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U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles

Reference: Letter from Keith R. Jury (Exelon Generation Company, LLC) to U. S. NRC, "Request for License Amendment for Technical Specifications Surveillance Requirement for Containment Spray Nozzles," dated April 19, 2002

In the referenced letter, Exelon Generation Company, LLC (Exelon) submitted a request for changes to the Technical Specifications (TS) of Facility Operating License Nos. NPF-72, NPF-77, NPF-37, and NPF-66 for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2. The proposed changes requested revision of TS 3.6.6, "Containment Spray and Cooling Systems," involving Surveillance Requirement (SR) 3.6.6.8. This SR verifies that each spray nozzle on the containment spray ring headers at the top of the containment dome is unobstructed. The required Frequency for SR 3.6.6.8 is "10 years." Exelon proposed to revise the required Frequency for SR 3.6.6.8 to "Following maintenance that could result in nozzle blockage OR Following fluid flow through the nozzles."

During NRC review of the referenced letter, additional information was requested and discussed on a telephone conference call between representatives of the NRC and Exelon on July 30, 2002. The attachment to this letter provides our written response to the NRC questions discussed on the telephone conference call.

A001

Should you have any questions related to this letter, please contact Mr. Brian Sweeney at (630) 657-2836.

Respectfully,

K. A. Ainger for

Keith R. Jury
Director – Licensing
Mid-West Regional Operating Group

Attachments:

Affidavit
Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles at Braidwood and Byron Stations

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Braidwood Station
NRC Senior Resident Inspector – Byron Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
EXELON GENERATION COMPANY, LLC	)	Docket Numbers
BRAIDWOOD STATION, UNITS 1 AND 2	)	50-456 AND 50-457
BYRON STATION, UNITS 1 AND 2	)	50-454 AND 50-455

SUBJECT: Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

K. A. Ainger
Manager – Licensing

Subscribed and sworn to before me, a Notary Public in and for the State above named, this 9th day of September, 2002.

Notary Public

"OFFICIAL SEAL"
TIMOTHY A. BYAM
COMMISSION EXPIRES 12/04/05

Attachment

Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles at Braidwood and Byron Stations

Question 1

Experience at D. C. Cook Unit 1 (LER 98-027-02) seems to indicate that boric acid plate-out with the potential to block flow through the containment spray headers and nozzles can occur following an inadvertent spray actuation. What type of inspection would be done following an inadvertent spray actuation? Why is this method sufficient to detect blockage due to boric acid plate-out?

Response

Exelon Generation Company, LLC (Exelon) has reviewed the D. C. Cook Unit 1 License Event Report (LER) 98-027-02 and the design of the containment spray system at D. C. Cook. D. C. Cook has a cross-connect valve between the discharge piping of the containment spray system pumps and borated water leaked past this valve as noted in the LER. Byron and Braidwood Stations have completely independent piping for each containment spray system train without a cross-connection at the containment spray system pump discharge piping. The Braidwood and Byron Station design also has two independent containment spray ring headers. The train 'A' ring header contains 219 spray nozzles and the train 'B' ring header contains 253 spray nozzles.

Byron/Braidwood Stations Updated Final Safety Analysis Report (UFSAR) Table 6.2-2, "Assumptions For Unit 1 Containment Analysis," and Table 6.2-3, "Assumptions For Unit 2 Containment Analysis," both specify that a minimum flow rate of 3285 gpm through the containment spray nozzles is required during a design basis loss of coolant accident. This minimum flow rate assumes one containment spray system train is unavailable. We have determined this minimum required flow rate would still be met if two spray nozzles were blocked in the single operating containment spray system train.

If an inadvertent containment spray actuation were to occur with injection of borated water through the spray ring header, a condition report would be initiated. The condition report would require an evaluation of the circumstances and determine appropriate corrective actions to ensure the spray nozzles are operable and to prevent recurrence. Corrective actions would include the performance of a gaseous flow surveillance test to ensure the spray nozzles are not obstructed and are capable of performing their safety function.

Attachment

Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles at Braidwood and Byron Stations

Question 2

Experience at D. C. Cook Units 1 and 2 (LER 98-027-02) seems to indicate that the typical test for blockage in the containment spray lines and nozzles may not be effective in detecting debris in the spray lines, at least the amount reported in this LER.

Do your testing records show any evidence that the technical specifications containment spray flow blockage test may have a sensitivity to debris in the lines or nozzles which is too low; that is, debris is present but not detected by this test? For example, has construction debris or other debris been found in the containment spray system as a result of later inspections, tests or repair work other than the containment spray system blockage test required by your technical specifications?

Response

The proposed changes to Surveillance Requirement (SR) 3.6.6.8 do not propose changes to the type or method of containment spray nozzle testing. As described in the Technical Specifications Bases for Byron and Braidwood Stations, the containment spray nozzle testing requirements are intended to "verify each nozzle is unobstructed," and are not intended to identify debris in the containment spray lines. Air flow testing of the containment spray nozzles has been the approved and accepted method for verifying operability. The Bases for SR 3.6.6.8 describes the type of testing performed and the purpose of the testing as follows.

"With the containment spray inlet valves closed and the spray header drained of any solution, low pressure air or smoke can be blown through test connections. This SR ensures that each spray nozzle is unobstructed and provides assurance that spray coverage of the containment during an accident is not degraded."

This type of testing is consistent with the type of testing that was performed to satisfy the preoperational testing requirements described in UFSAR Table 14.2-18, "Containment Spray System." UFSAR Table 14.2-8 describes the containment spray preoperational test, in part, as follows.

"Spray nozzles will be tested using hot air injected into the nozzles and infra-red thermography or alternative methods to verify proper nozzle flow. Water injection through the spray nozzles is not planned. ... The paths for the air flow test of the containment spray nozzles will overlap the water flow test paths of the pumps at the connecting spool pieces."

To satisfy the requirements of the preoperational testing described in UFSAR Table 14.2-18, the containment spray system was full flow tested from the refueling water storage tank to the reactor cavity. A blind flange was installed downstream of the tee-connection on the discharge line between the vertical riser to the nozzles and a temporary line going to the reactor cavity. This flushed out any debris in the system. For Braidwood Station, the blind

flange was relocated upstream of the tee-connection and test connections were installed to perform the preoperational nozzle test using air. For Byron Station, the blind flange was removed to perform the preoperational nozzle test using air. Air flow was verified coming out of each nozzle.

A similar test was performed at Braidwood Station during in-service testing in 1991 for both units (i.e., 3 years after initial operation) and at Byron Station during in-service testing in 1991 for Unit 1 and in 1992 for Unit 2. Hot air was blown through the risers at a minimum flow rate of 1500 cfm and a thermograph of each nozzle was obtained. The thermographs verified that each nozzle had air blowing out as indicated by a distinctively colored flume projecting from each nozzle.

Braidwood and Byron Stations also test the containment spray system containment isolation valve in accordance with 10 CFR 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors." To facilitate testing per Appendix J, the piping is drained between the tee-connection at the riser, where a blind flange is installed to support testing, and the discharge manual isolation valve for the containment spray pumps.

In addition, inspections in accordance with the In-Service Testing program for check valves CS008A/B are performed at the frequency of once every 54 months. During this inspection, CS008A/B are removed from the piping, inspected, rebuilt if required, and re-installed. Prior to installation, a foreign material exclusion (FME) inspection of the piping is performed. Once CS008A/B are restored, a full flow test using air is performed to verify the check valves will stroke open. Following the stroke open verification, a local leak rate test (LLRT) is performed on CS008A/B to determine any leakage past the check valves.

Based on these tests, we have not identified any nozzle blockage caused by debris in the containment spray system including the ring headers.

Attachment

Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles at Braidwood and Byron Stations

Question 3

Describe any previous maintenance activities on the containment spray system that had the potential to introduce debris. What assurance is there that no such debris presently exists (including debris from construction)?

Response

Braidwood and Byron Stations perform routine maintenance and calibrations on the containment spray system. For example, the check valves in the containment spray system are inspected every 54 months. In addition, an impeller was replaced on one of the containment spray pumps at Braidwood Station. During all work, foreign material exclusion practices were used as described in our response to Question 4. Following any work on the containment spray system, appropriate testing was performed to ensure the equipment was working properly.

Any debris in the containment spray system would be detected from post-maintenance testing. Both Braidwood and Byron Stations completed the pre-operational testing for the nozzle ring headers described in UFSAR Table 14.2-18. Prior to the containment spray system pre-operational testing, the containment spray system piping was inspected for cleanliness prior to installation (i.e., pipe weld/bolt-up) of the system. Neither Braidwood nor Byron Station have performed any maintenance that would have introduced foreign material into the nozzle ring header.

Attachment

Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles at Braidwood and Byron Stations

Question 4a

Please elaborate on the plant's foreign material exclusion program to prevent debris from remaining in the containment spray system piping, headers and nozzles following maintenance, testing or inspections which result in opening the system.

Response

Exelon Nuclear Procedure MA-AA-716-008, "Foreign Material Exclusion Program," provides the necessary requirements and guidance to prevent and control the introduction of foreign material into structures, systems, and components. It also controls the investigation and recovery actions when FME integrity is lost or unexpected material is discovered. FME controls are required to be established any time a system/component is opened for maintenance, regardless of size. The FME requirements are documented in each work package in an attachment to the work package. The work planner determines the foreign material exclusion area (FMEA) and any special requirements based on the planned work activity or task. This area requires authorization for entry.

There are two categories of FMEAs. An FMEA 1 has the highest level of FME control imposed on a system or component and is established in situations where a final visual inspection of internal cleanliness prior to system closure is not possible due to configuration or other circumstances (e.g., ALARA concerns). For work requiring that an FMEA 1 be established, an FMEA tool and parts log is required to be maintained except when FME devices are installed. An FME device is an internal device or external opening cover installed to prevent foreign material intrusion. In addition, non fail-safe tools are required to be attached by a lanyard or secured to prevent loss. An FME monitor may be assigned to monitor and log the movement of tools and materials in and out of the FMEA. The requirements of an FMEA 1 also include the establishment of an FMEA boundary that generally consists of a rope and sign visibly identifying a specific area as an FMEA. An FMEA 2 is established in situations where a final visual inspection of internal cleanliness prior to system closure is possible. Therefore, a less stringent level of FME control is allowed. In this case, the requirement to maintain an FMEA tool and parts log is optional, as is the requirement to establish an FMEA boundary with signs posted.

Some of the more relevant FMEA (i.e., Categories 1 and 2) work practices identified in the procedure are provided below:

- All foreign material that is created shall be captured/contained.
- Transparent materials used within an FMEA must be noticeably marked to ensure visibility.
- In activities that require grinding, machining, or lapping of valve seats, vacuum cleaning alone is not sufficient to ensure lapping compound or metal residue removal.

Wipes or similar methods shall be used to ensure all grit and debris is removed to prevent intrusion into the system.

- When welding/grinding inside a system, ensure all welding residue (i.e., slag, grinding dust and spatter) is removed. This includes non-destructive examination residue.
- To the extent practical, stage tools and materials outside the FMEA. Packaging and similar materials should not normally be taken inside the FMEA.
- Clean all tools, parts, hoses, and tubing, etc., entering an FMEA of any debris or excess lubricant.
- To the extent practical, trash cans are not to be used or kept within the FMEA. Remove all trash as it accumulated from the FMEA.
- Ensure that hoses being connected to a system and containers being used to fill systems are cleaned/flushed prior to use.
- Ensure that hoses and/or tubing used for venting/draining are routed to prevent debris from being siphoned into a system.

Only trained workers, whether Exelon Nuclear or contractor, may perform work independently in an FMEA. Under special circumstances, non-trained workers may perform work in an FMEA provided the work is continuously supervised or monitored by trained Exelon Nuclear or contractor personnel. The FME program not only applies to maintenance performed on open systems, but also to such activities as lubrication, chemistry additions, sampling, filling, draining, radiation surveying, inspections, surveillance testing, and refueling activities.

The FME program, in general, requires that all system breaches be covered where possible except when the specific opening is attended or work, inspection, testing, sampling or surveying is in progress that requires removal of the FME device. FME devices should be clearly marked to prevent inadvertent removal or damage. Bright colors are recommended. The work area is verified to be clean and free of foreign material prior to commencing work activities and is documented in an attachment. In-process inspections are performed to ensure that prescribed FME requirements are being effectively implemented. A final cleanliness inspection is also performed to verify the system, component or process is free of foreign material prior to final closure. This inspection is also documented.

When FME integrity is lost, the system engineer or cognizant management individual is notified to help assess the situation and a condition report is written. A recovery plan is developed and reviewed/approved by the system engineer or cognizant management individual before it is implemented.

These administrative controls are effective in preventing debris from entering the containment spray system piping, header, and nozzles following maintenance, testing or inspections which result in opening the system.

Attachment

Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles at Braidwood and Byron Stations

Question 4b

Why is the foreign material exclusion program sufficient, following any maintenance, testing or inspections which result in opening the system, to ensure that nothing remains in the system sufficient to block the system and cause a decrease in spray flow? How does the licensee provide defense in depth that the containment spray system is still capable of performing its safety function after the system is opened?

Response

The FME program described in our response to question 4a provides assurance that debris or foreign material will not be left in the containment spray system. When the containment spray system is opened for maintenance or testing, appropriate FME controls are put in place to prevent the introduction of foreign material. Routine maintenance activities performed on the containment spray system are described in the response to question 3.

Following maintenance activities, post maintenance testing (PMT) is performed to ensure that the equipment is capable of performing its intended function when returned to service. The requirements for PMT are contained in Exelon Nuclear Procedure MA-AA-716-012, "Post Maintenance Testing." Test matrices are provided for various components depending on the type of maintenance that was performed. Matrices are provided for containment spray system components subject to routine maintenance, such as pumps and valves. The PMT Program is an additional means of demonstrating that a system is free of foreign material that could significantly reduce its ability to perform its intended function. Although the PMT Program does not provide guidance for maintenance performed on the containment spray ring header or nozzles, a review of the available maintenance history indicates that no maintenance has been performed on the containment spray ring header or nozzles.

Braidwood and Byron Stations also perform quarterly surveillances on the containment spray pumps, in accordance with the In-Service Testing program, to ensure proper flow, pressure, and vibration parameters are met.

Attachment

Additional Information Supporting License Amendment Request on Technical Specifications Surveillance Requirement for Containment Spray Nozzles at Braidwood and Byron Stations

Question 4c

Following maintenance on a component of the containment spray system, what specific criteria are used to determine whether a flow blockage test of the containment spray system is required? Who makes the decision? At what level of management is this decision approved?

Response

As stated in the response to question 4b, the PMT Program described in Exelon Procedure MA-AA-716-012 is used to determine the appropriate PMT. Recommended testing is provided depending on the component and type of maintenance being performed. Maintenance Planning personnel are responsible for assigning the initial PMT requirements and obtain assistance, as necessary, from Operations, Engineering or the responsible system engineer, or other groups as needed to ensure that all testing requirements and acceptance criteria are specified. Final approval of the PMT requires reviews by the Shift Manager and/or Unit Supervisor to determine whether additional testing beyond that recommended in Exelon Procedure MA-AA-716-012 is required.