1. Procedure/test/change: T9-96-0142; DRP # 6-077
(Procedure, Mod #, Temp alt #, NWR #, DCR #, etc)

Station / Unit: Byron/Braidwood / 1&2 Applicable Modes: All

Other Relevant Plant Conditions: None

System(s) affected: CS

Equipment #(s): N/A

Equipment Name(s): Containment Spray System

2. a. Describe the proposed change.

Revision of B/B UFSAR per DRP 6-077. In addition, the Byron/Braidwood Containment Spray System Description and Surveillance Procedure 1,2 B(w)VS 6.2.2.d-1 will be revised.

b. Describe the reason for the change.

The purpose of this change is to update the Byron/Braidwood UFSAR, System Description and surveillance procedures in order to reflect the results of a Containment Spray (CS) system design basis review and reconstitution. This effort was performed to reflect the current CS surveillance requirements, system and component design parameters and the impact on related systems, equipment or design constraints. This effort applies to Byron and Braidwood Units 1 and 2. These changes are summarized below:

- Changes to the FSAR to include a more comprehensive discussion of the CS system design bases, system design parameters for fission product removal and testing and inspection programs.
- Changes to the CS Surveillance Procedure 1,2 B(w)VS 6.2.2.d-1 (which verify and validate the Spray Additive System (SAS) flow rate pursuant to Technical Specification 4.6.2.2.d) to increase the reliability of the system performance flow rate methodology.
- Changes to the CS System Description document to include more design detail and to reflect as-built system and component design conditions.

The scope of the design basis review and reconstitution consisted of the following:

- Reviewing previous CS design calculation parameters and assumptions,
- Reviewing any differences in system design or operation between Byron and Braidwood,
- Summarizing the CS Pre-Operational Test results to confirm that the CS design and operability requirements are reflected,
- Revising the Spray Additive Tank (SAT) Stress Report and the associated CS Overpressure Protection Report to reflect an increase in the SAT internal design pressure from 1.3 psig to 15 psig (reference calculation BYR-96-113 rev. 0),
- Performing the system design calculations for minimum (BYR-96-060 rev. 0) and maximum spray pH (BRW-96-342-M, rev. 0/BYR-96-170, rev. 0), and maximum sump pH (BRW-96-438-M, rev. 0/BYR-96-169 rev. 0), and the addressing of any Environmental Qualification (EQ) concerns as a result of these calculations.

- Re-performing calculations to determine the resulting hydrogen generation inside of containment. The UFSAR updates related to combustible gas control inside containment are being performed separately under DRP-6-108.

3. Document Review: List the SAR sections which describe the affected systems, structures, or components (SSCs) operations or activities. List any other controlling documents such as SERs, 10CFRs, Regulatory Guides, Fire Protection Report(FPR), Offsite Dose Calculation (ODCM), Core Operating Limits Report (COLR), previous modifications or safety evaluations, etc.

Technical Specifications :

3/4.3, Instrumentation

3/4.6, Containment Systems

3/4.7, Plant Systems

Bases for 3/4.3

Bases for 3/4.6

UFSAR Sections :

Master List of Figures

UFSAR Section 1.2, "General Plant Description"

UFSAR Section 1.3, "Comparison Tables"

UFSAR Section 1.7, "Drawings"

UFSAR Section 3.1, "Conformance with GDC"

UFSAR Section 3.2, "Classification of Structures, Systems and Components"

UFSAR Section 3.6, "Protection Against Dynamic Effects"

UFSAR Section 3.6, Tables

UFSAR Section 3.6, Attachment 3.6C

UFSAR Section 3.6, Attachment 3.6D

UFSAR Section 3.7, "Seismic Design"

UFSAR Section 3.8, Tables

UFSAR Section 3.9, Tables

UFSAR Section 3.10, "Seismic Qualification"

UFSAR Section 3.11, "Environmental Design"

UFSAR Section 3.11, Tables

UFSAR Section 6.1, "ESF Materials"

UFSAR Section 6.2, "Containment Systems"

UFSAR Section 6.2, Tables

UFSAR Section 6.3, "ECCS"

UFSAR Section 6.3, Tables

UFSAR Section 6.3, Attachment 6.3

UFSAR Section 6.4, Tables

UFSAR Section 6.5, "Fission Product Removal and Control Systems"

UFSAR Section 6.5, Attachment 6.5A

UFSAR Section 7.1, "Introduction - Instrumentation and Controls"

UFSAR Section 7.3, "ESF Actuation System"

UFSAR Section 7.3, Tables

UFSAR Section 7.5, "Safety-Related Display Instrumentation"

UFSAR Section 8.1, "Introduction - Electric Power"

UFSAR Section 8.3, Tables

UFSAR Section 9.2, "Water Systems"

UFSAR Section 9.2, Tables

UFSAR Section 9.3, "Process Auxiliaries"

UFSAR Section 9.4, "HVAC Systems"

UFSAR Section 9.4, Tables

UFSAR Section 11.1, "Source Terms"

UFSAR Section 12.3, "Radiation Protection Design Features"

UFSAR Section 12.3, Tables

UFSAR Section 13.4, "Review and Audit"

UFSAR Section 13.5, "Plant Procedures"

UFSAR Section 13.6, "Physical Security"

UFSAR Section 14.0, "Initial Test Program"

UFSAR Section 15.0, "Accident Analysis"

UFSAR Section 15.6, "Decrease In Reactor Coolant Inventory"

UFSAR Section 15.6, Tables

UFSAR Section 16.3, Tables

UFSAR Appendix A, "Application of NRC Regulatory Guides"

UFSAR Appendix E, "Requirements Resulting From TMI-2 Accident"

Safety Evaluation Report (SER) :

Chapter 1, "Introduction"

Chapter 6, "Engineered Safety Features"

Chapter 7, "Instrumentation and Control"

Chapter 9, "Auxiliary Systems"

Chapter 12, "Radiation Protection"

Chapter 14, "Initial Test Program"

Chapter 15, "Accident Analysis"

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4. Describe how the change will affect plant operation when the changed SSCs function as intended (i.e., focus on system operation/interactions in the absence of equipment failures). Consider all applicable operating modes. Include a discussion of any changed interactions with other SSCs. The description should provide all relevant information necessary for a reviewer unfamiliar with the change, to understand plant operational impact without reference to other sources.

The CS system is an emergency system that is designed to remove fission products from the containment atmosphere for the purpose of minimizing offsite radiological dose following a Loss of Coolant Accident (LOCA). It also serves to reduce the containment pressure and temperature following a LOCA and main steam line break (MSLB) by virtue of the condensation of steam on the spray droplets.

The proposed changes to the UFSAR, System Description and Surveillance Test Procedures 1/2 B(w)VS 6.2.2.d-1 will not affect plant operation in any manner. The UFSAR Sections which are affected provide the descriptive details on the CS system design and operation. There is no impact on plant operation due to the proposed changes to the Surveillance Test Procedures 1/2 B(w)VS 6.2.2.d-1. The revisions to the procedure add steps that further ensure system operation is within the design basis. The plant may be in any operating mode to perform this Surveillance Test (which is performed at least once every 5 years). While in Modes 5 or 6, LCOAR entry is not required. For testing in Modes 1,2, 3 or 4, LCOAR's 1/2B(w)OS 6.2.1-1a must be entered.

Calculations performed to determine sump pH indicate that the final containment recirculation sump pH is within the Byron/Braidwood Technical Specification basis of 8.0 to 11.0 assuming the worst-case operational parameters; however, it was demonstrated that the injection spray pH could reach a value which is higher than established by the Standard Review Plan 6.5.2, Rev. 1, and could exist for a time of 61 minutes (assuming worst case failures). Standard Review Plan 6.5.2, Rev. 2 has no such limit. Engineering evaluations have determined that this short-term increase in spray pH does not result in any plant operational consequences, as both the Environmental Qualification of equipment important to safety and hydrogen generation inside of containment were found to be within the plant established acceptance limits.

Spray pH also has an effect on iodine adsorption. Iodine removal is sensitive to pH in that the partition factor is directly related to the pH (ANS-56.5-1979 figure 8.3-1). Figure 8.3-1 provides that the same partition factor is allowed for NaOH solutions with a pH

from 8.5 to 11. In addition, WCAP-12635 states that the specification of CS pH for fission product control was based upon the assumptions that iodine removal capability of unadjusted boric acid spray is low, that iodine removal efficiency is greatly enhanced at pH values greater than 8.5, and that gaseous elemental iodine is the dominant species released from the reactor core. As a result, the spray system design is constrained to limit the spray pH to greater than 8.5 to ensure iodine removal and less than or equal to 10.5 for EQ concerns. Since it has been shown that the spray pH will be greater than 8.5, there are no concerns with the iodine adsorption ability of the CS system.

5. Describe how the change will affect equipment failures. In particular, describe any new failure modes and their impact during all applicable operating modes. Consider any new failure modes identified in Attachment D, Design Issues Worksheet

   No new equipment failure modes are created or introduced due to the proposed change to the UFSAR Sections, System Description and Surveillance Test Procedures 1/2 B(w)VS 6.2.2.d-1. The changes do not constitute a design change to the CS system since the function and operation of the system remain the same. The effects of increased pH on plant equipment has been found acceptable and will not result in new failures. The revisions to the procedure add steps that further ensure system operation is within the design basis.

6. Identify each accident or anticipated transient (i.e., large/small break LOCA, loss of load, turbine missiles, fire, flooding. A list is found in the station specific attachment) described in the SAR where any of the following is true:

   - The change alters the initial conditions used in the SAR analysis
   - The changed SSC is explicitly or implicitly assumed to function during or after the accident
   - Operation or failure of the changed SSC could lead to the accident

ACCIDENT	SAR SECTION
MSLB	15.1.5
LOCA	15.6.5
Inadvertent Operation of Containment Spray	6.2.1.1.3

7. To determine if the probability or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR may be increased, **use one copy of this page** to answer the following questions **for each accident** where the answers differ between each accident scenario listed in Step 6. **PROVIDE** an explanation for all NO answers. See procedure body for guidance in answering questions.

Affected accident: Main Steam Line Break (MSLB) Inside Containment

SAR Section: 15.1.5

If more than one, use attachments. Attachments? ☒ Yes ☐ No

a. May the probability of the accident be increased? ☐ Yes ☒ No

If No, explain:

The changes to UFSAR and System Description descriptive detail do not change any probabilities of a MSLB accident. The Containment Spray System cannot initiate a MSLB.

b. May the consequences of the accident (off-site dose) be increased? ☐ Yes ☒ No

If No, explain:

The CS system will function as designed to reduce containment temperature and pressure following a MSLB inside containment. The CS system is not required to function after a MSLB outside containment. The spray additive portion of the CS system is not required to function after a MSLB since no fuel failure is postulated to occur. Therefore, the consequences of a MSLB accident inside or outside containment are not increased.

c. May the probability of a malfunction of equipment important to safety increase? ☐ Yes ☒ No

If No, explain:

The CS system will continue to perform its intended function with the same reliability as assumed in the MSLB accident. The probability of the CS system malfunctioning is not increased by the proposed changes. Since a high CS system pH only results when the CS pump is taking a suction from the recirculation sump with caustic addition, and caustic addition is secured upon identification of a MSLB, high pH is not a concern. No other safety-related equipment is affected.

d. May the consequences of a malfunction of equipment important to safety increase? ☐ Yes ☒ No

If No, explain:

The CS system will continue to operate as designed to mitigate the consequences of a MSLB. No other safety related equipment is affected. Therefore, the consequences of a malfunction are not increased.

If any answer to Question 7 is YES, then a Unreviewed Safety Question exists.

7. To determine if the probability or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR may be increased, **use one copy of this page** to answer the following questions **for each accident** where the answers differ between each accident scenario listed in Step 6. **PROVIDE** an explanation for all NO answers. See procedure body for guidance in answering questions.

Affected accident: Loss Of Coolant Accident (LOCA)

SAR Section: 15.6.5

If more than one, use attachments. Attachments? ☒ Yes ☐ No

a. May the probability of the accident be increased? ☐ Yes ☒ No

If No, explain:

The changes to the UFSAR, B(w)VS 6.2.2.d-1 and the System Description do not change any probabilities of a LOCA. The Containment Spray System cannot initiate a LOCA.

b. May the consequences of the accident (off-site dose) be increased? ☐ Yes ☒ No

If No, explain:

The consequences of a LOCA are not increased since the CS system will function as designed to reduce containment temperature and pressure following a LOCA. In addition, the spray additive portion of the CS system will function to adsorb iodine and mitigate the re-evolution of iodine in the containment recirculation sump.

c. May the probability of a malfunction of equipment important to safety increase? ☐ Yes ☒ No

If No, explain:

The CS system will continue to perform their intended function with the same reliability as assumed in the LOCA. The probability of the CS system malfunctioning is not increased by the proposed changes.

In addition, the short-term increase in spray pH does not affect the probability of EQ equipment malfunction based on the following (reference EQ ER 00-96-008):

- Components sensitive to spray are protected from chemical spray, and terminations are protected from direct spray exposure.
- The duration for the increased spray pH is short (61 minutes assuming worst case failures), and the higher pH spray fluid remaining on equipment will be decreased by the subsequent spray with a pH of 10.5 or lower.
- The cables that may be exposed to spray have jacket materials that exhibit excellent resistance to NaOH at high temperatures.

In conclusion, the probability of malfunction of equipment important to safety does not increase as a result of these changes.

d. May the consequences of a malfunction of equipment important to safety increase? ☐ Yes ☒ No

If No, explain:

The CS system will continue to operate as designed to mitigate the consequences of a LOCA. No other safety related equipment is adversely affected. Therefore, the consequences of a malfunction are not increased.

If any answer to Question 7 is YES, then a Unreviewed Safety Question exists.

7. To determine if the probability or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the SAR may be increased, **use one copy of this page** to answer the following questions **for each accident** where the answers differ between each accident scenario listed in Step 6. **PROVIDE** an explanation for all NO answers. See procedure body for guidance in answering questions.

Affected accident: Inadvertent Operation of Containment Spray

SAR Section: 6.2.1.1.3

If more than one, use attachments. Attachments? ☒ Yes ☐ No

a. May the probability of the accident be increased? ☐ Yes ☒ No

If No, explain:

The changes do not affect the probability of an inadvertent Containment Spray Actuation. The initial conditions, failure modes and resulting effects are not changed from the original evaluation for this event.

b. May the consequences of the accident (off-site dose) be increased? ☐ Yes ☒ No

If No, explain:

No systems or components that are required to mitigate this event are affected. Therefore, the consequences of the event are not increased.

c. May the probability of a malfunction of equipment important to safety increase? ☐ Yes ☒ No

If No, explain:

Neither the probability nor the consequences of the inadvertent spray accident are changed from that of the original accident scenario. The inadvertent actuation is detected and halted within the same time period as assumed in the original accident scenario. Therefore, the spray pH during the actuation will be within acceptable EQ limits. The probability of equipment important to safety malfunctioning is not increased.

d. May the consequences of a malfunction of equipment important to safety increase? ☐ Yes ☒ No

If No, explain:

No systems or components that are required to mitigate this event are affected. Therefore, the consequences of safety related equipment malfunction are not increased.

If any answer to Question 7 is YES, then a Unreviewed Safety Question exists.

8. Based on your answers to Questions 4 and 5, does the change adversely impact systems or functions so as to create the possibility of an accident or malfunction of a type different from those evaluated in the SAR? ☐ Yes ☒ No

   Describe the rationale for your answer:

   No new accidents or malfunctions of a different type than that described in the UFSAR are created by the proposed changes. The proposed changes to Surveillance Test Procedure 1/2 B(w)VS 6.2.2.d-1 are being made to ensure system operation within its design basis.

   In addition, engineering evaluations have demonstrated that the short-term increase in spray pH during a LOCA will not result in any plant operational consequences, as both the environmental qualification of equipment important to safety and hydrogen generation inside containment were found to be within the plant established acceptance limits.

   No new failure modes are created or introduced as a result of these changes. As a result, no adverse impact to systems or functions occurs such that the possibility of an accident or malfunction different than those identified in the SAR could occur.

If the answer to Question 8 is YES, then a Unreviewed Safety Question exists.

9. To determine the factors affecting the specification, it is necessary to review the SAR and SER where the Bases Section of the Technical Specifications does not explicitly state the bases. List each Technical Specification (Safety Limit, Limiting Safety System Setting or Limiting Condition for Operation) where the requirement, associated action items, associated surveillance, or bases may be affected.

   List:

   Tech Spec 4.6.2.2, Spray Additive System Surveillance Requirements

> **NOTE**
> **If a Technical Specification revision is involved, the change cannot be implemented until the NRC issues a license amendment. When completing Step 13, indicate that a Technical Specification revision is required.**

10. Will the change involve a Technical Specification revision? (See procedure for guidance) ☐ Yes ☒ No

11. Determine if parameters used to establish the Technical Specification limits are changed or affected. **Use one copy of this page** to answer the following questions **for each Technical Specification** listed in Step 10. List the Technical Specification Technical Specification Bases, SER and SAR sections reviewed for this evaluation.

Technical Specification 4.6.2.2
SER Section N/A
SAR Section N/A
(Enter N/A if none are affected and check last option.)
If more than one, use attachments. Attachments? ☐ Yes ☒ No

Determine which of the following is true for the above specifications:

☒ All changes to the parameters or conditions used to establish the Technical Specification requirements are in a conservative direction. Therefore, the actual acceptance limit need not be identified to determine that no reduction in margin of safety exists - proceed to Question 12.

☐ The Technical Specification or SAR provides a margin of safety or acceptance limit for the applicable parameter or condition. List the limit(s)/margin(s) and applicable reference for the margin of safety below - proceed to Question 12.

☐ The applicable parameter or condition change is in a potentially non-conservative direction and neither the Technical Specification, the SAR, or the SER provides a margin of safety or an acceptance limit. Request Nuclear Licensing assistance to identify the acceptance limit/margin for the Margin of Safety determination by consulting the NRC, SAR, SERs, or other appropriate references. List the limit(s)/margin(s) below

☐ The change does not affect any parameters upon which Technical Specifications are based, therefore, there is no reduction in the margin of safety - NA Question 12 and proceed to Question 14.

List Acceptance Limits(s)/Margin(s) of Safety:

12. Use the above limits to determine if the margin of safety is reduced (i.e., the new values exceed the acceptance limits). Describe the rationale for your determination. Include a description of compensating factors used to reach that conclusion.

The margin of safety is not reduced. The final sump pH has been found to be within that described in Technical Specification 4.6.2.2 basis in that it will remain within the range of 8.0 to 11.0. This sump pH will be within EQ limits during CS recirculation (≤10.5) which is conservative with respect to this Technical Specification basis.

The flow rate of NaOH prescribed in Technical Specification 4.6.2.2 has been reviewed and found conservative in that a much broader range of flow rates would be acceptable.

If a Margin of Safety is reduced an Unreviewed Safety Question exists.

13. Is a revision to the SAR or Technical Specifications needed?

☒ Yes ☐ No

14. Check one of the following:

☒ No Unreviewed Safety Question will result (Steps 7, 8, 12) AND no Technical Specification revision will be involved. The change may be implemented in accordance with applicable procedures.

☐ An Unreviewed Safety Question was identified in Step 7, Step 8, or Step 12. The proposed change MUST NOT be implemented without NRC approval.

☐ A Technical Specification revision is involved; but no Unreviewed Safety Question will result. The proposed change requires a License Amendment. Notify Station Regulatory Assurance and Nuclear Licensing that a Technical Specification revision is required. Mark below as applicable:

- ☐ The change is not a plant modification or minor plant change and will not be implemented under 10CFR50.59. Upon receipt of the approved Technical Specification change from the NRC, the change may be implemented.
- ☐ The change is a design change. Mark below as applicable:
  - ☐ A revision to an existing Technical Specification is required. The change MUST NOT be installed until receipt of an approved Technical Specification revision.
  - ☐ The change will not conflict with any existing Technical Specifications and only new Technical Specifications are required. In these cases, Nuclear Licensing may authorize installation, but not operation, prior to receipt of NRC approval of the License Amendment. If such authorization is granted, the block below should be checked.
  - ☐ Nuclear Licensing has authorized installation, but not operation, prior to receipt of NRC approval of the License Amendment. The 10CFR50.59 Safety Evaluation indicates that no Unreviewed Safety Question will result and provides authority for installation only.

NOTE

Partial modifications and/or separate 10CFR50.59 reviews for portions of the work may be used to facilitate installation.

15.

Preparer: Frank L. Brueckmann 11/19/96
Signature Date

16. The reviewer has determined that the documentation is adequate to support the above conclusion and agrees with the conclusion. Ensure an updated copy is sent to Reg. Assurance.

Reviewer: K. J. Sumstad 11/19/96
Signature Date

-NOTICE-

The Containment Spray (CS) System Design Description is being issued **"FOR INFORMATION AND REFERENCE".**

The System Design Description (SDD) contained within has been prepared, reviewed and approved by ComEd Site Engineering. This document reflects the most recent design documentation at time of issue.

Components identified in the SDD System's Component Classification Matrix (CCM) as potentially reclassified cannot be considered reclassified until ComEd (and Westinghouse's, where applicable) concurrence and until appropriate design documents have been revised accordingly (e.g., design drawings, FSAR, etc.).

Inquiries on technical portions of this document should be directed to Byron/Braidwood Site Engineering.

The SDD provides documentation of the system's design requirements. The SDD and its Appendices does not change the system's design.