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ATTACHMENT 2

# TECHNICAL EVALUATION REPORT
# PUMP AND VALVE INSERVICE TESTING PROGRAM
# BRAIDWOOD NUCLEAR POWER STATION, UNITS 1 AND 2

Docket Nos. 50-456 AND 50-457

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## ABSTRACT

This Lockheed Martin Idaho Technologies Company (LMITCO) report presents the results of our evaluation of the Braidwood Nuclear Power Station, Units 1 and 2, Inservice Testing Program for pumps and valves whose function is safety-related.

## PREFACE

This report is supplied as part of the "Review of the Proposed Alternative Testing and Relief Requests for the Braidwood Nuclear Power Station, Units 1 and 2, Inservice Testing Program Second Ten Year Interval Which Require NRC Review" being conducted for the U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Reactor Regulation, Mechanical Engineering Branch, by LMITCO, Nuclear Operations Support Programs.

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# TECHNICAL EVALUATION REPORT
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## 1. INTRODUCTION

Contained herein is a technical evaluation of the pump and valve inservice testing (IST) program submitted by the Commonwealth Edison Company (ComEd) for its Braidwood Nuclear Power Station, Units 1 and 2.

By a letter dated April 16, 1998, ComEd submitted Revision 0 of their IST Program Plan for Pumps and Valves for Braidwood Nuclear Power Station, Units 1 and 2. The program for the second 10-year interval begins on July 29, 1998 and continues through July 28, 2008. The program was reviewed to verify compliance of proposed tests of pumps and valves whose function is safety-related with the requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1989 Edition.

This technical evaluation report (TER) does not address any IST program revisions subsequent to those noted above. Program changes involving additional or revised relief requests should be submitted to the U.S. Nuclear Regulatory Commission (NRC) under separate cover in order to receive prompt attention, but should not be implemented prior to review and approval by the NRC.

In its IST program, ComEd requests relief from the Code testing requirements for specific valves. These requests were evaluated individually to determine if the criteria in 10 CFR 50.55a for granting relief or authorizing alternatives are met for the specific valves. This review was performed utilizing the acceptance criteria and guidance of the following:

- Standard Review Plan, Section 3.9.6
- Draft Regulatory Guide and Value/Impact Statement titled "Identification of Valves for Inclusion in Inservice Testing Programs"
- Generic Letter No. 89-04, "Guidance on Developing Acceptable Inservice Testing Programs"
- NUREG 1482, "Guidelines for Inservice Testing at Nuclear Power Plants"
- NUREG/CR-6396, "Examples, Clarifications, and Guidance on Preparing Requests for Relief from Pump and Valve Inservice Testing Requirements"
- Summary of Public Workshops Held in NRC Regions on Inspection Procedure 73756, "Inservice Testing of Pumps and Valves," and Answers to Panel Questions on Inservice Testing Issues

IST Program testing requirements apply only to component testing (i.e., pumps and valves) and are not intended to provide the basis to change the licensee's current Technical Specifications for system test requirements.

Section 2 of this report presents the scope of the Braidwood Nuclear Power Station, Units 1 and 2, review.

Section 3 of this report presents the ComEd bases for requesting relief from the OM Code requirements for the Braidwood Nuclear Power Station, Units 1 and 2, valve testing program and Lockheed Martin Idaho Technologies Company's (LMITCO's) evaluations and conclusions regarding these requests.

Appendix A contains a listing of inconsistencies and omissions in the licensee's program noted during this review. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

Appendix B contains a listing of issues identified during a review of portions of the Containment Spray (CS) and Feedwater (FW) systems. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

Appendix C provides a brief description of the licensee's justifications for deferring tests to cold shutdowns or refueling outages.

This TER, including all relief requests and component identification numbers, is applicable to Units 1 and 2. The Unit 2 designator has been placed following the Unit 1 designator separated by a slash, where possible, to minimize repetition, i.e., 1/2FW079A. A zero used as a designator indicates that the component is common to both Units 1 and 2.

## 2. SCOPE

The LMITCO staff reviewed the Braidwood Nuclear Power Station, Units 1 and 2, inservice testing (IST) program valve relief requests, cold shutdown justifications, and refueling outage justifications. The staff specifically reviewed portions of the Containment Spray (CS) and Feedwater (FW) systems. The staff identified on the plant's P&ID(s) components in the CS and FW systems listed in the IST program and evaluated the test(s) designated in the IST program to assess compliance with the applicable American Society of Mechanical Engineers (ASME) Operations and Maintenance (OM) Code test requirements. Following this review, the staff assessed portions of the designated systems for completeness (to determine if additional components should have been included in the IST program). This review yielded a list of issues that should be addressed by the licensee as summarized in Appendices A and B.

# 3. VALVE TESTING PROGRAM

The Braidwood Nuclear Power Station, Units 1 and 2, IST program submitted by the Commonwealth Edison Company was examined to verify that all valves that are included in the program are subjected to the periodic tests required by the ASME Code, Section XI, 1989 Edition, and the NRC positions and guidelines. The reviewers found that, except as noted in Appendix C or where specific relief from testing has been requested, these valves are tested to the Code requirements and the NRC positions and guidelines. Each ComEd basis for requesting relief from the valve testing requirements and the reviewers' evaluation of that request is summarized below and grouped according to the system and valve Category.

## 3.1 Main Feedwater

### 3.1.1 Category C Valves

3.1.1.1 Relief Request. Valve Relief Request VR-1 requests relief from the exercising requirements of OM-10, Para. 4.3.2, for the check valves in the line from the main feedwater pumps to the steam generators, 1/2FW079A, B, C, and D, and proposes to include these valves in a sample disassembly and inspection group and to disassemble and inspect one valve from the group each refueling outage on a rotating basis.

3.1.1.1.1 Licensee's Basis for Requesting Relief–The main feedwater header flow check valves are 16-inch tilting disk check valves built with a vertical piston and rod assembly that serves as a controlled closure mechanism; the valves do not have external position indicators. The valves are designed to have a delayed closure time of 2 to 3 seconds to isolate flow during a feedwater line break accident without inducing significant water hammer transients. Their closed safety functions are to 1) mitigate a loss of secondary inventory and/or make-up, and 2) provide pressure integrity between the safety and non-safety related portions of piping.

These valves cannot be exercised to their closed position during power operations because feed flow to a steam generator would be isolated, causing loss of Steam Generator water inventory and a subsequent low S/G Level Reactor Trip.

Non-intrusive testing during cold shutdowns has been attempted at Braidwood Station with unreliable results. Specifically, ultrasonic examination of the piston rod position has not conclusively demonstrated valve closure. The anti-slam mechanism prevents the disk from traveling completely to its seat after cessation of forward flow. In fact, during normal feedwater system shutdown evolutions, the valves routinely come to rest at a partial open position -- substantial reverse flow or reverse differential pressure (.5 psid) would be required to bring the disk into contact with the seat. This is in accordance with the valve's design.

Traditional backflow testing methods were considered, but it has been determined that reverse flow and/or differential pressure sufficient to close the valve cannot be obtained without major modification to the existing plant configuration. Clearly, acoustic testing techniques which require contact noise between disk and seat cannot be used for this application, either.

Full-stroke exercising these valves by performing complete disassembly and inspection of each valve during cold shutdown conditions is undesirable and impractical because:

1) The main feedwater system would have to be drained. This would both delay reactor start-up and eliminate a method of reactor decay heat removal. The latter, in particular, could adversely affect shutdown safety.

2) Complete disassembly often requires machining activities that remove metal from the valve walls which may jeopardize minimum wall thickness. If minimum wall thickness is approached, then costly and difficult weld overlay techniques and associated machining would be required.

3) Scaffolding must be built and removed to allow examination of these valves.

4) Disassembly and inspection activities are extremely complicated for these valves, based on the piston assembly. Significant wear and tear is imposed on these valves in order to disassemble and reassemble them for inspection and test, to the point of being detrimental to the valve's material condition.

Full-stroke exercising these valves by performing partial disassembly (i.e. removing only the bonnet) of all four valves on a refueling or cold shutdown frequency is burdensome because of the system draining necessary and the potential wall material loss associated with disassembly and inspection work.

Because major plant modifications would be required to establish enough reverse flow/pressure to fully close the valves, in-service testing in accordance with NRC Generic Letter 89-04 is justified. The Generic Letter allows valves of the same design (manufacturer, size, model number, and materials of construction) and the same service conditions including valve orientation to be classified in sample disassembly and inspection groups. There may be up to four members in the group with testing of one valve in the group during each refueling outage.

In-service testing of the valves that close on a feedwater isolation signal, including the safety-related feedwater containment isolation valves (FW009A-D), the non-safety related feedwater regulating valves (FW510, 520, 530, 540), and the feedwater regulating bypass valves (FW510A, 520A,...) helps ensure that the power operated valves and the system are capable of safely responding to an initiating feedwater line break accident regardless of FW079 check valve position.

The alternate test method is sufficient to ensure operability of these valves and is consistent with Generic Letter 89-04 sample disassembly and inspection program. The alternate test method in conjunction with other existing in-service testing of feedwater valves is more than sufficient to ensure the system's ability to safely respond to a feedwater line break accident.

Proposed Alternate Testing: The four valves on each unit are of the same design (manufacturer, size, model number, and materials of construction) and have the same service conditions, including orientation; therefore, they form a sample disassembly group. One valve from each group, on a per unit basis, will be fully disassembled and examined each refueling outage. If the initial "fully" disassembled valve is not capable of being full stroke exercised or if there is binding or failure of internals, subsequent disassembly and inspection of the remaining three group members will be commensurate with the initial valve's failure mode.

Commensurate means that the remaining three valves may be "partially" disassembled, which refers to the removal of the bonnet for inspection of the accessible components (e.g. seal ring, mating surfaces), and also for manual full stroke closing. A "fully" disassembled valve (minimum of one per outage) would additionally include removal of the valve cylinder, giving access to the disk and seating surfaces. The subsequent disassembly requirements would be satisfied through either "partial" or "full" disassemblies depending on what is found with the initial disassembled valve. This will both satisfy the testing requirements to demonstrate all four valves' ability to perform their safety function and minimize the potential concerns regarding minimum wall thickness discussed earlier. This approach is consistent with Generic Letter 89-04, position 2.

A partial stroke test following disassembly (full or partial) is not required for these check valves since an "as left" stroke is performed prior to the installation of the bonnet. The installation of the bonnet does not affect the stroke of the valve. In addition, the plant operates with these valves in the open position and open stroke problems would be readily identified during plant startup.

3.1.1.1.2 Evaluation–There are two separate issues involved in this relief request. The first involves the frequency for the disassembly and inspection of the subject check valves and is evaluated under "Sample Disassembly and Inspection" below. The second issue deals with post maintenance testing of the disassembled valves prior to returning them to service. This second issue is evaluated under "Post Maintenance Testing."

**Sample Disassembly and Inspection**

The subject valves are simple check valves in the main feedwater lines to the steam generators. They are normally open during power operations to supply feedwater to the generators. These valves do not have position indication, therefore, the only practicable conventional method of verifying a full-stroke exercise closed is to perform a reverse flow differential pressure test. It is impractical to stop feedwater flow to a steam generator during power operations because this would cause a loss of steam generator water level control and could result in a low steam generator level reactor trip. The anti-slam feature of these valves can result in the valve hanging partially open even when feedwater flow has been stopped. A relatively substantial differential pressure must be established in the reverse flow direction to ensure positive closure of these valves. There are no provisions for establishing and verifying a substantial reverse differential pressure across these valves. Even if the valves can be closed using a reverse differential pressure, valve design precludes the verification of closure using non-intrusive techniques. For these reasons, the only practicable method of verifying the reverse flow closure capability of these valves is disassembly and inspection. The NRC has determined that the appropriate frequency for performing check valve disassembly and inspection is during reactor refueling outages.

Paragraph 4.3.2.4(c) of OM-10 allows that "As an alternative to the testing ... [exercising a check valve with flow or a manual exerciser], disassembly every refueling outage to verify operability of check valves may be used." Therefore, check valve disassembly and inspection is permitted by the Code and relief is not required. However, the Code requires each valve to be disassembled and inspected each refueling outage. Generic Letter 89-04, Position 2, permits a sampling program to be used for the disassembly and inspection of certain check valves. The Generic Letter states: "Where the licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage, a sample disassembly and inspection plan for groups of identical valves in similar applications may be employed." Generic Letter 89-04 grants relief to use sample disassembly and inspection of check valves if it is performed in accordance with the requirements of Position 2.

Based on the determination that check valve disassembly and inspection during refueling outages is authorized by OM-10 and that disassembly and inspection of each group valve every refueling outage would result in hardship or unusual burden to the licensee without providing a compensating increase in the level of quality and safety and considering the licensee's proposed sample disassembly and inspection of the subject check valves is performed in accordance with the conditions specified in GL 89-04, Position 2, the alternative should be authorized in accordance with 10 CFR 50.55a(a)(3)(ii).

**Post Maintenance Testing**

Paragraph 3.4 of OM-10 requires that a valve that has undergone maintenance have "an inservice test run prior to the time it is returned to service ... to demonstrate that the performance parameters which could be affected by the ... maintenance are within acceptable limits." The NRC staff has determined that check valve disassembly and inspection is a maintenance activity that requires post maintenance testing. However, the staff recognizes that in most cases, disassembly and inspection is performed because it is impractical or burdensome to full-stroke exercise the affected check valves using flow or by mechanical exerciser, therefore, they permit the use of a partial-stroke exercise following valve reassembly to satisfy the requirement for post maintenance testing of valves that have been disassembled and inspected. In their response to Question Group 11 for GL 89-04, Position 2, the staff stated: "partial stroke exercise testing with flow is expected to be performed after the disassembly and inspection is completed but before returning the valve to service."

The last paragraph of the proposed alternate testing for Valve Relief Request VR-1 indicates that a partial stroke test following disassembly will not be performed on the subject valves. Since the licensee's proposal does not fully comply with the GL 89-04 position and is a deviation from the requirements of Paragraph 3.4 of the OM Code, relief is necessary from this requirement.

The licensee stated that an "as left" stroke is performed on the disassembled valve prior to the installation of the bonnet. However, since the valve is still partially disassembled when this manual exercise is performed, the test is not truly a post maintenance test. In addition, the exercise is not performed in accordance with all of the requirements of Paragraph 4.3.2.4(b) (e.g., the force or torque required to initiate valve movement is not measured), therefore, the manual exercise cannot satisfy the post maintenance testing requirements of the Code.

The licensee indicated that these check valves must open to allow normal feedwater flow to the steam generators, therefore, any problem with a valve that had been disassembled would be readily identified during plant startup. Because establishing normal feedwater flow through these check valves during plant startup would provide indication of proper reassembly for a valve that had been disassembled, requiring the licensee to establish feedwater flow into a steam generator during the refueling outage would be a hardship without a compensating increase in the level of quality and safety.

Based on the determination that requiring the licensee to establish flow into the steam generators to exercise these feedwater check valves with flow during refueling outages would result in hardship or unusual burden to the licensee without providing a compensating increase in the level of quality and safety and considering the licensee's proposal to verify proper reassembly of these valves during plant startup following the refueling outage, the alternative should be authorized in accordance with 10 CFR 50.55a(a)(3)(ii).

## 3.2 Containment Spray System

### 3.2.1 Category A/C and C Valves

3.2.1.1 Relief Request. Valve Relief Request VR-2 requests relief from the full-stroke exercising requirements of OM-10, Para. 4.3.2 for the following containment spray check valves and proposes to include these valves in sample disassembly and inspection groups and to disassemble and inspect one valve from each group every refueling outage on a rotating basis.

| Valves | Safety Position | Function |
|---|---|---|
| 1/2CS003A/B | Open | Supply water to the spray nozzles |
| 1/2CS008A/B | Open | Provides flow path to spray nozzles |
| | Closed | Containment isolation |
| 1/2CS011A/B | Open | Supplies NaOH to suction of the CS pump (eductor outlet) |
| 1/2CS020A/B | Open | Supplies NaOH to suction of the CS pump (eductor inlet/ discharge of spray additive tank) |
| | Closed | Prevents backflow to the spray additive tank (quarterly test) |

3.2.1.1.1 Licensee's Basis for Requesting Relief–General: Currently full flow recirculation flow paths do not exist for the Containment Spray pumps. Extensive modifications to the existing plant design would be required to accommodate full flow testing of the 1/2CS003A,B and 1/2CS008A/B check valves, including the penetration of containment integrity. Additionally, NaOH in the spray additive tank limits the stroking of the 1/2CS011A,B and 1/2CS020A/B valves. Finally, the use of nonintrusive techniques, such as acoustic monitoring and magnetics, have not been successful in proving full stroking on this type of valve (dual disk).

Generic Letter 89-04, position 2, "Alternative to Full Flow Testing of Check Valves" allows for disassembly and inspection of check valves on a sampling basis during refueling outages. The purpose of this relief request is twofold. One is to establish a basis for performing disassemblies on these valves during refueling outages as established in Generic Letter 89-04, position 2. The second purpose is to establish a basis for performing disassembly and inspection using a sampling plan at the same approximate frequency as refueling outages, every 18 months, but not necessarily during the refueling outage mode (such as performing the disassembly and inspection during an operating mode). This second purpose would apply to the 1/2CS003A/B, 1/2CS011A/B, and 1/2CS020A/B. The 1/2CS008A/B valves disassemblies will remain during outages, due to their physical location in containment.

Per NUREG 1482, Appendix A, "Positions, Questions, Responses and Current Considerations Regarding Generic Letter 89-04," Question Group 14 considers the question of disassembling valves during a non-refueling outage schedule. Under "Current Considerations" for this question group, it states that "If it is practical to disassemble and inspect the selected valves at a frequency not determined by refueling outages, the licensee may establish a schedule for these valves that does not conform to a refueling outage schedule. However, ….entry into an LCO to perform the activity may not be acceptable (See Section 3.1.2)." Braidwood Station feels that the entry into the Containment Spray LCO to perform these check valve inspections would not create a significant safety or equipment problem which would discourage this activity. Per Braidwood Technical Specifications, there is a 7 day LCO to restore an inoperable Containment Spray System. If this could not be met, then the shutdown process would begin. However, the work involved with these check valves is easily completed within the 7 day LCO. Additionally, having a Containment Spray Train inoperable is low in risk significance when considering Braidwood's PRA analysis. Braidwood Station feels that it would be practical to disassemble and inspect these valves during non outage time periods. The NUREG 1482 Appendix A discussion discussed above, provides that a schedule may be established that does not conform to a refueling outage schedule.

Previous inspections at Byron and Braidwood Stations have shown no evidence of degradation or physical impairment which would inhibit the valves from performing the functions described in this relief request. These valves are not expected to experience degradation or impairment since the valves are infrequently actuated. A company wide check valve evaluation addressing the "EPRI Application guidelines for Check Valves in Nuclear Power Plants" revealed that the location, orientation and application of these valves are not conducive to the type of wear or degradation correlated with SOER 86-03 type problems. An 18 month frequency is being requested for the 1/2CS003A/B, 1/2CS011A/B, and 1/2CS020A/B valves to be consistent with Braidwood's current refueling outage frequency of 18 months.

Because of the significant work involved with the isolation, draining, maintenance, inspections, and partial stroke testing of the valves, along with the superior results of past inspections, it is clearly impractical and burdensome to perform disassemblies as frequently as quarterly or during cold shutdowns.

Additional technical support in justification for this relief request is provided for each set of valves in parts A through D of this section.

A. 1/2CS008A, B: With the existing plant configuration, these valves cannot be full flow or partial flow tested during unit operation, cold shutdown or refueling, as water from the CS pumps would be discharged through the CS ring headers, causing undesirable effects on system components inside containment. Additionally, it is impractical to erect temporary large bore piping from the CS line to the reactor cavity, during cold shutdowns or refueling outages, in order to perform a full stroke test on these valves. The filling of the cavity would require the removal of the reactor vessel head to preclude equipment damage from borated water and the construction of the temporary piping would take an estimated nine to twelve shifts (or longer) to complete. There would be even more time involved with the draining and removal of the piping from containment following the completion of the test.

Partial stroking of these valves using air during unit operation, cold shutdown, or refueling does not provide adequate assurance of valve operability and may be detrimental for the following reasons:

a. There is no correlation between air flow and angle of disc movement.

b. Venting and draining the required portion of piping to perform this test may cause deposition of boric acid residue which could in turn promote binding of the check valve internals.

B. 1/2CS003A, B: These valves cannot be full stroke tested due to the existing plant configurations, as previously discussed for the 1/2CS008A, B valves. However, these valves are partially stroked quarterly since they are in the flow path of their respective Containment Spray pump runs.

C. 1/2CS01 1A, B: These valves cannot be full stroke tested during unit operation or cold shutdown as NaOH from the spray additive tank would be discharged throughout the CS system causing undesirable chemical effects on the reactor makeup supply (RWST) and associated systems. Additionally, personnel safety would also be a factor, since NaOH is a hazardous caustic chemical. However, these valves are partially stroked quarterly during respective Containment Spray Pump runs in which the eductor flow passes through the valve, while the spray additive tank is isolated, thereby eliminating the NaOH flow required for the full stroke.

Full flow testing of these valves is accomplished a minimum of once every 5 years through the use of a temporary test hook-up in which flushing of the system is necessitated. Performing this testing on a more frequent basis is undesirable due to the accumulation of nearly two 55 gallon drums of potentially radioactive/toxic mixed waste that requires either recycling or disposal. Additionally, the handling of this material poses a significant safety hazard to personnel, potentially resulting in eye damage and/or chemical burns if splashed or spilled. This testing, currently performed every five years per Technical Specifications, would be impractical and burdensome to perform on a more frequent basis.

Non-intrusive techniques (acoustics and magnetics) have been attempted with unsuccessful results since the amount of flow required to full stroke the disks (critical velocity of 10 ft/sec) cannot be obtained based on current system design.

D. 1/2CS020A, B: These valves cannot be full stroked or partial stroked during unit operation, or cold shutdowns, for the same reasons as stated for the full flow testing of the 1/2CS011A, B valves. The Spray Additive tank is isolated during pump runs, so no flow is passed through the 1/2CS020A, B valves during this testing.

Additionally, the Technical Specifications full flow test, performed a minimum of once every five years, would apply to these check valves in addition to the 1/2CS011A/B valves. The hardship involved with the hazardous mixed waste disposal and handling caustic material with regards to personnel safety does not provide a compensated increase in safety of the CS system equipment (in regards to performing the test more than once every five years). The five year frequency on this Technical Specifications test in conjunction with the disassemblies performed, will more than adequately ensure operability of these valves.

Proposed Alternate Testing: Per Generic Letter 89-04, position 2, "...valve disassembly and inspection can be used as a positive means of determining that a valve's disk will full stroke exercise open..." Once stroked in the full open position, the valve's discs are then returned to their full closed position. The provisions of this position may be used in the case of the CS check valves for the open direction as follows:

The A and B train valves for each valve number are of the same design (manufacturer, size, model number, and materials construction) and have the same service conditions, including orientation, and, therefore, form sample disassembly groups.

| Group 1 (U-1) | Group 2 (U-1) | Group 3 (U-1) | Group 4 (U-1 ) |
|---|---|---|---|
| 1CS003A | 1CS008A | 1CS011A | 1CS020A |

| Group 1 (U-1) | Group 2 (U-1) | Group 3 (U-1) | Group 4 (U-1 ) |
|---|---|---|---|
| 1CS003B | 1CS008B | 1CS011B | 1CS020B |

| Group 5 (U-2) | Group 6 (U-2) | Group 7 (U-2) | Group 8 (U-2) |
|---|---|---|---|
| 2CS003A | 2CS008A | 2CS011A | 2CS020A |
| 2CS003B | 2CS008B | 2CS011B | 2CS020B |

Group numbers 1, 3, 4, 5, 7, and 8: One valve from each group, on a per unit basis, will be disassembled on an eighteen month frequency without restrictions on plant mode. Additionally, following re-installation, the 1/2CS003A, B and 1/2CS011A, B valves will be partial stroke tested using the CS pumps and the 1/2CS020A, B valves will be partial stroke tested using an alternate water source (Note: the 1/2CS020A, B test for the closed position is currently performed quarterly). When the Technical Specification full stroke testing of the respective CS020 and CS011 valves is completed, it may be used to satisfy the full stroke testing in lieu of the disassembly plan (if within the 18 month frequency guidelines established).

If a valve disassembled during power operation is found failed, Braidwood will evaluate the operability status of the remaining valve in the group. Expanding the sample expansion to the other valve in the group will be determined from the guidance provided by Generic Letter 89-04.

Group numbers 2 and 6: One valve from each group, on a per unit basis, will be disassembled on a refueling outage frequency. If the disassembled valve is not capable of being full-stroke exercised or if there is binding or failure of valve internals the remaining valve on the affected unit will be inspected prior to startup. This methodology is consistent with Generic Letter 89-04, position 2; prior NRC approval is not required. Since partial stroke testing is impractical, the as-left Appendix J leak rate test ensures the correct installation of the valve.

3.2.1.1.2 Evaluation–Because of major differences in the proposed alternate testing for the valves in this request, the evaluation is broken up into two sections, one for valves 1/2CS008A and B and the other for the remaining valves addressed by VR-2.

**Valves 1/2CS008A and B**

Valves 1/2CS008A and B are simple check valves in the containment spray pump discharge lines to the containment spray nozzles. These valves are located inside containment and do not have position indication, therefore, the only practicable conventional method of verifying a full-stroke exercise open is to pass maximum accident condition flow through the valves. The only flow path through these valves is into the spray nozzles and into the reactor containment, therefore, exercising these valves open with flow would result in spraying large quantities of water into containment. It is impractical to establish spray flow into the containment for testing during any plant mode, because this could result in damage to equipment and instrumentation. Full-stroke exercising the subject valves open with flow could only be accomplished if full flow test lines were installed downstream of the valves. Installing such test lines would be burdensome to the licensee and could result in reduced system reliability because of the increased chance of operator or equipment failure. Since it is impractical to exercise these valves open using conventional methods, the licensee's proposal to disassemble and inspect them may be the only practical method to verify their full-stroke capability.

Paragraph 4.3.2.4(c) of OM-10 allows that "As an alternative to the testing ... [exercising a check valve with flow or a manual exerciser], disassembly every refueling outage to verify operability of check valves may be used." Therefore, check valve disassembly and inspection is permitted by the Code and relief is not required. However, the Code requires each valve to be disassembled and inspected each refueling outage. Generic Letter 89-04, Position 2, permits a sampling program to be used for the disassembly and inspection of certain check valves. The Generic Letter states: "Where the licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage, a sample disassembly and inspection plan for groups of identical valves in similar applications may be employed." Generic Letter 89-04 grants relief to use sample disassembly and inspection of check valves if it is performed in accordance with the requirements of Position 2.

Paragraph 4.3.2.4(c) of OM-10 allows that "As an alternative to the testing ... [exercising a check valve with flow or a manual exerciser], disassembly every refueling outage to verify operability of check valves may be used." Therefore, check valve disassembly and inspection is permitted by the Code and relief is not required. However, the Code requires each valve to be disassembled and inspected each refueling outage. Generic Letter 89-04, Position 2, permits a sampling program to be used for the disassembly and inspection of certain check valves. The Generic Letter states: "Where the licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage, a sample disassembly and inspection plan for groups of identical valves in similar applications may be employed." Generic Letter 89-04 grants relief to use sample disassembly and inspection of check valves if it is performed in accordance with the requirements of Position 2.

Based on the determination that check valve disassembly and inspection during refueling outages is authorized by OM-10 and that disassembly and inspection of each group valve every refueling outage would result in hardship or unusual burden to the licensee without providing a compensating increase in the level of quality and safety and considering the licensee's proposed sample disassembly and inspection of the subject check valves is performed in accordance with the conditions specified in GL 89-04, Position 2, the alternative should be authorized in accordance with 10 CFR 50.55a(a)(3)(ii).

<u>**Valves 1/2CS003A, 1/2CS003B, 1/2CS011A, 1/2CS011B, 1/2CS020A, and 1/2CS020B**</u>

The subject valves are simple check valves in the Containment Spray System that do not have position indication or other means to verify their open position, therefore, the only practicable conventional method of verifying a full-stroke exercise open is to pass maximum accident condition flow through the valves. Valves 1/2CS003A and 1/2CS003B are on the discharge of the containment spray pumps and the only viable full-flow path through these valves is into the spray nozzles and into the reactor containment, therefore, establishing full-flow through these valves would necessitate spraying large quantities of water into containment. It is impractical to establish spray flow into the containment for testing during any plant mode, because this could result in damage to equipment and instrumentation.

Valves 1/2CS011A and 1/2CS011B are in the spray additive eductor loop flow paths and valves 1/2CS020A and 1/2CS020B are in the paths from the spray additive tank to the suction of the eductors. Unless extensive system flushes and drains are performed to clean out the NaOH from the spray additive tank, it is impractical to exercise these valves with flow at any frequency because it could result in contaminating the refueling water storage tank (RWST) or containment sump with highly caustic NaOH. Contamination of the RWST could result in contamination of the reactor coolant system (RCS) which could result in the RCS not meeting water chemistry limits and in damage to RCS piping and reactor components. Injecting NaOH contaminated water into the sump could result in damage to equipment inside of the sump. In addition, because of the production of large quantities of hazardous waste and personnel hazards associated with working with this hazardous liquid, it is not practical to flush and drain the system to allow full stroke exercising of these valves with flow more frequently than the once every 5 years as required by the Technical Specifications.

Because it is impractical to routinely full-stroke exercise these valves with flow, the licensee has proposed to use a sample disassembly and inspection program for these valves. As discussed above, OMa-1988, Part 10, permits disassembly and inspection of check valves each refueling outage and relief is granted by GL 89-04 to perform disassembly and inspection of identical valves in similar applications on a sampling basis if it is performed in accordance with Position 2 of the Generic Letter. The licensee's request differs from the approved testing in that they desire to disassemble and inspect the subject valves on an interval that corresponds with refueling outages (i.e., once every 18 months), but not necessarily during the outage. This situation is addressed in Appendix A of NUREG 1482 in the Current Considerations discussion for Question Group 14. In this section, the staff states: "If it is practical to disassemble and inspect the selected valves at a frequency not determined by refueling outages, the licensee may establish a schedule for these valves that does not conform to a refueling outage schedule. However, because disassembly and inspection is a maintenance activity and not a surveillance, entry into an LCO to perform the activity may not be acceptable..."

The licensee has demonstrated the impracticality of routinely exercising these valves open using flow, however, they have not demonstrated why it is impractical to disassemble and inspect these valves on a sampling basis during refueling outages in accordance with GL 89-04, Position 2. In fact, it is practical to disassemble and inspect these valves during refueling outages, therefore, relief cannot be granted in accordance with 10 CFR 50.55a(f)(6)(i). In VR-2, the licensee does not address the hardship or burden associated with disassembling these valves during refueling outages. Therefore, the alternative cannot be authorized in accordance with 10 CFR 50.55a(a)(3)(ii).

The only remaining means by which relief for the proposed frequency may be granted or the alternative authorized is under 10 CFR 50.55a(a)(3)(i). Approval under 10 CFR 50.55a(a)(3)(i) requires that the alternative be judged to be essentially equivalent to the Code authorized testing. The Code authorized testing is disassembly of each valve every refueling outage because the non-compliance with all of the Position 2 requirements makes it so relief cannot be obtained through GL: 89-04. Therefore, the issues are extension of the interval from every refueling outage to once every 36 months and performing the disassembly during non-outage conditions. Because the staff generally accepts the use of the position 2 sampling technique, issue will not be taken with the interval extension. Performing the disassembly during power operation may not provide equivalent levels of quality and safety as would be available if this were performed during a refueling outage. During power operation, one train of CS would have to be removed from service in order to disassemble and inspect the subject valves. Removing one train from service would reduce the system reliability because the entire system function could be made unavailable by the single failure of numerous components in the remaining train. The licensee stated that having a CS train inoperable is low risk significance when considering Braidwood's PRA analysis. It is not clear which PRA analysis the licensee is referring to, one dealing primarily with the risk associated with core damage, or a more comprehensive analysis that also considers the risks associated with containment integrity and the release of radioactive contamination. Because of the lack of more specific information, the reviewers cannot evaluate the reduction of safety that would be experienced by entering an LCO to perform the check valve disassembly and inspections during power operation. Therefore, the licensee has not provided adequate information to justify granting relief or authorizing the proposed alternate sample disassembly and inspection frequency for these valves.

Relief should not be granted or the alternative authorized to perform sample check valve disassembly and inspection on a refueling outage frequency during power operation. Relief should be denied for the proposed test frequency for valves 1/2CS003A, 1/2CS003B, 1/2CS011A, 1/2CS011B, 1/2CS020A, and 1/2CS020B. The licensee may, however, perform sample disassembly and inspection of the subject check valves during refueling outages as specified in GL 89-04, Position 2, in accordance with 10 CFR 50.55a(a)(3)(ii).

**NOTE:** Disassembly and inspection can provide a great deal of information about a check valve and is an approved alternative in the Code for verifying a valve's full-stroke capability. However, disassembly and inspection is an intrusive maintenance procedure that presents some risk of improper reassembly or valve damage. Some owners have had success using non-intrusive diagnostic techniques to verify a full-stoke exercise of dual disk check valves. Therefore, as advances are made to equipment and test methods that improve the capabilities of non-intrusive techniques, the licensee should consider reevaluating the use of these techniques for the testing of these valves in lieu of disassembly and inspection.

## 3.3 Component Cooling Water System

### 3.3.1 Category B/C Valves

3.3.1.1 Relief Request. Valve Relief Request VR-3 requests relief from the exercising requirements of OM-10, Para. 4.3.2, for the check valves in the line from the component cooling water system to the Reactor Coolant Pump (RCP) thermal barriers, 1/2CC9495A, B, C, and D, and proposes to include these valves in a sample disassembly and inspection group and to disassemble and inspect one valve from the group each refueling outage on a rotating basis.

3.3.1.1.1 Licensee's Basis for Requesting Relief–These valves cannot be verified for closure during unit operation. In order to verify these valves are closed, the corresponding RCP must be off and cooling flow isolated. Isolating Component Cooling Water flow to the RCP during unit operation is undesirable and may result in eventual pump damage and/or trip. Additionally, these valves are located in the containment building, inside the missile barrier, where entry requires a significant power reduction (to ~30% reactor total power) to reduce radiation levels (estimated to be 100 to 200 mr/hr generally when shut down).

Various methods of testing these valves to the closed direction were considered. The most practical and effective means of testing these valves is by means of disassembly and inspection. This will be performed at refueling outages, as permitted in OM Part 10 4.3.2.4(c). A sample disassembly and inspection plan will be used as provided by Generic Letter 89-04. Generic Letter 89-04 allows valves of similar design, service conditions, size, materials of construction, to be classified in sample disassembly and inspection groups of up to four members with testing of one valve in the group during each refueling outage. Additionally, these valves are designed with seal welded bonnet/cap and requires grinding and re-welding during inspection activity. This takes more than one shift to accomplish.

Proposed Alternate Testing: The four Unit 1 valves will compose one group, the four Unit 2 valves will compose another group. One valve from each group, on a per unit basis, will be disassembled and inspected on a refueling outage frequency. If the initial disassembled valve is not capable of being full stroke exercised, or if there is binding or failure of valve internals subsequent disassembly and inspection of the remaining three group members will be performed. This method is consistent with Generic Letter 89-04, Position 2.

3.3.1.1.2 Evaluation–The subject valves are simple check valves in the lines from the component cooling water system to the RCP thermal barriers. These valves do not have position indication, therefore, to verify them in the closed position using system hydraulics would involve leak rate or reverse flow closure testing of the valves. There are no test taps or installed gauges to verify the reverse flow closure of these valves, therefore, it is not practical to verify closure by conventional means. Verifying valve closure would require interruption of cooling flow to the RCP thermal barriers, therefore, it is impractical to verify closure of these valves during any plant mode when the RCPs are operating because interrupting cooling flow to the thermal barriers could damage the RCPs, which are major plant equipment necessary for power operation. The only practical method of verifying a full-stroke exercise of these valves to the closed position appears to be disassembly and inspection.

Paragraph 4.3.2.4(c) of OM-10 allows that "As an alternative to the testing ... [exercising a check valve with flow or a manual exerciser], disassembly every refueling outage to verify operability of check valves may be used." Therefore, check valve disassembly and inspection is permitted by the Code and relief is not required. However, the Code requires each valve to be disassembled and inspected each refueling outage. Generic Letter 89-04, Position 2, permits a sampling program to be used for the disassembly and inspection of certain check valves. The Generic Letter states: "Where the licensee determines that it is burdensome to disassemble and inspect all applicable valves each refueling outage, a sample disassembly and inspection plan for groups of identical valves in similar applications may be employed." Generic Letter 89-04 grants relief to use sample disassembly and inspection of check valves if it is performed in accordance with the requirements of Position 2.

Based on the determination that check valve disassembly and inspection during refueling outages is authorized by OM-10 and that disassembly and inspection of each group valve every refueling outage would result in hardship or unusual burden to the licensee without providing a compensating increase in the level of quality and safety and considering the licensee's proposed sample disassembly and inspection of the subject check valves is performed in accordance with the conditions specified in GL 89-04, Position 2, the alternative should be authorized in accordance with 10 CFR 50.55a(a)(3)(ii).

## 3.4 Diesel Generator Air Start System

### 3.4.1 Category B and C Valves

3.4.1.1 Relief Request. Valve Relief Request VR-4, requests relief from the exercising requirements of OM-10, Paras. 4.2.1 and 4.3.2, for the following listed valves in the diesel generator air start system, and proposes to verify proper operation of these valves during the monthly diesel generator start test by observing that the diesels start within the specified time period.

| | | | |
|---|---|---|---|
| 1/2DG5182A | 1/2DG5183A | 1/2DG5184A | 1/2DG5185A |
| 1/2DG5182B | 1/2DG5183B | 1/2DG5184B | 1/2DG5185B |

3.4.1.1.1 Licensee's Basis for Requesting Relief–The monthly Diesel Generator testing program, outlined in Braidwood Station's Technical Specifications and implemented by station operating procedures, exceeds the intent of the quarterly valve testing program which would be required by OM-10 Paragraph 4.2.1.2. Additionally, the stroke timing of solenoid operated valves associated with the Diesel Air Start System is impractical due to the fast actuation of these valves.

Proper valve operation will be demonstrated on a monthly basis by the verification of diesel generator air start capability. Such verification will compare the air pressures contained in the receiver tanks both before and after the diesel generator start, thus verifying the operability of the air start control valves. The proposed testing methodology at the increased frequency satisfies the intent of the Section XI requirements without posing undue hardships or difficulties.

Proposed Alternate Testing: The performance of Braidwood Station's Diesel Generator operability monthly surveillance will verify the operational readiness of the valves associated with the Diesel Air Start System. This surveillance testing will require the recording of the air pressures contained in both trains A & B of the Diesel Generator Air Start Receiver Tanks both before and immediately after diesel generator start. By comparison of these values between trains, the satisfactory operation of the power operated and self-actuated check valves associated with the Diesel Air Start System can be adequately demonstrated.

3.4.1.1.2 Evaluation–Part 10 of OMa-1988 Paras. 4.2.1 and 4.3.2 require Category B and C valves, respectively, to be exercised and Para. 4.2.1.4 requires Category B valves to have their full-stroke times measured when they are exercised. The emergency diesel generator air start valves and in-line check valves are normally closed and are required to open to admit starting air to the diesel starting air distributors. Stroke times cannot be measured for the air start power operated valves since they do not have any position indication and are totally enclosed so that the valve stems or discs cannot be observed unless the valves are substantially disassembled.

To obtain meaningful stroke times for the diesel air start power operated valves, the licensee would have to replace them with valves equipped with position indication or to develop some other means of determining valve position. To ensure a full-stroke exercise of the in-line check valves it would be necessary to verify that they fully open during diesel testing. Since they do not have position indication and their design is not conducive to non-intrusive diagnostic techniques, such as ultrasonics or acoustics, the valves would have to be replaced or modified to allow this verification. It would be burdensome to require the licensee to replace these valves with ones that permit stoke timing or full-stroke open verification respectively, and it would not provide a commensurate increase in the level of quality and safety.

The licensee proposes to exercise these valves monthly during diesel generator testing and to verify that each valve opens by observing a decrease in pressure of the respective air receivers. A decrease in receiver pressure would indicate that air flowed through the valve into the diesel air start distributor. If the decrease in each receiver is approximately equal, it indicates that both air start trains participated in the satisfactory diesel start and the associated control and check valves are not degraded. The licensee did not identify the acceptance criteria used for this testing, therefore, the reviewer cannot access the ability of this testing to adequately monitor the condition of all of the subject valves. Significant differences in the decrease in receiver tank air pressures could indicate that the control valve or check valve in one of the redundant air start trains is degraded and/or did not fully open. If the acceptance criteria for this testing is not appropriate, the licensee's proposed testing may not provide an adequate long term method to monitor or detect degradation of these valves unless both trains become degraded to the point that the diesel fails to start within the prescribed time. However, the proposed testing does ensure that at least one train of the emergency diesel air start system is operable and that the other train is, as a minimum, partially functional, therefore, this testing provides an adequate level of quality and safety during the interim period of six (6) months.

Based on the determination that requiring the licensee to make system modifications that permit valve testing in compliance with the Code requirements would be burdensome without a corresponding increase in the level of quality and safety, the alternative should be authorized in accordance with 10 CFR 50.55a(a)(3)(ii) for an interim period of six (6) months. By the end of this interim period, the licensee should document in Valve Relief Request VR-4 a technical justification that demonstrates that the acceptance criteria used in this testing adequately monitors the condition of these valves and is capable of detecting any significant degradation. VR-4 need not be resubmitted at the end of the interim period, however, the NRC may elect to review this justification during a future on-site inspection.

# APPENDIX A

## IST PROGRAM ANOMALIES IDENTIFIED DURING THE REVIEW

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## IST PROGRAM ANOMALIES IDENTIFIED DURING THE REVIEW

Inconsistencies and omissions in the licensee's program noted during the course of this review are summarized below. The licensee should resolve these items in accordance with the evaluations, conclusions, and guidelines presented in this report.

1. Valve Request VR-1 requests relief from the Code exercising requirements for check valves 1/2FW079A, B, C, and D in the line from the main feedwater pumps to the steam generators. The request proposes to include them in a sample disassembly and inspection group and to disassemble and inspect one valve from the group each refueling outage on a rotating basis. The request proposes to postpone the partial-stroke exercise of the disassembled valve following reassembly but perform it before returning it to service. This issue is not discussed in the basis for relief of VR-1, but is mentioned briefly in the proposed alternate testing. This deviates from the Code requirements and as such, should be justified in the relief request basis for relief. In Paragraph 3.1.1.1.2 of this report, the licensee's proposal to delay post maintenance testing of these valves until during startup from the outage was recommended to be authorized in accordance with 10 CFR 50.55a(a)(3)(ii), however, VR-1 should be modified as indicated above in any subsequent program revisions.

2. Valve Relief Request VR-2 requests relief from the full-stroke exercising requirements of OM-10, Para. 4.3.2 for containment spray check valves 1/2CS003A/B, 1/2CS011A/B, and 1/2CS020A/B (VR-2 also includes valves 1/2CS008A/B that are not addressed in this anomaly) and proposes to include these valves in sample disassembly and inspection groups and to disassemble and inspect one valve from each group every 18 months, irrespective of plant mode, on a rotating basis. As, discussed in Section 3.2.1 of this report, relief should not be granted or the alternative authorized to perform sample check valve disassembly and inspection on a refueling outage frequency during power operation for valves 1/2CS003A/B, 1/2CS011A/B, and 1/2CS020A/B. The licensee may, however, perform sample disassembly and inspection of the subject check valves during refueling outages as specified in GL 89-04, Position 2, in accordance with 10 CFR 50.55a(a)(3)(ii). The licensee may develop and submit a technical justification in accordance with the provisions of 10 CFR 50.55a for the proposed disassembly and inspection frequency for these valves.

3. Valve Request VR-4, requests relief from the exercising requirements of the Code for valves 1/2DG5182A/B, 1/2DG5183A/B, 1/2DG5184A/B and 1/2DG5185A/B in the diesel generator air start system. The licensee indicated that proper valve operation will be demonstrated on a monthly basis by the verification of diesel generator air start capability. Such verification will compare the air pressures contained in the receiver tanks both before and after the diesel generator start, thus verifying the operability of the air start control valves. If the decrease in each receiver is approximately equal, it indicates that both air start trains participated in the satisfactory diesel start and the associated control and check valves are not degraded.

   The licensee has not specified acceptance criteria for this testing, therefore, the reviewer cannot access its ability to adequately monitor the condition of all of the subject valves. Significant differences in the decrease in receiver tank air pressures could indicate that the control valve or check valve in one of the redundant air start trains is degraded and/or did not fully open. If the acceptance criteria for this testing is not appropriate, the licensee's proposed testing may not provide an adequate method to monitor or detect degradation of these valves unless both trains become degraded to the point that the diesel fails to start within the prescribed time. Without knowledge that the acceptance criteria is adequate to detect valve degradation, long term relief should not be authorized. Therefore, the alternative should be authorized in accordance with 10 CFR 50.55a(a)(3)(ii) for an interim period of two years or until the end of the next refueling outage, whichever occurs first. By the end of this interim period the licensee should submit a technical justification that demonstrates that the acceptance criteria used in this testing adequately monitors the condition of these valves and is capable of detecting any significant degradation.

# APPENDIX B

## IST PROGRAM ISSUES IDENTIFIED DURING THE SYSTEMS REVIEW

## APPENDIX B

## IST PROGRAM ISSUES IDENTIFIED DURING THE SYSTEMS REVIEW

The INEEL staff reviewed portions of the Containment Spray and Feedwater systems. The P&IDs containing system components that were reviewed are identified in the following table. The staff identified components on these P&IDs and evaluated the related Inservice Testing (IST) program test(s) to assess compliance with the applicable American Society of Mechanical Engineers (ASME) Operations and Maintenance (OM) Code requirements. Related extended test interval justifications, technical positions and relief requests were also assessed. Following this review, the staff assessed the available portions of the system for completeness (to determine if additional components should have been included in the IST program). This review yielded the following list of issues that should be addressed by the licensee.

**List of P&IDs Reviewed**

| System | P&ID No. | Sheet | Latest Revision |
|---|---|---|---|
| Containment Spray | M-46 | 1A, 1B, & 1C | 04/11/97 |
| Containment Spray | M-129 | 1A, 1B, & 1C | 04/11/97 |
| Feedwater | M-36 | 1A, 1B, 1C, & 1D | 04/23/98 |
| Feedwater | M-121 | 1A, 1B, 1C, & 1D | 04/23/98 |

1. P&ID No. M-46, Sheet 1A, coordinates D-7 and A-7 show containment spray system valves 1/2CS010A and 010B, respectively to have a fail-open function. These valves are not included in the IST program valve tables. If this is a required safety function, then these valves should be included in the IST program and be tested according to the applicable Code requirements.

2. Valve Technical Position, VA-4, addresses the method of valve position indication testing. At the bottom of IST program Section 3.2.2, page 5 of 9, the following statement is made with respect to a Section XI, IWV-3100, and OMa-1988, Part 10, intent inquiry (Interpretation XI-1-89-10) regarding verification of valve position. "However, if a valve is stroke time tested locally or manually exercised locally, a remote position indication test is not required." The applicability of the Code intent inquiry is to ". . . valves having remote position indicators at multiple locations . . ." OMa-1988, Part 10, Para. 4.1, Valve Position Verification, states; "Valves with remote position indicators shall be observed locally at least once every 2 years to verify that valve operation is accurately indicated." The licensee must comply with the applicable requirements of OMa-1988, Part 10, Para. 4.1, except where specific relief has been requested and granted.

3. Valve Technical Position, VA-4, addresses the method of valve position indication testing. In Section 3.2.2 at the bottom of page 6 of 9, is a Note to the effect that Braidwood Station's position is that OMa-1988, Part 10, Table 1, Inservice Test Requirements, does not require an expansion of scope. OMa-1988, Part 10, Table 1, clearly requires Position Indication Verification, according to Para. 4.1, of Category B, passive valves, which were not explicitly addressed in Section XI, Table IWV-3700-1. The licensee must comply with the applicable requirements of OMa-1988, Part 10, Table 1, except where specific relief has been requested

and granted. This issue is also discussed in NUREG-1482, 4.2.6, Requirements for Verifying Position Indication.

4. The valve tables in the Braidwood IST program do not include certain information that is important to assess compliance with ASME Code testing requirements. NUREG-1482, Section 2.4.2, Valves, recommends that licensees consider various information for inclusion in the valve tables. Specific information that is not addressed in the licensees IST program submittal includes Drawing Coordinates, Active/Passive status, and Safety Position. The licensee should consider including this information in future submittals.

5. Feedwater system valves 1/2FW079A, 079B, 079C, and 079D, are affected by relief request VR-1. The relief request's proposed alternative testing section addresses the deferral of part-stroke exercising following reassembly. However, the basis for this deferral is not included in "Basis for Relief" section of the request. The reviewers believe that there is an adequate basis for this deferral and that it should be added to the request in any subsequent program updates or revisions.

6. As a precautionary note, some of the test frequencies in the licensee's IST program are indicated to coincide with Appendix J, Type C, testing. The alternate testing according to Option B of Appendix J, while adequate for the required periodic assessment of containment isolation capability, has not been shown to be an adequate alternative to the exercise frequency requirements of the OM Part 10.

# APPENDIX C

# DEFERRED TEST JUSTIFICATIONS

APPENDIX C

DEFERRED TEST JUSTIFICATIONS

The INEEL staff reviewed the licensee's IST program to assess compliance with the applicable American Society of Mechanical Engineers (ASME) Operations and Maintenance (OM) Code requirements for deferred test justifications. The following section summarizes the licensee's proposed test interval extension and justification for extension to cold shutdowns or refueling outages and is organized by plant system. Inconsistencies or omissions related to deferred test justifications are addressed in Appendices A and B.

MULTIPLE SYSTEMS

Submittal **ROJ-7** provides justification to extend the test frequency for Category A/C and Category C charging pump discharge check valves, chemical and volume control (CVCS) to reactor coolant system (RCS) cold leg check valves, and reactor water storage tank (RWST) to charging pump suction check valves, 1/2CV8481A/B, 1/2CV8546, 1/2S18815, and 1/2SI8900A-D. Valves 1/2CV8481A/B will be partial stroke exercised in the open direction quarterly and full stroke exercised in the open and closed directions during refueling outages. The remaining valves will be full stroke exercised in the open and close directions during refueling outages.

**Basis:** The full stroke exercising of check valves 1/2SI8815 and 1/2S18900A-D associated with the emergency core cooling system during operation would induce thermal stresses on their respective reactor vessel nozzles as the RCS (maintained at greater than 500F) is injected with water from the RWST (maintained at approximately 65F). The thermal cycles imposed would exceed the allowable number for the reactor vessel nozzles. The 1/2CV8481A/B and 1/2CV8546 check valves are in series and cannot be full stroke exercised without causing stroking of 1/2SI8815 and 1/2SI8900A-D check valves. These valves cannot be full stroke exercised during routine mode 5 cold shutdowns due to Braidwood Station Technical Specifications requirements that all safety injection (SI) pumps and all but one charging pump be inoperable during modes 4, 5, and 6, except when the reactor vessel head is removed (mode 6 of refueling outages only). This requirement minimizes the possibility of low temperature overpressurization (LTOP) of the RCS. The alternate method of protecting against over-pressurization by partially draining the RCS to provide a surge volume is not considered a safe practice due to concerns of maintaining adequate water level above the reactor core. In addition, injecting large quantities of highly borated water from the RWST would likely delay reactor start up and the cost of processing the reactor coolant to restore the optimum boron concentration is consequential. Full stroke exercising of these valves may only be safely performed in Mode 6 with the reactor vessel head removed. The 1/2S18900A-D and 1/2S18815 check valves can only be verified closed by performance of an individual leakage test on each valve. These valves are simple lift check valves and are not equipped with an external operator or disk position indication. It is impractical to verify them closed during power operation or during cold shutdowns. System reconfiguration and connecting and disconnecting leak testing equipment during cold shutdowns would likely delay the return to power. This would be costly and burdensome to the station. System redesign and modification would be necessary to allow testing these valves closed quarterly, which would also be costly and burdensome. Both of these alternatives would provide no compensating increase in plant safety.

## AUXILIARY FEEDWATER

Submittal **VC-11** provides justification to extend the test frequency for Category C auxiliary feedwater (AFW) pump discharge, AFW mini-flow recirculation, and AFW header check valves, 1/2AF003A/B, 1/2AF029A/B, and 1/2AF014A-H. Valves 1/2AF003A/B will be partial stroke exercised quarterly and full stroke exercised in the open direction during cold shutdowns. Valves 1/2AF029A/B will be full stroke exercised in the open direction during cold shutdowns. Valves 1/2AF014A-H will be full stroke exercised in the open and close directions during cold shutdown periods.

**Basis:** The auxiliary feedwater check valves 1/2AF003A/B, 1/2AF014A-H, and 1/2AF029A/B cannot be full stroke tested during unit operation, as this would induce potentially damaging thermal stresses in the upper feedwater nozzle piping. The 1/2AF003A/B valves will be partially stroke tested during operation, and all valves full stroke tested during cold shutdown, in accordance with OM-10, paragraph 4.3.2.2. Check valves 1/2AF014A-H are verified to be closed each shift by the Operating Department, by verifying that the temperature at 1/2AF005A-H is ≤130F. If the temperature is > 130F at any 1/2AF005 valve, then abnormal operating procedure is entered to isolate and cool down the affected lines. This shiftly monitoring of 1/2AF014A-H in the closed position adequately monitors the status of these valves during unit operation. However, at the NRC's request, the official IST backflow test will be performed following the full flow test during cold shutdowns (NRC Inspection Report number 50-456/93011 (DRS) and 50-457/93011 (DRS) dated June 10, 1993, paragraph 2.C.(2)).

Submittal **ROJ-15** provides justification to extend the test frequency for Category C condensate storage tank to AFW pump suction check valves, 1/2AF001A/B. Each of these valves will be partial stroke exercised quarterly, full stroke exercised in the open during cold shutdown periods, and full stroke exercised in the close direction during refueling outages.

**Basis:** It is undesirable to full stroke open these valves quarterly due to the transients placed on the feedwater system and the potentially damaging stresses on the steam generator (S/G) nozzles. For the closure testing, performing a pressure test (by attaching a pump or other pressure source to a test connection and pressurizing the line) to verify closure is impractical due to the system configuration. Adequate closure capabilities of these check valves cannot be verified due to the multiple potential leakage paths (valves, pump seal, and instrument lines). This configuration makes it impossible to assign any observed leakage to any individual component using standard mass make-up or pressure delay techniques. Since there are no conventional ways to verify closure of these check valves, acoustic monitoring has been investigated as allowed by OM-10 Paragraph 4.3.2.4(a) (other positive means). First, it was attempted to verify closure during the cold shutdown full stroke test of the 1/2AF001A/B valves, in which only a single train of AFW is run at a time. With an AFW pump running on mini-flow recirculation, flow is initiated to each S/G and increased on a gradual basis, while simultaneously reducing feedwater flow. As soon as the required flow data is obtained, AFW flow is gradually reduced, while simultaneously increasing feedwater flow. This is done to minimize feedwater perturbations to the S/Gs. Due to this gradual change in flow, the open and closed acoustical impacts cannot be distinguished from that of the flow noise. However, the acoustic data taken during the 18-month dual pump injection test has provided sufficient data to determine valve disc closure. This test is only performed on refueling outage frequencies due to the large transient placed on feedwater flow and the thermal stresses imposed on the S/Gs. It is expected that acoustic testing will continue to provide adequate test results. If acoustic data does not provide an adequate determination of valve closure, another non-intrusive method such as ultrasonic testing or radiography, may be utilized or the valve will be disassembled and inspected.

COMPONENT COOLING

Submittal **VC-19** provides justification to extend the test frequency for Category B component cooling (CC) water supply to reactor coolant pump (RCP) valves 1/2CC9415. Each of these valves will be exercised in the open and close directions during cold shutdown periods when all RCPs are shutdown.

**Basis:** These valves cannot be stroked during normal operations because they would isolate flow to the RCPs. Failure of one of the CC valves in a closed position during an exercise test would result in a loss of cooling flow to the pumps and eventual pump damage and/or trip. Therefore, these valves will be stroke tested during cold shutdowns, in accordance with OM-10, paragraph 4.2.1.2 provided all of the RCPs are shutdown.

Submittal **ROJ-3** provides justification to extend the test frequency for Category B CC pump discharge isolation valves, CC suction header crosstie isolation valves, CC heat exchanger outlet crosstie isolation valves, and CC supply header crosstie isolation valves, 1/2CC9458, 1/2CC9459A/B, and 1/2CC9467A-C. The 1/2CC9459B and 1/2CC9467B valves will be exercised in one direction in preparation for the unit going into the refueling outage, to align the unit going into the outage to the unit 0 heat exchanger and unit 0 pump. Subsequently, when the opposite unit then goes into a refueling outage the valves will again be exercised in one direction (the opposite direction). An exception to stroking these valves during a refueling outage would be if for other reasons it was required or desirable to align the unit 0 heat exchanger and pump to a unit prior to its refueling outage. The valves would then be exercised at that time, and not necessarily during the refueling outage. The remaining valves in this refueling outage justification will normally be exercised within the same procedure.

**Basis:** This refueling outage justification will address the 1/2CC9459B and 1(2)CC9467B in more detail than the other valves in this justification (CC9458, CC9459A, CC9467A, and CC9467C); as these other valves are less safety significant within the CC system. None of these remaining valves would function as a primary means of mitigating an accident, and none of them are considered "active" valves per UFSAR Table 3.9.16. The reason for their inclusion is the possibility that they may be called upon following a single failure within the CC system. In addition, there are several other "maintenance" type valves that would also be available for isolation purposes. In a post accident situation, there are no specific directions taken within the CC system. If a malfunction were to occur, operators would be dispatched and the problem isolated as required. Braidwood conservatively added these valves to the program due to the uniqueness of the CC system and to address possible concerns about the valves' ability to isolate. In addition, Braidwood will be exercising these valves on the same frequency as the CC9459B and CC9467B valves. There would be no value added and it would be impractical to exercise them on a more frequent basis. The following is specific information concerning the valves in this refueling outage justification.

a. 1/2CC9459B and 1/2CC9467B

Manual valves 1/2CC9459B and 1/2CC9467B are used to provide train separation and/or isolation of the CC System. More specifically, they are aligned to place the unit 0 heat exchanger and pump on the unit 1 or unit 2 side of CC to ensure adequate cooling during shutdowns and/or post-accident. Exercising these valves presents a concern for the equipment cooled by the CC system. The CC system is a balanced system that has the potential for becoming upset upon swapping the unit 0 heat exchanger and pump from one unit to the other. History has shown that stroking these valves will cause oscillation in the lines, disrupt flow balancing due to D/P differences throughout the system, and would place the normal loads at risk for adequate cooling. For instance, the CC685 valve, which is the RCP thermal barrier CC water return valve, auto closes on high flow, which would result in a loss of flow to the RCP thermal barriers. The CC685 valve could potentially close during the exercising of the CC manual valves, due to the upset flow conditions. Exercising the CC manual valves quarterly is impractical for the reasons presented above. These valves require very careful plant monitoring and a considerable amount of time to physically exercise. The normal practice at Braidwood for the CC System is to align the unit 0 heat exchanger and Unit 0 pump to the unit going into a refueling outage. This is normally not done when going into a cold shutdown. As a result, the most practical method of exercising these valves is to exercise them during or shortly before a refueling outage, at which time the unit 0 heat exchanger and unit 0 pump are aligned to the unit in the refueling outage.

b. 1/2CC9467A

Exercising these valves quarterly is impractical. One function of these valves is to serve as another means of isolating flow to the normal plant loads in a post-accident situation in the event that the respective CC9415 valve was to fail open. Due to its function, it is an undesirable practice to exercise these manual valves during normal operations. Closing this valve for a particular unit, with the unit 0 heat exchanger and pump aligned to that unit, would divert CC flow through the unit 0 heat exchanger which may cause disruptions within the CC system. If the valve is closed at a time when the unit 0 heat exchanger and pump are not aligned to the unit, it would interrupt flow to the normal plant loads. It is impractical to induce the disruptions described above during normal operations. Additionally, finding an appropriate window to stroke these valves during a cold shutdown could possibly result in an extension of the cold shutdown and there would be no compensated increase in plant safety. The most practical alternative method is to exercise these valves at the same frequency (within the same procedure) as valves 1/2CC9459B and 1/2CC9467B.

c. 1/2CC9458, 1/2CC9459A, and 1/2CC9467C

Exercising these valves introduces possibilities of disrupting the CC system. There would be instances in which pumps may need to be swapped, or further re-routing of flow may be necessary due to other misc. work being performed throughout the system. For reasons justified in the general section and throughout this refueling outage justification, it is more practical to exercise these manual valves at the same frequency as described for the manual valves in Part a and Part b of this refueling outage justification.

To conclude, the most practical method of exercising all the CC manual valves included in this justification is to test all of them under the same procedure, under carefully controlled conditions, to ensure that all necessary precautions/actions are taken. To test them in a different manner would be impractical.

Submittal **ROJ-21** provides justification to extend the test frequency for Category A and Category A/C CC water to RCP motor bearing isolation valves and check valves, 1/2CC685, 1/2CC9413A, 1/2CC9414, 1/2CC9416, 1/2CC9438, 1/2CC9518, 1/2CC9486, and 1/2CC9534. Valves 1/2CC685, 1/2CC9413A, 1/2CC9414, 1/2CC9416, and 1/2CC9438 will be exercised in the close directions during refueling outages or at planned cold shutdowns when all four RCPs are no longer required to support plant operations and can be taken out of service. Valves 1/2CC9518, 1/2CC9486, and 1/2CC9534 will be exercised in the open and close directions during refueling outages.

**Basis:** CC water flow to the RCPs is required at all times while the pumps are in operation. The failure of one of these valves in a closed position during an exercise test would result in a loss of cooling flow to the RCPs and possible pump damage and/or trip, which can further lead to disruptions in RCS pressure control. In addition, the RCPs provide the necessary driving head to the pressurizer spray valves for pressure control in the RCS while a steam bubble exists in the pressurizer during power operation and cold shutdown. The Code requires that the 1/2CC9518, 1/2CC9534 and the 1/2CC9486 check valves be tested in the closed direction to verify their seating capability. However, these check valves can only be verified closed by performing the Appendix J, Type C LLRT. Performing the LLRT requires placing the system in an inoperable status (removed from service for an extended period of time due to the need to isolate and drain portions of the system, and connecting a leak rate monitor (LRM). This will prevent starting the RCPs and could delay reactor startup. These tests will require a minimum of three shifts each to perform. This would cause undue hardship with no compensating increase in plant or component safety, if the Code requirements were imposed. This alternate testing will adequately maintain these portions of the CC system in a state of operational readiness, while not impacting the safety of the plant. It also eliminates unnecessary personnel radiation exposure, possible damage to the RCP seals, and minimizes the potential RCS pressure transient involved with restarting RCPs at low temperatures. Back flow testing these check valves on the same schedule as their Appendix J leakage test will adequately maintain this portion of the CC system in a state of operational readiness without causing unnecessary personnel radiation exposure possible damage to the RCPs or delays in reactor startup. In addition, the Code only requires a five-year frequency for pressure relief testing.

## CHEMICAL & VOLUME CONTROL

Submittal **VC-2** provides justification to extend the test frequency for Category B and Category C emergency boration flowpath valves, 1/2CV8104, 1/2CV8442, 1/2CV8804A, and 1/2CV112D/E. Valves 1/2CV8104, 1/2CV8804A, and check valves 1/2CV8442 will be exercised in the open direction during cold shutdown periods. Valves 1/2CV112D/E will be exercised in the open and close directions during cold shutdown periods.

**Basis:** The testing of any emergency boration flowpath valves during unit operation is not practical. Stroke testing the boric acid injection isolation valve 1/2CV8104 and check valve 1/2CV8442, the residual heat removal (RHR) to charging pump suction isolation valve 1/2CV8804A, or the RWST to charging pump suction isolation valves 1/2CV112D/E could result in boration of the RCS, resulting in a cooldown or reactivity transient. Aligning the system in this configuration even for a short duration is, therefore, unacceptable.

Submittal **VC-4** provides justification to extend the test frequency for Category A and Category B charging pump suction valves, normal charging path containment isolation valves, and letdown containment isolation valves, 1/2CV112B/C, 1/2CV8105, 1/2CV8106, 1/2CV8152, and 1/2CV8160. Valves 1/2CV8152 and 1/2CV8160 will be exercised in the open and close directions and the fail-safe close operation on loss of actuator air supply will be verified during cold shutdown periods. Valves 1/2CV112B/C, 1/2CV8105, and 1/2CV8106 will be exercised in the close direction during cold shutdown periods when the charging pumps are secured for sufficient duration to exercise the valves.

**Basis:** Closure of these letdown and charging makeup valves 1/2CV112B/C, 1/2CV8105, 1/2CV8106, 1/2CV8152, and 1/2CV8160 during normal unit operation would cause a loss of charging flow which would result in a reactor coolant inventory transient, and possibly, a subsequent reactor trip. Additionally, isolating letdown during normal unit operation would result in a thermal transient on the charging nozzle. Valves 1/2CV8152 and 1/2CV8160 will be stroke time tested during cold shutdown in accordance with OM-10, paragraph 4.2.1.2 (also covers fail-safe tests for 1/2CV8152 and 1/2CV8160). As valves 1/2CV112B/C are the volume control tank outlet isolation/charging pump suction valves, they should not be closed while the charging pumps are running. As valves 1/2CV8105 and 1/2CV8106 are in the normal charging flow path, they should not be closed while the charging pumps are running. Valves 1/2CV112B/C, 1/2CV8105, and 1/2CV8106 will be exercised during cold shutdowns when the charging pumps are not running, as a result they may not be tested during cold shutdowns in which the charging pumps are not secured for sufficient duration to perform the tests. It is not the intent of this justification to require charging pump shutdown only to perform the exercise test for these valves. Valves 1/2CV112B/C, 1/2CV8105, and 1/2CV8106 will be tested during cold shutdowns in which the charging pumps are secured for sufficient duration to perform the tests, which is in accordance with OM-10, paragraph 4.2.1.2.

Submittal **VC-10** provides justification to extend the test frequency for Category B letdown isolation and orifice isolation valves, 1/2CV459, 1/2CV460, and 1/2CV8149A/B/C. Each of these valves will be exercised in the close direction and the fail-safe close operation on loss of actuator air supply will be verified during cold shutdown periods of sufficient duration.

**Basis:** It is impractical to exercise and stroke time the above listed valves on a quarterly basis. Due to the interlocks between the 1/2CV459, 1/2CV460, & the 1/2CV8149A/B/C valves, exercising these valves during normal operation results in (multiple) total letdown flow isolation events. The affect of a letdown isolation with the unit at power is a thermal transient to the RPV charging nozzle. A letdown isolation also results in some amount of pressurizer level fluctuation until equilibrium letdown and makeup is re-established. While the piping and components are designed for thermal transients, each cycle presents some additional stress to all of the affected equipment. It is prudent to minimize the number of transients the equipment is required to undergo to prevent premature failures.

Submittal **VC-22** provides justification to extend the test frequency for Category B RCP seal injection inlet containment isolation valves, 1/2CV8355A-D. Each of these valves will be exercised in the close direction during cold shutdown periods when the RCPs are secured for sufficient duration.

**Basis:** RCPs are required to be in operation in Mode 1, Power Operation. Seal injection flow must be maintained when the RCPs are running. Interruption of seal injection flow with the RCPs in operation, even for a short duration, is detrimental to the RCP seals. The above listed valves are seal injection inlet valves and are designated containment isolation valves (CIVs). The 1/2CV8355A-D valves are exempt from local leakage rate testing of 10 CFR 50, Appendix J, but due to their designation as CIVs, they will be tested per ASME Code in the closed direction. Due to the above, these valves will not be exercised during plant operation, but they will be exercised during cold shutdown when the RCPs are not running. Short duration forced outages to cold shutdown seldom require shutdown of RCPs as they are part of the normal heat removal loop. It is not the intent of this justification to require RCP shutdown only to perform the exercise tests for these valves. It is anticipated that these valves may not normally be tested more often than once per refueling outage. However, these valves will be tested during cold shutdowns in which the RCPs are secured for sufficient time to perform the tests, which is in accordance with OM-10, paragraph 4.2.1.2.

Submittal **ROJ-11** provides justification to extend the test frequency for Category C reactor coolant loop fill check valves, 1/2CV8348. Each of these valves will be full stroke exercised in the close direction during refueling outages.

**Basis:** These valves are exempt from local leakage rate testing of 10 CFR 50, Appendix J, but due to their designation as CIVs, they shall be tested in the closed direction. These particular check valves are difficult to test in the closed direction. Traditional methods of measuring leakage and/or closure are not sufficient for these valves. Non-intrusive techniques are required to test these valves adequately. For this type of check valve (2" Kerotest) radiography has been the most effective method of verifying valve closure. Performing radiography requires the use of outside contractor personnel, which may not be available unless planned well in advance. The valves are physically located inside containment approximately 14 feet above the floor, requiring scaffolding for access. Scaffolding for elevations, 14 to 20 feet above the floor takes approximately 32 person-hours. There is no flow through these valves during periods when the associated reactor is at power, and there is very seldom any flow through these valves during any mode of operation. This valve opens during initial loop fill following a refueling outage. Testing these valves more frequently than every associated refueling outage adds no additional confidence on the valves' closure capability but it does add to the occupational radiation exposure of those personnel required to perform the test. In addition to two radiographers, an engineer and four radiation technicians are needed. The testing requires approximately one eight-hour shift. Testing these valves on a frequency of every three months during normal operation adds to the occupational radiation exposure of the personnel required to perform the test. Erection of scaffolding inside containment while at power presents unique hazards and requires extensive analysis and evaluation. There is normally no flow through this valve to result in the valve disc leaving the seat, therefore the valve remains passively closed during periods of normal operation. No additional confidence in the ability of the valve to close is gained by subjecting this valve to quarterly or cold shutdown testing versus testing on a refueling outage frequency.

Submittal **ROJ-12** provides justification to extend the test frequency for Category C RCP seal injection line check valves, 1/2CV8368A-D. Each of these valves will be full stroke exercised in the close direction during refueling outages.

**Basis:** These valves are exempt from local leak rate testing, but due to their designation as CIVs, they will be conservatively tested per the ASME code in the closed direction. RCPs are required to be in operation in Mode 1, power operation. Seal injection flow must be maintained when the RCPs are running. Seal injection flow stoppage with the RCPs in operation, even for a short duration, is detrimental to the RCP seals. Therefore, these valves cannot be tested at power or shutdown when RCPs are running. Seal flow perturbations in cold shutdown or refuel have lead to seal leakage problems and need to be minimized. Seal injection flow is also used for flushing, and is maintained even when RCPs are off. These particular check valves are difficult to test in the closed direction. Traditional methods of measuring leakage and/or closure are not sufficient for these valves. Nonintrusive techniques are required to test these valves adequately. For this type of check valve (2" Kerotest) radiography has been the most effective method of verifying valve closure. Performing radiography requires the use of two outside contractor personnel, which are not onsite during cold shutdowns (or refueling outages). Scheduling a radiographer for on-site work usually requires a 30 day notice. Also, to safely perform radiography or any other non-intrusive technique on these valves, scaffolding will be required. Additionally, cold shutdown testing would add to the occupational radiation exposure of the personnel required to complete the test, with the test duration possibly holding up a cold shutdown. For these reasons, it would be costly and impractical to perform this testing on a cold shutdown frequency. Testing these valves for closure at a refueling outage frequency is sufficient for maintaining these valves in a state of operational readiness.

Submittal **ROJ-20** provides justification to extend the test frequency for Category A/C and Category C RCP seal water check valves, 1/2CV8100, 1/2CV8112, and 1/2CV8113. Valves 1/2CV8100 and 1/2CV8112 will be exercised in the close directions during refueling outages or at planned cold shutdowns when all four RCPs are no longer required to support plant operations and can be taken out of service. Valves 1/2CV8113 will be exercised in the open and close directions during refueling outages.

**Basis:** These valves cannot be tested during unit or pump operation as seal water flow from the CV system is required continuously while the reactor coolant pumps are in operation. Loss of flow could result in damage to the seals from overheating and contamination by foreign material. Also, failure of one of these valves in the closed position during an exercise test would result in seal water return flow being diverted to the PRT by lifting a relief valve upstream of the isolation valves, generating significant quantities of liquid radwaste. The RCPs are also needed to provide the driving head to the pressurizer spray valves for pressure control in the RCS while a steam bubble exists in the pressurizer during power operation and cold shutdown. A RCP start involves two operations personnel in attendance to monitor and report pump shaft rotation information to the control room. This involves a containment entry, inside the inner missile barrier, which is a high radiation area. The exposure to personnel is dependent on the number of "bumps" needed (normally 2-3 bumps estimated at an 8-12 hours) to rid the system of air. The closure test for the 1/2CV8113 (seal return pressure relief check valves) can only be verified by performing an LLRT. Performing this test requires placing the system in an inoperable status, isolating the seal return line portion of piping, and connecting an external pressure supply. This test will require a minimum of two shifts to perform. The opening test requires isolating both the inboard motor and manual isolation valves and running a centrifugal charging pump on mini-flow recirculation to supply pressure for opening the valve. The inboard manual vent is opened to verify that the check valve is capable of relieving pressure. This would require a minimum of 1 shift to perform. Backflow testing these check valves on the same schedule as their Appendix J leak rate test will adequately maintain this portion of the CV system in a state of operational readiness without causing unnecessary personnel radiation exposure, delays in reactor startup or possible damage to the RCPs. In addition, the Code only requires a five-year frequency for pressure relief testing.

Submittal **ROJ-22** provides justification to extend the test frequency for Category C Volume Control Tank (VCT) to the CV pump suction check valves 1/2CV8440. These valves will be exercised in the close direction during refueling outages

**Basis:** These valves may only be tested closed when all 4 RCPs and charging pumps are off. Isolation at power would isolate flow to the suction of the CV pumps, which, in turn would isolate charging flow and flow to the RCP seals. Isolating charging flow, which provides flushing to the RCP seals, is not performed routinely during cold shutdowns. These valves were reclassified by Site Engineering as active in a letter dated November 23, 1992 (CHRON # 0117821). Based on this reclassification, the valves were added to the IST Program for testing in the close direction. Testing methods for this valve were considered. The most practical method of testing this valve is by the use of non-intrusive techniques. Currently, ultrasonic testing has provided the most meaningful results. Utilizing non-intrusive techniques requires set up of equipment and planning, and for ultrasonic testing requires qualified ultrasonic testing personnel which may require off-site contractor support. For these reasons, these valves will be tested during refueling outages.

## FIRE PROTECTION

Submittal **ROJ-10** provides justification to extend the test frequency for Category C fire protection system supply to containment check valves, 1/2FP345. Each of these valves will be full stroke exercised in the close direction during refueling outages.

**Basis:** These valves are exempt from local leakage rate testing of 10 CFR 50, Appendix J, but due to their designation as CIVs, they shall be tested in the closed direction. The valves are physically located inside containment making a quarterly test impractical. There is no flow through these valves during periods when the associated reactor is at power, and there is very seldom any flow through these valves during any mode of operation. This valve would only open in the event of a fire or during the flushing surveillance of the fire hose stations. Testing these valves more frequently than each associated refueling outage adds no additional confidence in the valve's closure capability but it does add to the occupational radiation exposure of those personnel required to perform the test. Verifying the closed position of these valves during cold shutdowns is a significant burden for the following reasons:

1. The valves are inconveniently located for testing purposes. At a minimum, a ladder is required for one person to climb, but ladders are not routinely taken into containment during cold shutdowns. Also, climbing is a personnel safety concern.

2. Scaffolding is the safest way to access these valves, but for elevations of 14 to 20 feet above the floor construction of scaffolds takes approximately 32 person hrs at a cost of $900 to $1,000. Scaffolding removal has the same costs. The time associated with this job could delay plant startup.

3. Cold shutdown testing would violate ALARA radiation exposure goals since it is estimated that total dose to scaffold installers, insulation removers, and testing personnel would be at least 50-70 mrem on either unit.

4. Ultrasonic testing requires special expertise. Since a non-intrusive technique has been selected for verifying valve position, certified UT inspectors must be involved. Since inspectors are not necessarily on site during cold shutdown activities but are routinely hired to support refuel outage activities, cold shutdown frequency testing would required additional cost.

## MAIN FEEDWATER

Submittal **VC-3** provides justification to extend the test frequency for Category B main feedwater (FW) isolation valves, 1/2FW009A, 1/2FW009B, 1/2FW009C, and 1/2FW009D. Each of these valves will be exercised in the close direction during cold shutdown periods.

**Basis:** The FW isolation valves cannot be fully stroked during operation as feedwater would be terminated causing a reactor trip. Failure of these valves during partial stroke testing can result in a valve closure and subsequent reactor trip. Because stroke testing of these valves at power would result in a reactor trip, and because partial stroke testing at power presents the unwarranted risk of a potential reactor trip, testing of these valves during operation is not practical.

Submittal **VC-9** provides justification to extend the test frequency for Category B FW preheater bypass downstream isolation valves, 1/2FW039A-D. Each of these valves will be exercised in the close direction and the fail-safe close operation on loss of actuator air supply will be verified during cold shutdown periods.

**Basis:** It is not practical for the 1/2FW039A-D valves to be stroke tested during normal operation as closure of these valves would require a power reduction from full power to less than 80%. Stroking these valves closed above 80% would result in undesirable preheater tube vibrations within the S/Gs.

Submittal **VC-20** provides justification to extend the test frequency for Category C FW tempering flow check valves, 1/2FW036A-D. Each of these valves will be exercised in the close direction during cold shutdown periods.

**Basis:** The 1/2FW036A-D valves are 3" swing type check valves with no position indication. Flow through this line at full/high power cannot be stopped for longer than one minute while in Mode 1 as it's needed to maintain subcooling on the nozzle used for auxiliary feedwater (AFW). Also, flow/pressure is always toward the S/Gs during operation, making it impractical to perform a back leakage or back pressure test to prove valve closure.

Submittal **ROJ-14** provides justification to extend the test frequency for Category B FW regulating bypass valves, FW regulating valves, FW tempering flow control valves, 1/2FW510A, 1/2FW520A, 1/2FW530A, 1/2FW540A, 1/2FW510, 1/2FW520, 1/2FW530, 1/2FW540, 1/2FW034A-D. The fail-safe close operation on loss of actuator air supply will be verified for each of these valves during refueling outages in accordance with Braidwood Technical Specifications.

**Basis:** These valves are not considered to be CIVs per the Braidwood Station Technical Specifications, and are considered only FW control valves that, additionally, serve as backup feedwater isolation valves. They are not considered to be in the scope of the IST Program (per OM-10, paragraph 1.1). This has always been Braidwood's position on these valves. However, since they do receive a FW isolation signal, an augmented test to verify the fail-safe test will be tracked within the IST Program. The augmented fail-safe test will be performed. These valves are all part of the surveillance executed to satisfy Technical Specifications, which manually simulates a SI signal, causing these valves to fail closed. These valves will be fail-safe tested to satisfy the requirements of this Technical Specification (refueling outage frequency). Additionally, the closure of the FW regulating bypass valves (1/2FW510A, 1/2FW520A, 1/2FW530A, and 1/2FW540A) during unit operation would require the FW regulating valves to correct for bypassed flow and could result in a plant transient with a possible reactor trip as a result. The closure of the FW regulating valves (1/2FW510, 1/2FW520, 1/2FW530, 1/2FW540) during unit operation would cause a loss of FW to the S/Gs, resulting in a plant transient with a reactor trip as a result. Finally, it would be impractical to fail-safe test any of these augmented valves on a more frequent basis than required by the Technical Specifications.

## INSTRUMENT AIR

Submittal **ROJ-5** provides justification to extend the test frequency for Category A and Category A/C instrument air (IA) supply containment isolation valves and air supply line check valves to IA inboard containment isolation valves, 1/2IA065, 1/2IA066, and 1/2IA091. Valves 1/2IA065 and 1/2IA066 will be exercised in the open and close directions and the fail-safe close operation on loss of actuator air supply will be verified during refueling outages. Check valve 1/2IA091 will be full stroke exercised in the open and close direction during refueling outages.

**Basis:** Stroke/fail-safe testing of the 1/21A065 and 1/21A066 valves (and full stroke testing of the 1/21A091 valves upon re-opening of the 1/21A066 valves) during plant operation or cold shutdowns would, by design, isolate the air to air operated instruments inside the containment building. This would introduce the possibility of major operating perturbations and/or personnel safety concerns should these valves fail to re-open during testing activities. This would result in scenarios such as:

1. Loss of Pressurizer Pressure Control - The pressurizer spray valves 1/2RY455B/C and the pressurizer auxiliary spray valve 1/2CV8145 would fail closed and not be available

for pressurizer pressure control. There will also be a loss of air supply to the PORV accumulators.

2. Loss of CV System Letdown Flow (both normal and excess) and Charging Flow - The loss of instrument air would cause a disruption in the unit letdown flow paths resulting in pressurizer level increases. Such valves as the letdown orifice containment outlet header isolation valve 1/2CV8160, the letdown line isolation valves 1/2CV459 and 1/2CV460, the letdown orifice outlet isolation valves 1/2CV8149A/B/C, the excess letdown heat exchanger inlet isolation valves 1/2CV8153A/B, and the regenerative heat exchanger letdown inlet isolation valves 1/2CV8389A/B would go to their fail closed positions. Additionally, the ability to normally make-up RCS inventory and adjust the reactor chemical shim (i.e., normal boration/dilution) would also be lost as the regenerative heat exchanger inlet isolation valves 1/2CV8324A/B would fail to their respective closed positions.

3. Loss of CC to Containment Penetrations - The loss of IA supply would cause the penetration cooling supply flow control valve 1/2CC053 to go to its fail closed position. The loss of penetration cooling would result in elevated temperatures being imposed on the penetrations being supported by the CC system.

4. Loss of Personnel Breathing Air - The loss of IA supply to the service air downstream isolation valve 1/2SA033 would cause this valve to go to its fail close position. This loss of service air in the containment building would eliminate the normal source of supplied breathing air needed to support numerous maintenance and component inspection activities in a contaminated environment.

## MAIN STEAM

Submittal **VC-1** provides justification to extend the test frequency for Category B main steam (MS) isolation valves (MSIVs), 1/2MS001A-D. Each of these valves will be exercised in the close direction during cold shutdown periods.

**Basis:** Closure of the MSIVs 1/2MS001A-D during unit operation would result in reactor trip and SI actuation. Failure of these valves during partial stroke testing can result in a valve closure and subsequent reactor trip. NUREG-1482 section 4.2.4 states, "MSIVs should not be tested at power, since even a part-stroke exercise increases the risk of a valve closure when the unit is generating power." Because stroke testing of these valves at power would result in a reactor trip, and because partial stroke testing at power presents the unwarranted risk of a potential reactor trip, testing of these valves during operation is not practical.

## PROCESS RADIATION MONITORING

Submittal **ROJ-16** provides justification to extend the test frequency for Category A/C process radiation monitor return line check valves, 1/2PR032. These valves will be full stroke exercised in the close direction and leak rate tested during refueling outages.

**Basis:** These check valves are located inside containment. They do not have remote or local position indication devices to indicate the position of the check valve. The most practical method for verifying closure for these check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is identical to the Appendix J local leak rate test. Testing these valves closed would not be practical to perform routinely at power or during cold shutdowns. To perform the closure test, the test equipment and testing methodology would be the same as that used to satisfy the Appendix J leak test. This involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. The test equipment, the test rig, and air supply lines would need to be run throughout the containment building and the penetration area. Personnel entry into the containment would be required, resulting in exposure to radiation. Performing the test requires placing the system in an inoperable status (removed from service) for an extended period of time due to the need to isolate portions of the system, and connecting the leak rate equipment. This would make the process radiation monitor (PRM) inoperable while this testing was being performed.

Submittal **ROJ-23** provides justification to extend the test frequency for Category A/C radiation monitor pump discharge check valves 1/2PR002G and 1/2PR002H. These valves will be full stroke exercised in the close direction and leak rate tested during refueling outages.

**Basis:** These check valves are located inside containment. They do not have remote or local position indication devices to indicate the position of the check valve. The most practical method for verifying closure for these check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is the Appendix J local leak rate test. Testing these valves closed would not be practical to perform routinely at power or during cold shutdowns. To perform the closure test, the test equipment and testing methodology would be the same as that used to satisfy the Appendix J leak test. This involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. The test equipment, the test rig, and air supply lines would need to be run throughout the containment building and the penetration area. Personnel entry into the containment would be required, resulting in exposure to radiation.

PROCESS SAMPLING

Submittal **ROJ-17** provides justification to extend the test frequency for Category A/C post-LOCA hydrogen monitor return line check valves, 1/2PS231A/B. These valves will be full stroke exercised in the close direction and leak rate tested during refueling outages.

**Basis:** These check valves are located inside containment. They do not have remote or local position indication devices to indicate the position of the check valve. The most practical method for verifying closure for these check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is identical to the Appendix J local leak rate test. Testing these valves closed would not be practical to perform routinely at power or during cold shutdowns. To perform the closure test, the test equipment and testing methodology would be the same as that used to satisfy the Appendix J leak test. This involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. The test equipment, the test rig, and air supply lines would need to be run throughout the containment building and the penetration area. Personnel entry into the containment and climbing in the penetration areas would be required, resulting in exposure to radiation. Also, quarterly testing would conflict with the Technical Specifications, which requires the hydrogen monitors to be in the standby mode in order to meet the requirements set forth in NUREG 0737, Item F.1.6 in Modes 1 and 2. Performing the test requires placing the system in an inoperable status (removed from service) for an extended period of time due to the need to isolate portions of the system, and to connect the leak rate equipment. This would make the hydrogen monitor inoperable while the system is isolated.

## REACTOR COOLANT

Submittal **VC-6** provides justification to extend the test frequency for Category B RCS head vent valves, 1/2RC014A-D. Each of these valves will be exercised in the open and close directions and the fail-safe close operation on loss of actuator air supply will be verified during cold shutdown periods.

**Basis:** The Reactor Pressure Vessel Vent Valves 1/2RC014A-D cannot be stroked during unit operation, as they provide a pressure boundary between the RCS and containment atmosphere. Failure of one of these valves in the open position would result in leaving only one valve as the high pressure boundary.

Submittal **VC-14** provides justification to extend the test frequency for Category B pressurizer power operated relief valves (PORVs), 1/2RY455A and 1/2RY456. Each of these valves will be exercised in the open and close directions and the fail-safe close operation on loss of actuator air supply will be verified during cold shutdown periods.

**Basis:** PORV's 1/2RY455A and 1/2RY456 will be stroke/fail safe tested on a cold shutdown frequency per Generic Letter 90-06. This recommendation comes from Enclosure A to Generic Letter 90-06, which addresses the NRC staff positions concerning PORV and block valve reliability. Item number 3.1.2 states that the "Stroke testing of PORVs should only be performed during Mode 3 (HOT STANDBY) or Mode 4 (HOT SHUTDOWN) and in all cases prior to establishing conditions where the PORVs are used for low-temperature overpressure protection. Stroke testing of-the PORV's should not be performed during power operation." For this reason, these valves will be stroke time tested/fail-safe tested during cold shutdowns in accordance with OM10, paragraph 4.2.1.2 and Generic Letter 90-06. The actual test mode will be Mode 3 or 4, as the Technical Specifications require full cycle operation in Mode 3 or 4 once per 18 months. This is accomplished before entering Mode 5 during plant shutdowns per station administrative procedures.

Submittal **ROJ-18** provides justification to extend the test frequency for Category A/C primary water supply line to the pressure relief tank (PRT) check valves, 1/2RY8046 and 1/2RY8047. These valves will be full stroke exercised in the close direction and leak rate tested during refueling outages.

**Basis:** These check valves are located inside containment. They do not have remote or local position indication devices to indicate the position of the check valve. The most practical method for verifying closure for these check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is identical to the Appendix J local leak rate test. Testing these valves closed would not be practical to perform routinely at power or during cold shutdowns. To perform the closure test, the test equipment and testing methodology would be the same as that used to satisfy the Appendix J leak test. This involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. The test equipment, the test rig, and air supply lines would need to be run throughout the containment building and the penetration area. Personnel entry into the containment would be required, resulting in exposure to radiation. Performing the test requires placing the system in an inoperable status (removed from service) for an extended period of time due to the need to isolate portions of the system, and connecting the leak rate equipment. Also, it is not practical to remove these valves from service, during quarterly or cold shutdowns, as these systems are required to support plant conditions (RCS pressure protection and control) and safe equipment (PRT and the RCP #3 seal operation).

RESIDUAL HEAT REMOVAL

Submittal **VC-5** provides justification to extend the test frequency for Category A RCS loop to RHR pump suction isolation valves, 1/2RH8701A/B, and 1/2RH8702A/B. Each of these valves will be exercised in the open and close directions during cold shutdown periods.

**Basis:** Opening one of these valves during unit operation will leave only one valve isolating RHR from the high RCS pressure. This would place the plant in an undesirable and potentially unsafe condition.

Submittal **VC-7** provides justification to extend the test frequency for Category C RHR pump discharge check valves, 1/2RH8730A/B. Each of these valves will be full stroke exercised in the open and close directions during cold shutdown periods and will be partial stroke exercised in the open direction quarterly.

**Basis:** The RHR pump discharge check valves 1/2RH8730A/B cannot be full stroke exercised during unit operation due to the RCS pressure being greater than the RHR pumps are capable of putting out. These check valves will be partial stroke tested, however, on a quarterly basis during the mini-flow recirculation RHR pump tests and full stroke exercised during cold shutdown. This is in accordance with OM-10, paragraph 4.3.2.2. Additionally, it would be impractical to backflow test these valves during unit operation. The methodology for testing these valves involves closing the mini-flow valve on the train being tested and having the opposite train provide pressure against the check valve being tested. The test is satisfied by verifying that the pump on the same train as the check valve is not rotating backwards. However, this testing would put the plant in an undesirable condition as both trains of RHR would be considered inoperable. During cold shutdowns, the train running on shutdown cooling may be used to pressurize against the opposite train's check valve.

Submittal **VC-18** provides justification to extend the test frequency for Category B RHR system cross connect valves, 1/2RH8716A/B. Each of these valves will be exercised in the open and close directions during cold shutdown periods.

**Basis:** Technical Specifications require these valves to be open. Stroking either valve closed would make both trains of RHR inoperable, which is a violation of the Technical Specification. They can only be exercised during cold shutdowns or refueling outages.

Submittal **ROJ-9** provides justification to extend the test frequency for Category A/C RHR suction line thermal relief check valves, 1/2RH8705A/B. Each of these valves will be full stroke exercised in the open and close directions during refueling outages.

**Basis:** These valves are simple spring loaded lift check valves and are not equipped with an external operator or disk position indicator. The only way to verify operability in the open direction is by verifying that the piping between the suction isolation valves is able to be depressurized through the applicable valve via a field test. It would be impractical to perform this testing during unit operation due to the necessity to enter containment, hook up a pressurized water source to the piping via a test/vent valve, and slowly increase the pressure until the check valve opens to relieve the pressure. Additionally, the RCS must be depressurized in order to perform this test. It would be impractical to perform this test during cold shutdowns as it requires placing the standby train of RHR in an inoperable condition and the RCS must be depressurized (requires all RCPs to be stopped). Then, due to the extensive field work involved, there is a potential for delaying a reactor start up and return to power. Additionally, taking away the backup/redundant train of RHR reduces both the plant decay removal capability and the available safety margin regarding shutdown risk assessment. The 1/2RH8705A/B thermal/pressure relief check valves can only be verified closed by performance of an individual leakage test on each valve. These valves are simple spring loaded lift check valves and are not equipped with an external operator or disk position indication. It is impractical to verify them closed during power operation or during cold shutdowns. System reconfiguration and connecting and disconnecting leak testing equipment in conjunction with depressurizing the RCS during cold shutdowns would delay the return to power. This would be costly and burdensome to the station. System redesign and modification would be necessary to allow testing these valves closed quarterly which would also be costly and burdensome.

## WASTE DISPOSAL - S/G BLOWDOWN

Submittal **VC-23** provides justification to extend the test frequency for Category B S/G blowdown throttle control valves, 1SD054A-H. Each of these valves will be exercised in the close direction and the fail-safe close operation on loss of actuator air supply will be verified during cold shutdown periods of sufficient duration.

**Basis:** It is impractical to exercise and stroke time the above listed valves on a quarterly basis. The valves have no open/closed hand switch. They are normally operated by means of a potentiometer which ultimately controls an air signal to a positioner. Attainment of repeatable stroke time results requires the valves to be stroked by causing (or simulating) HELB relay actuation. This method of closure causes multiple valve actuations resulting in complete S/G blowdown isolation. Furthermore, the remote position indicator, (a 0-100% indicator- not based on limit switch operation) may lag actual valve position. Therefore the only repeatable method of stroke timing these valves involves stationing personnel locally at the valve(s) to witness actual valve movement. Full stroke exercising the valves is a unit operation concern in that closure of these valves during normal operation presents a thermal transient to the downstream piping and components including the blowdown condenser. While the valves, piping, and components are designed to withstand this thermal transient, each transient produces stress which may lead to premature failure of the affected components. It is prudent to minimize the number of thermal transients that these high energy lines are required to undergo. Personnel safety concerns exist with this stroking exercise during normal operation in that the valves are physically located in the MSIV valve room, off the steam tunnel. This room contains the MSIVs, FW isolation valves, MS safety valves, MS PORVs, and other miscellaneous piping and valves. The normal ambient temperature in this room with the unit at power is greater than 110F. Almost all of the piping (most of which is insulated) and instrument tubing in the room are normally at temperatures of approximately 500F or more. The SD054 valves are located above the floor some 16 to 20 feet and are not visible from the floor being obscured by MS and FW Piping. Since personnel must be stationed locally at the valve to witness actual valve movement, it is necessary to climb around very hot piping in a hot and very noisy ambient atmosphere. In some cases it may be necessary to erect scaffolding to conduct this test with the unit in normal operation.

## SAFETY INJECTION

Submittal **VC-8** provides justification to extend the test frequency for Category A/C and Category C SI to RCS loop cold leg and RWST to RHR pump suction check valves, 1/2SI8818A-D, and 1/2SI8958A/B. Valves 1/2SI8818A-D will be full stroke exercised in the open and close directions, and valves 1/2SI8958A/B will be full stroke exercised in the open direction during cold shutdown periods.

**Basis:** Due to the high RCS pressure during unit operation (2235 psi), these valves cannot be full or partial stroke exercised during quarterly testing. The 1/2S18958A/B check valves, although located at the suction of the RHR pumps, are not in the recirculation flow path to allow partial stroking each quarter.

Submittal **VC-12** provides justification to extend the test frequency for Category B charging pumps to RCS cold leg isolation valves, 1/2SI8801A/B. Each of these valves will be exercised in the open and close directions during cold shutdown periods when the charging pumps are secured for sufficient duration to exercise the valves.

**Basis:** Valves 1/2S18801A/B cannot be stroke tested during unit operation. These valves isolate the CV system from the RCS. Opening them during operation would enable charging flow to pass directly into the RCS, bypassing the regenerative heat exchanger. The temperature difference of the charging flow and the RCS could result in damaging thermal stresses to the cold leg nozzles as well as cause a reactivity change which would, in turn, cause a plant transient. These valves will be stroke time tested during cold shutdowns provided the charging pumps are shutdown. As a result, they may not be tested during cold shutdowns for which the charging pumps are required to be running. It is not the intent of this justification to require charging pump shutdown to perform the exercise test for these valves.

Submittal **VC-13** provides justification to extend the test frequency for Category B SI to RCS hot leg isolation valves, SI pump suction isolation valves from RWST, RHR pumps to RCS cold leg isolation valves, SI pumps common mini-flow recirculation isolation valves, SI pumps cold leg isolation valves, and RHR TO RCS hot leg isolation valves, 1/2S18802A/B, 1/2SI8806, 1/2S18809A/B, 1/2SI8813, 1/2S18835, and 1/2SI8840. Valves 1/2S18802A/B, 1/2S18809A/B, 1/2S18835, and 1/2SI8840 will be exercised in the open and close directions during cold shutdown periods. Valves 1/2SI8806 and 1/2SI8813 will be exercised in the close direction during cold shutdown periods.

**Basis:** The SI spurious valve actuation group valves (SVAG) 1/2S18802A/B, 1/2SI8806, 1/2S18809A/B, 1/2S18813, 1/2S18835, and 1/2S18840 cannot be stroke tested during unit operation. These valves are required by Technical Specification to be de-energized in their proper positions during unit operation. Stroking them would be a violation of the Technical Specifications as well as defeating the de-energized SVAG valve principle.

Submittal **VC-21** provides justification to extend the test frequency for Category B SI accumulator discharge isolation valves, 1/2SI8808A-D. Each of these valves will be exercised in the open and close directions during cold shutdown periods.

**Basis:** Technical Specifications requires "The (accumulator) isolation valve open and power removed," while in Modes 1, 2 or 3 (with pressurizer pressure above 1000 psig). Since the Technical Specifications require these valves to be open with power to their motor operators removed during periods when pressurizer pressure is above 1000 psig, the valves cannot be exercised every three months. In lieu of stroke time testing the valves every three months, these valves will be tested during heat up or cooldown (the pressure transition between 800 and 1000 psig pressurizer pressure) or, they will be tested with the RCS depressurized and the associated accumulator vented and drained.

Submittal **ROJ-1** provides justification to extend the test frequency for Category C SI pump discharge check valves, 1/2SI8922A/B and 1/2SI8926. Each of these valves will be full stroke exercised in the open and close directions during refueling outages.

**Basis:** These check valves cannot be full flow tested during operation as the shut-off head of the SI pumps is lower than the RCS pressure. Performance of this test with the RCS depressurized, but intact, could lead to inadvertent over-pressurization of the system. The alternate method of protecting against over-pressurization by partially draining the RCS to provide a surge volume is not considered a safe practice due to concerns of maintaining adequate water level above the reactor core. Backflow testing during operation requires configurations of the system which is impractical except for during refueling outages.

Submittal **ROJ-2** provides justification to extend the test frequency for Category A/C SI accumulators to RCS cold leg check valves, 1/2SI8948A-D and 1/2SI8956A-D. Valves 1/2SI8948A-D will be part stroke exercised in the close direction during cold shutdown periods and full stroke exercised in the open and close directions during refueling outages. Valves 1/2SI8956A-D will be full stroke exercised in the open and close directions during refueling outages. All valves will be leak rate tested during refueling outages.

**Basis:** These sixteen valves are part of the passive injection subsystem portion of the SI system. This subsystem is designed to inject borated water into the reactor cold legs only after RCS pressure has decreased below the accumulator nitrogen gas pressure. Under normal plant conditions the RCS system pressure is 2235 psig and the accumulator pressure is 650 psig making passive injection impossible. Check valves 1/2SI8956A-D cannot be full or partial tested during unit operation due to the pressure differential between the accumulators (650 psig) and the RCS (2235 psig). Full or partial stroke exercising of these valves could occur only with a rapid depressurization of the RCS. Check valves 1/2SI8948A-D cannot be full or partial stroke tested during unit operation without depressurizing the RCS to 1600 psig (to stroke using SI pumps) or to 200 psig (to use the RHR pumps). Full stroking these valves during cold shutdowns, routine or forced, would impose hardship with no compensating increase in plant safety. To perform this test, the RCS must be at approximately 40 psi with all 4 RCPs off and accumulator pressure at approximately 100 psi over RCS pressure. An additional concern with testing is that at or near end-of-core life, the boron concentration of the RCS is low compared to the approximate 2300 ppm concentration of the accumulators. This injection test requires that approximately 8 thousand gallons of this borated water be injected into the RCS. This would result in a considerable increase in the boron concentration of the RCS. The feed and bleed process required to restore desired RCS boron concentration would result in considerable increases in restoration time and in amounts of radioactive water rejected from the site. The cost of nitrogen required to test these valves is at least $2,500, and although not quantified, the cost of processing the reactor coolant to restore the optimum boron concentration are consequential.

Submittal **ROJ-4** provides justification to extend the test frequency for Category B containment recirculation sump discharge valves, 1/2SI8811A/B. Each of these valves will be exercised in the open and close directions during refueling outages.

**Basis:** The stroke time testing of the 1/2S18811A/B valves require the suctions of the RHR pumps to be drained, thus rendering the train that is being tested inoperable. The stroke time testing of these valves during unit operation would be clearly impractical due to the extensive activities required to perform this testing, along with rendering a subsystem of ECCS (RHR) inoperable for an extended period of time (placing the plant in an undesirable condition). The routine testing of these valves during cold shutdowns is also impractical for the following reasons:

1. For a cold shutdown in which the RCS loops remain filled and there is one train of RHR declared inoperable, Braidwood Station's Technical Specifications require the secondary side narrow range water level to be sufficient to provide a viable heat sink.

However, if the cold shutdown was necessitated by a problem requiring draining of the secondary side of the S/Gs (i.e. tube leaks), Braidwood Station's Technical Specifications would preclude the testing of the containment sump outlet isolation valves until such time as the affected S/Gs had been refilled.

2. For cold shutdown operations with the RCS loops not filled (i.e., drained down to support reactor vessel incore seal table, loop stop valve, RCP and seal maintenance or primary leakage), Braidwood Station's Technical Specifications would preclude the testing of the containment sump outlet isolation valves as it mandates that "two RHR loops shall be operable and at least one RHR loop shall be in operation."

3. The full stroke testing of the 1/2S18811A/B valves; in conjunction with system draining, filling and venting of each train, accounts for an additional six days (3 days per train) of scheduling requirements and increased radiation dose to operators and radiological control personnel. Processing of thousands of gallons of contaminated water, and subsequent required liquid effluent discharges would also result from the draining, refilling and venting of the RHR system. This time duration required to perform the surveillance testing of the containment sump outlet isolation valves during cold shutdown activities could, as a result, cause a violation of the action requirements for Braidwood Technical Specifications. The violations would occur since these action statements require (as noted in their respective foot note sections) the return of the inoperable RHR loop to service within 2 hours, if such loop was removed for surveillance testing provided the other RHR loop is operable and in operation.

4. In addition, NRC Generic Letter 88-17, Loss of Decay Heat Removal, highlights the consequences of a loss of RHR during reduced RCS inventory (below three feet below the reactor vessel flange). If the operating RHR pump is lost due to air entrainment, and the other train is inoperable for the stroke test, then the "operable" train must be vented to restore decay heat removal. Under worst conditions, boiling in the core would occur in approximately 10 minutes, the core would be uncovered in approximately 30 minutes, and fuel damage would occur in approximately 1hour.

Given the apparent disparity between the Technical Specification time requirements for an inoperable RHR loop return to service (2 hours) and the time required to perform surveillance stroke testing of the containment sump outlet isolation valves (3 days) during cold shutdown, the alternate testing frequency of refueling outage periodicity will adequately maintain the system in a state of operational readiness, while not imposing undue hardships or sacrificing the safety of the plant.

Submittal **ROJ-6** provides justification to extend the test frequency for Category A/C SI pumps to the RCS cold leg and SI pumps to RCS hot leg check valves, 1/2SI8819A-D, 1/2SI8905A-D, 1/2SI8949B, and 1/2SI8949D. Each of these valves will be full stroke exercised in the open and close directions during refueling outages.

**Basis:** These valves cannot be full stroke exercised open during operation as the shut-off head of the SI pumps is lower than the RCS pressure. These valves cannot be full stroke exercised during routine Mode 5 cold shutdowns due to the Braidwood Station Technical Specification requirement that all SI pumps and all but one charging pump be inoperable during Modes 4, 5, and 6 (temperature less than 350F), except when the reactor vessel head is removed (Mode 6 refueling outages only). This requirement minimizes the possibility of LTOP of the RCS. The alternate method of protecting against over-pressurization by partially draining the RCS to provide a surge volume is not considered a safe practice due to concerns of maintaining adequate water level above the reactor core. Full stroke exercising of these valves may only be safely performed in Mode 6 with the reactor vessel head removed.

Submittal **ROJ-8** provides justification to extend the test frequency for Category A/C and Category C RHR pumps to RCS "A" and "C" hot leg check valves and ECCS to RCS "A" and "C" hot leg check valves, 1/2SI8841A/B, and 1/2SI8949A/C. Each of these valves will be full stroke exercised in the open and close directions during refueling outages.

**Basis:** The full stroke exercising of check valves 1/2SI8841A/B and 1/2SI8949A/C, associated with the ECCS and the RHR system cannot be accomplished during normal reactor operation because the low head developed by the RHR pumps (less than 250 psi) is not great enough to inject into the RCS (2235 psi). Similarly, the 1/2SI8949A/C check valves cannot be partial stroke tested during normal reactor operation with the SI pumps since the RCS pressure cannot be overcome by the SI pump developed head (1500 psi). Full or partial stroke testing of these valves during cold shutdowns would induce thermal stresses on their respective reactor vessel nozzles as the RCS (maintained at approximately 180 F) is injected with water from the RWST (maintained at approximately 65 F). Additionally, the margin of safety is reduced for brittle fracture prevention and an unacceptable reactivity excursion could be created (high boron concentration and low temperature water). Exercising these check valves in cold shutdown is not practical, full or partial, because they are required by Technical Specifications to be leak tested if there has been flow through them. This leak rate testing will cause a delay in returning the plant to power. Flow testing and the resultant leak rate testing would cause unnecessary radiation exposure to test personnel. For the 1/2SI8841A/B and 1/2SI8949A/C valves, it is best to perform the backflow (Bt) test, which in this case is accomplished in conjunction with the leakage test (Lt), on the same frequency as the full flow (Ct) test, thus testing them to their open position and then to their closed position.

Submittal **ROJ-24** provides justification to extend the test frequency for Category A/C nitrogen supply to the SI accumulator isolation check valves 1/2SI8968. These valves will be full stroke exercised in the close direction and leak rate tested during refueling outages.

**Basis:** These check valves are located inside containment. They do not have remote or local position indication devices to indicate the position of the check valve. The most practical method for verifying closure for these check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is the Appendix J local leak rate test. Testing these valves closed would not be practical to perform routinely at power or during cold shutdowns. To perform the closure test, the test equipment and testing methodology would be the same as that used to satisfy the Appendix J leak test. This involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. The test equipment, the test rig, and air supply lines would need to be run throughout the containment building and the penetration area. Personnel entry into the containment would be required, resulting in exposure to radiation.

## PRIMARY CONTAINMENT PURGE

Submittal **VC-24** provides justification to extend the test frequency for Category A containment purge supply isolation valves, 1/2VQ001A/B and 1/2VQ002A/B. Each of these valves will be exercised in the close direction during cold shutdown periods when valve exercising capabilities are required to be operable.

**Basis:** The primary containment purge supply and exhaust valves, 1/2VQ001A/B and 1/2VQ002A/B, cannot be stroke time tested during unit operation. These 48-inch valves are the only isolation points between the containment atmosphere and the environment. Stroking these valves at any time other than modes 5 or 6 would be a violation of Braidwood Technical Specifications, in which it states that in modes 1-4 the valves "..shall be closed and power removed." Administratively, these valves are maintained out of service closed in a blocked closed condition. As a containment isolation valve, the closure function is considered to be operable. The valves are leak tested in accordance with Technical Specifications every 6 months on a staggered basis and a monthly verification is performed to verify that these valves are closed and power is removed. The monthly verification is completed by verifying the closed indication of the Group 6 monitor lights in the control room and that each power supply is off. However, if re-positioning this valve is necessary and the valve needs to be considered operable in association with exercising capabilities of it, then the IST stroke time testing and remote position indication testing will be completed prior to declaring the valve operable per OM-10, paragraph 4.3.2.5. It is anticipated that the necessary stroke time testing of these valves will be very infrequent, if at all, in the future.

## MAKE-UP DEMINERALIZER

Submittal **ROJ-25** provides justification to extend the test frequency for Category A/C make up demineralized water supply to containment check valves 1/2WM191. These valves will be full stroke exercised in the close direction and leak rate tested during refueling outages.

**Basis:** These check valves are located inside containment. They do not have remote or local position indication devices to indicate the position of the check valve. The most practical method for verifying closure for these check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is the Appendix J local leak rate test. Testing these valves closed would not be practical to perform routinely at power or during cold shutdowns. To perform the closure test, the test equipment and testing methodology would be the same as that used to satisfy the Appendix J leak test. This involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. The test equipment, the test rig, and air supply lines would need to be run throughout the containment building and the penetration area. Personnel entry into the containment would be required, resulting in exposure to radiation.

## CHILLED WATER

Submittal **ROJ-19** provides justification to extend the test frequency for Category A/C chilled water supply to reactor containment fan coolers check valves, 1/2WO007A/B. Each of these valves will be exercised in the close direction during refueling outages.

**Basis:** These check valves are located inside containment. They do not have remote or local position indication devices to indicate the position of the check valve. The most practical method for verifying closure for these check valves, is through the execution of the Appendix J local leak rate testing methods. The closure test for these check valves is identical to the Appendix J local leak rate test. Testing these valves closed would not be practical to perform routinely at power or during cold shutdowns. To perform the closure test, the test equipment and testing methodology would be the same as that used to satisfy the Appendix J leak test. This involves a considerable amount of planning and set up, in addition to taking containment penetrations out of service. The test equipment, the test rig, and air supply lines would need to be run throughout the containment building and the penetration area. Filing and venting would also be required. Personnel entry into the containment would be required, resulting in exposure to radiation. Performing the test requires placing the system in an inoperable status (removed from service) for an extended period of time due to the need to isolate portions of the system, and connecting the leak rate equipment. Additionally it is impractical to perform this test during power operation because the WO system is needed to keep containment temperatures below 120 degrees F. This is based on the environmental qualification of components inside containment and accident analysis assumptions.