UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

October 22, 2018

Mr. Richard L. Anderson, Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
N-TSB-58
1448 S.R. 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE - NRC DESIGN BASES ASSURANCE INSPECTION (TEAMS) INSPECTION REPORT (05000313/20180011 and 05000368/20180011)

Dear Mr. Anderson:

On August 31, 2018, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Arkansas Nuclear One, Units One and Two. On September 21, 2018, the NRC inspectors discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented two findings of very low safety significance (Green) in this report. These findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

If you contest the violations or significance of these NCV(s), you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement; and the NRC resident inspector at Arkansas Nuclear One.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region IV; and the NRC resident inspector at the Arkansas Nuclear One.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and at the NRC Public Document

Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Thomas R. Farnholtz, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos. 50-313; 50-368
License Nos. DPR-51; NPF-6

Enclosure:
1. Inspection Report 05000313/20180011 and 05000368/20180011

cc: Electronic Distribution to Arkansas Nuclear One

U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number(s):	05000313, 05000368
License Number(s):	DPR-51, NPF-6
Report Number(s):	05000313/20180011; 05000368/20180011
Enterprise Identifier:	I-2018-011-0005
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1 and 2
Location:	Russellville, Arkansas
Inspection Dates:	August 13, 2018 to August 31, 2018
Inspectors:	W. Sifre, Senior Reactor Inspector, Team Lead N. Okonkwo, Reactor Inspector C. Smith, Reactor Inspector G. Callaway, Senior Reactor Technology Instructor R. Deese, Senior Reactor Analyst
Accompanying Personnel:	C. Baron, Contractor, Beckman and Associates S. Gardner, Contractor, Beckman and Associates
Approved By:	Tom R. Farnholtz, Chief Engineering Branch 1 Division of Reactor Safety

Enclosure

SUMMARY

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting Inspection Procedure 71111.21M, "Design Bases Assurance (Teams)," at Arkansas Nuclear One, Units 1 and 2 in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information. NRC-identified and self-revealed findings, violations, and additional items are summarized in the table below. Licensee-identified non-cited violations are documented in the Inspection Results at the end of this report.

List of Findings and Violations

Failure to Properly Size the Unit 1 Emergency Diesel Generator Room Ventilation Systems			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000313/2018011-01 Closed	None	71111.21M
An NRC identified Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified for failure to properly size the Unit 1 emergency diesel generator room ventilation systems to be capable of removing the design heat load during the most limiting design conditions while maintaining redundancy of the exhaust fans.			

Failure of Both Arkansas Nuclear One Units to Establish Adequate Corrective Actions Resulting in Excessive Instances of Damaged and Broken Internals of the Emergency Feedwater Pump Turbine Steam Admission Check Valves.			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000313/2018011-02 and 05000368/2018011-02 Closed	H.6	71111.21M
An NRC identified Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," was identified for failure to establish an adequate corrective action program and the resulting inability to correct a deficient system design which resulted in damaged and broken internals of the check valves admitting steam to the emergency feedwater pump turbine.			

Additional Tracking Items

Type	Issue number	Title	Inspection Procedure	Status
URI	05000313/2018011-03 and 05000368/2018011-03	Failure to Evaluate the Effects and the Suitability of Components in Containment from a Main Steam Line Break.	71111.21M	Open

INSPECTION SCOPES

Inspections were conducted using the appropriate portions of the inspection procedures (IPs) in effect at the beginning of the inspection unless otherwise noted. Currently approved IPs with their attached revision histories are located on the public website at http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html. Samples were declared complete when the IP requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

REACTOR SAFETY

71111.21M—Design Bases Assurance Inspection (Teams)

The inspectors evaluated the following components and listed applicable attributes, permanent modifications, and operating experience during the weeks of August 13 to August 17, 2018, and August 27 to August 31, 2018:

Component (6 Samples)

(1) Unit 1 Decay Heat Removal Pump Motor P-34A

a) Component system health and maintenance history reports to verify the monitoring of potential degradation.
b) Calculations for motor protection and qualified environmental life, to verify motor protection and remaining life.
c) The protective device settings and circuit breaker ratings to ensure adequate selective protection coordination of connected equipment during worst-case short circuit conditions.
d) Procedures for motor preventive maintenance, inspection, and testing to compare maintenance practices against industry and vendor guidance.

(2) Unit 2 High Pressure Safety Injection Pump Motor 2P-89B

a) Component system health and maintenance history reports to verify the monitoring of potential degradation.
b) Calculations for motor protection and qualified environmental life, to verify motor protection and remaining life.
c) The protective device settings and circuit breaker ratings to ensure adequate selective protection coordination of connected equipment during worst-case short circuit conditions.
d) Procedures for motor preventive maintenance, inspection, and testing to compare maintenance practices against industry and vendor guidance.

(3) Unit 1 Class 1E 4160V Bus A3 - Red Train AC Bus

a) Component system health and maintenance history reports to verify the monitoring of potential degradation.
b) Logic and schematic diagrams for the switchgear and associated feeder circuit breakers.
c) Protective device settings and circuit breaker ratings to ensure adequate selective protection coordination of connected equipment during worst-case short circuit conditions.
d) Licensee procedures and vendor manuals for switchgear and feeder breaker maintenance, overhaul, and surveillances.
e) Sizing and coordination calculations for the associated circuit breakers.

(4) Unit 1 4160V Switchgear A1

a) Component system health and maintenance history reports to verify the monitoring of potential degradation.
b) Logic and schematic diagrams for the switchgear and associated feeder circuit breakers.
c) Protective device settings and circuit breaker ratings to ensure adequate selective protection coordination of connected equipment during worst-case short circuit conditions.
d) Licensee procedures and vendor manuals for switchgear and feeder breaker maintenance, overhaul, and surveillances.
e) Sizing and coordination calculations for the associated circuit breakers.

(5) Unit 1 Emergency Diesel Generator 1K4A

a) Component maintenance history and corrective action program reports to verify the monitoring of potential degradation.
b) Calculations for emergency diesel generator loading, to verify capacity.
c) Procedures for performing integrated engineered safety equipment loading to ensure proper corrective actions were in place regarding previous Component Design Basis Inspection finding, "Failure to Incorporate NRC Safety Guide 9 Criteria into Surveillance Procedures", NCV 05000313/2016008-02.
d) Procedures for generator preventive maintenance, inspection, and testing to compare maintenance practices against industry and vendor guidance.

(6) Unit 1 Emergency Diesel Generator Ventilation Fans K-4A and K-4B

a) Component maintenance history and corrective action program reports to verify the monitoring of potential degradation.
b) Calculations for system air flow rate, pressure losses, and surveillance test acceptance criteria, and minimum acceptable flow rate to satisfy room temperature design limits.
c) Belt driven fan revolutions per minute, motor revolutions per minute, sheave sizes, and available flow area at the inlet and outlet.
d) Procedures for operation of the component and logic diagram for starting and stopping of fans.
e) Damper size and logic for opening and closing for each fan and for combined operation.

Component Large Early Release Frequency (LERF) (1 Sample)

(1) Unit 2 Refueling Water Tank and Water Supply

a) Calculation for system flow rates as well as vortex limit and net positive suction head for each affected pump.
b) Calculations for tank size, including high and low water levels.
c) Requirements and analyses for tank protection from natural phenomena.
d) Suction flow rates, including combined pump suctions capabilities and transfer of flow rate to another source when tank level is low.
e) Tank level and flow instrumentation, and control room indications.

Permanent Modification (4 Samples)

(1) ER-ANO-2002-1381-000, "ANO-1 Steam Generator Replacement"
(2) EC 49431, "Temporary Modification to a Cooling Fan for Startup Transformer #3"
(3) EC 69247, "Update Unit 2 Battery Size and Voltage Drops"
(4) EC 0000072421, "MS-271 / 272 Equivalent Valve Design Change"

Operating Experience (3 Samples)

(1) NRC Generic Letter 2008-01, "Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems."
(2) NRC Information Notice 2006-31, "Inadequate Fault Interrupting Rating of Breakers."
(3) NRC Information Notice 2016-01, "Recent Issues Related to the Commercial Grade Dedication of Allen Bradley 700-RTC Relays."

Evaluation of Inspection Sample Related Operator Procedures and Actions (3 Samples)

(1) Control room operator actions resulting from a simulated station blackout. The Unit 2 Control room crew was expected to start the alternate AC diesel generator and energize a vital AC bus within 10 minutes of station blackout diagnosis.
(2) Control room operator actions resulting from a loss of all feedwater. The control room crew was expected to start a common feedwater pump and feed both Unit 2 steam generators prior to steam generator dryout.
(3) In plant operator actions resulting from simulated station blackout. The in plant operators were expected to locally start the alternate AC diesel generator and make it available to energize a vital AC bus.

INSPECTION RESULTS

Failure to Properly Size the Unit 1 Emergency Diesel Generator Room Ventilation Systems			
Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000313/2018011-01 Closed	None	71111.21M

Introduction:

An NRC identified Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," was identified for failure to properly size the Unit 1 emergency diesel generator room ventilation systems to be capable of removing the design heat load during the most limiting design conditions while maintaining redundancy of the exhaust fans.

Description:

The emergency diesel generator room ventilation system was sized as two redundant fans with 30,000 Cubic Feet per Minute (CFM) capacity each. According to the Updated Final Safety Analysis Report, each fan is capable of maintaining the emergency diesel generator room at its design temperature of 120°F when the outside temperature is 100°F. Bechtel Purchase Order number 6600-M-57AC states that fans VEF-24A, 24B, 24C, and 24D have a flow rating of 30,000 CFM. Design calculation 3600-37 concludes that with 30,000 CFM per fan, the room can be kept at 110°F with two fans operating and at 120°F with one fan operating. However, Startup Test Results titled "Diffuser & Grille Test Sheet" documents the flow rate of each fan as follows: 24A at 22,729 CFM, 24B at 22,680 CFM, 24C at 24,332 CFM, and 24D at 23,555 CFM. Fans 24A and 24B serve Emergency Diesel Generator 1, while fans 24C and 24D serve Emergency Diesel Generator 2. As a result of this discovery, the licensee performed flow rate testing during the inspection and found that the flow rates of the 24A and B fans are 22,051 and 25,301 CFM respectively. The test also specified that the 24A fan loses about 15 percent of its flow rate when it operates with 24B, and that the 24B fan loses about 10 percent of its flow rate when it operates with 24A. The Emergency Diesel Generator 2 fans were also tested during the inspection resulting in the following flow rates: VEF-24C running alone at 21,781 CFM, VEF-24D running alone at 23,431 CFM. Working in tandem, 24C was running at 22,203 CFM and 24D was running at 20,687 CFM.

The results of the tests performed during the inspection also indicate excessive losses of flow rate (up to 15 percent) due to restricted openings of the air inlet and outlet. The restricted openings are also evident from the start up tests showing air pressure of -0.8 inch water gauge (IWG) while the fans' specification limits the air pressure to -0.5 IWG.

The reduced flow rates of the ventilation system negate the 30,000 CFM used in design calculations thereby resulting in a loss of redundancy, as both fans must operate simultaneously in order to achieve the design flow rate during design conditions. This condition has been in existence since 1973.

Corrective Actions: The licensee entered the condition into its corrective action program and initiated the following compensatory measures (Operations directives): (1) Protective Equipment Posting for the four fans stating "Operability Concern Related to VEF-24A/B/C/D Exhaust Fan Flow Rates," and (2) Tagout for EDG-1-VEF-24A/B/C/D stating "This caution is to maintain all EDG fans available. Currently, for each EDG to remain OPERABLE, BOTH

to maintain all EDG fans available. Currently, for each EDG to remain OPERABLE, BOTH associated EDG exhaust fans must remain FUNCTIONAL." The licensee also followed up with Operability Determinations and Determination of Past Operability.

Corrective Action Reference: CR-ANO-1-2018-04294, CR-ANO-1-2018-04314, and CR-ANO-1-2018-04376

Performance Assessment:

Performance Deficiency: The licensee's failure to properly size the Unit 1 Emergency Diesel Generator room ventilation systems to deliver the design flow rate of 30,000 Cubic Feet per Minute by each of its two exhaust fans, as specified in design calculations was a performance deficiency.

Screening: The inspectors determined that the performance deficiency was more than minor because it affected the Mitigating Systems Cornerstone attribute of design control and adversely affected the cornerstone objective of ensuring the reliability, availability and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the capability of the safety related emergency diesel generator room ventilation system is significantly lower than its design parameters such that the plant lost the redundancy inherent in the system and described in the Updated Final Safety Analysis Report.

Significance: The inspectors assessed the significance of the finding using NRC Inspection Manual Chapter 0609, Appendix A, "Significance Determination Process for Findings at Power," dated October 7, 2016. Using Exhibit 2, "Mitigating Systems Screening Questions," the inspectors determined the finding to be of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating structure, system, or component (SSC), and the SSC maintained its operability.

Cross-cutting Aspect: No cross cutting aspect was assigned to this finding because the inspectors determined that the finding did not reflect current licensee performance.

Enforcement:

Violation: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires in part that "measures shall be established to assure that applicable regulatory requirements and the design basis are correctly translated into specifications, drawings, procedures, and instructions" and that "Measures shall also be established for the selection and review for suitability of application of materials, parts, equipment, and processes that are essential to the safety-related functions of the structures, systems and components."

Contrary to the above, since 1973, The licensee failed to assure that applicable regulatory requirements and the design basis were correctly translated into specifications drawings, procedures, and instructions and also failed to assure that measures were established for the selection and review for suitability of application of materials, parts, equipment and processes that are essential to the safety related functions of the structures, systems, and components. Specifically, the Unit 1 Emergency Diesel Generator room ventilation systems are up to 25 percent undersized, hence, cannot obtain the redundancy inherent in the design basis, such that with one fan operating, sufficient flow is achieved to ensure the design function of

maintaining the Emergency Diesel Generator rooms at their design temperature under the most limiting design conditions.

Enforcement Action: This violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2.a of the Enforcement Policy, because it was very low safety significance (Green) and was entered into the licensee's corrective action program as Condition Reports CR-ANO-1-2018-04294, CR-ANO-1-2018-04314, and CR-ANO-1-2018-04376.

Failure of Both Arkansas Nuclear One Units to Establish Adequate Corrective Actions Resulting in Excessive Instances of Damaged and Broken Internals of the Emergency Feedwater Pump Turbine Steam Admission Check Valves.

Cornerstone	Significance	Cross-cutting Aspect	Report Section
Mitigating Systems	Green NCV 05000313/2018011-02 and 05000368/2018011-02 Closed	H.6	71111.21M

Introduction:

An NRC identified Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," was identified for failure to establish an adequate corrective action program and the resulting inability to correct a deficient system design which resulted in damaged and broken internals of the check valves admitting steam to the emergency feedwater turbine.

Description:

The safety-related function of check valve MS-271 is to open and admit steam from its steam generator to the Emergency Feedwater pump turbine and to close to prevent excessive loss of steam flow from the opposite steam generator such that sufficient flow of steam will pass through the sister check valve, MS-272 (and vice versa). The same arrangement applies to the Unit 2 design with check valves 2-MS-39A and 2-MS-39B.

The plant has experienced multiple failures with these check valves since 1986, after the system was modified to include check valves under Design Change DCP-86-1005. The check valves experienced rapid cycling caused by changing steam generator pressures resulting in significant seat damage.

In 1987, Design Change DCP-86-1017 replaced the swing check valves with lift check valves. The lift check valves experienced chatter and abnormal wear due to differential pressure oscillations.

The lift check valves were replaced in December 2000 by Design Change ER99164N101 with spring loaded in-line nozzle check valves. In 2004, the Unit 1 in-line nozzle check valve MS-272 failed testing due to disc/stem bending at the threaded area. The stem was bent at both the diffuser and threaded stem area. Design Change ER-ANO-2004-0373-000 modified the disc/stem material from SA479 Type 316 stainless steel to Inconel 625, and the spring constant was changed from 78 pounds force per inch to 226 pounds force per inch in order to prevent valve closure during testing. The valves experienced additional failures of their

internals. In 2005, Design Change ER-ANO-2005-0014-000 modified the Unit 2 valves to be just like the Unit 1 valves, but additional failures occurred. In 2007, The plant decided to reject a proposed design change by the valve vendor and instead, implemented a practice to "inspect the valves and replace components as necessary." In 2009, as a result of additional failures, LO-WTANO-2009-00021 implemented a design change to heat treat the disc/stem Inconel 625, but more failures of valve internals occurred. In 2011, a Preventive Maintenance strategy was developed to replace the spring and disc prior to static load test failure since the valves experienced failures during these tests. In 2012, the licensee revised Procedure OP-2402.089 to replace the valves' springs during each disassembly and inspection. In 2014, after finding a portion of the stud of Unit 2 check valve 2MS-39A inside check valve 2MS-39B, Modification EC 51099 directed the welding of the pin to the nut to prevent the nut from rotating and ejecting out of the valve body. In 2015, after additional failures, Modification EC54698 reversed the spring action to hold the valve closed rather than open and to completely remove the spring from the sister valve. In 2017, Modification EC 71145 reverted from the 2015 modification back to the 2014 modification (which proved unsuccessful). The modification was implemented in March 2018 and the valve's internals broke again in June 2018.

During the entire process, the valves experienced repeated failures and numerous condition reports were written to document the failures. The condition reports included six apparent cause evaluations and two adverse condition analyses. Yet, as of the time of this inspection, at least one of the check valves is known to have broken internals and if called upon, the system will have to operate with the degraded and non-conforming condition. Operability Evaluations performed for each failure always determined that the valves were operable in spite of their broken internals.

Corrective Actions: The licensee entered the deficient condition into the Corrective Action Program and expressed a commitment to correct the condition and avoid future failures of these check valves.

Corrective Action Reference: CR-ANO-C-2018-03443.

Performance Assessment:

Performance Deficiency: The licensee's failure to correct a condition adverse to quality related to multiple failures of safety-related emergency feedwater pump turbine steam admission check valves was a deficiency.

Screening: The inspectors determined that the performance deficiency was more than minor because it affected the Mitigating Systems Cornerstone and adversely affected the cornerstone objective of ensuring the reliability, availability and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the check valve internals were damaged for long periods of time during the past 32 years and parts of the broken valves were found inside other valves in the system, such that the overall performance of the system could not be considered as reliable as designed.

Significance: The inspectors assessed the significance of the finding using NRC Inspection Manual Chapter 0609, Appendix A, "Significance Determination Process for Findings at Power," dated October 7, 2016. The finding screened as having very low safety significance (Green) because it was a design deficiency that did not represent a loss of operability or

functionality at the time of the inspection; did not represent an actual loss of safety function of the system or train; did not result in the loss of one or more trains of non-technical specification equipment; and did not screen as potentially risk-significant due to seismic, flooding, or severe weather.

Cross-cutting Aspect: Human Performance, H.6, Design Margins, because in the case of these check valves, the organization did not maintain the equipment within their design margins and the design changes did not reflect a rigorous change process.

Enforcement:

Violation: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Actions," requires, in part, that that "Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected."

Contrary to the above, since 1986, the licensee failed to assure that conditions adverse to quality such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances were promptly identified and corrected. Specifically, attempts to correct conditions adverse to quality were unsuccessful when the internals of the safety-related emergency feedwater steam admission check valves were found damaged or broken resulting in the system experiencing multiple and extended periods of degraded and nonconforming conditions.

Enforcement Action: This violation is being treated as a Non-Cited Violation, consistent with Section 2.3.2.a of the Enforcement Policy, because it was very low safety significance (Green) and was entered into the licensee's corrective action program as Condition Report CR-ANO-C-2018-03443.

Unresolved Item (Open)	Failure to Evaluate the Effects and the Suitability of Components in Containment from a Main Steam Line Break.	71111.21M

Description:

The team identified an unresolved item (URI) related to the containment environment that would result from a main steam line break. Specifically, for ANO Unit 1 the licensee did not analyze the containment temperature, or evaluate the suitability of components in containment for the effects of a main steam line break (MSLB) accident. The Final Safety Analysis Report states, in part, that "At the end of Cycle 19, the original once through steam generators (OTSGs) were replaced. In support of Cycle 20 operation, an evaluation of the containment pressure/temperature response with the replacement OTSGs for loss of coolant accidents (LOCA) and MSLB was performed. For the MLSB, the containment pressure response with the replacement OTSGs was bounded by the current analysis. The post-MSLB temperature response with the replacement OTSGs would be worse. Entergy Operations, Inc. has adopted NUREG-0458 into the ANO-1 licensing basis which recognizes that the post-MSLB atmosphere may become superheated, but the temperature spike is of such short duration that the thermal lag of any SSC inside containment will not increase significantly. Consequently, the initial temperature peak does not define operating limits on any system, structure, or component (SSC) and the long-term containment temperature (which is essentially the saturation temperature) dominates the temperature response of SSCs.

Therefore, as long as the peak MSLB pressure is less than the peak pressure following a LOCA, the temperature response of SSCs will still be defined by the LOCA."

The NRC issued several bulletins subsequent to the issuance of NUREG-0458. Specifically IEB-79-01, as supplemented, and NRC Order CLI 80-21 state, in part, that "The Guidelines leave open the question of what standard will be applied to replacement parts in operating plants. Unless there are sound reasons to the contrary, the 1974 standard in NUREG-0588 will apply. The Guidelines and NUREG-0588 apply progressively less strict standards to the older plants. The justification for this position was not articulated at the time the older plants were grandfathered from the provisions of Reg. Guide 1.89."

The NRC issued a Safety Evaluation Report to ANO, which states, in part, "A final rule on environmental qualification of electric equipment important to safety for nuclear power plants became effective on February 22, 1983. This rule, Section 50.49 of 10 CFR 50, specifies the requirements of electrical equipment important to safety located in a harsh environment. In accordance with this rule, equipment for Arkansas Unit 1 may be qualified to the criteria specified in either the DOR Guidelines or NUREG-0588, except for replacement equipment. Replacement equipment installed subsequent to February 22, 1983 must be qualified in accordance with the provisions of 10 CFR 50.49, using the guidance of Regulatory Guide 1.89, unless there are sound reasons to the contrary."

The NRC issued Information Notice 85-39 states, in part, that the "Qualification of some replacement equipment was based on previously allowed DOR guidelines that stated "equipment is considered qualified for main steam line break environmental conditions if it was qualified for a loss-of-coolant accident environment in plants with automatic spray systems not subject to disabling single component failures." This basis of qualification is not acceptable without additional justification for replacement equipment that was procured and installed after February 22, 1983."

The replacement steam generators have several design differences compared to the original steam generators. Specifically, the replacement steam generators were designed with larger secondary volumes, more tubes, flow-restricting venturis, and different materials (Alloy 690 vs. Alloy 600). Because the replacement steam generators were installed in 2005 (after 10 CFR 50.49 became effective on February 22, 1983) all replacement equipment must be qualified using the guidance of NUREG-0588 or Regulatory Guide 1.89. In addition, as stated above the licensee did not analyze or quantify the containment temperature that would result from a MSLB, and instead compared the containment pressures and the mass/energy releases that would result from a MSLB using the superseded guidance of NUREG-0458. The NRC team identified that there are several parameters that could have changed with the replacement steam generators which could impact the containment response. Specifically, input parameters such as: sub-compartment analysis, net positive suction head analysis, containment volume, heat sinks, properties of materials, heat transfer coefficients, initial conditions, and possibly cooling water temperature may affect the containment temperature response.

Planned Closure Action(s): In order to resolve this issue, the NRC needs a list of environmentally qualified components within containment and an analysis for the conditions associated with a main steam line break.

Licensee Action(s): The licensee believes that because the peak temperature associated with a main steam line break is of such short duration, the condition is bounded by the analyzed loss of coolant accident. However, the licensee is providing additional information regarding Environmentally Qualified components in containment for review and assessment.

Corrective Action Reference: Condition Report CR-ANO-C-2018-03439

EXIT MEETINGS AND DEBRIEF

On September 21, 2018, the inspectors presented the inspection results to Mr. R. Anderson, Site Vice President, and other members of the licensee staff. The inspectors confirmed that proprietary information was controlled to protect from public disclosure.

DOCUMENTS REVIEWED

71111.21M—Design Bases Assurance Inspection (Teams)

Condition Reports (Reviewed)

CR-ANO-1-2002-01414	CR-ANO-1-2004-00802	CR-ANO-2-2005-00031
CR-ANO-1-2007-00975	CR-ANO-1-2011-02153	CR-ANO-2-2012-02081
CR-ANO-2-2012-02083	CR-ANO-2-2012-02336	CR-ANO-2-2014-01556
CR-ANO-1-2016-00233	CR-ANO-1-2016-00327	CR-ANO-2-2016-00465
CR-ANO-2-2016-00624	CR-ANO-1-2017-01239	CR-ANO-2-2017-01711
CR-ANO-1-2017-02396	CR-ANO-1-2017-02885	CR-ANO-1-2017-03412
CR-ANO-2-2017-05268	CR-ANO-1-2018-00285	CR-ANO-1-2018-03832
CR-ANO-2-2018-01656	CR-ANO-1-2018-02801	CR-ANO-1-2018-02832
CR-ANO-1-2016-04785	CR-ANO-2-2016-04257	OE-NOE-2016-00051
CR-ANO-1-2017-02331	CR-ANO-2-2018-01717	CR-ANO-1-2010-01538
CR-ANO-2-2016-04257	CR-ANO-1-2016-04785	CR-ANO-1-2017-00894
CR-ANO-1-2016-04241	CR-ANO-1-2017-03986	CR-ANO-1-2017-03385

Condition Reports (Issued)

CR-ANO-1-2018-04238	CR-ANO-1-2018-04239	CR-ANO-1-2018-04314
CR-ANO-1-2018-04376	CR-ANO-1-2018-04377	CR-ANO-1-2018-04378
CR-ANO-1-2018-04294	CR-ANO-2-2018-01656	CR-ANO-2-2018-01661
CR-ANO-2-2018-01717	CR-ANO-2-2018-01872	CR-ANO-2-2018-01893
CR-ANO-2-2018-01907	CR-ANO-2-2018-01952	CR-ANO-C-2018-03439
CR-ANO-C-2018-03443		

Work Orders

00312189	52665015	52691303	52752583
52752523	52706959	52623361	52639301
00376169	50238445	50234809	50980737
50980737	52700344	52415472	52461813
52552897			

Procedures

Number	Title	Revision
1402.192	Disassembly Inspection and Re-Assembly of MS-271 and MS-272	9
2202.008	Station Blackout	16
EN-LI-102	Corrective Action Program	33
1107.002	ES Electrical System Operation	47
1305.006	Integrated ES System Test	51
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