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September 13, 2005

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Serial No. 05-357
NLOS/PRW R1
Docket No. 50-423
License No. NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3
PROPOSED TECHNICAL SPECIFICATIONS CHANGE
RECIRCULATION SPRAY SYSTEM

Pursuant to 10 CFR 50.90, Dominion Nuclear Connecticut, Inc. (DNC) hereby requests to amend Operating License NPF-49 for Millstone Power Station Unit 3 (MPS3). The changes revise surveillance requirements for the recirculation spray system (RSS) to verify proper initiation of recirculation spray through actuation by the refueling water storage tank low-low level signal instead of actuation by a timer. The proposed wording is consistent with Improved Standard Technical Specifications Change Traveler, TSTF-286-A, Revision 2 and NUREG 1431, Westinghouse Owners Group Standard Technical Specifications, Revision 3, March 31, 2004. This amendment request is being submitted as part of Dominion's resolution to NRC Generic Safety Issue 191 (GSI-191).

The proposed amendments do not involve a significant impact on public health and safety and do not involve a Significant Hazards Consideration pursuant to the provisions of 10 CFR 50.92.

Attachment 1 contains the description, justification, and no Significant Hazards Consideration determination for MPS3. Attachment 2 contains the associated marked-up technical specification pages. Attachment 3 contains the proposed amendment pages. Attachment 4 contains the marked-up pages of the TS Bases for information only. Attachment 5 contains the radiological analysis assumptions and results. The Site Operations Review Committee and the Management Safety Review Committee have reviewed and concurred with the determinations.

In a letter dated May 27, 2004, DNC requested an amendment to the MPS3 operating license based on the radiological dose analysis margins obtained by using an alternate source term (AST) consistent with 10 CFR 50.67. This request also affects that May 27, 2004 submittal in that it modifies the LOCA analysis and resultant dose calculations provided with that request. Furthermore, the analysis referenced in this request is predicated on approval of the MPS3 AST amendment request.

DNC requests NRC staff approval by September 30, 2006 in order to implement the changes prior to the spring 2007 refueling outage for MPS3 to meet the required implementation schedule for GSI-191 resolution. In addition, approval of the AST amendment request is required prior to or concurrent with approval of this request.

In accordance with 10 CFR 50.91(b), a copy of this license amendment request is being provided to the State of Connecticut.

If you should have any questions regarding this submittal, please contact Mr. Paul R. Willoughby at (804) 273-3572.

Very truly yours,

Leslie N. Hartz
Vice President – Nuclear Engineering

Attachments:

1. Evaluation of Proposed License Amendment, MPS3
2. Marked-Up Pages, MPS3
3. Re-typed Pages, MPS3
4. Re-typed Bases Pages (for information only)
5. Radiological analysis assumptions and results

Commitments made in this letter: None

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COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Leslie N. Hartz, who is Vice President - Nuclear Engineering of Dominion Nuclear Connecticut, Inc. She has affirmed before me that she is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of her knowledge and belief.

Acknowledged before me this 13th day of September, 2005.

My Commission Expires: August 31, 2008.

Margaret B. Bennett
Notary Public

(SEAL)

ATTACHMENT 1

PROPOSED TECHNICAL SPECIFICATIONS CHANGE
RECIRCULATION SPRAY SYSTEM SURVEILLANCE REQUIREMENTS

EVALUATION OF PROPOSED LICENSE AMENDMENT

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

PROPOSED TECHNICAL SPECIFICATIONS CHANGE
RECIRCULATION SPRAY SYSTEM SURVEILLANCE REQUIREMENTS
EVALUATION OF PROPOSED LICENSE AMENDMENT

1.0 DISCUSSION OF PROPOSED CHANGES

Pursuant to 10 CFR 50.90, Dominion Nuclear Connecticut, Inc. (DNC) hereby requests to amend Operating License NPF-49 for Millstone Power Station Unit 3 (MPS3). The changes revise surveillance requirements for the recirculation spray system (RSS) to verify proper initiation of recirculation spray through actuation by the refueling water storage tank (RWST) low-low level signal instead of actuation by a timer. The proposed wording is consistent with Improved Standard Technical Specifications Change Traveler, TSTF-286-A, Revision 2 and NUREG 1431, Westinghouse Owners Group Standard Technical Specifications, Revision 3, March 31, 2004. This amendment request is being submitted as part of Dominion's resolution to NRC Generic Safety Issue 191 (GSI-191).

In a letter dated September 13, 2004, the NRC issued Generic Letter 2004-02: "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors." The generic letter requests that addressees perform an evaluation of the emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions in light of the information provided in the letter and, if appropriate, take additional actions to ensure system function. Additionally, addressees are requested to submit the information specified in the letter to the NRC. The request is based on the identified potential susceptibility of pressurized-water reactor (PWR) recirculation sump screens to debris blockage during design basis accidents requiring recirculation operation of ECCS or CSS. In addition, the potential for adverse effects of debris blockage on flow paths necessary for ECCS and CSS recirculation and containment drainage must be considered. The generic letter requests a general description of and planned schedule for any changes to the plant licensing basis including any licensing actions needed to support these changes.

As part of the plan for addressing the requirements specified in NRC Generic Letter 2004-02, it has been identified that a technical specification change is necessary to increase the available margin to suction pipe flashing and for pump net positive suction head (NPSH) in order to accommodate the increase in head loss. The change involves increasing the RSS pumps start delay time following a containment depressurization actuation (CDA) signal.

In a letter dated May 27, 2004, Dominion Nuclear Connecticut, Inc. (DNC) requested an amendment to the MPS3 operating license based on the radiological dose analysis margins obtained by using an alternate source term consistent with 10 CFR 50.67. This request also affects the May 27, 2004 submittal in that it modifies the LOCA analysis and resultant dose calculations provided with that request.

1.1 Millstone Unit 3 ECCS Pump System Description

The MPS3 ECCS design includes several sets of pumps that reduce containment temperature and pressure and remove core heat following an accident. Following a design basis loss of coolant accident (LOCA), reactor coolant system (RCS) pressure will drop resulting in a safety injection signal (SIS) and containment pressure will rise resulting in a CDA signal. Upon receipt of the SIS, the charging pumps, intermediate high head safety injection (SI) pumps and low head safety injection (RHS) pumps are started to inject water into the RCS from the refueling water storage tank (RWST). Upon receipt of the CDA signal, the quench spray system (QSS) pumps also start drawing water from the RWST and spraying that water into containment via spray headers to lower containment temperature and pressure. The RSS pumps will start (after a time delay of approximately 660 seconds) and draw water from the containment emergency sump and spray that water into containment via spray headers to assist in lowering containment temperature and pressure. When the RWST reaches its low-low level point, (approximately half full), the transfer to the recirculation mode is initiated. The RHS pumps automatically stop on the low-low RWST level signal and the SI and charging pumps are manually realigned to take suction from the discharge of one of the two RSS pumps on each train to continue core heat removal. These pumps remain aligned to the spray headers and excess pump flow not used by the ECCS pumps is directed to the spray headers. The other RSS pump on each train continues to discharge to its spray header to continue lowering containment temperature and pressure. The QSS pumps continue to take suction from the RWST and discharge to spray headers until they stop automatically on a RWST level signal indicating that the RWST is empty. Recirculated containment water is provided to each RSS pump through a dedicated inlet line from the containment emergency sump. Each RSS pump discharges to a dedicated RSS heat exchanger that is cooled by service water from Long Island Sound.

Because the four MPS3 RSS pumps are started after a timer delay of approximately 660 seconds following a CDA, there is a limited quantity of water on the containment floor (in the containment sump) for LOCAs. As a result there is little margin to suction pipe flashing and for pump NPSH. For the limiting case there is approximately 1½ inches of margin to suction line flashing. This amount of margin is adequate to support the current licensing basis for operability of the ECCS system for MPS3. The proposed delay in starting the RSS pump is considered necessary to provide additional water level to the containment floor (and hence suction line flashing and NPSH margin for the RSS pumps prior to their start) to ensure operability of the RSS pumps under the revised licensing basis to be established to resolve GSI-191.

Delaying the initiation of RSS has a potential adverse impact on a number of different areas, including post-LOCA containment pressure and temperature, environmental conditions for safety related equipment inside containment, spray piping stress and support loads, diesel loading and the post-LOCA radiological analysis. Each of these areas have been evaluated as summarized below.

1.2 Containment Reanalysis Results

Delaying RSS will result in a reduction in heat removal from the containment atmosphere, potentially increasing containment pressure and temperature from approximately 15 minutes after LOCA initiation (i.e., the time when RSS was previously effective). In addition it can reduce the removal of iodine from the containment atmosphere, potentially increasing the release of iodine to the environment during the delay period. Each of these impacts has been evaluated as summarized below.

1.2.1 Containment Composite Profile Impact

The containment reanalysis using the proposed delayed start time of the RSS pumps led to the development of a revised temperature profile following a LOCA. This new profile was compared to the existing composite profile and the differences were evaluated to determine the impact.

The first 24 hours of the accident comprise the transient portion of the curve. The most important aspect of the transient period is the peak temperature and its duration due to the impact on equipment thermal stress. The peak temperature portion and duration of peak temperature for the existing and proposed profiles are identical. Beyond the peak portion, but still within the transient period, a portion of the existing profile does not envelope the proposed profile. The proposed profile has higher temperatures between 2225 seconds and approximately 20,083 seconds. Equipment subject to the requirements of electrical equipment qualification (EEQ) was compared to the proposed profile. The comparison showed that all EEQ equipment test profiles bound the proposed containment profile or are acceptable by evaluation.

The steady state portion of the profile is the time when the temperature has stabilized, typically after the first 24 hours following the accident. The steady state portions of the existing and proposed profiles are nearly identical. The only difference is at 432,000 seconds, the existing profile temperature is 120°F versus 125°F for the proposed profile. An Arrhenius temperature aging equivalency methodology was used to compare the steady state regions of the existing and proposed profiles. This is achieved by equating each curve to an equivalent time at 50°C and then comparing the two time values. This comparison showed that the difference is less than 1 day at 50°C which is inconsequential considering the profiles represent approximately 1 year of post-accident conditions.

The results of the comparison between the existing and proposed containment profiles showed that the proposed profile has no effect on the environmental qualification status of equipment. All EEQ required components are fully qualified for the revised containment profiles resulting from the RSS pump start time delay.

1.2.2 Containment Pressure and Temperature Impact

The analysis of containment pressure and temperature was performed with the proposed delay in RSS pump start time from the present timer setting to the estimated time of the RWST low-low level signal. The analysis was completed using the LOCTIC computer code to determine the containment pressure and temperature response for a large break LOCA at various break locations and for various break sizes and single failure assumptions. The LOCTIC code is the MPS3 containment analysis code of record. The analysis of record was used, changing the RSS pump start time to generate the new containment pressure and temperature profiles. As the time delay uncertainty is accounted for in the analysis, it has been omitted from the surveillance. For the proposed change, the worst case peak pressure is 38.25 psig, which occurs at 18 seconds after the accident. The worst case peak temperature is 263.0 °F, which occurs at 17.9 seconds after the accident. These values represent slight reductions due to the increased heat sink mass. There is no difference in either the time or the magnitude of either the peak pressure or peak temperature due to a change in RSS pump start times because both the existing and proposed RSS pump start times are significantly later than the time of containment peak pressure and temperature.

1.3 Emergency Diesel Generator Starting and Loading Impact

In the current design, the RHS pumps start on a SI signal and are automatically secured when the RWST reaches its low-low level. Also with the current design, the RSS pumps start approximately 11 minutes following a CDA and run for the duration of the accident. Thus both RHS and RSS pumps run at the same time for part of the accident sequence. With the proposed design, the RSS pump start is delayed until the RWST low-low level signal which is the same signal that stops the RHS pumps. Thus in the design to be implemented with the proposed amendment, the RHS and RSS pumps will no longer operate at the same time. The RSS pumps in the current design have a staggered start on the timer following a CDA signal. In the proposed design, a time delay is provided between the start of the lead and follow RSS pumps on each train to avoid overloading the diesel with high starting loads. Thus there is no adverse impact on the emergency diesel generator (EDG) capability.

1.4 Pipe Stress / Pipe Support Analysis

DNC has evaluated the potential impact to pipe stress and pipe support analyses for the change to the containment response due to extending the delay in starting the RSS pumps [from a fixed time of approximately 660 seconds until the low-low level signal for the refueling water storage tank (as early as approximately 2450 seconds)]. Piping and supports connected to the containment liner are affected by changes in the displacement of the liner. The containment liner displacement is influenced by containment internal pressure, liner temperature, and containment concrete shell temperature. Piping systems attached to the liner at MPS3 include the QSS and the RSS. Special load combinations and stress allowables are specified for MPS3 QSS and RSS piping (refer to MPS3 Final Safety Analysis Report Table 3.9B-11). While the proposed change has no impact on the peak containment pressure and operation of the QSS prevents a second pressure peak from occurring, the proposed change tends to delay the time when the containment pressure is substantially reduced. This change was evaluated for its impact on pipe stress and pipe supports since a time phasing analysis approach has been used to qualify the RSS and QSS piping. Time phasing analysis was conducted for the specific piping operating conditions that are coincident with containment displacement. Several time steps were considered and bounding parameters were used in order to provide assurance that the limiting operating scenario was considered and evaluated.

Sufficient margin was determined to be available in all cases to accommodate the proposed change (the extended delay in RSS pump start time). No modification to any piping segment or pipe support was determined to be necessary to support the change. Based on the detailed analysis performed, all piping and pipe supports were determined to be acceptable for the change and all MPS3 stress limits were met.

1.5 Radiological Analysis Impact

In a letter dated May 24, 2004, DNC previously submitted a license amendment for use of the alternate source term (AST) per DNC letter 04-285 "Dominion Nuclear Connecticut, Inc. Millstone Power Station Unit 3 Proposed Technical Specification Changes Implementation of Alternate Source Term." That license amendment request is pending with NRC. That analysis used the current RSS pump start time of approximately 660 seconds following a CDA. The proposed delay of the RSS pump start time to the RWST low-low level signal affects the radiological analysis since it changes the effective time of RSS spray coverage. While RSS spray will be delayed, QSS is unaffected by the change and will remove iodine from the containment atmosphere. This will minimize the impact of delaying RSS spray. In addition, the AST analysis did not credit iodine removal by RSS following the switchover to sump recirculation. Eliminating this over-conservatism and crediting RSS delay following switchover will more than offset the reduction in spray removal time due to the delay in initiation of RSS spray. The net result is a reduction in the predicted doses from a design basis LOCA. The change in assumptions and results of the radiological consequences are detailed in Attachment 5.

1.6 Impact on Other Accident Analyses

A systematic review of all other FSAR Chapter 15 design basis accidents has been performed. Because a LOCA is the only accident analysis for which RSS operation is credited, it is concluded that no other accident analyses are impacted. Due to the relatively large volume of the MPS3 RWST (approximately 1.2 million gallons), QSS alone is sufficient to mitigate the effects of the spectrum of main steam line break and feed line break accidents.

2.0 DESCRIPTION OF PROPOSED CHANGES

Technical Specification Surveillance Requirement (TS/SR) 4.6.2.2.c is affected by the proposed RSS pump start change. In order to meet the required NRC GSI-191 milestones, Dominion is requesting approval of the proposed amendment by September 30, 2006.

TS 3.6.2.2 RECIRCULATION SPRAY SYSTEM

Description:

TS/SR 4.6.2.2.c, Current Wording:

"At least once per 24 months by verifying that on a CDA test signal, each recirculation spray pump starts automatically after a 660 $\pm$ 20 second delay;"

TS / SR 4.6.2.2.c Proposed Wording:

"At least once per 24 months by verifying that on a CDA test signal, each recirculation spray pump starts automatically after receipt of an RWST Low-Low signal;"

Justification:

Delay of initiation of containment sump recirculation until after the RWST Low-Low level is reached ensures a sufficient amount of water is available in the sump to provide adequate net positive suction head (NPSH) and prevent suction piping flashing for the RSS pumps. The RSS pumps in the current design have a staggered start on the timer following a CDA signal. As with the current design, the proposed design will employ a timer to stagger the start of the RSS pumps to avoid overloading the diesel with high starting loads. Thus there is no adverse impact on the emergency diesel generator (EDG) capability. This increase in NPSH is necessary to offset the increased head loss due to the increased accumulation of debris on the sump screen postulated as a result of GSI-191.

BASES CHANGES

The bases will be modified as shown in Attachment 4 to describe the acceptability of the 24 month frequency for checking the RSS pump start on an RWST Low-Low level signal.

3.0 REASON FOR PROPOSED AMENDMENT

In a letter dated September 13, 2004, the NRC issued Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors." The generic letter identified a potential susceptibility of recirculation flow paths and sump screens to debris blockage. The generic letter requested that addressees perform an evaluation of the emergency core cooling system (ECCS) and containment spray system (CSS) recirculation functions in light of the information provided in the letter and, if appropriate, take additional actions to ensure system function. This generic letter documents the final resolution of NRC Generic Safety Issue (GSI) 191 "Assessment of Debris Accumulation on PWR Sump Performance." The objective of GSI-191 is to ensure that post-accident debris blockage will not impede or prevent the operation of the ECCS and CSS in the recirculation mode at pressurized water reactors (PWRs) during LOCAs or other high energy line break (HELB) accidents for which sump recirculation is required.

As part of its analysis related to resolution of the GSI-191, Dominion determined that additional water is required as a prerequisite for the start of the MPS3 RSS pumps during accident conditions, i.e., during LOCAs. The additional water is necessary to assure flashing does not occur in the suction piping and that there is adequate NPSH available for the RSS pumps in the recirculation mode. In order to obtain this additional water it was found that it would be necessary to delay the initiation of RSS pump start until the RWST reached its low-low level. Waiting for the transfer of the additional water from the RWST to the containment sump would result in providing sufficient margin for RSS pump suction piping flashing and NPSH under the debris loading conditions required to be postulated for the analysis required by GL 2004-02.

In a letter dated May 27, 2004, DNC requested an amendment to the MPS3 operating license based on the radiological dose analysis margins obtained by using an alternate source term consistent with 10 CFR 50.67. This request also affects the May 27, 2004 submittal in that it modifies the LOCA analysis and resultant dose calculations results provided with that request. The current basis of this submittal is predicated on approval of the AST amendment as modified.

Operability of the RSS will continue to be assured by verification of RSS pump start after receipt of concurrent RWST low-low level and CDA signals instead of a time delay and CDA signal.

4.0 SAFETY SUMMARY

DNC has evaluated the proposed change and has concluded that it will have no adverse effect on plant safety. Delay of the RSS pump start to the RWST low-low level signal results in an acceptable containment response relative to EEQ. Peak containment pressure is unaffected by the pump start change. There is a positive impact relative to EDG loading (i.e., The RHS pumps will now stop on the same signal that starts the RSS pumps with the result that the RHS pumps and the RSS pumps will no longer operate at the same time.) In addition, the dose consequences relative to the alternate source term (AST) analysis DNC submitted for MPS3 have been evaluated and the results have been determined to be acceptable. Pipe stress/support aspects of the change have been reviewed and results show that no pipe support modifications are necessary to support the RSS pump start change.

TS 3.6.2.2 RECIRCULATION SPRAY SYSTEM

TS/SR 4.6.2.2.c. currently reads: "At least once per 24 months by verifying that on a CDA test signal, each recirculation spray pump starts automatically after a 660 $\pm$ 20 second delay;" The proposed wording changes the surveillance requirement to read: "At least once per 24 months by verifying that on a CDA test signal, each recirculation spray pump starts automatically after receipt of an RWST Low-Low signal;" This change has no adverse impact on plant safety. This deletes the initiation of recirculation from the timer and adds it to the RWST low-low signal that already exists. The proposed SR requires verification that each RSS pump starts upon receipt of the CDA test signal in conjunction with the RWST Low-Low level signal. The 24 month frequency is based on the need to perform these surveillances under the conditions that apply during a plant outage and potential for unplanned transient if the surveillances were performed with the reactor at power. Operating experience has shown that these components pass the surveillances when performed at the 24 month frequency. Therefore the frequency was concluded to be acceptable from a reliability standpoint. This change has no adverse impact on plant safety.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

The proposed amendment modifies the Millstone Unit 3 Technical Specifications Surveillance Requirements to verify that each RSS pump automatically starts on a CDA test signal after receipt of an RWST low-low level signal. A plant modification associated with the proposed change to the technical specifications is required to delete the timer from the RSS pump start circuitry in the recirculation mode and replace it with an existing RWST low-low level signal.

DNC has evaluated whether or not a Significant Hazards Consideration (SHC) is involved with the proposed changes by addressing the three standards set forth in 10 CFR 50.92(c) as discussed below.

Criterion 1:

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

Response: No.

The RSS is only an accident mitigation system. As such, changes in the operation of RSS cannot have an impact on the probability of an accident. The delay in the start of the RSS pump is to assure there is sufficient water in the containment sump for adequate RSS pump NPSH and margin to suction pipe flashing in light of the debris analysis conducted in response to GL 2004-02. Containment analyses have been performed to demonstrate that there is no impact on the peak containment pressure and temperature following a LOCA. While there are some changes in the predicted post-LOCA environmental conditions, evaluations have been performed to show that there is no significant impact on the environmental qualification for equipment inside containment. The impact to piping and supports has been demonstrated to be acceptable without modification. Delay in RSS spray start will result in a reduction in diesel generator loading since the RSS pumps and the RHS pumps will no longer be running concurrently. The reduction in iodine removal efficiency during the delay period is more than offset by elimination of over-conservatisms in assumptions for long term iodine removal by the RSS system. The net impact is a reduction in the predicted offsite doses and control room doses following a design basis LOCA. Based on this discussion, the proposed amendment does not increase the probability or consequence of an accident previously evaluated.

Criterion 2:

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

Response: No.

The proposed modification alters the RSS pump circuitry by initiating the start sequence with an existing RWST low-low level signal instead of a timer. The timer is now used to sequence pump starts. The pump function is not changed in any way. The proposed amendment does not introduce failure modes, accident initiators, or malfunctions that would cause a new or different kind of accident. Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

Criterion 3:

Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The proposed change ensures that adequate margin to suction line flashing and NPSH margin exists for proper operation of the RSS pumps once the effects of debris are considered as required per GL 2004-02. Function of the pumps is not affected. Analyses have been performed that show the containment design basis limits are satisfied and the post-LOCA offsite and control room doses meet the required criteria. Therefore, based on the above, the proposed amendment does not involve a significant reduction in a margin of safety.

In summary, DNC concludes that the proposed amendment does not represent a SHC under the standards set forth in 10 CFR 50.92(c).

5.2 Conclusion

In conclusion, based on the considerations discussed above: (1) there is reasonable assurance the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

DNC has determined that the proposed amendment does change requirements with respect to use of a facility component located within the restricted area, as defined by 10 CFR 20. It also represents a change to a surveillance requirement. DNC has evaluated the proposed change and has determined that the change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released off site, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

ATTACHMENT 2

PROPOSED TECHNICAL SPECIFICATIONS CHANGE RECIRCULATION SPRAY SYSTEM SURVEILLANCE REQUIREMENTS

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DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

CONTAINMENT SYSTEMS

RECIRCULATION SPRAY SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.2 Two independent Recirculation Spray Systems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With one Recirculation Spray System inoperable, restore the inoperable system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the inoperable Recirculation Spray System to OPERABLE status within the next 48 hours or be in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.2 Each Recirculation Spray System shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position;

b. By verifying that each pump's developed head at the test flow point is greater than or equal to the required developed head when tested pursuant to Specification 4.0.5;

c. At least once per 24 months by verifying that on a CDA test signal, each recirculation spray pump starts automatically after ~~a 660 ±20 second delay~~ receipt of an RWST Low-Low signal;

d. At least once per 24 months, by verifying that each automatic valve in the flow path actuates to its correct position on a CDA test signal; and

e. By verifying each spray nozzle is unobstructed following maintenance that could cause nozzle blockage.

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ATTACHMENT 3

PROPOSED TECHNICAL SPECIFICATIONS CHANGE
RECIRCULATION SPRAY SYSTEM SURVEILLANCE REQUIREMENTS

RETYPED PAGE

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

RECIRCULATION SPRAY SYSTEM

LIMITING CONDITION FOR OPERATION

3.6.2.2 Two independent Recirculation Spray Systems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

With one Recirculation Spray System inoperable, restore the inoperable system to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours; restore the inoperable Recirculation Spray System to OPERABLE status within the next 48 hours or be in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.2.2 Each Recirculation Spray System shall be demonstrated OPERABLE:

a. At least once per 31 days by verifying that each valve (manual, power-operated, or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position;

b. By verifying that each pump's developed head at the test flow point is greater than or equal to the required developed head when tested pursuant to Specification 4.0.5;

c. At least once per 24 months by verifying that on a CDA test signal, each recirculation spray pump starts automatically after receipt of an RWST Low-Low signal;

d. At least once per 24 months, by verifying that each automatic valve in the flow path actuates to its correct position on a CDA test signal; and

e. By verifying each spray nozzle is unobstructed following maintenance that could cause nozzle blockage.

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ATTACHMENT 4

PROPOSED TECHNICAL SPECIFICATIONS CHANGE
RECIRCULATION SPRAY SYSTEM SURVEILLANCE REQUIREMENTS

BASES PAGE

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

The design of the Containment RSS is sufficiently independent so that an active failure in the recirculation spray mode, cold leg recirculation mode, or hot leg recirculation mode of the ECCS has no effect on its ability to perform its engineered safety function. In other words, the failure in one subsystem does not affect the capability of the other subsystem to perform its designated safety function of assuring adequate core cooling in the event of a design basis LOCA. As long as one subsystem is OPERABLE, with one pump capable of assuring core cooling and the other pump capable of removing heat from containment, the RSS system meets its design requirements.

The LCO 3.6.2.2. ACTION applies when any of the RSS pumps, heat exchangers, or associated components are declared inoperable. All four RSS pumps are required to be OPERABLE to meet the requirements of this LCO 3.6.2.2. During the injection phase of a Loss Of Coolant Accident all four RSS pumps would inject into containment to perform their containment heat removal function. The minimum requirement for the RSS to adequately perform this function is to have at least one subsystem available. Meeting the requirements of LCO 3.6.2.2. ensures the minimum RSS requirements are satisfied.

Surveillance Requirements 4.6.2.1.d and 4.6.2.2.e require verification that each spray nozzle is unobstructed following maintenance that could cause nozzle blockage. Normal plant operation and maintenance activities are not expected to trigger performance of these surveillance requirements. However, activities, such as an inadvertent spray actuation that causes fluid flow through the nozzles, a major configuration change, or a loss of foreign material control when working within the respective system boundary may require surveillance performance. An evaluation, based on the specific situation, will determine the appropriate test method (e.g., visual inspection, air or smoke flow test) to verify no nozzle obstruction.

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Surveillance Requirement 4.6.2.2.c requires that at least once per 24 months, verification is made that on a CDA test signal, each RSS pump starts automatically after receipt of an RWST Low-Low level signal. The 24 month frequency is based on the need to perform this surveillance under the conditions that apply during a plant outage and potential for unplanned transient if the surveillance was performed with the reactor at power. Operating experience has shown that these components pass the surveillance when performed at the 24 month frequency. Therefore the frequency was concluded to be acceptable from a reliability standpoint. This change has no adverse impact on plant safety.

The design of the Containment RSS is sufficiently independent so that an active failure in the recirculation spray mode, cold leg recirculation mode, or hot leg recirculation mode of the ECCS has no effect on its ability to perform its engineered safety function. In other words, the failure in one subsystem does not affect the capability of the other subsystem to perform its designated safety function of assuring adequate core cooling in the event of a design basis LOCA. As long as one subsystem is OPERABLE, with one pump capable of assuring core cooling and the other pump capable of removing heat from containment, the RSS system meets its design requirements.

The LCO 3.6.2.2. ACTION applies when any of the RSS pumps, heat exchangers, or associated components are declared inoperable. All four RSS pumps are required to be OPERABLE to meet the requirements of this LCO 3.6.2.2. During the injection phase of a Loss Of Coolant Accident all four RSS pumps would inject into containment to perform their containment heat removal function. The minimum requirement for the RSS to adequately perform this function is to have at least one subsystem available. Meeting the requirements of LCO 3.6.2.2. ensures the minimum RSS requirements are satisfied.

Surveillance Requirement 4.6.2.2.c requires that at least once per 24 months verification is made that on a CDA test signal, each RSS pump starts automatically after receipt of an RWST Low-Low signal. The 24 month frequency is based on the need to perform this surveillance under the conditions that apply during a plant outage and potential for unplanned transient if the surveillance was performed with the reactor at power. Operating experience has shown that these components pass the surveillance when performed at the 24 month frequency. Therefore the frequency was concluded to be acceptable from a reliability standpoint. This change has no adverse impact on plant safety.

Surveillance Requirements 4.6.2.1.d and 4.6.2.2.e require verification that each spray nozzle is unobstructed following maintenance that could cause nozzle blockage. Normal plant operation and maintenance activities are not expected to trigger performance of these surveillance requirements. However, activities, such as an inadvertent spray actuation that causes fluid flow through the nozzles, a major configuration change, or a loss of foreign material control when working within the respective system boundary may require surveillance performance. An evaluation, based on the specific situation, will determine the appropriate test method (e.g., visual inspection, air or smoke flow test) to verify no nozzle obstruction.

ATTACHMENT 5

REVISED ALTERNATE SOURCE TERM RADIOLOGICAL ANALYSIS ASSUMPTIONS AND RESULTS

DOMINION NUCLEAR CONNECTICUT, INC.
MILLSTONE POWER STATION UNIT 3

1.1 Background

The recirculation spray system (RSS) together with quench spray system (QSS) is credited for removal of iodine from the containment atmosphere following a design basis loss of coolant accident (LOCA). Until the RSS start timer has elapsed (approximately 660 seconds following the containment depressurization actuation [CDA] signal), only QSS is running to remove iodine from the containment. When the timer has elapsed, both QSS and RSS are available for reducing iodine from the containment atmosphere. When the refueling water storage tank (RWST) is emptied, QSS is terminated, and only RSS is available for removing iodine. In the alternate source term (AST) radiological analysis described in DNC letter 04-285 "Dominion Nuclear Connecticut, Inc. Millstone Power Station Unit 3 Proposed Technical Specification Changes Implementation of Alternate Source Term" dated May 24, 2004," credit is taken for iodine removal from the combined spray flow of RSS and QSS after the RSS timer has elapsed. However, no credit was taken for iodine removal by RSS after the RWST empties and QSS is stopped. The AST analysis has been revised. The revision accounts for the delay in RSS switchover and credits continual RSS spray removal of iodines after QSS is stopped. The changes in the analysis assumptions and radiological results are discussed in detail below.

1.2 Analysis Assumptions & Key Parameter Values

This section describes the general analysis approach and presents analysis assumptions and key parameter values that are used in the LOCA reanalysis. Since the LOCA is the only accident that credits containment sprays, it is the only accident that is reanalyzed. All assumptions and parameters used in the AST submittal for the LOCA are valid for the reanalysis except those pertaining to containment sprays.

The dose analysis documented in this application employs the total effective dose equivalent (TEDE) calculation method as specified in RG-1.183 for AST applications. The TEDE is determined at the exclusion area boundary (EAB) for the worst 2-hour interval. TEDE for individuals at the low population zone (LPZ) and for the MPS3 control room personnel are calculated for the assumed 30-day duration of the event.

The TEDE concept is defined to be the deep dose equivalent (DDE) (from external exposure) plus the committed effective dose equivalent (CEDE) (from internal exposure). In this manner, TEDE assesses the impact of all relevant nuclides upon all body organs, in contrast with the previous single, critical organ (thyroid) concept for assessing internal exposure. The DDE is nominally equivalent to the effective dose equivalent (EDE) from external exposure if the whole body is irradiated uniformly. Since this is a reasonable assumption for submergence exposure situations, EDE is used in lieu of DDE in determining the contribution of external dose to the TEDE. EDE dose conversion factors were taken from Table III.1 of Federal Guidance Report 12.

Table 1

Control Room Assumptions & Key Parameters Employed in the LOCA Analyses

Assumption / Parameter	Value
Control Room Effective Volume	2.38E+05 ft^3
Normal Control Room Intake Flow Rate prior to Isolation	1595 cfm
Unfiltered Inleakage during Periods Of Neutral Pressure	350 cfm
Unfiltered Inleakage during Periods Of Positive Pressure	100 cfm
Emergency Ventilation System Recirculation Flow Rate	666 cfm
Emergency Ventilation System Pressurization Flow Rate	230 cfm
Time to place Emergency Ventilation System in service	101 minutes post LOCA
Filter Efficiencies	90% elemental & aerosol 70% organic
Millstone Unit 3 Control Building Wall Thickness:	2 feet Concrete
Millstone Unit 3 Control Room Ceiling Thickness:	8 inches Concrete
Millstone Unit 3 Control Building Roof Thickness:	1ft-10in Concrete
Millstone Unit 3 Control Room Occupancy Factors	
0 – 24 hours	1.0
24 – 96 hours	0.6
96 – 720 hours	0.4

Table 2

Control Room Atmospheric Dispersion Factors

Source Location / Duration		X/Q (sec/m^3)
Turbine Building Ventilation Vent		
	0 – 2 hour	2.82E-03
	2 – 8 hour	1.65E-03
	8 – 24 hour	6.67E-04
	24 – 96 hour	4.83E-04
	96 – 720 hour	3.80E-04
Main Steam Valve Building Ventilation Exhaust		
	0 – 2 hour	1.46E-03
	2 – 8 hour	8.76E-04
	8 – 24 hour	3.42E-04
	24 – 96 hour	2.71E-04
	96 – 720 hour	1.96E-04
Containment Enclosure Building		
	0 – 2 hour	5.34E-04
	2 – 8 hour	3.23E-04
	8 – 24 hour	1.38E-04
	24 – 96 hour	8.78E-05
	96 – 720 hour	7.42E-05
ESF Building Ventilation Exhaust		
	0 – 2 hour	3.18E-04
	2 – 8 hour	2.26E-04
	8 – 24 hour	9.06E-05
	24 – 96 hour	6.42E-05
	96 – 720 hour	4.59E-05
Refueling Water Storage Tank Vent		
	0 – 2 hour	2.61E-04
	2 – 8 hour	1.59E-04
	8 – 24 hour	6.45E-05
	24 – 96 hour	4.83E-05
	96 – 720 hour	3.63E-05
Millstone Stack		
	0 – 4 hour	1.39E-04
	4 – 8 hour	3.23E-05
	8 – 24 hour	1.56E-05
	24 – 96 hour	3.20E-06
	96 – 720 hour	3.30E-07

Table 3 Offsite Atmospheric Dispersion Factors (sec/m3)	
Receptor/ Source Location / Duration	**X/Q (sec/m^3)**
Exclusion Area Boundary (EAB) (0 – 720 hours)	
Containment	5.42E-04
Millstone Stack (includes fumigation)	1.00E-04
Other Release Points	4.30E-04
Low Population Zone (LPZ)	
Non-Millstone Stack Release Points	
0 – 8 hours	2.91E-05
8 – 24 hours	1.99E-05
24 – 96 hours	8.66E-06
96 – 720 hours	2.63E-06
Millstone Stack (includes fumigation)	
0 – 4 hours	2.69E-05
4 – 8 hours	1.07E-05
8 – 24 hours	6.72E-06
24 – 96 hours	2.46E-06
96 – 720 hours	5.83E-07

Table 4 Breathing Rates	
Source Location / Duration	**(m^3/sec)**
Offsite (EAB & LPZ)	
0 – 8 hour	3.50E-04
8 – 24 hour	1.80E-04
24 – 720 hour	2.30E-04
Control Room	
0 – 720 hour	3.50E-04

Table 5
NSS Assumptions & Key Parameters Commonly Employed in the LOCA Analyses

Assumption / Parameter	Value
Containment Free Volume	2.35E6 ft^3
Millstone Unit 3 Containment Wall Thickness:	4.5ft Concrete
Millstone Unit 3 Containment Dome Thickness:	2.5ft Concrete
Distance from Millstone Unit 3 Containment to the MP3 Control Room:	228ft
Millstone Unit 3 Containment Inner Radius:	70ft

2. Proposed Licensing Basis Changes

This section provides a summary description of the key proposed licensing basis changes that are justified with the reanalysis of the MPS3 LOCA.

2.1 Spray Parameters

The delay in RSS pump start time from a timer basis to dependence on the RWST low-low level setpoint necessitated calculation of RSS only spray coverage and iodine removal coefficients. The various iodine removal coefficients for QSS operation and simultaneous operation of QSS and RSS have been reanalyzed using the updated containment conditions due to the proposed delay in RSS pump start time. Therefore, the delay in RSS pump start time resulted in changes to:

a) QSS end time
b) RSS start time
c) Particulate iodine removal coefficients for QSS only operation and simultaneous QSS and RSS operation
d) The time at which an elemental iodine DF of 200 is reached
e) The time at which an particulate iodine DF of 50 is reached
f) The time at which any iodine removal due to spray ends
g) The time at which ECCS leakage starts
h) The volume of water in the containment sump when ECCS leakage starts

Other changes made in support of the delay in RSS pump start time include the following parameters:

a) QSS start time
b) RSS only spray coverage

The changes made to QSS parameters were a result of bounding the spectrum of possible conditions. Previously the minimum QSS flow rate and the associated time with the minimum ESF condition was used. A decision was made to continue to use the minimum QSS flow rate, but use the time associated with the maximum ESF case. To a lesser degree the depletion of the RWST will occur earlier due to an increase in the containment heat sinks. The increase in heat sinks results in lower pressure and higher injection flow.

2.2 Summary of Design and Licensing Basis Changes

Table 6 provides a summary table of the current design and licensing basis based on the AST submittal and the proposed changes.

Table 6

Parameter	Current Basis	Proposed Basis
Quench Sprays	Effective from 72.5 seconds to 7,480 seconds	Effective from 71 seconds to 6,620 seconds
Recirculation Sprays	Effective from 14 minutes to 7,480 seconds	Effective from 2,710 seconds to 30 days
Recirculation Only Spray Coverage	Not credited	1,102,000 ft3
Particulate Iodine Removal Coefficients		
Quench Spray only	12.73 per hour	12.37 per hour
Quench and Recirc. Sprays	16.14 per hour	14.11 per hour
Recirculation Sprays Only	Not credited	7.77 per hour for DF<50 0.78 per hour for DF>50
Time at which Elemental Iodine DF of 200 is Reached	Not reached – sprays secured at 7,480 seconds	2.636 hours
Time at which Particulate Iodine DF of 50 is Reached	1.9 hours	2.045 hours
Start time of ECCS leakage	640 seconds	2,530 seconds

Table 6		
Parameter	**Current Basis**	**Proposed Basis**
Sump Volume at the Start Time of ECCS Leakage	1.068E5 gallons	6.495E5 gallons

3. Design Basis Loss of Coolant Accident (LOCA) Reanalysis

As documented previously, this application involves the reanalysis of the design basis LOCA radiological analysis.

This analysis incorporated the features of the AST, including the TEDE analysis methodology and modeling of plant systems and equipment operation that influence the events. The calculated radiological consequences are compared with the revised limits provided in 10 CFR 50.67(b)(2).

Dose calculations are performed at the EAB for the worst 2-hour period, and for the LPZ and MPS3 control room for the duration of the accident (30 days). The methodology used to evaluate the control room and offsite doses resulting from a LOCA was consistent with RG 1.183. DNC performed the radiological consequence calculations for the AST with the RADTRAD-NAI and SCALE computer codes.

This section describes the methods employed and results obtained from the LOCA design basis radiological analysis. The analysis includes dose from several sources. They are:

- Containment Leakage Plume,
- Emergency Core Cooling System (ECCS) Component Leakage
- Refueling Water Storage Tank Vent
- Shine from the plume,
- Shine from containment and
- Shine from the control room filter loading.

3.1 LOCA Scenario Description

The design basis LOCA scenario for radiological calculations is initiated assuming a major rupture of the primary reactor coolant system (RCS) piping. In order to yield radioactive releases of the magnitude specified in RG 1.183, it is also assumed that the ECCS does not provide adequate core cooling, such that significant core melting occurs. This general scenario does not represent any specific accident sequence, but is representative of a class of severe damage incidents that were evaluated in the development of the RG 1.183 source term characteristics. Such a scenario would be expected to require multiple failures of systems and equipment and lies beyond the severity of incidents evaluated for design basis transient analysis.

3.2 LOCA Source Term Definition

RG 1.183 provides explicit description of the key AST characteristics recommended for use in design basis radiological analyses. Table 7 below lists source term characteristics.

Table 7

Regulatory Guide 1.183 Source Terms

Characteristic	**RG 1.183 Source Term**	
Core Fractions Released To Containment	Noble Gases	100%
	Iodine	40%
	Cesium	30%
	Tellurium	5%
	Barium	2%
	Others	0.02% to 0.25%
Timing of Release	Released in Two Phases Over 1.8 hour Interval	
Iodine Chemical and Physical Form	Inorganic Vapor	4.85%
	Organic Vapor	0.15%
	Aerosol	95%
Solids	Treated as an Aerosol	

RG-1.183 divides the releases from the core into two phases:

The Fuel Gap Release Phase during the first 30 minutes and
The Early In-vessel Release Phase in the subsequent 1.3 hours.

Table 8 below shows the fractions of the total core inventory of various isotope groups that are assumed released in each of the two phases of the LOCA analysis.

Table 8
RG 1.183 Release Phases

	Core Release Fractions[a]	
Isotope Group	**Gap**	**Early In-Vessel**
Noble Gases[b]	0.05	0.95
Halogens	0.05	0.35
Alkali Metals	0.05	0.25
Tellurium	0.00	0.05
Barium, Strontium	0.00	0.02
Noble Metals	0.00	0.0025
Cerium	0.00	0.0005
Lanthanides	0.00	0.0002
Duration (hours)	0.50	1.30

a. Release duration applies only to the Containment release. The ECCS leakage portion of the analysis conservatively assumes that the entire core release fraction is in the containment sump from the start of the LOCA.
b. Noble Gases are not scrubbed from the containment atmosphere and therefore are not found in either the sump or ECCS fluid.

The core source term used in the LOCA reanalysis is the same that was used in the AST submittal. The core radionuclide inventory for use in determining source term releases was generated using the ORIGENS code. ORIGENS is part of the SCALE computer code system. Table 9 lists the 66 isotopes at the end of a fuel cycle, the associated curies, and their respective CEDE and EDE dose conversion factors taken from Federal Guidance Reports 11 and 12.

Table 9

Core Inventory and Dose Conversion Factors by Isotope

Isotope	Isotope Group	Curies	EDE Sv-m³/Bq-sec	CEDE Sv/Bq
Kr-85	Noble gas	1.075E+06	1.190E-16	0.000E+00
Kr-85m	Noble gas	2.590E+07	7.480E-15	0.000E+00
Kr-87	Noble gas	4.755E+07	4.120E-14	0.000E+00
Kr-88	Noble gas	7.060E+07	1.020E-13	0.000E+00
Xe-133	Noble gas	1.980E+08	1.560E-15	0.000E+00
Xe-135	Noble gas	6.440E+07	1.190E-14	0.000E+00
Xe-135m	Noble gas	3.589E+07	2.040E-14	0.000E+00
Xe-138	Noble gas	8.610E+07	5.770E-14	0.000E+00
Br-84	Halogen	1.904E+07	9.410E-14	2.270E-11
I-131	Halogen	9.710E+07	1.820E-14	8.890E-09
I-132	Halogen	1.416E+08	1.120E-13	1.030E-10
I-133	Halogen	2.008E+08	2.940E-14	1.580E-09
I-134	Halogen	2.146E+08	1.300E-13	3.550E-11
I-135	Halogen	1.864E+08	7.980E-14	3.320E-10
Rb-86	Alkali Metal	2.170E+05	4.810E-15	1.790E-09
Rb-88	Alkali Metal	7.500E+07	3.360E-14	2.260E-11
Rb-89	Alkali Metal	6.400E+07	1.060E-13	1.160E-11
Cs-134	Alkali Metal	2.037E+07	7.570E-14	1.250E-08
Cs-136	Alkali Metal	6.270E+06	1.060E-13	1.980E-09
Cs-137	Alkali Metal	1.256E+07	7.740E-18	8.630E-09
Cs-138	Alkali Metal	1.711E+08	1.210E-13	2.740E-11
Sb-127	Tellurium	8.810E+06	3.330E-14	1.630E-09
Sb-129	Tellurium	3.080E+07	7.140E-14	1.740E-10
Te-127	Tellurium	8.700E+06	2.420E-16	8.600E-11
Te-127m	Tellurium	1.463E+06	1.470E-16	5.810E-09

Table 9

Core Inventory and Dose Conversion Factors by Isotope

Isotope	Isotope Group	Curies	EDE	CEDE
			$Sv\text{-}m^3/Bq\text{-}sec$	Sv/Bq
Te-129	Tellurium	3.013E+07	2.750E-15	2.090E-11
Te-129m	Tellurium	6.140E+06	1.550E-15	6.470E-09
Te-131m	Tellurium	1.969E+07	7.010E-14	1.730E-09
Te-132	Tellurium	1.391E+08	1.030E-14	2.550E-09
Te-133m	Tellurium	7.620E+07	1.140E-13	1.170E-10
Te-134	Tellurium	1.438E+08	4.240E-14	3.440E-11
Sr-89	Barium-Strontium	1.056E+08	7.730E-17	1.120E-08
Sr-90	Barium-Strontium	9.330E+06	7.530E-18	3.510E-07
Sr-91	Barium-Strontium	1.276E+08	3.450E-14	4.490E-10
Sr-92	Barium-Strontium	1.278E+08	6.790E-14	2.180E-10
Ba-139	Barium-Strontium	1.722E+08	2.170E-15	4.640E-11
Ba-140	Barium-Strontium	1.800E+08	8.580E-15	1.010E-09
Mo-99	Noble Metal	1.826E+08	7.280E-15	1.070E-09
Rh-105	Noble Metal	1.052E+08	3.720E-15	2.580E-10
Ru-103	Noble Metal	1.606E+08	2.250E-14	2.420E-09
Ru-105	Noble Metal	1.137E+08	3.810E-14	1.230E-10
Ru-106	Noble Metal	6.120E+07	0.000E+00	1.290E-07
Tc-99m	Noble Metal	1.618E+08	5.890E-15	8.800E-12
Ce-141	Cerium	1.657E+08	3.430E-15	2.420E-09
Ce-143	Cerium	1.558E+08	1.290E-14	9.160E-10
Ce-144	Cerium	1.290E+08	8.530E-16	1.010E-07

Table 9

Core Inventory and Dose Conversion Factors by Isotope

Isotope	Isotope Group	Curies	EDE	CEDE
			Sv-m^3/Bq-sec	Sv/Bq
Np-239	Cerium	2.080E+09	7.690E-15	6.780E-10
Pu-238	Cerium	4.083E+05	4.880E-18	7.790E-05
Pu-239	Cerium	3.404E+04	4.240E-18	8.330E-05
Pu-240	Cerium	4.810E+04	4.750E-18	8.330E-05
Pu-241	Cerium	1.511E+07	7.250E-20	1.340E-06
Am-241	Lanthanides	4.520E+03	8.180E-16	1.200E-04
Cm-242	Lanthanides	5.129E+06	5.690E-18	4.670E-06
Cm-244	Lanthanides	6.289E+05	4.910E-18	6.700E-05
La-140	Lanthanides	1.864E+08	1.170E-13	1.310E-09
La-141	Lanthanides	1.628E+08	2.390E-15	1.570E-10
La-142	Lanthanides	1.551E+08	1.440E-13	6.840E-11
Nb-95	Lanthanides	1.738E+08	3.740E-14	1.570E-09
Nd-147	Lanthanides	6.590E+07	6.190E-15	1.850E-09
Pr-143	Lanthanides	1.519E+08	2.100E-17	2.190E-09
Y-90	Lanthanides	9.700E+06	1.900E-16	2.280E-09
Y-91	Lanthanides	1.347E+08	2.600E-16	1.320E-08
Y-92	Lanthanides	1.366E+08	1.300E-14	2.110E-10
Y-93	Lanthanides	1.018E+08	4.800E-15	5.820E-10
Zr-95	Lanthanides	1.728E+08	3.600E-14	6.390E-09
Zr-97	Lanthanides	1.587E+08	9.020E-15	1.170E-09

3.3 Determination of Atmospheric Dispersion Factors (X/Q)

3.3.1 Millstone Unit 3 Control Room X/Q

The MPS3 control room X/Q's are the same X/Q's used in the AST submittal. The onsite atmospheric dispersion factors were calculated by DNC using the ARCON96 code and guidance from Regulatory Guide 1.194 (RG 1.194), except those from the Millstone Stack that are based on Regulatory Guide 1.145 methodology using fumigation conditions.

The control room X/Qs for the LOCA are from the following MPS3 source points:

- Turbine Building Ventilation Vent
- Main Steam Valve Building (MSVB) Ventilation Exhaust
- Containment Enclosure Building
- Engineered Safeguards (ESF) Building Ventilation Exhaust
- Refueling Water Storage Tank (RWST) vent
- Millstone Stack

The control room X/Q's used in the LOCA analysis are listed in a previous table.

3.3.2 Offsite (EAB & LPZ) X/Q

The EAB and LPZ atmospheric dispersion factors, which were not revised from the AST analysis, are listed in a previous table.

3.4 Determination of Containment Airborne Activity

3.4.1 Containment Sprays

The use of containment sprays and approval of elemental and particulate iodine removal rates for QSS were originally approved in Amendment No. 211, dated September 16, 2002 and November 25, 2002, to Facility Operating License No. NPF-49 for Millstone Unit 3 regarding the revised final safety analysis report (FSAR) licensing basis for post-accident operation of the supplementary leakage collection and release system (SLCRS) (TAC No. MB3700). The application was dated June 6, 1998.

The volume of containment that is covered by quench spray is 1,166,200 ft3 (49.63%). The QSS becomes effective at 71 seconds. At 2,710 seconds post-LOCA, the RSS becomes effective and the sprayed coverage of containment increases to 1,515,858 ft3 (64.5%) during the time when both spray systems are operating. At 6,620 seconds the QSS ends due to RWST inventory depletion and RSS continues to operate for the duration of the accident. The spray coverage of containment during operation of only the RSS is 1,102,000 ft3. The mixing rate during all spray operation is 2 turnovers of the unsprayed volume per hour.

The elemental and particulate iodine removal rates due to sprays are listed in a previous table. There was a decrease in elemental and particulate iodine removal rates associated with QSS due to the use of a more conservative QSS flow rate. An elemental iodine decontamination factor (DF) of 200 was calculated at 2.636 hours, after which time credit for removal of elemental iodine is assumed to end. A particulate iodine DF of 50 was calculated at 2.045 hours, at which time it was reduced to the value listed in the previous table.

3.4.2 Natural Deposition

A reduction in airborne radioactivity in the containment by natural deposition within containment was credited, as it was in the AST submittal. The model used is described in NUREG/CR-6189 and is incorporated into the RADTRAD computer code. This model is called the Powers model and it's used for aerosols in the unsprayed region and set for the 10th percentile.

4. LOCA Analysis Assumptions & Key Parameter Values

4.1 Method of Analysis

The RADTRAD-NAI code is used to calculate the radiological consequences from airborne releases resulting from a LOCA at the EAB, LPZ, and MPS3 control room. The ORIGENARP code is used to determine the grams of iodine in the core for calculating RWST back leakage. The QADS code was used to calculate the shine dose to the control room from containment shine and control room filter shine.

This analysis addresses a plant specific issue of unfiltered post-LOCA releases due to damper bypass and duct leakage from the plant ventilation system that was described and approved in Amendment No. 211, dated September 16, 2002 and November 25, 2002, to Facility Operating License No. NPF-49 for Millstone Unit 3 regarding the revised FSAR licensing basis for post-accident operation of the SLCRS (TAC No. MB3700). The application was dated June 6, 1998. The reanalysis does not change any aspect of unfiltered post-LOCA releases due to damper bypass and duct leakage from the plant ventilation system.

Amendment 211 identified potential release pathways from the secondary containment to the environment that could bypass the SLCRS filter following a design-basis accident due to non-nuclear safety grade (NNS) exhaust fan operation after the accident. Amendment 211 also approved an operator action that would manually trip the breakers on selected fans at 1 hour and 20 minutes post-LOCA. This operator action is only credited in the control room habitability analysis. This licensing basis is further described in section 15.6.5.4, Radiological Consequences of a LOCA, in the MPS3 FSAR. The AST analysis does not change the licensing basis for the post-accident operation of SLCRS as described and approved in Amendment 211.

4.2 Basic Data & Assumptions for LOCA

The following data and assumptions used in the LOCA reanalysis were used in the AST submittal except those that pertain to sprays and were previously noted.

Table 10

Basic Data and Assumptions for LOCA

Parameter or Assumption	**Value**
Containment Leak Rate:	0.3% by weight of the containment air per 24 hours (La)
Containment Bypass Leak Rate:	0.06La
Containment leak rate Reduction:	50% after 24 hours (offsite) 50% after 1 hour (control room)
Secondary Containment Drawdown Time:	2 minutes
Iodine Chemical Form in Containment Atmosphere:	95% Cesium Iodide 4.85% Elemental Iodine 0.15% Organic Iodine
Iodine Chemical Form in the Sump and RWST:	97% Elemental 3% Organic
Containment Sump pH:	at least 7
Dose Conversion Factors:	Federal Guidance Reports 11 and 12
SLRCS Filter Efficiency:	95% all Iodines and Particulates
Auxiliary Building Filter Efficiency:	95% all Iodines and Particulates
Quench Spray System Effective Period of Operation:	71 – 6,620 seconds
Recirculation Spray System Start Time:	2,530 seconds

Table 10

Basic Data and Assumptions for LOCA

Parameter or Assumption	Value
Recirculation Spray System Effectiveness Time:	2,710 seconds
Elemental Iodine Removal Coefficient:	20 per hour
Particulate Iodine Removal Coefficient for Quench Spray:	12.37 per hour
Particulate Iodine Removal Coefficient for Quench and Recirculation Spray:	14.11 per hour
Particulate Iodine Removal Coefficients for Recirculation Spray	DF < 50: 7.77 per hour DF > 50: 0.78 per hour
Quench Spray Volume of Containment:	1,166,200 ft^3
Quench and Recirculation Spray Volume:	1,515,858 ft^3
Recirculation Spray Volume	1,102,000 ft3
ECCS System Leakage Outside of Containment:	4,730 cc/hr
Minimum Available RWST Volume:	1,072,886 gallons
Minimum Quench Spray System Auto Trip Value:	47,652 gallons
RWST Maximum Fill Volume:	1,206,644 gallons

4.3 Containment Leakage Model

The containment leakage model was not changed from the model used in the AST submittal. The containment leakage normally consists of filtered and bypass leakage. As stated in the data and assumptions, the total containment leak rate (La) is 0.3% per day. The bypass leak rate is assumed to be 0.06 * La or 0.018% per day after SLCRS draw down time. The bypass leak rate bypasses the secondary containment and is released unfiltered at ground level directly from containment. The entire containment leak rate bypasses the secondary containment until the SLCRS draw down time of 2 minutes. The leak rate is reduced by one-half (0.009% per day) at 24 hours for offsite calculations and at 1 hour for control room calculations.

The reduction in the containment leak rate by 50% at 1 hour for the control room analysis was approved in Amendment No. 211 (TAC No. MB3700). The application was dated June 6, 1998. This reduction in containment leakage is based on the fact that the MPS3 containment pressure is rapidly reduced compared to typical PWR's because of its original design as a subatmospheric containment.

The collection, processing, and release of containment leakage vary depending on the location of the leak. Ventilation characteristics and release paths are different for each building comprising the secondary containment. Tables 15.6-9 and 15.6-12 of the MPS3 FSAR describe the ventilation characteristics and release paths.

4.4 Model of ECCS Leakage

The ECCS fluid consists of the contaminated water in the sump of the containment. This water contains 40% of the core inventory of iodine, 5% released to the sump water during the gap release phase (30 minutes) and 35% released to the sump water during the early in-vessel phase during the next 1.3 hours. During a LOCA the highly radioactive ECCS fluid is pumped from the containment sump to the recirculation spray headers and sprayed back into the containment sump. Also, following a design basis LOCA, valve realignment occurs to switch the suction water source for the ECCS from the RWST to the containment sump.

ECCS leakage develops when emergency safety features (ESF) systems circulate sump water outside containment and leaks develop through packing glands, pump shaft seals and flanged connections. Technical Specification 6.8.4a, Primary Coolant Sources Outside Containment Program Manual calculates this leakage at 4,780 cc/hr. The ECCS analysis makes use of 10,000 cc/hr for ECCS leakage. The leakage of recirculating sump fluids commences at 2,530 seconds, which is the earliest time of recirculation. The start time is less than the RSS effective time by 3 minutes, which is the time assumed to fill the system.

The temperature of the containment sump is conservatively assumed to reach a maximum of 240 degrees F. At this maximum temperature, a flash fraction of 0.03 is calculated. However, per the guidance of R.G.-1.183, a conservative flash fraction of 0.1 was used for the ECCS leakage during the entire event. The water volume of the sump at 2,530 seconds is 86,814 ft^3 and is conservatively assumed to remain constant even though QSS continues to dilute the sump from the RWST.

4.5 Model of ECCS Back Leakage to Refueling Water Storage Tank (RWST)

The RWST back leakage model used in the AST analysis is not changed in this reanalysis. The AST analysis and this reanalysis conservatively do not credit the delay time for the start of sump recirculation in the times calculated for back leakage to reach the RWST.

Following a design basis LOCA, valve realignment occurs to switch the suction water source for the ECCS from the RWST to the containment sump. In this configuration, motor operated valves (MOVs) and check valves in the normal suction line from the RWST and MOVs in the recirculation line provide isolation between this contaminated flow stream and the RWST. RADTRAD-NAI is used to model leakage of ECCS fluid through these valves back into the RWST with subsequent leakage of the evolved iodine through the vent at the top of the RWST to the environment.

The RADTRAD-NAI source term used to model the ECCS leakage into the RWST contains only the iodine isotopes. Forty percent of the core inventory of iodine isotopes was modeled as being instantaneously transported from the core to the containment sump. The iodine form is 97% elemental and 3% organic in accordance with RG-1.183.

New times, new flow rates and new contaminated volumes discharged to the RWST from assuming higher leak rates in the RWST back leakage paths have been calculated. The leak paths back to the RWST are:

- CHS Alternate Recirculation Leakage
- RHS Leakage through V*43
- SIH Pump Recirculation
- RHS A and B suction
- CHS Suction
- SIH Suction

The leakage paths and methodology to calculate times, flow rates and volumes were approved in Amendment 176 to Facility Operating License No. NPF-49 for MPS3, in response to the application dated May 7, 1998 as supplemented January 22, 1999 regarding RWST back leakage (TAC No. MA1749).

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Table 11 below summarizes the results of the above leakages for the 7 sources of back leakage to the RWST.

Table 11

Contaminated Inflow to RWST

Source	Time, hours	Flow Rate, gpm
CHS Suction	137.66	0.20
RHS A Suction	126.25	0.20
RHS B Suction	144.43	0.20
SIH Recirculation	8.50	0.20
RHS Recirculation	29.83	0.60
CHS Recirculation	36.93	0.20
SIH Suction	67.48	0.20

Using the methodology approved in Amendment 176, the time for contaminated sump water to reach the RWST is based on the calculated flow rates and the volume of clean water in the associated piping. The time required to displace the clean volume is reduced by 50% to account for mixing in the lines. This is considered a reasonable assumption since the sump fluid is relatively cool and thermal mixing will be minimal. In addition, the lines are isolated and stagnant except for minor leakage rates and the mixing due to flow is negligible. Table 12 below reduces the times by 50%, integrates the flow rates over time and calculates the total contaminated volume discharged to the RWST over the 30 day LOCA period.

Table 12 Summary of Times, Integrated Flow Rates & Volumes for RWST Backleakage			
Time (hrs)	**Flow Rate (cfm)**	**Volume (ft3)**	
4.25	0.03	0.00	SIS R
14.91	0.11	17.11	RHS R
18.46	0.13	39.88	CHS R
33.74	0.16	162.41	SIH S
63.13	0.19	445.21	RHSRHRS A
68.83	0.21	509.27	CHS S
72.21	0.24	552.68	RHR B
720.0	0.24	9,904.49	@ 30 days

For the analysis of the partition coefficient, the amount of water remaining in the RWST at the end of the injection phase is conservatively taken to correspond to the lowest possible value; the minimum QSS auto trip value or 47,652 gallons. The RWST airflow rate of 8.7 cfm was determined by making use of the ideal gas law and expected volumetric change. The latter was based on a conservative rise in air temperature within the RWST as a result of solar heating. The air released from the RWST will be free of radioactivity until the backleakage reaches the RWST at 4.25 hours post-LOCA.

The partition coefficient (PC) applicable to the iodines in the RWST water is based upon information in BNP-100, "Iodine Removal From Containment Atmospheres by Boric Acid Spray" dated July 1970. For this application, the RWST was assumed to behave like a closed system for the establishment of equilibrium conditions between the water and air. ORIGEN was used to calculate the quantity of grams of iodine in the core at 20,000 grams. The fraction of iodine released during the LOCA is 0.4, resulting in the grams of iodine in the sump at 8.0E+03. The volume of liquid in the sump is 1,160,776 gallons, resulting in an iodine concentration in the sump of 7 mgrams / gallon. Total volume transferred to the RWST over the 30 days as a result of backleakage is 7.41E+04 gallons resulting in a total of 5.187E+05 mgrams of iodine transferred to the RWST. The maximum concentration of iodines in the RWST is 4.3 mgrams/gallon or 1.2 mgrams/liter. The PC of 4,000 corresponds to an iodine concentration of 1.2 mgrams/liter. A PC of 4,000 results in a DF of 450. A DF of 100 was used for conservatism.

4.5 Millstone Unit 3 Control Room

The control room volume is 2.38E5 ft^3. The LOCA causes a control building isolation (CBI) signal to isolate the control room (current technical specifications). The control building is isolated within 5 seconds after a CBI signal. According to R.G. 1.183, the onset of the gap release does not start until 30 seconds post-LOCA. Therefore the control room will be isolated prior to the arrival of the radioactive release.

In the LOCA analyses the control room envelope pressurization system (CREPS) is not credited with operating and providing a positive pressure in the control room. Therefore during the one-hour period that the CREPS should be operating, the control room is assumed to be at a neutral pressure. During periods of neutral pressure in the MPS3 control room, unfiltered inleakage is 350 cfm. During periods of positive pressure in the MPS3 control room unfiltered inleakage is 100 cfm.

The control room emergency ventilation system (CREVS) filter efficiencies are conservatively assumed at 90% for both elemental and aerosol and 70% for organic iodines.

The post LOCA dose consequences to the MPS3 control room are due to the following sources:

4.5.1 airborne contribution due to
- containment leakage
- ESF leakage
- RWST backflow

4.5.2. dose from external sources
- control room filter shine
- cloud shine
- RWST direct shine
- containment direct shine

The dose due to cloud shine was calculated using data from the proceeding tables. The dose due to RWST shine did not change from the AST submittal because none of the assumptions regarding RWST backleakage changed. Since the dose due to the airborne contribution from containment leakage decreased and therefore less iodines escaped from containment, this reanalysis conservatively assumes the dose due to filter and containment shine also does not change from the AST submittal.

5. LOCA Results

Table 13 below lists TEDE to the EAB and LPZ from each pathway of a LOCA at MPS3. The dose to the EAB and LPZ is less than the 25 rem TEDE limit stated in 10CFR50.67 and Regulatory Guide 1.183. The EAB dose represents the worst 2-hour dose for each release pathway.

The dose to the MPS3 control room is less than the 5 rem TEDE limit specified in 10CFR50.67 and Regulatory Guide 1.183.

Table 13

TEDE from a Millstone Unit 3 LOCA

Location	TEDE (rem)
EAB	7.5E+00
LPZ	1.8E+00
Millstone Unit 3 Control Room	1.90E+00