September 22, 2005

Mr. David A. Christian
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SUBJECT: MILLSTONE POWER STATION, UNIT NO. 3 - ISSUANCE OF AMENDMENT RE: CHANGE TO APPROVED FIRE PROTECTION PLAN (TAC NO. MC3100)

Dear Mr. Christian:

The Commission has issued the enclosed Amendment No. 227 to Facility Operating License No. NPF-49 for the Millstone Power Station, Unit No. 3, in response to your application dated April 15, 2004, as supplemented on June 23, 2005. The amendment authorizes a change to your Approved Fire Protection Program that would allow for a manually-actuated carbon dioxide suppression system in cable spreading areas.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/RA/

George Wunder, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosures: 1. Amendment No. 227 to NPF-49
2. Safety Evaluation

cc w/encls: See next page

Millstone Power Station, Unit No. 3

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DOMINION NUCLEAR CONNECTICUT, INC., ET AL.

DOCKET NO. 50-423

MILLSTONE POWER STATION, UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 227
License No. NPF-49

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Dominion Nuclear Connecticut, Inc. (the licensee) dated April 15, 2004, as supplemented on June 23, 2005, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the requested change to the fire protection program, as described in the attached Safety Evaluation dated September 22, 2005, is approved.

3. This license amendment is effective as of its date of issuance and shall be implemented within 90 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Darrell J. Roberts, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Safety Evaluation

Date of Issuance: September 22, 2005

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 227

TO FACILITY OPERATING LICENSE NO. NPF-49

DOMINION NUCLEAR CONNECTICUT, INC.

MILLSTONE POWER STATION, UNIT NO. 3

DOCKET NO. 50-423

1.0 INTRODUCTION

By application dated April 15, 2004, as supplemented June 23, 2005, Dominion Nuclear Connecticut, Inc. (DNC or the licensee) requested a change to the Approved Fire Protection Program (AFPP) for the Millstone Power Station, Unit No. 3 (MPS3). Branch Technical Position (BTP) CMEB 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," Revision 2, July 1981 (BTP 9.5-1), recommends a fixed-water suppression system for cable spreading areas (CSAs). In September 1985, the Nuclear Regulatory Commission (NRC or the Commission) staff issued NUREG 1301, Supplement 2, "Safety Evaluation Report Related to the Operation of Millstone Nuclear Power Station, Unit No. 3," which allows an automatic carbon dioxide (CO_2) fire extinguishing system to be installed in the CSA in place of the fixed-water suppression system recommended by BTP 9.5-1. The licensee's April 15, 2004, amendment request would allow a change from having an automatic CO_2 fire extinguishing system to having a manually-actuated CO_2 fire extinguishing system. This change to the fire protection program is being submitted to improve personnel safety by providing improved control over CO_2 discharge in the CSA and, thereby, significantly decreasing the likelihood of inadvertent CO_2 discharge, which is a potential safety hazard for plant workers. Such an inadvertent discharge occurred at MPS3 in 1999.

The licensee's June 23, 2005, supplement provided additional information. It did not expand the scope of the application as originally noticed and it did not change the staff's original proposed no significant hazards determination as published in the *Federal Register* on July 6, 2004 (69 FR 40672).

2.0 REGULATORY EVALUATION

The licensee is requesting a change to the AFPP as described in their license. The licensee is permitted to make changes (without NRC approval) to the AFPP that do not adversely affect their ability to achieve and maintain safe shutdown in the event of a fire. The NRC staff considers this change to have the potential to impact the MPS3 AFPP adversely; therefore, the NRC staff requested that the licensee submit an amendment request subject to NRC review and approval.

The CSA contains cables from multiple trains that could be damaged by a fire in this area. MPS3 has an alternate shutdown capability that meets the guidance provided in BTP 9.5-1, Section C.7.c. The alternative shutdown has been evaluated as being capable of bringing the plant to a safe shutdown condition in the event that a fire occurs, which damages multiple trains of safe shutdown equipment within the CSA.

The proposed amendment evaluates the conversion of the automatic CO_2 fire extinguishing system to a manually-actuated system. The manually-actuated configuration includes additions to and modifications of existing fire protection features. These additions and modifications are intended to decrease the likelihood of a fire, thereby counterbalancing any decrease in plant fire protection that could have potentially resulted from converting the CO_2 system to a manually-operated or activated one. Enhancements have been made to ensure that safe shutdown can be achieved if a fire does occur, which damages safe shutdown equipment in the CSA.

3.0 TECHNICAL EVALUATION

Automatic CO_2 fire extinguishing systems are more effective at extinguishing cable fires than manual CO_2 fire extinguishing systems because they actuate earlier in the development of the fire. This early actuation allows the CO_2 to extinguish the flaming portion of the fire before other combustibles have been heated. The heating of other combustibles may cause fires to reignite after the dissipation of CO_2 fire suppressant.

Changing the fire suppression system to a manually-actuated system does delay the actuation of the suppression system. This has the potential to create an adverse affect on the ability to shut down the reactor safely.

3.1 Plant Area and Fire Protection Description

Area Description

The fire area that contains the CSA involves the entire 24 ft. - 6 in. elevation of the control building. The room measurements are approximately 116 feet by 100 feet with a ceiling height of approximately 21 feet. All area boundaries are 3-hour fire-rated fire barriers, with the exception of the north boundary and portions of the west wall, which are exposed to the outside and are not fire-rated. The CSA is a large open area with no subdivision walls. There are no floor drains in the CSA.

The primary in situ combustible in the CSA is cable in cable trays. This cable either meets the requirements of Institute of Electrical and Electronics Engineers (IEEE) -383 or is jacketed with flame retardant material and fillers. All cables are provided with circuit fault protection devices (power supplies are coordinated) to remove overcurrent or faulted conditions.

Aside from cabling, the CSA also contains two electrical isolation panels. The cables feeding these panels are in metal conduits from the cable trays. The nearest cable trays to the panels are located approximately three feet horizontally from the isolation panels. Heavy gauge metal junction boxes are also located throughout the area at the ceiling, floor, walls, and on columns within the CSA. The junction boxes and electrical isolation panels have steel construction with no or minimal openings. Additionally, there are other small panels and junction-type boxes within the room that contain low quantities of combustibles.

Fire Protection Equipment

The licensee has installed dry booster continuous flow hose reels of sufficient number and at locations such that the hoses can reach all trays that are located within the CSA. Outside the area is a hose bin with 200 feet of hose; this is an adequate length of hose to reach all portions of the area. Portable extinguishers are provided in and around the area. To assist in identifying a fire location for small and difficult to find fires, thermal imaging cameras dedicated for fire brigade use in the CSA are located within and outside the area.

The CSA is equipped with ionization and photoelectric spot-type smoke detectors. The control room operators monitor all fire alarms, detection and trouble signals from the detectors. These spot-type smoke detectors have been augmented by an incipient fire detection (IFD) system. In IFD operation, an air sample is delivered to a detector by means of a blower connected to zone sampling lines throughout the CSA. The air drawn through the sampling line is measured for thermally generated particles (such as fire products). This system is designed to detect fire products very early in the development of a fire, during the fire's incipient stages. A 24-hour battery backup for the IFD is provided. The licensee reports that the IFD system is compatible with the electromagnetic environment in the CSA. The licensee further reports that there have been no spurious IFD system alarms due to either welding or grinding outside the CSA, or from monthly emergency diesel runs during the first 11 months of use.

The area is equipped with a total-flooding CO_2 fire extinguishing system. This is a low-pressure total-flooding system that is designed to maintain 50% CO_2 concentration for greater than 20 minutes. To discharge the CO_2 manually, alarm signals from both an ionization and a photoelectric smoke detector are required. There are methods available to inhibit CSA CO_2 discharge, which may be used when the area is occupied.

Fire Brigade Response and Training

The fire brigade has a minimum of five members per shift and is supported by an additional Operations fire team advisor knowledgeable in plant safety-related system operations. Approximately 9 minutes after receipt of an alarm in the control room, the first brigade member in full turnout gear is expected to arrive at the scene. Application of the first suppression agent is expected to occur between 9 to 15 minutes after receipt of an alarm in the control room.

The fire brigade has been trained on the IFD system, including searches for hot spots in the CSA cable trays using a thermal imaging camera prior to initiating fire suppression. Based on fire drill data gathered for 2001 through 2002 for drills conducted at the Millstone units, the first arriving member of the fire brigade (without full turnout gear) is expected to arrive at the scene of a fire in approximately 4 minutes after the receipt of an alarm in the control room.

The Millstone fire brigade training facility includes full-scale mockups of Millstone-specific plant areas, including an elevated cable tray mockup. The licensee built this mockup to support training for deep-seated cable tray fire scenarios. Training also includes using a thermal imaging camera to locate hot spots in cable trays.

Safe Shutdown

The CSA contains cables from redundant trains of safety-related systems. Alternate shutdown capabilities are provided for a fire in the CSA using the fire transfer switch panel (east switchgear room) and the auxiliary shutdown panel (west switchgear room), which are located in separate fire areas. Redundant Class 1E cables, conduit and trays are generally separated by a minimum of three feet vertically and one foot horizontally. Alternative arrangements and deviations have been evaluated and documented by the licensee.

3.2 Staff Technical Evaluation

The proposed amendment would allow a manually-actuated CO_2 fire suppression system in conjunction with manual fire fighting in the CSA to be used in place of an automatic CO_2 fire extinguishing system. The current NRC AFPP documented in the MPS3 Fire Protection Evaluation Report would be superceded by this amendment.

The NRC staff has reviewed the licensee's submittal and determined that a review of the submittal on a risk-informed basis is appropriate. Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," provides guidance for performing a risk-informed analysis of the submittal.

3.2.1 Detailed Description of the Change

The change from an automatic CO_2 fire extinguishing system to a manual CO_2 fire extinguishing system is a reduction in fire protection capability for the CSA. The licensee presents the case that the change of the gaseous fire extinguishing actuation system from automatic to manual, when balanced against the other enhancements made to the CSA, provides an acceptable level of protection. In addition, the licensee expects that a manual CO_2 fire extinguishing system will be safer for plant personnel.

Changes to CSA Fire Detection

The original fire detection system in the CSA was a system of spot-type smoke detectors. With the addition of the IFD system, the current fire detection methodology for the CSA consists of the original smoke detectors in conjunction with the IFD system. The licensee submits that the IFD system increases the defense-in-depth element for fire detection.

The fire fighting strategies, fire brigade training, and drills have been updated by the licensee to reflect IFD system response; specifically, the training stresses use of the IFD panel zone indications and a thermal imaging camera to determine hot spots. This training also reinforces the fact that a valid IFD alarm may not yield visible smoke or flames upon operator investigation of the alarm, yet there still may be a fire present.

Changes to CSA Fire Suppression

The licensee has changed the CSA CO_2 fire extinguishing system from automatic to manual-only actuation. In manual-only actuation configuration, the system supply valve is closed under the system's normal configuration. New descriptive labels at the panel and manual station have been added to instruct operators and fire brigade personnel regarding operation of the system. Additional training with revised procedures has also been performed.

Initiation of the CO_2 system in the manual configuration requires the alarm condition to exist as did the automatic actuation configuration. Manual opening of the supply valve is necessary to initiate the discharge. The supply valve is operated by a key lock that is controlled by the control room operators. A step stool is provided near the valve to allow access.

The CO_2 enclosure and system have been modified to support this evaluation. For example, the supply and exhaust dampers that enter the CSA have been isolated and blocked off. This change prevents pressurization of the control building purge system and potential CO_2 leakage through purge system dampers into areas outside the CSA during a CSA CO_2 discharge event. Manual bubble tight dampers that are normally closed have replaced backdraft dampers. This change was made in an effort to eliminate any potential CO_2 leakage into the adjacent rooms.

Based on data obtained during the February 2001 discharge test, it was determined that the discharge timer timed out approximately 30 seconds later than required by the original qualification test criteria. The timer has been recalibrated and a periodic surveillance is planned for this timer as well as other initial pneumatic discharge timers.

Leakage noted during an inadvertent discharge event in 1999 was further investigated during the February 2001 test. The failure of the west CSA door during this test was attributed in part to latching problems. The licensee thought that the unexpected extended initial discharge period may have caused an overpressurization condition in the room contributing to door failure as well. The door, door hardware, electronic striker, closure arm, hinges, door sweep, auto door sweep and weather strip were all replaced after the discharge test in 2001.

In the event of a large fire in the CSA, fire dampers would close and isolate purging operations. As defined in the MPS3 Fire Protection Evaluation Report during original plant licensing, portable smoke ejectors are provided to assist in removal of the products of combustion should the normal ventilation systems be unavailable because of damper closures or other failures.

This amendment changes the fire suppression philosophy such that a greater reliance is placed on manual fire fighting efforts relying upon water as the fire suppressant, reserving CO_2 system actuation for severe fires. The fire brigade is directed to remove water rapidly after fire suppression activities have been completed. There are numerous electrical and mechanical penetrations from the CSA to areas below. These penetrations are sealed to a 3-hour fire rating and a hydrophoric rating of four inches of water. An engineering evaluation concluded that the control building flooding analysis bounds the resultant water discharge expected during manual fire fighting activities in the CSA. This evaluation considered the fact that boot seal joints and spare conduit penetration caps were sealed with an adhesive sealant.

3.2.2 Safe Shutdown in the Event of Control Room Evacuation

The control room is evacuated if either of the following conditions is verified to exist: 1) the control room is judged to be an unsuitable environment in which to continue operating, or 2) instrumentation or control for both trains of safety-related equipment required for achieving and maintaining hot standby or cold shutdown is degraded. If an emergency operating procedure-directed habitability assessment determines hazardous conditions exist, the control room would be evacuated as well. All operating shifts are trained on shutdown from the alternate shutdown panel once per training cycle (currently a two-year training cycle).

In the event a control room evacuation becomes necessary due to a fire in the CSA, the operators will proceed to areas adjacent to the CSA to perform an alternate plant shutdown. Due to the potential for CO_2 migration into the safe shutdown areas, the operators will be directed to don self-contained breathing apparatus (SCBA) while in the control room before proceeding to the shutdown areas if a CSA CO_2 discharge has occurred. Control room SCBAs are equipped with voice amplifiers to facilitate communication. Once operators are stationed in the east switchgear room or at the alternate shutdown panel and once control has been established (critical steps met), the operators will hook up to the fixed bottled breathing air stations. Operators are also qualified yearly on SCBA and are qualified on transferring from SCBA to the breathing air system installed at the alternate shutdown panel.

The fixed breathing air systems at the shutdown panels provide operators breathing air to supplement their SCBA bottle air while performing safe shutdown procedures in the east and west switchgear room (alternate shutdown panel) following a control room evacuation and CSA CO_2 discharge. The combination of SCBA tethered into the breathing air system is designed to provide approximately three hours of breathing air for each of six operators. The hose lines are of sufficient length to reach required stations in the east and west switchgear rooms.

If a CSA CO_2 discharge has not occurred, and a control room evacuation is necessary due to a fire in the CSA, operators are directed to carry the SCBA with them to the alternate shutdown areas. If a CSA CO_2 discharge should become necessary, the operators at the alternate shutdown areas will be directed to don the SCBA prior to CO_2 discharge.

Carbon dioxide and oxygen (O2) monitoring equipment are being installed in the control room, instrument rack room, service building west stairway, and east and west switchgear rooms. The air monitoring/indicating components will be permanently mounted and powered by a non-safety-related source with battery backup. The monitoring equipment has both audible and visual (LED) alarms to warn personnel of restricted concentration levels.

3.2.3 NRC Staff Review Methodology

For the quantitative evaluation of the risk impact of changing the CSA CO_2 fire extinguishing system from an automatic system to a manual system, the licensee performed a fire risk analysis of the area.

The results of the risk analysis are compared to the acceptance criteria in RG 1.174 to determine if the requested change is within a region where changes are permitted. If the change is allowed per RG 1.174, then the change will be evaluated to determine whether or not

an adequate defense-in-depth and safety margin remains. Defense-in-depth will be reviewed based on the defense-in-depth discussion provided in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix R, and in RG 1.174. Safety margins will be reviewed based on the discussion provided in RG 1.174.

3.2.4 Risk Review of CSA Evaluation

The April 15, 2004, submittal identified numerous targets within the CSA that could be affected by a fire. The following fire scenarios were identified: 1) transient fire, 2) transient fire caused by hot work, 3) cable fire caused by hot work, 4) self ignited cable fire and 5) cabinet fire (electrical isolation cabinets). Scenarios 1, 2 and 3, were evaluated throughout the analysis. The analysis did not evaluate scenario 4, self-ignited cable fire, since the probability of self-ignited cable fires occurring in the installed IEEE-383 rated cables is considered to be very small. The analysis did not consider scenario 5, electrical isolation cabinet fires, since the cabinets are remote from target cables and completely enclosed. The reasoning to exclude scenarios 4 and 5 are consistent with the state-of-the-art in risk analysis methods, and the NRC staff finds this reasoning to be acceptable.

The licensee identified pinch points that would be affected by the remaining fire scenarios. These pinch points are locations where two trains of cables come together. Damage to both trains would likely require an alternate safe shutdown.

The licensee performed an analysis of the detection and suppression times for fire scenarios affecting multiple trains in the CSA. The licensee used hand calculations to develop fire scenarios for each of the pinch-points identified. The analyst used Electric Power Research Institute's (EPRI's) Fire Induced Vulnerability Evaluation (FIVE) Rev. 1 tools to develop plume temperature calculations. Based on the fire sizes expected to cause damage, the analyst applied fire severity factors. The fire severity factors are consistent with the methods developed using the ERPI-NRC/Office of Research fire risk requantification.

The following cases explore how the above three evaluated scenarios could potentially affect the pinch points considering the manual CO_2 extinguishing system as compared to the automatic CO_2 extinguishing system for a set of postulated fires.

3.2.5 Comparison of Core Damage Frequency for Automatic and Manual Systems

In the case of the manual CO_2 actuation, there is a delay in suppression compared to the case of the automatic CO_2 actuation. There are two significant fire scenarios, transient fire (expected to be unattended) and hot work fire (expected to have a fire watch in place). The hot work transient and hot work cable fire scenarios (scenarios 2 and 3 above) have been combined.

For the transient fire scenarios, the automatic suppression system provides a better probability from between 9 and 19 times that suppression will occur before the redundant cables are damaged when compared to the manual CO_2 fire suppression system. The frequency of a multi-train damaging fire occurring in unattended transient combustibles is 7.6E-8 per year if the area had an automatic CO_2 fire extinguishing system. This value rises to 1.1E-6 per year without the automatic CO_2 fire extinguishing system.

The licensee also evaluated the conditional core damage probability (CCDP) for the cables affected by each specific scenario. The scenario-specific conditional core damage probabilities were multiplied by the frequency of a damaging fire for each of the scenarios. For the automatic CO_2 fire suppression system scenarios, the core damage frequency (CDF) is 2.5E-8 per year. For the scenario with the manual CO_2 system, the CDF is estimated to be 2.5E-7 per year. The delta CDF between the automatic system and the manual system, therefore, is 2.3E-7 per year.

For hot work type fires, the automatic CO_2 fire extinguishing system is expected to be locked out or isolated due to personnel safety concerns. There is, therefore, no delta CDF for hot work type fires.

3.2.6 Other Considerations

Cumulative Risk

In the June 23, 2005, response to the NRC's request for additional information (RAI), the licensee submitted an analysis of the increase in risk involved in this change. This analysis included considerations of other risk-informed license changes. The licensee's analysis showed that the total cumulative risk increase is about 1.0E-6 per year which is considered small based on the guidance included in RG 1.174.

Fire Modeling Sensitivity Analysis

In the April 15, 2004, submittal the licensee calculated the delta CDF as 2.3E-7 per year. The licensee based this calculation on five fire scenarios that were postulated to occur in the CSA. In the licensee's June 23, 2005, RAI response submittal, the licensee explored additional circumstances.

The licensee performed an evaluation of potential fire sizes for the area and concluded that either large or fast growing fires could not be reasonably postulated. The licensee performed a more detailed analysis of the delta CDF assuming a range of conditional core damage probabilities for transient-type fires. The analysis considered five additional cases. The sensitivity analyses showed that the total CDF due to transient fire scenarios varied from 2.3E-7 per year to 1.1E-6 per year. Based on this analysis, the licensee's "worst case" scenario is considered a small increase in risk based on RG 1.174 guidelines.

3.2.7 Defense-In-Depth and Safety Margins

Both 10 CFR Part 50, Appendix R and RG 1.174 deal with defense-in-depth. RG 1.174 also addresses the impact of changes on safety margins.

Fire Protection (10 CFR Appendix R) Defense-in-Depth

Fire Protection Defense-in-Depth Criterion 1 - To prevent fires from starting.

The conversion to a manually-actuated system has no impact on the likelihood that fires will start. Neither combustible loading or ignition sources are affected by this change.

Fire Protection Defense-in-Depth Criterion 2 - To detect rapidly, control, and extinguish promptly those fires that do occur.

The conversion to a manually-actuated system does affect this criterion. Certain fires will be detected more rapidly due to the installation of an IFD system. This detection system may be more effective in sensing products of combustion due to overheating of cable or other causes. Increasing the sensitivity of the detection system is expected to improve fire detection in the area.

By changing from an automatic to a manual fire suppression system, control and extinguishment of fires that do occur may have been degraded. This is compensated for by the improved fire detection and manual fire suppression equipment (hose stations within the room, temperature sensors and other features), which should improve the ability to control and extinguish fires that do occur

Fire Protection Defense-in-Depth Criterion 3 - To provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

The conversion to a manually-actuated CO_2 system is likely to have a beneficial impact on safe shutdown in that it prevents inadvertent actuation of the system. Such inadvertent actuation could spread CO_2 to manned areas of the plant and could challenge the ability of operators to either operate or shut down the plant safely. The licensee's changes have also added breathing air to the emergency control stations to allow operators to shut down the plant in challenging environments. Such an environment is a potential during fire events (protecting the operators from smoke or suppressant gas (CO_2)) or from other toxic gasses that may enter some areas of the plant.

RG 1.174 - Defense-in-Depth Philosophy

In making the change from an automatic to a manual CO_2 system, the licensee has tried to balance the loss of rapid suppression with the enhancements to manual fire suppression and safe shutdown activities. There is more reliance on fire brigade actions when compared to having a system with the automatic fire suppression. The licensee has proposed a variety of improvements to make fire brigade actions more effective and timely.

The licensee has considered numerous possible scenarios. These scenarios indicate a high likelihood of mitigation before there is any challenge to plant safety. The most likely scenarios have been explored in detail using reasonable risk analysis methods. The licensee did not rely on certain equipment in the risk analysis, such as the IFD system, that could have been credited.

The change is consistent with General Design Criterion 3, "Fire Protection," since components important to safety in the CSA have been designed to minimize the effects of fires. Fire detection and suppression for the area have been installed and have been evaluated for use in the CSA.

Impact on Safety Margins

A measure of safety margins, as described in RG 1.174, is that codes and standards or their alternatives approved for use by the NRC are met. The licensee is requesting to deviate from their approved codes and standards, which would require a water fire suppression system or the approved automatic CO_2 suppression system. The licensee is using a quantitative risk assessment to meet the acceptance guidelines for CDF in RG 1.174. The licensee's results are consistent with those required to make changes to their licensing basis.

Human Factors Considerations

The staff's review criteria for human factors engineering are based on an adaptation of existing NRC review guidance for human factors engineering provided in NUREG-0800, Standard Review Plan, Chapter 18.0, "Human Factors Engineering," and documents referenced therein.

The licensee is proposing certain manual actions in support of their license amendment request. Of particular concern to the NRC staff was the ability of the operators to shut down the plant safely when an evacuation from the control room is required because of a fire in the CSA that would require manual actuation of the CO_2 suppression system. To verify that the proposed manual actions can be accomplished, the licensee performed a mock evacuation of the control room to demonstrate the ability of operations personnel to perform required alternate shutdown activities.

The mock evacuation, described in the licensee's supplement dated June 23, 2005, was accomplished by two off-shift operators and two fire brigade members using two observers who recorded performance data. The mock evacuation demonstrated the operators' ability to evacuate, don SCBAs and communicate effectively.

The licencee noted that typically four operators are available during a fire emergency to perform an actual plant shutdown at the ASP, and the timed scenario confirmed by the mock evacuation is considered conservative by the licensee. The current performance times are conservatively based on meeting the performance standards identified in BTP 9.5-1 (i.e., maintaining pressurizer level in the indicating range, reactor heat removal function capable of removing decay heat), while the performance margins discussed in the NRC's draft position on this subject are based on the point at which equipment damage occurs. Concurrent actions, as well as pre-staging of steps, would occur if four operators performed a plant shutdown versus the two operators used during the walk-through.

The licensee further stated that the required completion time for the critical manual actions specified in its April 15, 2004, submittal are based on the performance goals set by the NRC's BTP 9.5-1 and generally do not correspond to an equipment damage state. For example, the time specified for those manual actions associated with establishing reactor coolant system (RCS) inventory control are based on maintaining pressurizer level within the indicating range rather than on the time to reach an RCS voiding or core uncovery condition. For the purpose of the mock evacuation conducted, the more limiting times associated with the BTP performance goals were used to measure success.

The licensee also indicated that the mock evacuation did not include a simulation of delayed access or alternate access to the switchgear rooms and ASP. An alternate path to the ASP exists and is well known by the operating crews; however, the EOP-directed pathway does not result in the operators traversing stairwells/hallways adjacent to the CSA (i.e, those areas most likely to induce delays due to fire fighting activities). In addition, fire fighting strategies for the CSA direct activities to be performed away from the EOP-directed pathway the operators use to access the ASP.

The licensee further stated that the results from the mock evacuation can be generalized to all crews because the operating crews receive the same hands-on training at the simulator ASP. Additionally, all licensed operators are trained in use of SCBA and need to pass yearly qualification testing.

Training on the breathing air stations in the east and west switchgear rooms has been conducted for all operations shifts and is included in the periodic training requirements for licensed operators. Operator training on the fire emergency EOPs (shutdown actions at the ASP) is conducted for licensed operators once per training cycle (two-year cycle). The ASP in the west switchgear room is modeled in the MPS3 simulator and provides an effective training aid for switch manipulations required by the EOPs.

As part of the mock evacuation, the timing of two actions considered to be critical to achieving stable shutdown conditions, as well as the overall safe performance of operators using SCBA at the ASP (communications, movement, etc.), were validated. The participants verified that the power operated relief valves (PORVs) were closed at the auxiliary shutdown panel in the west switchgear room in 14 minutes and 16 seconds, which was within the acceptable 15-minute time frame. They also verified that reactor head vent letdown was accomplished in 24 minutes and 46 seconds, which was within the 30-minute acceptance criteria. The licensee also noted that, prior to control room evacuation, EOP-directed action ensures the PORV block valves are closed. The licensee further indicated that the EOP directs numerous actions be performed at the ASP. The licensee stated that no additional actions are time-constrained and, therefore, were not part of the exercise.

With regard to the access path to the ASP or other locations that may require access during a fire in the CSA, the licensee stated that access is via the service building west stairwell and was chosen and proceduralized to protect the control room operators from potential leakage of CO_2 from the CSA east side door. The areas that are required to be accessed by the control room operators for shutdown outside the control room are the east and west switchgear rooms. Shutdown from outside the control room is designed to be accomplished with the minimum crew composition described in the plant Technical Specifications. The EOP directs the shift manager, the unit supervisor, and the two control room operators to proceed to the ASP. From the ASP, other plant equipment operators are dispatched via radio or telephone to remote areas of the plant.

The licensee noted, however, that additional personnel would become available within approximately 90 minutes of event initiation given that the abandonment of the control room results in a declared emergency (ALERT level classification), which requires activation of the emergency response organization.

Based on a comparison of the licensee's safety analysis with the staff's review criteria, the staff concludes that the licensee has provided reasonable assurance that the operators will be able to successfully perform the required tasks. Therefore, the staff finds this proposed amendment request to be acceptable with respect to required human actions related to the manual operation of the MPS3 CO_2 suppression system.

3.3 Technical Evaluation Conclusion

The NRC staff has reviewed the licensee's analysis for the removal of the automatic capability for the CSA CO_2 fire extinguishing system. The NRC staff used the Fire Protection Significance Determination Procedure (FPSDP) as a guide for evaluating the risk method of the evaluation. The evaluation methodology is consistent with the method in the FPSDP, specifically with respect to the risk equation that includes fire frequency, fire suppression probability, and the CCDP. The licensee's analysis also satisfies applicable criteria in the NRC's Standard Review Plan, Chapter 18.0, "Human Factors Engineering," related to the crediting of certain manual actions to support the proposed change from an automatic to a manually-actuated CO2 suppression system.

The evaluation accounted for an increase in plant risk, while also addressing defense-in-depth and safety margin issues. Based on this analysis, the NRC staff concludes that although the change represents an overall increase in risk, the increase is small and falls within an acceptable region. Furthermore, the staff finds that the licensee is employing reasonable defense-in-depth, and has made reasonable efforts to counterbalance any increase in risk with improved detection equipment and training. The NRC staff, therefore, finds the conversion to a manually-actuated CO_2 system to be acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Connecticut State official was notified of the proposed issuance of the amendment. The State concurred with the staff's evaluation.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (69 FR 40672). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that 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.

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