therefore inoperable. According to ACTM design, the gripper holding the CEA will not release unless the other gripper has properly engaged; however, system behavior may be influenced by the temporary modification or other condition. The most likely worst-case scenario would involve repeated failed attempts ultimately resulting in a dropped or ratcheted CEA. Post-installation testing demonstrated that the likelihood of such a drop is low, although the risk cannot be fully eliminated.

To correct the condition, ANO-2 must be in Mode 3 or Mode 5, depending on if the fault is on the reactor vessel head or located elsewhere. Initial troubleshooting can be performed in Mode 3 to determine the location of the fault. Cable and connection troubleshooting requires disconnecting the CEA 29 coil stack, and estimated repair times vary. Repairing a failed connection could possibly be performed within one day, while repairing a failed cable could require up to a week depending on materials, location, and the extent of damage. If the fault is determined to be a failed pull-down coil, ANO-2 must be in Mode 5 so the CEA 29 coil stack assembly could safely be replaced. Coil stack replacement requires the vessel to be cooled and the maintenance structure to be removed. This is estimated to take approximately one week after shutdown.

2.5 Description of the Proposed Change

The proposed change will modify a Note to SR 4.1.3.1.2, previously applicable to CEA 4 during Cycle 26 operation, as follows:

Note 1 - Movement of CEA 429 is not required for the remainder of Cycle-2632. If an outage of sufficient duration occurs prior to the end of Cycle-2632, maintenance activities will be performed to restore the CEA.

3.0 TECHNICAL EVALUATION

All CEA coil stacks and CEDMs were replaced during ANO-2 refueling outage 2R31 (spring 2026) as part of the replacement reactor vessel closure head project.

The CEA drives are electromechanical devices that convert electrical energy into mechanical motion. The CEA coils provide the magnetic flux that operates the mechanical parts of the drive within the pressure housing. Linear motion of these components causes operation of latching devices, which translate the motion of the gripper assembly to the CEDM drive shaft.

Failure Modes

The primary failure modes of an inductor (coil) are:

- One or more winding shorts
- An open coil or bad connection resulting in an open circuit

Heating is the primary driver of both failure modes. The heating is primarily internal and largely a result of the coil being energized. A high resistance connection between the cable and the coil stack at the push connector would be worsened by energization and de-energization of the pull-down coil, eventually resulting in a failed connection.

CEA 29 troubleshooting has indicated an open circuit condition in the field downstream of the CEDMCS cabinets. Possible causes of the open circuit are as follows:

- Failed or degraded connection
- Damaged cable
- Failed pull-down coil

The temporary modification installed a spare pull-down coil in place of the installed pull-down coil to simulate the electrical response expected by the CEDM control system. This allows the control system to perform the CEDM movement sequence with gravity performing the function of resetting the upper gripper instead of positive action from the pull-down coil. Although the CEA was returned to its normal fully withdrawn position, there is concern that continued use of the temporary modification could lead to unintended CEDM operation, resulting in dropping or ratcheting of the CEA. If gravity does not reset the upper gripper in time or to the correct location, the gripper may attempt to latch in the wrong position, such as outside of the lands of the drive shaft or above the normal position for lower gripper engagement.

Movement of CEA 29 in this condition could result in undesired operation of the grippers. This condition increases the potential for dropping the CEA, which could cause a reactivity transient, necessitate a power reduction, and could potentially result in a reactor shutdown. Therefore, Entergy requests NRC approval to not perform SR 4.1.3.1.2 CEA exercise tests for CEA 29 that are due to be performed before repairs can be completed in the fall 2027 refueling outage 2R32.

The purpose of SR 4.1.3.1.2 is to verify that the CEAs are moveable and trippable (i.e., free from mechanical binding). This is accomplished by moving each CEA in the Manual Individual Mode, i.e., only one CEA is moved at a time by the Control Room Operator. Instrument and Control technicians normally verify proper operation of the CEDMCS coils during performance of this test. The technician utilizes a digital recorder with storage/print capabilities, which plots the voltage and current supplied to each coil during a withdrawal or insertion sequence. These traces can be used during troubleshooting efforts to determine if the CEDMCS is energizing the CEA coils in the proper sequence and is applying the proper voltages for the optimum length of time. Successful movement of the CEAs indicates no mechanical binding exists.

As stated in the amendment requests associated with References 1, 2, and 3, the possibility of warped CEAs, which could result in mechanical binding, is minimal. The ANO-2 CEAs were last replaced in 2020. In addition, the five finger design of the CEAs ensures relatively free movement. Because of the design of the CEDMCS, electrical problems will not prevent insertion of a CEA into the core when the reactor trip breakers are opened. However, mechanical failures, which would result in less than full insertion of a CEA upon reactor trip, could be significant, although are much less common and have not been noted during testing.

ANO-2 has not experienced mechanical binding. As stated in the amendment requests for References 1, 2, and 3, only two documented instances of individual CEAs failing to insert fully when tripped have been previously recorded. In both cases, the CEA dropped to approximately 11 inches above the bottom of the core. The cause in each case was debris in the fuel assembly, not mechanical binding. SR 4.1.3.1.2 would not detect this condition since the CEAs moved freely in the upper portion of the core. No further occurrences of CEAs failing to fully insert have been identified since the Reference 3 amendment submitted in January of 2018.

With respect to Combustion Engineering plants such as ANO-2, only a single case of stuck CEA binding has been identified (Reference 4).

All postulated failure modes are associated with the coil and associated control circuitry. The reactor trip circuit breakers (RTCBs) are upstream of the control and power switch assemblies. The RTCBs open upon an automatic or manual reactor trip signal, removing all power from both control and holding circuitry. All coils on each CEA subsequently de-energize resulting in all CEAs inserting into the core. This design is fail-safe in that a loss of power itself, regardless of whether a reactor trip signal has been generated, will result in the CEAs inserting into the core.

As described previously, the CEDMCS is an electromechanical device such that the various grippers associated with each CEA are magnetically coupled to the subject coil; there is no physical (mechanical) coupling between the CEDMCS circuit/coil and the associated gripper. Heating, which is the primary driver of coil degradation, is associated with the internal heating of the coil windings. Any postulated failure mechanism that could prevent rod insertion (such as mechanical binding of the CEA itself) is not influenced or impacted by coil failure or, control or holding circuitry failures. Therefore, there are no postulated failure mechanisms where the coil or associated circuitry could physically prevent rod insertion once the RTCBs have opened (or power is otherwise lost).

In addition, the postulated failure modes would not affect the RTCBs. Although not directly related to the current condition affecting CEA 29, the system is designed in accordance with single failure criteria such that all circuitry will be de-energized even if one RTCB fails to open

upon a reactor trip. The control circuitry does not impact the RTCBs nor is there a failure mode associated with the control circuitry which would prevent the loss of holding power when the RTCBs open. The control circuitry and/or power source interacts with the lifting device magnetically and is not electrically connected to the mechanical "grippers" which perform the actual movement of the CEA. The CEAs are designed to be fail-safe upon a loss of power. Therefore, once power is lost (normally by opening of the RTCBs), no failure mode exists within the CEDMCS control or power circuitry that could interfere with control rod insertion.

Reactivity Impact

Group P and/or Group 6 are used during a plant power maneuver for Axial Shape Index (ASI) control using the Manual Group (MG) control mode. The rods in these groups are inserted to maintain ASI within TS limits (located in the Core Operating Limits Report) and ASI guidance in the Power Operations procedure. The Operations department has developed an Adverse Condition Monitoring and Contingency Planning (ACMP) document that contains general instructions to best mitigate the condition. CEA 29 is a Group P control element assembly. Due to the failed pull-down coil on CEA 29, Reactor Engineering developed contingency reactivity plans that minimize use of Group P. If necessary to use Group P and time allows, the ACMP recommends monitoring CEA 29 coil voltage traces. For emergent ASI and reactor power control, the ACMP directs inserting Group 6 up to and including into the Long-Term Steady State Insertion Limits and not below 80 inches withdrawn prior to utilizing Group P for ASI and power control. If Group P must be used, operators are to monitor for slower response from CEA 29 when compared to the rest of Group P and also monitor the need to align CEA 29 with the rest of the group.

Because CEA 29 is trippable and is expected to remain trippable, no additional reactivity considerations need to be taken into consideration. However, to further demonstrate the acceptability of excluding CEA 29 during future performances of SR 4.1.3.1.2 for the remainder of Cycle 32, the following reactivity information is provided.

The TS definition of Shutdown Margin (SDM) is:

Shutdown Margin shall be the instantaneous amount of reactivity by which the reactor is subcritical or would be subcritical from its present condition assuming all control element assemblies are fully inserted except for the single assembly of highest reactivity worth which is assumed to be fully withdrawn.

ANO-2 TSs 3.1.1.1 (Modes 1 through 4) and 3.1.1.2 (Mode 5) specify that SDM shall be greater than or equal to that specified in the Core Operating Limits Report (COLR). The Cycle 32 COLR SDM operating limit is 5.0% $\Delta k/k$ in Modes 1 through 5. Calculations were performed at various Effective Full Power Days (EFPDs) throughout the remainder of Cycle 32 operation, and Entergy has determined that a minimum SDM of 5.2675% $\Delta k/k$ exists for the remainder of Cycle 32 assuming both CEA 29 and the single CEA of highest reactivity worth to fail to insert, well above the 5.0% $\Delta k/k$ SDM requirement of the COLR. It should be noted that the preceding discussion does not reflect the response of the Control Room Operator. Procedures require emergency boration of the Reactor Coolant System at a minimum rate of 40 gpm (gallons per minute) with 2500 ppm (parts per million) of borated water if one or more CEAs fail to fully insert into the core following a reactor trip. Reactivity control is of primary importance in accident mitigation and Operator training.

The COLR is developed using the NRC approved methodologies listed in Section IV of the COLR. When performing TS SRs to verify that adequate SDM is present, plant procedures use models and methods approved for use by the NRC by acceptance of the Entergy topical report ENEAD-01-P-A, "Qualification of Reactor Physics Methods for the Pressurized Water Reactors of the Entergy System" (Reference 5). The calculations performed to ensure adequate SDM would exist, assuming both CEA 29 and the single CEA of highest reactivity worth failed to insert, use the same models and methods as those used to perform the TS SRs. Based on this, it can be shown analytically that SDM in excess of the COLR limit will be present at all times for the remaining portion of Cycle 32 should CEA 29 fail to insert into the core.

Summary

Based on the above, justification for an amendment request exists and that excluding CEA 29 from further exercise testing for the remainder of Cycle 32 is warranted. Precedent is listed in Section 4.2 of this Enclosure below. Entergy has reviewed the precedents, including any associated Requests for Additional Information, and has included all relevant information within this amendment request.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Plant," requires, in part, safety system designs with adequate margin to ensure specified acceptable fuel design limits are not exceeded. The applicable General Design Criteria (GDC) for CEA design requirements included the following:

GDC-23, "Protection System Failure Modes," requires that the protection system be designed to fail into a safe state;

GDC-25, "Protection System Requirements for Reactivity Control Malfunctions," requires that the protection system be designed to assure that specified acceptable fuel design limits are not exceeded for any single malfunction of the reactivity control systems;

GDC-26, "Reactivity Control System Redundancy and Capability," insofar as it requires that two independent reactivity control systems be provided, with both systems capable of reliably controlling the rate of reactivity changes resulting from planned, normal power changes;

GDC-27, "Combined Reactivity Control Systems Capability," requires that the reactivity control systems be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes under postulated accident conditions, with appropriate margin for stuck rods to assure the capability to cool the core is maintained;

GDC-28, "Reactivity Limits," requires that the reactivity control systems be designed to assure that the effects of postulated reactivity accidents can neither result in damage to the reactor coolant pressure boundary greater than limited local yielding, nor disturb the core, its support structures, or other reactor vessel Internals so as to significantly impair the capability to cool the core; and

GDC-29, "Protection Against Anticipated Operational Occurrences," (AOOs) requires that the protection and reactivity control systems be designed to assure an extremely high probability of accomplishing their safety functions in event of AOOs.

The amendment request has concluded that CEA 29 is not mechanically bound and its failure to insert would not result in inadequate SDM should both CEA 29 and the CEA having the highest reactivity worth fail to insert following a reactor trip. Delaying SR performance for CEA 29 for the remainder of the operating cycle until the pull-down coil can be repaired has no impact on the CEA's ability to move. Because the required shutdown margin will continue to be maintained under the conditions above, the proposed amendment does not challenge any fuel design limits. Furthermore, the amendment request does not affect the plant's second reactivity control system (boration); therefore, compliance with the applicable regulatory requirements is maintained.

4.2 Precedents

This amendment request is similar to that approved for ANO-2 due to degradation of CEA 4 in 2018 (Reference 3), CEA 18 in 2015 (Reference 2), and CEA 43 in 2001 (Reference 1). This amendment request is also similar to that approved for the Palo Verde Nuclear Generating Station, Unit 2, in 2015 (Reference 6) and the Millstone Power Station, Unit 2, in 2017 (Reference 7). Although, these precedents are all for degraded upper gripper coils, the consequences of a CEDM malfunction are very similar (i.e.: CEA drop, CEA ratcheting, or failure of the CEA to trip due to not detecting sticking CEA during rod exercises).

4.3 No Significant Hazards Consideration Analysis

Entergy Operations, Inc. (Entergy) has evaluated the proposed changes to the Technical Specifications (TS) using the criteria in 10 CFR 50.92 and has determined that the proposed changes do not involve a significant hazards consideration.

Entergy proposes a change to a note associated with Arkansas Nuclear One, Unit 2 (ANO-2) TS Surveillance Requirement (SR) 4.1.3.1.2 to eliminate the requirement to move Control Element Assembly (CEA) 29 for the remainder of the current fuel cycle, Cycle 32. Cycle 32 is currently scheduled to end in September of 2027. The SR requires that each CEA not fully inserted in the core shall be determined to be operable by movement of at least five inches in any one direction in accordance with the Surveillance Frequency Control Program (SFCP), which is currently every 184 days.

As required by 10 CFR 50.91(a), Entergy Operations, Inc. (Entergy) has evaluated the proposed changes to the ANO-2 TS and has determined that the proposed changes do not involve a significant hazards consideration. An analysis of the issue of no significant hazards is presented below:

- 1) Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

One function of the CEAs is to provide a means of rapid negative reactivity addition into the core. This occurs upon receipt of a signal from the Reactor Protection System (RPS). This function will continue to be accomplished with the approval of the proposed change. Typically, once per 184 days, each CEA is moved at least five inches to ensure the CEA is free to move. CEA 29 remains trippable (free to move) as illustrated by startup during spring of 2026 and during power restoration following installation of the temporary modification in June 2026. However, due to failure of the pull-down coil, future exercising of the CEA could result in the CEA inadvertently inserting into the core during CEA movement. Undesired operation of a CEA, which includes a CEA drop event, is an abnormal occurrence and has been previously evaluated as part of the ANO-2 accident analysis. Inadvertent CEA insertion will result in a reactivity transient and power reduction and could lead to a reactor shutdown if the CEA is deemed to be unrecoverable. The proposed change would minimize the potential for inadvertent insertion of CEA 29 into the core by maintaining the CEA in place. The proposed change will not affect the CEAs ability to insert fully into the core upon receipt of a reactor trip signal.

No additional modifications are proposed to the RPS or associated Control Element Drive Mechanism Control System (CEDMCS) logic regarding the ability of CEA 29 to remain available for immediate insertion due to a trip signal. The accident mitigation features of the plant are not affected by the proposed amendment. Because CEA 29 remains trippable, no additional reactivity considerations need to be taken into consideration. Nevertheless, Entergy has evaluated the reactivity consequences associated with failure of CEA 29 to insert upon a reactor trip in accordance with TS requirements for Shutdown Margin (SDM) and has determined that SDM requirements would be met should such an event occur at any time during the remainder of Cycle 32 operation.

Therefore, this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

- 2) Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

CEA 29 remains trippable. The proposed change will not introduce any new design changes or systems that can prevent the CEA from performing its specified safety function. As discussed previously, CEA mis-operation has been previously evaluated in the ANO-2 accident analysis. Furthermore, SDM has been shown to remain within limits should an event occur at any time during the remainder of operating Cycle 32 such that CEA 29 fails to insert into the core upon receipt of a reactor trip signal. Therefore, this change does not create the possibility of a new or different kind of accident from an accident previously evaluated.

- 3) Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No

SR 4.1.3.1.2 is intended to verify CEAs are free to move (i.e., not mechanically bound). The physical and electrical design of the CEAs, and past operating experience provides high confidence that CEAs remain trippable whether or not exercised during each SR interval. Excluding further exercising of CEA 29 for the remainder of Cycle 32 operation does not directly relate to the potential for CEA binding to occur. No mechanical binding has been previously experienced at ANO-2. In addition, Entergy has concluded that required SDM will be maintained should CEA 29 fail to insert following a reactor trip at any point during the remainder of Cycle 32 operation.

Therefore, this change does not involve a significant reduction in a margin of safety.

Based upon the reasoning presented above, Entergy concludes that the requested change involves no significant hazards consideration, as set forth in 10 CFR 50.92(c), "Issuance of Amendment."

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) 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.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined the proposed change qualifies for a categorical exclusion from environmental review in accordance with 10 CFR 51.22. The proposed action is confined to changes to surveillance, inspection, or testing requirements as described in 10 CFR 51.22(d)(8). The proposed action does not disturb any previously undisturbed ground and there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, does not result in a significant increase in individual or cumulative public or occupational radiation exposure, and does not result in a significant increase in the potential for or consequences from radiological accidents. Therefore, pursuant to 10 CFR 51.22, neither an environmental assessment nor an environmental impact statement is required.

6.0 REFERENCES

1. NRC Letter to Entergy Operations, Inc. (Entergy), "Arkansas Nuclear One, Unit 2 –Issuance of Amendment Re: Allowance to Eliminate Movement of Control Element Assembly #43 for the Remainder of Cycle 15," (2CNA100104) (ML012960550), Dated October 22, 2001
2. NRC Letter to Entergy, "Arkansas Nuclear One, Unit 2 – Issuance of Amendment Re: Revise Technical Specification Surveillance Requirement to Eliminate Movement of Control Element Assembly 18 for the Remainder of Operating Cycle 24" (2CNA041502) (ML15096A381), Dated April 29, 2015
3. NRC Letter to Entergy, "Arkansas Nuclear One, Unit 2 - Issuance of Amendment to Exclude Exercise of Control Element Assembly 4 With Respect to Surveillance Requirement 4.1.3.1.2 for the Remainder of Cycle 26," (2CNA011803) (ML18011A064), Dated January 18, 2018
4. Constellation Letter to NRC, "Licensee Event Report 2006-002, Rev. 0, Calvert Cliffs Nuclear Power Plant - Control Element Assembly Determined to be Inoperable" (ML061580322), Dated June 5, 2006
5. NRC Letter to Entergy, "Safety Evaluation by the Office of Nuclear Reactor Regulation - Topical Report ENEAD-01-P, Rev. 0, Qualification of Reactor Physics Methods for Application to Pressurized Water Reactors of the Entergy System" (ML20092N101), Dated September 29, 1995
6. NRC Letter to Arizona Public Service Company, "Palo Verde Nuclear Generating Station, Unit 2 – Issuance of Amendment to Amend Technical Specification Surveillance Requirement to Eliminate Movement of Control Element Assembly 88 for the Remainder of Unit 2, Operating Cycle 19 (Exigent Circumstances)" (ML15266A005), Dated September 25, 2015
7. NRC Letter to Dominion, "Millstone Power Station, Unit No. 2 – Issuance of Amendment Re: Technical Specification Surveillance Requirement 4.1.3.1.2 for Control Element Assembly 39" (ML17018A000), Dated February 7, 2017

Attachment 1

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Technical Specification Page Markups

[1 page]

REACTIVITY CONTROL SYSTEMS

ACTION: (Continued)

- e. With more than one CEA misaligned from any other CEA in its group by more than 7 inches (indicated position), be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

- 4.1.3.1.1 The position of each CEA shall be determined to be within 7 inches (indicated position) of all other CEAs in its group in accordance with the Surveillance Frequency Control Program.
- 4.1.3.1.2 Each CEA not fully inserted in the core shall be determined to be OPERABLE by movement of at least 5 inches in any one direction in accordance with the Surveillance Frequency Control Program. [\(Note 1\)](#)

Note 1 - Movement of CEA [429](#) is not required for the remainder of Cycle [2632](#). If an outage of sufficient duration occurs prior to the end of Cycle [2632](#), maintenance activities will be performed to restore the CEA.

Attachment 2

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Technical Specification Pages Retyped

[1 Page]

REACTIVITY CONTROL SYSTEMS

ACTION: (Continued)

- e. With more than one CEA misaligned from any other CEA in its group by more than 7 inches (indicated position), be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

- 4.1.3.1.1 The position of each CEA shall be determined to be within 7 inches (indicated position) of all other CEAs in its group in accordance with the Surveillance Frequency Control Program.
- 4.1.3.1.2 Each CEA not fully inserted in the core shall be determined to be OPERABLE by movement of at least 5 inches in any one direction in accordance with the Surveillance Frequency Control Program. (Note 1)

Note 1 - Movement of CEA 29 is not required for the remainder of Cycle 32. If an outage of sufficient duration occurs prior to the end of Cycle 32, maintenance activities will be performed to restore the CEA.