FENOC
FirstEnergy Nuclear Operating Company

Davis-Besse Nuclear Power Station
5501 N. State Route 2
Oak Harbor, Ohio 43449

December 30, 2014
L-14-405

10 CFR 50.90

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

SUBJECT:
Davis-Besse Nuclear Power Station, Unit No. 1
Docket No. 50-346, License No. NPF-3
License Amendment Request for Proposed Revision of Technical Specification 3.6.6, "Containment Spray and Air Cooling Systems"

In accordance with Title 10 of the *Code of Federal Regulations*, (10 CFR), Part 50, Section 50.90, "Application for amendment of license, construction permit, or early site permit." FirstEnergy Nuclear Operating Company (FENOC) hereby requests amendment of Operating License NPF-3 for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). The Surveillance Requirement 3.6.6.8 frequency for verification that each containment spray system spray nozzle is unobstructed would be revised from a fixed ten-year frequency to an event-based frequency.

An evaluation of the proposed amendment is enclosed. FENOC is requesting Nuclear Regulatory Commission (NRC) staff approval by January 6, 2016, and an implementation period of 45 days following issuance of the amendment.

There are no regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing at (330) 315-6810.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 30, 2014.

Sincerely,

David M. Imlay

David M. Imlay
Director, Site Performance Improvement

Enclosure: FENOC Evaluation of the Proposed Amendment

cc: NRC Region III Administrator
Nuclear Reactor Regulation Project Manager
NRC Resident Inspector
Executive Director, Ohio Emergency Management Agency,
State of Ohio (NRC Liaison)
Utility Radiological Safety Board

Subject: Application to Revise Technical Specification 3.6.6, "Containment Spray and Air Cooling Systems."

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1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Operating License No. NPF-3 for the Davis-Besse Nuclear Power Station, Unit No. 1 (DBNPS). The proposed change would revise Technical Specification (TS) 3.6.6, "Containment Spray and Air Cooling Systems." Current Surveillance Requirement (SR) 3.6.6.8 requires verification that each spray nozzle is unobstructed at least once every ten years. The proposed change would revise the fixed ten-year frequency with an event-based frequency.

2.0 DETAILED DESCRIPTION

Technical Specification Surveillance Requirement 3.6.6.8 currently requires verification that each spray nozzle is unobstructed. FirstEnergy Nuclear Operating Company (FENOC) proposes to change the specified frequency of this verification from "10 years" to "Following maintenance that could result in nozzle blockage."

This surveillance is currently conducted during refueling outages. The proposed change would eliminate unnecessary periodic testing of spray nozzles and replace it with event-based testing to be performed following activities or conditions that could potentially cause nozzle blockage. The current surveillance requires personnel to verify air flow at each spray nozzle located at high elevations inside containment. The proposed change is expected to result in a reduction in personnel risk, radiation exposure, and outage costs associated with performing the test.

The proposed technical specification change is shown in Attachment 1. Attachment 2 provides the retyped technical specification. Attachments 3 and 4 provide the related Technical Specification Bases change and are provided for information only. The changes to the affected TS Bases pages will be incorporated in accordance with TS 5.5.13, "Technical Specifications (TS) Bases Control Program."

3.0 TECHNICAL EVALUATION

The containment spray system (CSS) is an engineered safety feature used in response to a postulated loss-of-coolant accident (LOCA). In response to a LOCA, the CSS is designed to remove heat and fission product iodine from the post-accident containment atmosphere. The system cools and condenses the post-LOCA containment atmosphere to reduce the pressure and as a result minimizes the leakage of airborne and gaseous radioactivity from the containment.

These functions are performed by chemically treated water sprayed into the containment atmosphere through nozzles installed on two containment ring headers located near the top of the containment dome. The spray pattern of either of the two independent and redundant spray headers provides adequate volumetric coverage for containment fission product removal. Water from the borated water storage tank (BWST) is slightly acidic, which would lower the effectiveness of the sprays in removing iodine and greatly promote corrosion. Baskets of trisodium phosphate are in the containment so that when sump flooding occurs, neutralization will result. The basic pH of the recirculated sump water enhances the retention of elemental iodine, reduces the potential for stress corrosion cracking of stainless steel components, and reduces hydrogen generation by minimizing corrosive action of the spray. A major benefit of the CSS is removal of iodine from the containment atmosphere. Radioiodine in its various forms is a fission product of primary concern in evaluating the consequences of a LOCA.

The CSS consists of two separate trains of equal capacity, each independently capable of meeting the design basis. Each train includes a containment spray pump, a containment isolation valve that also serves as a throttle valve, piping, instrumentation, and a containment spray ring header with 90 full cone spray nozzles constructed of American Iron and Steel Institute (AISI) 316 stainless steel. One train of containment spray operating with one containment air cooler is designed to remove the total post LOCA heat release to the containment. The two containment spray pumps are single stage, horizontal, centrifugal pumps each driven by a 200 horsepower motor. These pumps supply the containment spray ring headers after a LOCA and thereby cool the containment.

Spray headers are located in the containment building dome. The spray nozzles are spaced on the headers to provide uniform spray coverage of the containment volume above the operating floor. The upper spray ring header is at approximately 807 foot elevation while the lower ring header is at approximately 788 foot elevation. Each containment spray header contains 90 nozzles, each capable of providing the capacity to release 15 gallons per minute at 15.0 pounds per square inch gauge differential pressure. The spray pattern is the full cone type with uniform distribution throughout the spray pattern.

The CSS is actuated either manually or automatically. High containment vessel pressure or low reactor coolant system pressure will open the spray isolation valves. Two containment spray pumps will start upon a higher containment pressure. The pumps take suction initially from the BWST. After the water in the BWST reaches a low level, the spray pump suction is transferred to the containment emergency sump.

<u>Performance History</u>

Preoperational testing of the containment spray system demonstrated the capability of the CSS to provide sufficient flow and respond to a safety features actuation system (SFAS) signal. The testing also demonstrated that the spray nozzles in the containment spray header are clear of obstructions by passing air through them, confirming that all spray nozzle paths were open.

Periodic in-place air flow tests through the spray nozzles are conducted at the interval specified in the TSs. The spray nozzles for DBNPS were initially tested at five-year intervals. As approved by the Nuclear Regulatory Commission (NRC) in License Amendment No. 196 dated March 21, 1995 (ML021210194), the surveillance interval is currently 10 years. The dates for the DBNPS containment spray nozzle testing are listed below and in some cases, included the allowable 1.25 times the interval Frequency as specified in TS 3.0, "SURVEILLANCE REQUIREMENT (SR) APPLICABILITY," SR 3.0.2.

Test Date

March 1977
June 1982
October 1988*
April 1993
February 2005

*Two of the nozzles on each header were inadvertently missed during the inspection; however, these nozzles have been successfully tested twice since that inspection.

The results of each test demonstrated unobstructed flow through each nozzle. These tests confirmed that the nozzles are free from construction debris, and also free from obstructions that could have occurred following startup and operation of the plant. Also, the tests show that the spray nozzles did not become obstructed over a period of normal reactor operation.

Modifications

The containment spray system piping in containment was modified in 2005 to provide the ability to install spectacle flanges that are reoriented during an outage in support of leak rate testing of the associated containment penetrations. The nozzles were successfully tested since this modification. A routine maintenance activity is periodically performed that includes the unbolting of the discharge piping bolted flange and reorienting the associated spectacle flanges. This activity is not expected to trigger the requirement to perform the nozzle air test unless a break down in the established FME controls occurs that results in an intrusion of adverse foreign material that could not be retrieved.

Nozzle Blockage Mechanisms

Boric Acid

A one-time internal remote visual inspection of containment spray train 1 (CS 1) and containment spray train 2 (CS 2) lower elevation discharge piping was performed during the spring of 2014. The limited inspection was performed using a video probe that was inserted into the access point created by the temporary removal of the associated spectacle flange. The inspection access points were at approximately 606 foot and 599 foot elevations. The associated nozzles are at approximately 788 foot and 807 foot elevations. The initial inspection for CS 1 observed white boric acid residue / deposits on the horizontal piping segment at the 598 foot elevation. The inspection revealed two trails of boric acid along the visible length of the horizontal segment, conservatively estimated to be approximately 1 inch in width and one half inch in height. The inspection also revealed what appears to be an older, crystalline residue layer on the piping's elbow transition from the horizontal pipe segment up to the vertical segment. A similar inspection of the CS 2 discharge piping in containment revealed very minor, limited traces of dry white boric acid. The residue was likely the result of evaporation of residual borated water that remained in the discharge segment and was determined to not adversely affect system operability.

As a result of the inspection of a containment spray lower elevation discharge piping, the CS 1 piping was filled with demineralized water to assist in dissolving the minor boric acid residue. After approximately 8 hours of soaking, the piping was drained. An "as-left" inspection indicated only minor trails of boric acid in two locations. The amount of boric acid crystals is minimal and is expected to either immediately dissolve or be dispersed upon initiation of containment spray flow through the piping. Therefore, no adverse chemical or operational impact is expected. Standing water was observed but this was not unexpected because of the preceding rinsing activities.

Corrosion Debris

The CSS headers and nozzles are passive devices that are not normally exposed to fluids or debris. The DBNPS spray rings are maintained dry. The system piping and nozzles are fabricated of stainless steel, which is highly resistant to corrosion. Conditions for stainless steel corrosion (such as stress, temperature, and chlorides) are not present. Standing water is present in system piping up to the normally closed containment isolation valves. Additionally, maintenance activities could permit water to remain in piping up to the BWST level elevation of approximately 625 foot, which is significantly below spray ring elevations. The spring 2014 limited inspection of the piping revealed dull, rust coloration/streaks with no notable depth on distinct areas of the surface near an elbow.

Construction Debris

The spring 2014 limited inspection revealed no foreign material such as construction debris, wire, wood chips, and metal shards during the "as found" or the "as left" inspection.

NRC Generic Letter 93-05, "Line-Item Technical Specifications Improvement to Reduce Surveillance Requirements for Testing During Power Operation," (ML031070342) described a problem at San Onofre Unit 1 that was caused because sodium silicate, a coating material applied to the containment spray system carbon steel piping, clogged seven nozzles. The DBNPS containment spray system piping and nozzles are stainless steel and are not coated; therefore this concern is not applicable to the DBNPS CSS.

Foreign Material Exclusion

The containment spray ring headers and nozzles are located under the domed roof of the containment building and are above the polar crane. The nozzles are located above all equipment in containment except for two maintenance monorails. It is unlikely for any foreign material to travel upward from a work area to enter into the nozzles.

FENOC procedure NOP-WM-4001, "Foreign Material Exclusion," focuses on the prevention of foreign material intrusion into plant systems and components through effective behaviors by all plant workers. The procedure provides guidelines for inspection of work areas, establishing foreign material exclusion (FME) control requirements, and prevents introduction of foreign material into open systems or components. It also requires that personnel performing operating, maintenance, or inspection activities on open systems or within a FME area to be trained to implement the requirements of NOP-WM-4001 or continuously be supervised by a FENOC qualified FME worker.

4.0 REGULATORY EVALUATION

The proposed change would revise Technical Specification 3.6.6, "Containment Spray and Air Cooling Systems." Current Surveillance Requirement 3.6.6.8 requires verification that each spray nozzle is unobstructed at least once every ten years. The proposed change would revise the fixed ten-year frequency with an event-based frequency.

4.1 No Significant Hazards Consideration Analysis

FENOC has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below.

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The containment spray system and its spray nozzles are not accident initiators and therefore the proposed change does not involve a significant increase in the probability of an accident. The revised surveillance requirement will require event-based frequency verification in lieu of a fixed frequency verification. The proposed change does not have a detrimental impact on the integrity of any plant structure, system, or component that may initiate an analyzed event. The proposed change will not alter the operation or otherwise increase the failure probability of any plant equipment that can initiate an analyzed accident. Because the system will continue to be available to perform its accident mitigation function, the consequences of accidents previously evaluated are not significantly increased.

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

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change will not physically alter the plant (no new or different type of equipment will be installed) or change the methods governing normal plant operation. The proposed change does not introduce new accident initiators or impact assumptions made in the safety analysis. Testing requirements continue to demonstrate that the limiting conditions for operation are met and the system components are functional.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

The safety function of the CSS is to spray water into the containment atmosphere in the event of a loss-of-coolant accident to prevent containment pressure from exceeding the design value and to remove fission products from the containment atmosphere.

The CSS is not susceptible to corrosion-induced obstruction or obstruction from sources external to the system. Maintenance activities that unexpectedly introduce unretrievable foreign material into the system would require subsequent verification to ensure there is no nozzle blockage. The spray header nozzles are expected to remain unblocked and available in the event that a safety function is required. Therefore, the capacity of the system would remain unaffected. The proposed change does not relax any criteria used to establish safety limits and will not relax any safety system settings. The safety analysis acceptance criteria are not affected by this change.

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

4.2 Applicable Regulatory Requirements/Criteria

The change described in the license amendment request complies with the following regulation and continues to meet the intent of the applicable General Design Criteria.

10 CFR 50 Appendix A, Criterion 38 – *Containment heat removal.* A system to remove heat from the reactor containment shall be provided. The system safety function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels.

10 CFR Appendix A, Criterion 39 – *Inspection of containment heal removal system.* The containment heat removal system shall be designed to permit appropriate periodic inspection of important components, such as the torus, sumps, spray nozzles, and piping to assure the integrity and capability of the system.

10 CFR Appendix A, Criterion 40 – *Testing of containment heat removal system.* The containment heat removal system shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and performance of the active components of the system, and (3) the operability of the system as a whole, and under the conditions as close to the design as practical the performance of the full operational sequence that brings the system into operation, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of the associated cooling water system.

This request does not change or alter the design of DBNPS. Although a calendar based periodic nozzle flow test would no longer be required, an event or condition based test requirement would provide reasonable assurance that the spray nozzles will perform their safety function.

Based on the above, FENOC concludes that the proposed amendment is acceptable and complies with all of the applicable regulatory requirements.

4.3 Precedent

On December 21, 2012 the NRC issued Amendment No. 203 (ML12334A312) for the Wolf Creek Nuclear Operating Corporation (WCNOC). The amendment revised the containment spray nozzles obstruction surveillance frequency specified in Surveillance Requirement 3.6.6.8 from a fixed "10 year" to "following maintenance that could result in nozzle blockage." Based upon a review of the WCNOC license amendment request submitted on May 2, 2012 (ML12132A050), and the NRC Safety Evaluation supporting the amendment, the Wolf Creek plant appears to be sufficiently similar to DBNPS to provide precedent for approval of this license amendment request.

4.4 Conclusion

The license amendment request proposes revising the containment spray nozzle surveillance (SR 3.6.6.8) to require verification that the nozzles are unobstructed following maintenance that could result in nozzle blockage. The CSS was demonstrated to be OPERABLE prior to initial plant startup. Since then, five successful air flow tests have been performed. Additionally, the design of the system minimizes the likelihood of corrosion, degradation, or inadvertent introduction of FME that could adversely affect the CSS header flow. Industry experience indicates that maintenance activities are the most likely event that would introduce foreign material to cause nozzle blockage. DBNPS uses a FME program during CSS maintenance or modifications that require opening the system. The revision to the surveillance requirement proposed by this license amendment requires verification that each spray nozzle is unobstructed following maintenance activities that could result in nozzle obstruction.

Reduced testing is justified when operating experience has shown that routinely passing a surveillance test performed at a specified interval has no apparent connection to overall component reliability. In this case, routine surveillance testing at the specified frequency is not connected to any activity that may initiate reduced component reliability and therefore is of limited value in ensuring component reliability. The design of the CSS, maintenance and testing history of the system, and FME controls provide reasonable assurance that reduced surveillance frequency will not impact the ability of the system to perform its specified function.

5.0 ENVIRONMENTAL CONSIDERATION

The proposed change would change 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 would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

Proposed Revision of Technical Specification (TS) 3.6.6, “Containment Spray and Air Cooling Systems” for the Davis-Besse Nuclear Power Station, Unit Number 1 (DBNPS) Operating License Number NPF-3

Attachment 1

Proposed Technical Specification Change (Mark-Up)

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1 Page Follows

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.6.3	Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.6.4	Verify each required containment air cooling train starts automatically on an actual or simulated actuation signal.	18 months
SR 3.6.6.5	Verify each required containment air cooling train cooling water flow rate is ≥ 1150 gpm.	24 months
SR 3.6.6.6	Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.6.6.7	Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.6.8	Verify each spray nozzle is unobstructed.	~~10 years~~ Following maintenance that could result in nozzle blockage.

Proposed Revision of Technical Specification (TS) 3.6.6, "Containment Spray and Air Cooling Systems" for the Davis-Besse Nuclear Power Station, Unit Number 1 (DBNPS) Operating License Number NPF-3

Attachment 2

Proposed Technical Specification Change (Re-Typed)

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1 Page Follows

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.6.6.3	Verify each containment spray pump's developed head at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program
SR 3.6.6.4	Verify each required containment air cooling train starts automatically on an actual or simulated actuation signal.	18 months
SR 3.6.6.5	Verify each required containment air cooling train cooling water flow rate is ≥ 1150 gpm.	24 months
SR 3.6.6.6	Verify each automatic containment spray valve in the flow path that is not locked, sealed, or otherwise secured in position, actuates to the correct position on an actual or simulated actuation signal.	24 months
SR 3.6.6.7	Verify each containment spray pump starts automatically on an actual or simulated actuation signal.	24 months
SR 3.6.6.8	Verify each spray nozzle is unobstructed.	Following maintenance that could result in nozzle blockage.

Proposed Revision of Technical Specification (TS) 3.6.6, “Containment Spray and Air Cooling Systems” for the Davis-Besse Nuclear Power Station, Unit Number 1 (DBNPS) Operating License Number NPF-3

Attachment 3

Proposed Technical Specification Bases Change (Mark-Up)

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1 Page Follows

SURVEILLANCE REQUIREMENTS

SR 3.6.6.6 and SR 3.6.6.7 (continued)

at power. Operating experience has shown that these components usually pass the Surveillances when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.6.8

With the containment spray header isolated and drained of any solution, low pressure air or smoke can be blown through test connections. Performance of this Surveillance demonstrates that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded. Due to the passive nature of the design of the nozzles, a test at 10 year intervals is considered adequate to detect obstruction of the spray nozzles.

REFERENCES

1. UFSAR, Appendices 3D.1.34, Criterion 38 – Containment Heat Removal; 3D.1.35, Criterion 39 – Inspection of Containment Heat Removal System; 3D.1.36, Criterion 40 – Testing of Containment Heat Removal System; 3D.1.37, Criterion 41 – Containment Atmosphere Cleanup; 3D.1.38, Criterion 42 – Inspection of Containment Atmosphere Cleanup Systems, and 3D.1.39, Criterion 43 – Testing of Containment Atmosphere Cleanup Systems.

2. UFSAR, Section 6.2.2.

3. UFSAR, Section 6.2.

4. UFSAR, Figure 6.2-26.

5. BAW-2295-A, Revision 1, Justification for Extension of Allowed Outage Time for Low Pressure Injection and Reactor Building Spray Systems.

6. ASME Code for Operation and Maintenance of Nuclear Power Plants.

Surveillance Requirement SR 3.6.6.8 requires verification that each nozzle is unobstructed following maintenance that could cause nozzle blockage. Normal plant operation and maintenance activities are not expected to trigger performance of this surveillance requirement. However, activities such as an inadvertent spray actuation that causes fluid flow through the nozzles, or a loss of foreign material control when working within the respective system boundary may require surveillance performance. An evaluation, based on the specific situation, will determine the appropriate method (e.g., visual inspection, air, or smoke flow test) to verify no nozzle obstruction.

Proposed Revision of Technical Specification (TS) 3.6.6, "Containment Spray and Air Cooling Systems" for the Davis-Besse Nuclear Power Station, Unit Number 1 (DBNPS) Operating License Number NPF-3

Attachment 4

Proposed Technical Specification Bases Change (Re-Typed)

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1 Page Follows

BASES

SURVEILLANCE REQUIREMENTS

SR 3.6.6.6 and SR 3.6.6.7 (continued)

at power. Operating experience has shown that these components usually pass the Surveillances when performed at the 24 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

SR 3.6.6.8

Surveillance Requirement SR 3.6.6.8 requires verification that each nozzle is unobstructed following maintenance that could cause nozzle blockage. Normal plant operation and maintenance activities are not expected to trigger performance of this surveillance requirement. However, activities such as an inadvertent spray actuation that causes fluid flow through the nozzles, or a loss of foreign material control when working within the respective system boundary may require surveillance performance. An evaluation, based on the specific situation, will determine the appropriate method (e.g., visual inspection, air, or smoke flow test) to verify no nozzle obstruction.

REFERENCES

1. UFSAR, Appendices 3D.1.34, Criterion 38 – Containment Heat Removal; 3D.1.35, Criterion 39 – Inspection of Containment Heat Removal System; 3D.1.36, Criterion 40 – Testing of Containment Heat Removal System; 3D.1.37, Criterion 41 – Containment Atmosphere Cleanup; 3D.1.38, Criterion 42 – Inspection of Containment Atmosphere Cleanup Systems, and 3D.1.39, Criterion 43 – Testing of Containment Atmosphere Cleanup Systems.

2. UFSAR, Section 6.2.2.

3. UFSAR, Section 6.2.

4. UFSAR, Figure 6.2-26.

5. BAW-2295-A, Revision 1, Justification for Extension of Allowed Outage Time for Low Pressure Injection and Reactor Building Spray Systems.

6. ASME Code for Operation and Maintenance of Nuclear Power Plants.