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Dominion

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August 7, 2003

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Serial No.: 03-368
NL&OS/PRW Rev 0
Docket Nos.: 50-338/339
50-280/281
50-336/423
License Nos.: NPF-4/7
DPR-32/37
DPR-65
NPF-49

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
DOMINION NUCLEAR CONNECTICUT, INC. (DOMINION)
NORTH ANNA POWER STATION UNITS 1 AND 2
SURRY POWER STATION UNITS 1 AND 2
MILLSTONE POWER STATION UNITS 2 AND 3
SIXTY DAY RESPONSE TO NRC BULLETIN 2003-01
POTENTIAL IMPACT OF DEBRIS BLOCKAGE ON EMERGENCY SUMP RECIRCULATION AT PRESSURIZED-WATER REACTORS

On June 9, 2003 the NRC issued NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors." The bulletin describes the results of recent NRC-sponsored research on potential in-containment debris generation and transport during accidents. In response to the emergent items associated with the potential post-accident debris blockage concerns identified in the bulletin, the NRC requested individual PWR licensees to submit information on an expedited basis to document that they have either:

1) analyzed the ECCS and CSS recirculation functions with respect to post-accident debris blockage effects, taking into account the recent research findings described in the bulletin, and determined that compliance exists with all respective regulatory requirements, or
2) implemented or scheduled for implementation appropriate interim compensatory measures to reduce the risk that may be associated with potentially degraded or nonconforming ECCS or CSS recirculation functions while evaluations to determine compliance proceed.

Dominion has concluded that the scope of the analyses required to address Option 1 of the Bulletin precludes providing a response in the time frame specified. Therefore,

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Dominion is responding to Option 2 of the Bulletin. Attachment 1 of this letter provides the Option 2 response for North Anna Power Station Units 1 and 2. Attachment 2 of this letter provides the Option 2 response for Surry Power Station Units 1 and 2. Attachment 3 of this letter provides the Option 2 response for Millstone Power Station Unit 2. Attachment 4 of this letter provides the Option 2 response for Millstone Power Station Unit 3.

Dominion has been proactive in confirming the current configuration inside containment and establishing baseline containment conditions for analysis of sump performance using industry guidelines and draft Regulatory Guide 1.82, Revision 3. Dominion has completed NEI-02-01 walkdowns at North Anna Unit 1, Surry Unit 1, and Millstone Unit 3. NEI-02-01 walkdowns are planned at Millstone Unit 2 and Surry Unit 2 in Fall 2003 and at North Anna Unit 2 in Spring 2004.

In addition, Dominion has in place containment inspection procedures that review containment cleanliness, containment drainage paths, and sump screen integrity. Dominion has issued an informational briefing to licensed operators to: enhance their knowledge of the sump blockage issue, review existing procedures dealing with potentially degraded ECCS or CSS, and identify alternate water sources available should they become necessary. Also, an Information Bulletin has been issued to Dominion nuclear personnel to emphasize containment cleanliness and strict adherence to the foreign material exclusion program.

Dominion plant design features, containment inspection and cleanliness programs, and emergency operating procedures, together with program enhancements identified in the attachments, promote risk reduction consistent with the intent of Bulletin 2003-01.

If you have any further questions or require additional information, please contact us.

Very truly yours,

William R. Matthews
Senior Vice President – Nuclear Operations
Virginia Electric and Power Company
Dominion Nuclear Connecticut, Inc.

Attachments

Commitments made in this letter:

1. Dominion will implement the EOP revisions and training before March 31, 2004.

2. An informational briefing has been distributed to operators, with required verification of completion by August 22, 2003, or prior to assuming duties on shift for those not available due to vacation or other similar reasons.

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SN: 03-368
Docket Nos.: 50-338/339
50-280/281
50-336/423
Subject: 60 Day Response to NRC Bulletin 2003-01

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by William R. Matthews, who is Senior Vice President - Nuclear Operations of Virginia Electric and Power Company and Dominion Nuclear Connecticut, Inc. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of those Companies, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 7th day of August, 2003.

My Commission Expires: March 31, 2004.

Maggie McClure
Notary Public

(SEAL)

ATTACHMENT 1

Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

North Anna Power Station Units 1 and 2

Virginia Electric and Power Company
(Dominion)

North Anna Power Station Units 1 and 2
Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

NRC required information: Option 2

Within 60 days of the date of the Bulletin all PWR addressees are required to submit a written response that describes any interim compensatory measures that have been implemented or that will be implemented to reduce risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete. The following possible interim compensatory measures are specifically required to be addressed:

a. operator training on indications of and responses to sump clogging.
b. procedural modifications, if appropriate, that would delay switchover to containment sump recirculation (e.g., shutting down redundant pumps that are not necessary to provide required flows to cool the containment and reactor core, and operating the CSS intermittently).
c. ensuring alternative water sources are available to refill the RWST or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere.
d. more aggressive containment cleaning and increased foreign material controls.
e. ensuring containment drainage paths are unblocked.
f. ensuring sump screens are free of adverse gaps and breaches.

Response to Items a., b., and c. above:

Review of North Anna Power Station Operator Training, Emergency Operating Procedures, and Alternate Water Sources

Dominion has reviewed the North Anna Power Station (NAPS) operator training program, Emergency Operating Procedures (EOPs), and plant design features that ensure adequate backup water supplies in light of the information provided in the bulletin. The NAPS evaluation of these types of compensatory actions to reduce risk is summarized in the following sections. Descriptions of the design and operation, including interaction with the containment sump, of the ECCS and Recirculation Spray (RS) systems are contained in Chapter 6 of the NAPS Updated Final Safety Analysis Report.

Emergency Operating Procedure Review and Identified Enhancements

The Loss of Coolant Accident (LOCA) response strategy implemented in the NAPS EOPs is based upon the Westinghouse Owners Group (WOG) Emergency Response Guidelines (ERGs). At the start of the LOCA transient, entry is made into E-0, "Reactor Trip or Safety Injection." Upon diagnosis of a LOCA, transition is made to E-1, "Loss of Reactor or Secondary Coolant." For small LOCAs where pressurizer level can be maintained, Emergency Core Cooling System (ECCS) injection will be terminated as specified in ES-1.1, "SI Termination." For small LOCAs where pressurizer pressure remains above the shutoff head for the low head safety injection (LHSI) pumps, transfer is made to ES-1.2, "Post LOCA Cooldown and Depressurization," where ECCS injection is systematically reduced from two trains to termination and charging is realigned from ECCS injection to the normal charging line-up. Thus, for small LOCAs, the strategy of shutting down redundant pumps that are not necessary to provide required flows is implemented.

For larger LOCAs, where the Reactor Coolant System (RCS) will depressurize below the LHSI pump shutoff head and for which the conditions for ECCS termination are not achieved, the Refueling Water Storage Tank (RWST) inventory will be depleted, requiring switchover to sump recirculation as specified in ES-1.3, "Transfer to Cold Leg Recirculation." In this procedure, the establishment of sump recirculation is confirmed. In the event that there is no power to the LHSI pumps, the recirculation valve alignment cannot be established, or inadequate flow is measured, transfer is made to ECA-1.1, "Loss of Emergency Coolant Recirculation."

The ECA-1.1 strategy includes reduction of ECCS flow to one train, starting all available recirculation spray pumps, cycling the quench spray pumps enough to maintain containment pressure while minimizing flow, aligning alternate core cooling sources, and re-filling the RWST if the normal recirculation path is lost due to debris blockage. A unit experiencing a LOCA at NAPS is capable of cross connecting to the non-faulted unit's charging system. A minimum ECCS flow curve is provided to allow the operators to ensure core cooling is maintained when alternate cooling supplies are used until recirculation from the sump is reestablished. Therefore, Dominion believes that NAPS has adequate alternate water sources to ensure core cooling and containment cooling during a LOCA.

In summary, the current LOCA mitigation strategy implemented at NAPS already contains elements that will delay the switchover to containment sump recirculation for more-probable, small breaks and establishes alternate core cooling sources should sump recirculation be lost. Dominion has identified the following enhancements to the NAPS EOPs that will not impact the current symptom-based strategies of the EOPs:

- Provide for continuous monitoring of key sump performance indicators to ensure transfer to ECA 1.1 on indications of pump cavitation due to debris blockage of the sump.
- Streamline ECA 1.1 instructions to identify debris blockage as the reason for the loss of recirculation and to prioritize sources of alternate core cooling.

Due to the complexity of the procedure changes and the time needed to train the operations staff, Dominion will implement the EOP revisions and training before March 31, 2004. In the interim, an informational briefing has been distributed to licensed operators, with required verification of completion by August 22, 2003, or prior to assuming duties on shift for those not available due to vacation or other similar reasons. The informational briefing reviews the issues identified in Bulletin 2003-01, the key sump performance indicators to monitor during an accident, identification of sump blockage using the indicators, and the current procedures that respond to debris blockage.

Dominion has considered other procedure modifications that would affect the strategies of the EOPs, such as preemptive operator actions to shut off one train of ECCS or quench spray to preserve RWST inventory prior to transfer to sump recirculation. Since the symptom-based response strategies were developed in conformance with the WOG ERGs, changes involving preemptive operator actions to shut off one train of ECCS should only be considered after Owners Group programs have evaluated the generic impact of the changes. An ERG Maintenance Direct Work Request has been submitted to determine and evaluate guidance for diagnosing recirculation sump blockage and potential mitigating actions for incorporation in the ERGs in response to NRC Bulletin 2003-01. This request has not yet been screened for acceptance into the ERG Maintenance Program. If it is determined that ERG changes are appropriate to address potential sump blockage, such changes will be evaluated by the WOG Procedures Working Group. The process to change and issue revisions to the ERGs to address containment sump blockage issues is expected to be completed by March 31, 2004. Dominion will participate in these WOG activities and evaluate any recommended changes to determine if they are appropriate for NAPS.

Review of Current Operator Training on Sump Performance

Current operator training includes guidance on the monitoring of operating ECCS and RS pumps for indications of pump distress or loss of Net Positive Suction Head (NPSH), such as erratic current, flow or discharge pressure. Utilizing all available instrumentation to identify symptoms of containment sump blockage or degraded ECCS pump performance will enhance the current training. General symptoms of pump distress (erratic current, flow or discharge pressure) can be used in combination with sump level to determine sump blockage. Note that operator guidance for the loss of the SI recirculation function is currently contained in ECA-1.1 and that the loss of sump recirculation due to sump blockage is another potential entry into this existing procedure. Operators at NAPS are trained on ECA-1.1 every 24 months.

Response to Items d. and e. above:

Containment Cleaning, Foreign Material Controls, and Drainage Pathways

NAPS has an operating procedure with a containment checklist to provide instructions for a senior reactor operator (SRO) to inspect all accessible areas of the containment, verifying that no loose debris (rags, trash, clothing, etc.) is present in the containment that could be transported to the containment sump and cause restriction of the pump suctions during LOCA conditions. This satisfies the NAPS Technical Requirements Manual surveillance requirements. The containment checklist procedure gives instructions to perform a final containment walkdown before the containment is closed and the unit undergoes a mode change. The walkdown, in part, is designed to inspect for cleanliness and to instruct in minor cleanup of foreign material. The foreign material inspection includes, but is not limited to, any unauthorized rags, trash, clothing, or any other materials that could possibly be transported to the containment sump. The inspection of containment includes normally inaccessible areas such as the top of equipment, the top of ventilation ducts, specifically the ring duct, equipment supports, etc. A second SRO, independent of the first, completes a final inspection. Per the procedure, if additional material is removed, then additional independent verification must be performed until all extraneous material found is removed from containment. Loose debris is required to be removed from containment as part of the containment inspection procedure. This includes any debris that could block drainage paths. Additionally, the drain path from the reactor cavity transfer canal is verified open by operating procedures. The safety analyses conservatively account for water holdup in different areas of containment, such as the reactor cavity, to specifically address blockage of drain paths.

NAPS Radiation Protection Job Guideline describes the methods, preparations, and precautions necessary to support the decontamination of the containment building. Under this guideline a thorough water flush of surfaces within the containment building is performed.

Dominion has an administrative procedure to provide approval and implementation guidelines for subatmospheric containment entry. This procedure includes instructions for the containment entry team leader to inspect entry and work areas inside containment for loose debris that could restrict drainage paths. The procedure also includes the requirement that equipment remaining in containment must be approved by station Engineering and the Station Nuclear Safety and Operating Committee or the equipment is to be removed.

Response to Item f. above:

Sump Screen Inspections

Periodic test procedures are performed each refueling outage to provide a comprehensive sump screen inspection as directed by Technical Specifications surveillance requirements. These inspections verify the condition of the sump screens against design requirements. Use of these procedures would detect the presence of gaps or breaches in the existing sump screens and corrective action would result should any such defects be detected. The sump screens were last inspected at NAPS 1 in March of 2003 and at NAPS 2 in September 2002. The next scheduled inspection of the sump screens for NAPS 1 is the Fall 2004 refueling outage and the next scheduled inspection of the sump screen for NAPS 2 is the Spring 2004 refueling outage. Inspections during refueling outages at both units have ensured the condition of the sump screens conforms with design requirements.

ATTACHMENT 2

Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

Surry Power Station Units 1 and 2

Virginia Electric and Power Company
(Dominion)

Surry Power Stations Units 1 and 2
Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

NRC required information: Option 2

Within 60 days of the date of the Bulletin all PWR addressees are required to submit a written response that describes any interim compensatory measures that have been implemented or that will be implemented to reduce risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete. The following possible interim compensatory measures are specifically required to be addressed:

a. operator training on indications of and responses to sump clogging.
b. procedural modifications, if appropriate, that would delay switchover to containment sump recirculation (e.g., shutting down redundant pumps that are not necessary to provide required flows to cool the containment and reactor core, and operating the CSS intermittently).
c. ensuring alternative water sources are available to refill the RWST or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere.
d. more aggressive containment cleaning and increased foreign material controls.
e. ensuring containment drainage paths are unblocked.
f. ensuring sump screens are free of adverse gaps and breaches.

Response to Items a., b., and c. above:

Review of Surry Power Station Operator Training, Emergency Operating Procedures, and Alternate Water Sources

Dominion has reviewed the Surry Power Station (SPS) operator training program, Emergency Operating Procedures (EOPs), and plant design features that ensure adequate backup water supplies in light of the information provided in the bulletin. The SPS evaluation of these types of compensatory actions to reduce risk is summarized in the following sections. Descriptions of the design and operation, including interaction with the containment sump, of the ECCS and Recirculation Spray (RS) systems are contained in Chapters 5 and 6 of the SPS Updated Final Safety Analysis Report.

Emergency Operating Procedure Review and Identified Enhancements

The Loss of Coolant Accident (LOCA) response strategy implemented in the SPS EOPs is based upon the Westinghouse Owners Group (WOG) Emergency Response Guidelines (ERGs). At the start of the LOCA transient, entry is made into E-0, "Reactor

Trip or Safety Injection." Upon diagnosis of a LOCA, transition is made to E-1, "Loss of Reactor or Secondary Coolant." For small LOCAs where pressurizer level can be maintained, Emergency Core Cooling System (ECCS) injection will be terminated as specified in ES-1.1, "SI Termination." For small LOCAs where pressurizer pressure remains above the shutoff head for the low head safety injection (LHSI) pumps, transfer is made to ES-1.2, "Post LOCA Cooldown and Depressurization," where ECCS injection is systematically reduced from two trains to termination and charging is realigned from ECCS injection to the normal charging line-up. Thus, for small LOCAs, the strategy of shutting down redundant pumps that are not necessary to provide required flows is already implemented.

For larger LOCAs, where the Reactor Coolant System (RCS) will depressurize below the LHSI pump shutoff head and for which the conditions for ECCS termination are not achieved, the Refueling Water Storage Tank (RWST) inventory will be depleted, requiring switchover to sump recirculation as specified in ES-1.3, "Transfer to Cold Leg Recirculation." In this procedure, the establishment of sump recirculation is confirmed. In the event that there is no power to the LHSI pumps, the recirculation valve alignment cannot be established, or inadequate flow is measured, transfer is made to ECA-1.1, "Loss of Emergency Coolant Recirculation."

The ECA-1.1 strategy includes reduction of ECCS flow to one train, cycling the recirculation spray pumps enough to maintain containment pressure while minimizing flow, aligning alternate core cooling sources, and re-filling the RWST if the normal recirculation path is lost due to debris blockage. A unit experiencing a LOCA at SPS is capable of cross-connecting to the non-faulted unit's charging system (charging pump discharge) or to the non-faulted unit's RWST (charging pump suction), if necessary. A minimum ECCS flow curve is provided to allow the operators to ensure core cooling is maintained when alternate cooling supplies are used until recirculation from the sump is reestablished. Therefore, Dominion believes that SPS has adequate alternate water sources to ensure core cooling and containment cooling during a LOCA.

In summary, the current LOCA mitigation strategy implemented at SPS already contains elements that will delay the switchover to containment sump recirculation for more-probable, small breaks and establishes alternate core cooling sources should sump recirculation be lost. Dominion has identified the following enhancements to the SPS EOPs that will not impact the current symptom-based strategies of the EOPs:

- Provide for continuous monitoring of key sump performance indicators to ensure transfer to ECA 1.1 on indications of pump cavitation due to debris blockage of the sump.
- Streamline ECA 1.1 instructions to identify debris blockage as the reason for the loss of recirculation and to prioritize sources of alternate core cooling.

Due to the complexity of the procedure changes and the time needed to train the operations staff, Dominion will implement the EOP revisions and training before March 31, 2004. In the interim, an informational briefing has been distributed to

licensed operators, with required verification of completion by August 22, 2003, or prior to assuming duties on shift for those not available due to vacation or other similar reasons. The informational briefing reviews the issues identified in Bulletin 2003-01, the key sump performance indicators to monitor during an accident, identification of sump blockage using the indicators, and the current procedures that respond to debris blockage.

Dominion has considered procedure modifications that would affect the strategies of the EOPs, such as pre-emptive operator actions to shut off one train of ECCS or containment spray to preserve RWST inventory prior to transfer to sump recirculation. Since the symptom-based response strategies were developed in conformance with the WOG ERGs, changes involving pre-emptive operator actions to shut off one train of ECCS should only be considered after Owners Group programs have evaluated the generic impact of the changes. An ERG Maintenance Direct Work Request has been submitted to determine and evaluate guidance for diagnosing recirculation sump blockage and potential mitigating actions for incorporation in the ERGs in response to NRC Bulletin 2003-01. This request has not yet been screened for acceptance into the ERG Maintenance Program. If it is determined that ERG changes are appropriate to address potential sump blockage, such changes will be evaluated by the WOG Procedures Working Group. The process to change and issue revisions to the ERGs to address containment sump blockage issues is expected to be completed by March 31, 2004. Dominion will participate in these WOG activities and implement any recommended changes that are determined to be appropriate for SPS.

Review of Current Operator Training on Sump Performance

Current operator training includes guidance on the monitoring of operating ECCS and RS pumps for indications of pump distress or loss of Net Positive Suction Head (NPSH), such as erratic current, flow or discharge pressure. Utilizing all available instrumentation to identify symptoms of containment sump blockage or degraded ECCS pump performance will enhance the current training. General symptoms of pump distress (erratic current, flow or discharge pressure) can be used in combination with sump level to determine sump blockage. Note that operator guidance for the loss of the SI recirculation function is currently contained in ECA-1.1, "Loss of Emergency Coolant Recirculation," and that the loss of sump recirculation due to sump blockage is another potential entry into this existing procedure. SPS operators are trained on ECA-1.1 every 36 months.

Response to Items d. and e. above:

Containment Cleaning, Foreign Material Controls, and Drainage Pathways

SPS has an attachment in the operating procedure for RCS heatup that verifies the containment is free of debris and equipment not intended to remain in containment, and that doors and any equipment intended to remain in containment are properly secured.

Surry containments use a significant amount of floor grating in the area outside of the crane wall on all elevations above the containment basement floor. Areas inside the crane wall, which include the loop rooms containing the reactor coolant pumps and steam generators, and pressurizer cubicle are provided with sufficient openings, such as gated doorways and floor gratings, to allow water to flow easily from these areas to the containment sump. Floor plugs on the operating deck, used to support containment refueling activities, are verified to be removed in the operating procedure for RCS heatup. Removal of these plugs provides sufficient openings in the containment operating deck for water to easily flow to the lower containment elevations and ultimately to the sump. Water entering the reactor cavity will drain into the incore sump area beneath the reactor filling this volume until it reaches the elevation of the reactor coolant loop penetrations. At this point it will spill out of the area and flow to the sump. The attachment to the RCS heatup procedure verifies the removal of debris or materials that could potentially block these flow paths. Additionally, the drain path from the refueling cavity transfer canal to the sump is verified open by a valve line-up procedure. The safety analyses conservatively account for water holdup in different areas of containment, such as the reactor cavity, to specifically address blockage of drain paths. The containment sump inspection procedure verifies the sump is clean and screens conform with design requirements.

Dominion has an administrative procedure to provide approval and implementation guidelines for subatmospheric containment entry. This procedure includes instructions for the containment entry team leader to inspect entry and work areas inside containment for loose debris that could restrict drainage paths. The procedure also includes the requirement that equipment remaining in containment must be approved by station Engineering or the equipment is to be removed.

Response to Item f. above:

Sump Screen Inspections

Comprehensive sump inspection procedures are required by Technical Specifications to be performed each refueling outage. These inspections verify the condition of the sump screens against design requirements. Use of these procedures would detect the presence of gaps or breaches in the existing sump screens and corrective action would result should any such defects be detected. The sump screens were last inspected at SPS 1 in May of 2003 and at SPS 2 in April 2002.

The next scheduled inspection of the sump for SPS 1 is the Fall 2004 refueling outage and the next scheduled inspection of the sump for SPS 2 is the Fall 2003 refueling outage. Inspections during each refueling outage at both units have ensured the condition of the sump screens is satisfactory.

ATTACHMENT 3

Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

Millstone Power Station Unit 2

Dominion Nuclear Connecticut, Inc.
(Dominion)

Millstone Power Station Unit 2
Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

NRC required information: Option 2

Within 60 days of the date of the Bulletin all PWR addressees are required to submit a written response that describes any interim compensatory measures that have been implemented or that will be implemented to reduce risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete. The following possible interim compensatory measures are specifically required to be addressed:

a. operator training on indications of and responses to sump clogging.
b. procedural modifications, if appropriate, that would delay switchover to containment sump recirculation (e.g., shutting down redundant pumps that are not necessary to provide required flows to cool the containment and reactor core, and operating the CSS intermittently).
c. ensuring alternative water sources are available to refill the RWST or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere.
d. more aggressive containment cleaning and increased foreign material controls.
e. ensuring containment drainage paths are unblocked.
f. ensuring sump screens are free of adverse gaps and breaches.

Response to Items a., b., and c. above:

Review of Millstone Power Station Unit Operator Training, Emergency Operating Procedures, and Alternate Water Sources

Dominion has reviewed the Millstone Power Station Unit 2 (MPS 2) operator training program, Emergency Operating Procedures (EOPs), and plant design features that ensure adequate backup water supplies in light of the information provided in the bulletin. The MPS 2 evaluation of these types of compensatory actions to reduce risk is summarized in the following sections. Descriptions of the design and operation, including interaction with the containment sump, of the Emergency Core Cooling System (ECCS) and Containment Spray System (CSS) are contained in Chapter 6 of the MPS 2 Final Safety Analysis Report.

Emergency Operating Procedure Review and Identified Enhancements

The Loss of Coolant Accident (LOCA) strategy implemented in the MPS 2 EOPs, is based upon the Combustion Engineering Owners Group (CEOG) Emergency

Procedure Guidelines (EPGs). At the start of the LOCA transient, entry is made into EOP 2525, "Standard Post-Trip Actions." Upon diagnosis of a LOCA, transition is made to EOP 2532, "Loss of Coolant Accident." For small LOCAs where reactor vessel and pressurizer level, Reactor Coolant System (RCS) subcooling and Steam Generator (SG) heat removal can be maintained or restored, High Pressure Safety Injection (HPSI) flow will be throttled or stopped. Thus, for these ranges of small break LOCA, the strategy of shutting down redundant pumps that are not necessary to provide required flows is implemented.

For larger LOCAs, where the HPSI throttle/stop criteria are not met, ECCS injection will continue until low level is reached in the Refueling Water Storage Tank (RWST), thereupon sump recirculation is initiated. EOP 2532 and the Functional Recovery Procedure (FRP) EOP 2540 contain steps that monitor the adequacy of HPSI pump flow and pump current to confirm that sump recirculation is working properly. The check on pump current would detect inadequate pump Net Positive Suction Head (NPSH) due to debris blockage of the sump. If these conditions are encountered, one of the HPSI pumps will be stopped. This also implements the recommended strategy of shutting down redundant pumps. Other than tripping one HPSI pump, no other actions are currently specified. Implementation of the Westinghouse Owners Group (WOG) strategy for loss of sump recirculation would enhance this EOP with respect to the potential for sump blockage.

The current MPS 2 EOPs do not address refilling the RWST. Changes to the EOPs will be made to add the contingency for refilling the RWST. At a minimum, the use of the normal blended makeup system will be specified. In addition, other potential sources including the spent fuel pool system and fire water system will be evaluated for inclusion in the EOP. Methods for refilling the RWST exist in normal operating procedures.

Dominion has identified enhancements to the MPS 2 EOPs that would not impact the current symptom-based strategies of the EOPs and will implement the following elements of the WOG strategy:

- Incorporate the use of other available instrumentation for monitoring for debris blockage of the sump
- Reduce or stop containment spray flow while maintaining containment cooling using Containment Air Recirculation (CAR) fans
- Throttle HPSI flow to maintain minimum flow to match decay heat
- Refill the RWST and re-establish ECCS injection

Due to the complexity of the procedure changes and the time needed to train the operations staff, Dominion will implement the EOP revisions and training before March 31, 2004. In the interim, an informational briefing has been distributed to licensed operators, with required verification of completion by August 22, 2003, or prior to assuming duties on shift for those not available due to vacation or other similar

reasons. The briefing reviews the issues identified in Bulletin 2003-01, the key sump performance indicators to monitor during an accident, identification of sump blockage using the indicators, and the current procedures that respond to debris blockage.

While other changes can be made, such as preemptive operator actions to shut off one train of ECCS and/or CSS prior to transfer to sump recirculation, these strategies would be in conflict with the current framework of the CEOG EPGs. Since these strategies were developed in conformance with the CEOG EPGs, changes involving preemptive operator actions to shut off one train of ECCS and/or CSS should only be considered after Owners Group programs have been completed to evaluate the generic impact of the changes. If it is determined that EPG changes are appropriate to address sump blockage, any such changes will be evaluated under the CEOG EPG maintenance program. The process and schedule to change and issue applicable revisions to the EPGs to address containment sump blockage issues is expected to be completed by March 31, 2004. Dominion will participate in these owner group activities and implement any recommended changes that are determined to be appropriate for MPS 2.

Review of Current Operator Training on Sump Performance

Current operator training includes guidance on the monitoring of operating ECCS and CSS pumps for indications of pump distress or loss of Net Positive Suction Head (NPSH), such as erratic current, flow or discharge pressure. Emphasizing use of all available instrumentation to identify symptoms of containment sump blockage or degraded ECCS pump performance will enhance the current training. General symptoms of pump distress (erratic current, flow or discharge pressure) can be used in combination with sump level to determine sump blockage.

Response to Items d. and e. above:

Containment Cleaning, Foreign Material Controls, and Drainage Pathways

For MPS 2, a comprehensive containment inspection procedure is in effect. Performance of this inspection procedure is presently required by Technical Specifications although the obligation is being transferred to the Technical Requirements Manual under a separate license amendment request. This containment inspection is completed prior to closing containment following a plant outage, which requires a containment entry, or following a containment entry at power. This procedure specifically discusses the potential for loose debris that could block the emergency sump screens and directs the inspection for and removal of all loose debris. Additionally, this procedure directs the removal of temporary equipment used in containment and the restraint of any temporary material that is to be left in containment. Detailed checklists are required to be used to document the performance of the containment inspection whenever the procedure is invoked.

The containment inspection procedure includes the following:

- Performance of a visual inspection for loose material, which could obstruct flow to the containment sump during a LOCA.
- Specific criteria for temporary equipment that will remain in containment following closeout.
- Formal documentation of completion of the inspection by requiring forms to be initialed and dated.

For MPS 2, the containment inspection procedure also includes the inspection for any debris, which can block containment drainage paths. Most of the floor is constructed of grating through which water easily passes. The containment inspection procedure, which is completed whenever containment closeout is required, ensures that no material (such as floor coverings) is left in place that may block flow through the grating.

Three significant constricted drain paths exist in the MPS 2 containment. Two of these are refueling cavity drains that drain separate (and independent) sections of the refuel pool. Clogging of these drain lines is minimized by the presence of a screened enclosure over each of the lines and an isolation valve which is procedurally locked open while the plant is at power. The third constricted flow path is from the reactor cavity, which is in the space between the reactor vessel and the shield wall. No isolation valve exists in this line and no screened enclosure protects this line from blockage by debris. A containment water hold-up calculation conservatively analyzed water hold-up in containment following a LOCA. In that calculation, no credit is taken for drainage from the larger half of the refueling pool. With this assumption, which results in significant water hold up from Containment Sprays, adequate NPSH exists to support recirculation. Additional assurance that the drain lines are not clogged is provided by the operating procedure used to drain the refuel pool following the completion of refueling. This procedure directs that the refueling pool be emptied by pumping it down to about 6" level, draining the remainder through a filter to the normal containment sump, and then flushing the filter with clean water. After the refuel pool is thus emptied, the normal drains are opened and left open to ensure any water that collects in the refueling pool drains to the containment sump.

Response to Item f. above:

Sump Screen Inspections

At MPS 2, a comprehensive sump screen inspection procedure is required by Technical Specifications to be performed each refueling outage. These inspections verify the condition of the sump screens against design requirements. Use of these procedures would detect the presence of gaps or breaches in the existing sump screens and corrective action would result should any such defects be detected.

As a result of detailed inspections of the sump screens in 1996, a thorough design review of the sump screen area and opening size including generation of a mechanistic debris transport calculation, a containment water level calculation, a sump screen structural integrity calculation, and a containment water hold-up calculation was completed. This design review supported a formal design change that redesigned and rebuilt the emergency sump screen to ensure its capability to perform during sump recirculation.

Since 1996, inspections during each subsequent refueling outage have ensured the condition of the sump screens is satisfactory. The next scheduled inspection of the sump screens for MPS 2 is the Fall 2003 refueling outage.

Additional Unique Plant-Specific Compensatory Measures

The MPS 2 Safety Parameter Display System (SPDS) includes displays that provide continuous monitoring of the accomplishment of sump recirculation and the adequacy of ECCS flow and will provide warning to the operators if unsatisfactory performance is detected. For sump recirculation, SPDS determines the status by monitoring valve position, High Pressure Safety Injection (HPSI) and Low Pressure Safety Injection (LPSI) pump status, and RWST level. For ECCS flow, SPDS monitors the charging and HPSI flow rates and compares it to an integrated pressure dependent flow delivery curve. The SPDS display will indicate SAT/UNSAT status for these parameters, alerting the operators to the potential for sump blockage. As changes are made to the EOPs to address sump blockage, the SPDS design will also be evaluated for enhancements to maintain consistency with the EOPs.

ATTACHMENT 4

Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

Millstone Power Station Unit 3

Dominion Nuclear Connecticut, Inc.
(Dominion)

Millstone Power Station Unit 3
Sixty Day Response to NRC Bulletin 2003-01
Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors

NRC required information: Option 2

Within 60 days of the date of the Bulletin all PWR addressees are required to submit a written response that describes any interim compensatory measures that have been implemented or that will be implemented to reduce risk which may be associated with potentially degraded or nonconforming ECCS and CSS recirculation functions until an evaluation to determine compliance is complete. The following possible interim compensatory measures are specifically required to be addressed:

a. operator training on indications of and responses to sump clogging.
b. procedural modifications, if appropriate, that would delay switchover to containment sump recirculation (e.g., shutting down redundant pumps that are not necessary to provide required flows to cool the containment and reactor core, and operating the CSS intermittently).
c. ensuring alternative water sources are available to refill the RWST or to otherwise provide inventory to inject into the reactor core and spray into the containment atmosphere.
d. more aggressive containment cleaning and increased foreign material controls.
e. ensuring containment drainage paths are unblocked.
f. ensuring sump screens are free of adverse gaps and breaches.

Response to Items a., b., and c. above:

Review of Millstone Power Station Unit 3 Operator Training, Emergency Operating Procedures, and Alternate Water Sources

Dominion has reviewed the Millstone Power Station Unit 3 (MPS 3) operator training program, Emergency Operating Procedures (EOPs), and plant design features that ensure adequate backup water supplies in light of the information provided in the bulletin. The MPS 3 evaluation of these types of compensatory actions to reduce risk is summarized in the following sections. Descriptions of the design and operation, including interaction with the containment sump, of the Emergency Core Cooling System (ECCS) and Recirculation Spray System (RSS) are contained in Chapter 6 of the MPS 3 Final Safety Analysis Report.

Emergency Operating Procedure Review and Identified Enhancements

The Loss of Coolant Accident (LOCA) strategy implemented in the MPS 3 EOPs, is based upon the Westinghouse Owners Group (WOG) Emergency Response

Guidelines (ERGs). At the start of the LOCA transient, entry is made into E-0, "Reactor Trip or Safety Injection." Upon diagnosis of a LOCA, transition is made to E-1, "Loss of Reactor or Secondary Coolant." For small LOCAs where pressurizer level can be maintained, ECCS injection will be terminated as specified in ES-1.1, "SI Termination." For small LOCAs where pressurizer level is lost but pressurizer pressure remains above the shutoff head for the Residual Heat Removal (RHR) pumps, transfer is made to ES-1.2, "Post LOCA Cooldown and Depressurization." ECCS injection is systematically reduced from two trains to termination and charging is realigned from ECCS injection to the normal charging line-up. Thus, for more realistic, small break LOCAs, the strategy of shutting down redundant pumps that are not necessary to provide required flows is implemented.

For larger LOCAs, where the Reactor Coolant System (RCS) will depressurize below the RHR shutoff head and for which the conditions for ECCS termination are not achieved, the Refueling Water Storage Tank (RWST) inventory will be decreased, with switchover to sump recirculation as specified in ES-1.3, "Transfer to Cold Leg Recirculation." In this procedure, the adequacy of the establishment of sump recirculation is monitored. In the event that there is no power to the RSS pumps, the recirculation valve alignment cannot be established, or inadequate flow is measured, transfer is made to ECA-1.1, "Loss of Emergency Coolant Recirculation." To address the potential for loss of sump recirculation due to debris blockage, ES-1.3 will be changed to include transfer to ECA-1.1 upon indications of flow blockage (e.g., low containment sump level, unstable motor current, low RSS discharge pressure).

In ECA-1.1, the strategy includes reducing ECCS and containment spray flow to one train, cycling the recirculation containment spray pump enough to maintain containment pressure while minimizing flow, refilling the RWST and realigning ECCS back to injection. A minimum ECCS flow curve is provided to allow the operators to cycle the pumps to conserve RWST inventory. For MPS 3, this strategy can be very effective in dealing with debris blockage since approximately half of the 1.1 million gallons in the RWST will be injected into the RCS and containment spray at time of realignment to recirculation. This also implements the recommended strategy of shutting down redundant pumps. The guidance in Generic Attachment 10 (GA-10) for filling the RWST utilizes the normal blended makeup systems. Enhancements will be made to this procedure to reorder the steps to minimize the RWST draindown and to add additional options for filling the RWST. There are additional options for alternative water sources already specified in the Severe Accident Management Guidelines (SAMGs) that will be considered.

In the SAMGs, additional water sources such as the spent fuel pool and purification system and the fire water system are identified as sources for refilling the RWST. Some of these methods involve installation of spool pieces and routing of fire hoses. Some changes are needed in order to include these options in the EOPs. These additional options will be reviewed and GA-10 will be supplemented with additional ways to refill the RWST.

Dominion has identified enhancements to the MPS 3 EOPs that will not impact the current symptom-based strategies of the EOPs and will implement the following:

- Expand the conditions for transfer to ECA 1.1 to include indications of debris blockage of the sump.
- Re-order the steps in ECA 1.1 to minimize the rate of RWST draindown
- Add additional options for filling the RWST to GA-10

Due to the complexity of the procedure changes and the time needed to train the operations staff, Dominion will implement the EOP revisions and training before March 31, 2004. In the interim, an informational briefing has been distributed to licensed operators, with required verification of completion by August 22, 2003, or prior to assuming duties on shift for those not available due to vacation or other similar reasons. The briefing reviews the issues identified in Bulletin 2003-01, the key sump performance indicators to monitor during an accident, identification of sump blockage using the indicators, and the current procedures that respond to debris blockage.

Dominion has considered other procedure changes that would affect the strategies of the EOPs. Since these strategies were developed in conformance with the WOG ERGs, changes involving pre-emptive operator actions to shut off one train of ECCS and/or Containment Spray System (CSS) should only be considered after Owners Group programs have been completed to evaluate the generic impact of the changes. An ERG Maintenance Direct Work Request has been submitted to evaluate guidance for diagnosing recirculation sump blockage and potential mitigating actions for incorporation in the ERGs in response to NRC Bulletin 2003-01. This request has not yet been screened for acceptance into the ERG Maintenance Program. If it is determined that ERG changes are appropriate to address sump blockage, any such changes will be evaluated by the WOG Procedures Working Group. The process and schedule to change and issue revisions to the ERGs to address containment sump blockage issues is expected to be completed by March 31, 2004. Dominion will participate in these WOG activities and implement any recommended changes that are determined to be appropriate for MPS 3.

Review of Current Operator Training on Sump Performance

Current operator training includes guidance on the monitoring of operating ECCS and RSS pumps for indications of pump distress or loss of Net Positive Suction Head (NPSH), such as erratic current, flow or discharge pressure. Emphasizing use of all available instrumentation to identify symptoms of containment sump blockage or degraded ECCS pump performance will enhance the current training. General symptoms of pump distress (erratic current, flow or discharge pressure) can be used in combination with sump level to determine sump blockage. Note that operator guidance for the loss of the SI recirculation function is currently contained in ECA-1.1 and that

the loss of sump recirculation due to sump blockage is another potential entry into this existing guidance. MPS 3 operators are trained on ECA-1.1 every 24 months.

Response to Items d. and e. above:

Containment Cleaning, Foreign Material Controls, and Drainage Pathways

For MPS 3, a comprehensive containment inspection procedure is in effect. Performance of this inspection procedure is required by Technical Specifications. This containment inspection is completed prior to closing containment following a plant outage, which requires a containment entry, or following a containment entry at power. This procedure specifically discusses the potential for loose debris to block the emergency sump screens and directs the inspection for and removal of all loose debris. Additionally, this procedure directs the removal of temporary equipment used in containment and the restraint of any temporary material that is to be left in containment. Detailed checklists are required to be used to document the performance of the containment inspection whenever the procedure is invoked.

The containment inspection procedure includes the following:

- Performance of a visual inspection for loose material, which could obstruct flow to the containment sump during a LOCA.
- Visual inspection of the containment sump to verify the RSS suction inlets are not obstructed by debris and components are not distressed or corroded.
- Specific criteria for temporary equipment that will remain in containment following closeout.
- Inspection requirements for each level of containment.
- Maintenance inspections of RSS pump suction piping by establishing an FME zone, removing the deck plates, and inspecting the suction lines for debris and irregularities.
- Examples of loose debris for which to check.
- Formal documentation of completion of inspection by requiring forms to be initialed and dated for each level of containment.

For MPS 3, the containment inspection procedure requires removal of all loose debris from containment. This includes any debris that can block containment drainage paths. Most of the floor is concrete with grating in the outer annulus. The containment inspection procedure, completed whenever containment closeout is required, ensures that no material (such as floor coverings) is left in place that may block flow through the grating.

Floor drains exist in each of the reactor coolant pump cubicles and in the bottom of the refueling cavity. During the containment closeout inspections, all loose debris is removed from containment which could block drain lines or block the sump. This includes loose debris in the pump cubicles and in the refueling cavity. The drain lines

are either supplied with isolation valves procedurally locked open while at power or have no isolation valves. A comprehensive and detailed calculation has been done to analyze the water hold up in containment. In that calculation, no credit is taken for flow from any of these drain lines and the analysis demonstrates that with this assumption resulting in significant water hold-up from the containment sprays and potentially the break flow, adequate NPSH exists for the pumps taking suction on the sump during recirculation.

Response to Item f. above:

Sump Screen Inspections

At MPS 3, a comprehensive sump screen inspection procedure is required by Technical Specifications to be performed each refueling outage. The inspections verify the condition of the sump screens against design requirements. Use of this procedure would detect the presence of gaps or breaches in the existing sump screens and corrective action would result should any such defects be detected.

As a result of detailed inspections of the sump screen in 1997, a thorough design review of the sump screen area and opening size including generation of a mechanistic debris transport calculation, a containment water level calculation, and a containment water hold-up calculation was completed. This design review supported a formal design change that repaired the emergency sump screen to ensure its capability to perform during sump recirculation.

Since 1997, inspections during each subsequent refueling outage have ensured the condition of the sump screens is satisfactory. The next scheduled inspection of the sump screens for MPS 3 is the Spring 2004 refueling outage.

Additional Unique Plant-Specific Compensatory Measures

The MPS 3 Safety Parameter Display System (SPDS) includes a display that provides continuous monitoring of the post-LOCA cooling (PLC) status and will provide warning to the operators by changing the color-coded status indication from GREEN to YELLOW when unsatisfactory performance is detected. SPDS determines the status by monitoring RWST and sump level, ECCS flow, ECCS discharge pressure and hot leg temperatures. For example, sump blockage would result in abnormal ECCS flow and discharge pressure and would indicate YELLOW on the SPDS status display. This will allow the operator to diagnose the sump blockage and transfer to ECA-1.1. This SPDS capability has been included in the operator informational briefing. As changes are made to the EOPs to address sump blockage, the SPDS design will also be evaluated for enhancements to maintain consistency with the EOPs.