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U. S. Nuclear Regulatory Commission
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Dresden Nuclear Power Station, Units 2 and 3
Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Quad Cities Nuclear Power Station, Units 1 and 2
Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Additional Information Regarding Request for Amendment to Technical Specifications Surveillance Requirements for the Main Steam Line Relief Valves and Associated Relief Requests

Reference: Letter from P. R. Simpson (Exelon Generation Company, LLC) to U. S. NRC, "Request for Amendment to Technical Specifications Surveillance Requirements for the Main Steam Line Relief Valves and Associated Relief Requests," dated January 15, 2004

In the referenced letter, Exelon Generation Company, LLC (EGC) requested an amendment to Facility Operating License Nos. DPR-19 and DPR-25 for Dresden Nuclear Power Station (DNPS), Units 2 and 3, and Facility Operating License Nos. DPR-29 and DPR-30 for Quad Cities Nuclear Power Station (QCNPS), Units 1 and 2. The proposed changes modify Technical Specifications (TS) Surveillance Requirement (SR) 3.4.3.2, SR 3.5.1.10, and SR 3.6.1.6.1 to provide an alternative means for testing the main steam electromatic relief valves (ERVs) and the dual function Target Rock safety/relief valves (S/RVs). These valves provide overpressure protection, automatic depressurization, and low set relief functions. The proposed changes will allow demonstration of the capability of the valves to perform their function without requiring that the valves be cycled with steam pressure while installed.

The referenced letter also requested NRC approval of Relief Request RV-02I for DNPS, Units 2 and 3, and Relief Request RV-30E for QCNPS, Units 1 and 2. These relief requests provide an alternative to the requirement of the American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI), Operation and Maintenance of Nuclear Power Plants, 1998 Edition through 2000 Addenda, Section ISTC-3510, "Exercising Test Frequency," Section ISTC-5113, "Valve Stroke Testing,"

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Section ISTC 5114, "Stroke Test Acceptance Criteria," and Section I-3410, "Class 1 Main Steam Pressure Relief Devices With Auxiliary Actuating Devices."

On April 29, 2004, the NRC requested additional information that is needed to complete review of the proposed amendment and relief requests. The attachment to this letter provides the requested information.

EGC has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Attachment 1 of the referenced letter. The supplemental information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration.

If you have any questions concerning this letter, please contact Mr. Kenneth M. Nicely at (630) 657-2803.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 19th day of July 2004.

Respectfully,

Patrick R. Simpson

Patrick R. Simpson
Manager – Licensing

Attachment: Response to Request for Additional Information

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Dresden Nuclear Power Station
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station
Illinois Emergency Management Agency – Division of Nuclear Safety

ATTACHMENT
Response to Request for Additional Information

NRC Request 1

On page 7 of Attachment 1 of the above submittal, the licensee states that a potential reason for performing the currently required in situ testing of the relief valves is to verify that the discharge line is not blocked. The licensee states that (even without performing the in situ testing) the plant Foreign Material Exclusion (FME) program provides the necessary requirements and guidance to prevent and control introduction of foreign materials into structures, systems, and components. However, the staff is aware that there have been several condition reports written over approximately the past two years involving insufficient foreign material control, and that this was considered an area for needed improvement. Provide a summary discussion of the recent failings of the FME program as they could relate to identification of blockage of the relief valve discharge lines, if the same type of failings had occurred there, and how any implemented improvements to the program provide necessary assurance that blockage would be discovered without performing the currently required in situ testing.

Response

Under the current requirements, a manual actuation of each electromatic relief valve (ERV) valve is performed at power to verify that the valve is functioning properly. The ERV discharge lines are not flow instrumented, therefore, this test provides a gross system check that verifies flow indirectly by observing the response of the turbine control valves or bypass valves. The current method may not have the sensitivity to detect partial blockage in all cases. This assurance is provided through the administrative requirements associated with the FME program.

Exelon Generation Company, LLC (EGC) recognizes there have been recent failings in the FME program at Dresden Nuclear Power Station (DNPS) and Quad Cities Nuclear Power Station (QCNPS). A summary of recent failings as they could relate to identification of blockage of the relief valve discharge lines is provided below.

At QCNPS, during the Unit 2 refueling outage in February 2004, a new ERV was found with the pilot valve flange open (i.e., no FME cover) and no one in attendance; however, this incident did not result in any foreign material entering the valve. During removal of the Unit 1 3D ERV in November 2003, a black plastic like material was found on the inlet flange. This material was subsequently analyzed and determined to be consistent with duct tape; however, there was no foreign material on the valve disc and the as-found location of the foreign material would not have prevented the valve from operating. During the May 2003 Unit 1 fuel replacement outage, insufficient FME barriers contributed to the gasket for the 3C ERV to fall into the main steam piping through the opening for the ERV. This material was identified and retrieved prior to valve installation. Insufficient control or cleanup of wood used for scaffolding in the main condenser during a recent refueling outage resulted in a Unit 2 condensate pump seal failure because of wood splinters blocking the seal cooling line to the pump. In March 2002, FME shipping plugs were not removed from newly installed Unit 2 C and D feedwater heater relief valves during maintenance activities; however, the plugs were identified in the installed relief valve before plant startup. In December 2001, a screw located inside the station blackout diesel prevented the fuel injector from being seated properly, resulting in excessive external fuel spray that required the diesel to be shut down during its post-maintenance testing. The screw was left in the station blackout diesel during the just-completed scheduled maintenance of the diesel generator.

Similar FME events have also occurred at DNPS. Examples of the DNPS events include a small wire brush found inside the Unit 2 E ERV inlet piping during the October 2003 Unit 2 refueling outage. The condition of this brush indicates that it was not in the pipe during the previous cycle. The brush was found by Engineering during an inspection of the inlet flange prior to installation of the new valve. Also during the October 2003 Unit 2 refueling outage, welding slag and pieces from a wire wheel were found in the 'C' feedwater pump suction line. This foreign material was believed to have come from welding that was performed on the suction valve internal seats during that same refueling outage. In December 2003, two ½" o-rings were discovered in the electrohydraulic control (EHC) reservoir during cleaning of that reservoir. The o-rings were similar to the ones used at the turbine valve actuator for the installation of solenoids and servo valves. These o-rings were too small to have plugged the EHC pump suction strainer. In January 2004, post-maintenance testing of a newly installed emergency diesel generator (EDG) fuel oil pump identified that FME caps were not removed from the pump inlet and outlet prior to installation of the pump. The caps were discovered when the pump failed the post-maintenance test causing a delay in returning the EDG to operable status.

EGC is confident that the incidents described above, if they would have involved an ERV or S/RV, would not have prevented the actuation of the ERV or S/RV or proper function of the discharge line. The ERV removal and installation procedure provides specific FME controls. These steps include the installation of protective covers on the inlet and outlet of the ERV once it is disconnected from the steam line. A blind flange is also installed on the associated steam line flange. During valve installation, the procedure requires piping internals to be visually inspected to ensure they are free of debris.. A final cleanliness inspection of the ERV ensures accessible areas of the valve inlet and outlet piping are free of foreign material.

A fleetwide FME improvement project has been initiated to improve performance in this area. The following actions are part of this effort.

- Corporate personnel have briefed the site senior management and maintenance directors on their roles and responsibilities under the corporate sponsored FME improvement project.
- DNPS and QCNPS personnel have completed Dynamic Learning Activity scenarios focusing on Maintenance, Operations, Radiation Protection, Chemistry, and Plant Engineering departments. Similar training is planned for Fuel Handlers and Reactor Services personnel.
- Station supervisors were provided "one-on-one" accountability sessions, which provided guidance on how to conduct critical in-field observations for FME.
- The Nuclear Employee In-processing Training has been revised to provide an in-depth discussion and visual examples of FME standards.
- FME walkthrough demonstrations for the DNPS and QCNPS contract work force were conducted during in-processing prior to the recent DNPS Unit 2 and QCNPS Unit 2 refueling outages in October 2003 and February 2004, respectively. The targeted contractors included outage workers and their supervision.

The FME programmatic improvements discussed above coupled with the specific FME procedural requirements provide effective FME controls, and include measures to ensure any foreign material would be discovered without performing the currently required in-situ testing.

NRC Request 2

As stated on pages 7 and 8 of Attachment 1, the proposed changes would reduce the testing frequency for testing the main disks of the electromatic relief valves (ERVs) to once every two cycles, while the current requirement is once each cycle. One benefit to the more frequent current testing of the main disks with steam pressure is more frequent verification of the functional capability of the pilot leak-off line. In recent experience at Quad Cities 1, a leak-off line connection was highly stressed due to a cold spring condition and failed in fatigue during plant operation. The staff is concerned that even with a lesser amount of cold spring, under high-cycle loading, the leak-off lines may fail or crimp or other internal components may wear excessively or bind and would not be identified by the testing proposed. In addition, it is the staff's understanding that some of the ERV components have to be changed out more often than every two cycles. Describe the recent maintenance history of the ERVs and how the proposed surveillance, testing, or any on-line monitoring activities provide assurance that all of the ERV components will continue to perform properly over the proposed surveillance periods of the components.

Response

Failures Due to Pilot Leak-Off Line Cold Spring or Cyclic Fatigue

The pilot leak-off line and above seat drain are not required to be routed to the downcomer in order for the ERV to be operable. The pilot leak-off lines need only to provide a discharge path. It is advantageous to have these steam or condensate sources routed to the downcomer to prevent excess heat, steam, or contamination input to the general areas of the drywell near the valves.

QCNPS specific actions in response to the pilot leak-off line issue, including addition of 2:1 Electric Power Research Institute (EPRI) Weld Profiles, cold spring checks, non-destructive examination of welds, and reanalysis of piping loads, have been completed or are scheduled for the valves and associated piping where applicable.

ERVs on DNPS Unit 2 have been installed and operated for greater than one fuel cycle. Therefore, per the EGC small bore screening criteria, this piping screens out as no longer susceptible to fatigue failure. During the last DNPS Unit 2 refueling outage, preventive maintenance activities on the ERV actuators did not identify any leak-off line issues and a walkdown during a subsequent forced outage found no anomalies.

For DNPS Unit 3, the ERVs were instrumented and the vibration data was compared to the QCNPS data for analysis. The results of the evaluation found that for Unit 3, vibrations were significantly less than the QCNPS vibrations; therefore, the ERV and leak-off line piping are not susceptible to fatigue failure.

These actions address the loads experienced by the valve and piping from vibrations experienced during normal plant operation.

Failures Due to Internal Component Wear or Binding

As-found testing prior to shutdown is not currently performed. Therefore, the following method is currently used for identifying issues related to wear or binding. The pilot valve assemblies (i.e., internal assembly, but not the pilot body) are replaced every outage. Two pilots are included as part of complete valve refurbishments, and the other two pilots are replaced with the main valve still installed in the plant. The main valve is replaced every second refueling outage, in a staggered fashion such that two of four valves are replaced at each refueling outage. After the pilot or main valve is removed, the valves are disassembled completely, with the exception of removing welded seats from valve bodies, and inspected for proper dimensions as well as any signs of wear or damage.

Components Replaced More Often than Every Two Cycles

Each refueling outage, the following general maintenance is performed on the relief valves. The discussion below also identifies the components that are replaced more often than every two cycles.

- The Target Rock dual function safety/relief valve (S/RV) is removed each refueling outage, and a fully refurbished and certified S/RV is installed in its place.
- Two of the four ERVs are completely removed, and fully refurbished valves are installed.
  - For QCNPS Unit 1, the 3E ERV is replaced every refueling outage due to historic wear and vibration data. Therefore, for QCNPS Unit 1, three ERVs are replaced during some refueling outages.
- Refurbished pilot valve assemblies are installed on the ERVs that are not replaced.
- Refurbished solenoid actuators are installed on all four ERVs.

DNPS and QCNPS Maintenance History

Prior to extended power uprate (EPU) operation, maintenance frequencies described above were followed for approximately three to four operating cycles per unit, and included post-maintenance cycling of the valves at 300 psi during reactor startup. The following general statements can be made about the valves at DNPS and QCNPS during this period.

- S/RVs performed adequately, but experienced occasional seat leakage.
- S/RV setpoint drift was experienced, typical of drift experienced for this valve model at other boiling water reactors.
- S/RV seat damage was usually found when seat leakage was present.
- ERVs performed adequately, with no failures noted during startup cycling. At QCNPS, one failure was identified during valve refurbishment where the main disk was wearing grooves into the guide that may have prevented operation. This failure was attributed to insufficient reassembly torque, which allowed the main disk to become loose after valve heat up.
- ERVs experienced occasional seat leakage from both main seats and pilot seats.
- ERV solenoid operators performed adequately. During refurbishment, wear was identified, sometimes significant at QCNPS, on the solenoid plunger guide assembly.
- At QCNPS, a 125 VDC ground was experienced associated with cables from the ERV junction box to the ERV solenoid operator. The ground was a result of cable insulation degradation from rubbing on the conduit.
- Typical ERV refurbishment findings included seat wear or damage as a result of steam

leakage on applicable valves, and degradation of threads in the valve bodies from repeated installation and removal. Seats and disks sometimes required replacement due to steam cutting or as a result of multiple cycles of lapping and grinding.

Following EPU operation, the QCNPS valves have experienced some additional wear that has been attributed to increased vibration levels. Corrective actions at QCNPS have been implemented or planned as described below.

- S/RV adjusting spring to bellows cap wear results in high lift setpoint
  - Shaker table testing is scheduled for the Summer 2004.
  - The need for modifications will be evaluated based on the results of this testing.
- ERV pilot line failure due to cold spring, a weld indication, and vibration
  - 2:1 welds were installed on QCNPS Unit 2 ERV small bore lines. Similar modifications are planned for QCNPS Unit 1 and spare ERVs.
  - Cold spring was relieved as needed and maintenance procedures were revised to inspect for cold spring.
  - The refurbishment procedure is being revised to include weld inspections.
  - Re-analysis was performed based on measured vibrations.
- ERV solenoid actuator degraded or failed due to vibration-induced wear
  - Shaker table testing identified the frequency where self-excitation was present. Materials were upgraded to withstand effects of this vibration.
  - Materials for the parts experiencing wear were upgraded. Age testing was performed on the Shaker table to show that these parts can withstand expected vibration magnitudes over an entire fuel cycle.

<u>Acceptability of Proposed Testing</u>

Proper valve operation will be demonstrated by testing at a steam test facility. This testing will demonstrate that pilot operation results in main disk operation, the hydraulic balance of the valve is correct, and internal ports are clear. Plant circuit operation is verified by both logic testing on a periodic basis, and by installation procedures for the ERV or air operator testing of the S/RV. For the ERVs, installation testing includes verification that the pilot valve stroke and return are correct, and that the electrical characteristics of the solenoid are correct.

Full valve replacement will rely on adherence to the FME program to ensure that ERV or S/RV tailpipes do not become obstructed, or that ERV pilot or drain lines do not become obstructed. Pilot replacement on the ERV will rely on the same FME controls for the pilot valve body, followed by pilot valve stroke verifications.

Shaker table testing identified critical frequencies for the ERVs, and EGC plans to perform similar testing on the portion of the S/RV which has recently experienced what appears to be vibration-induced wear. For the ERVs, material changes have been made, and the new materials have been tested on the Shaker table with successful results in an aging run. The aging run was intended to prove component integrity for a full cycle at EPU conditions.

On-line monitoring will focus primarily on valve leakage, which is not necessarily a function of vibrations. The 125 VDC Ground Detection System captures grounds that may develop in the circuits controlling the valves.

The option to perform cycling of the relief valves while on-line or during reactor startup will be maintained as a method to demonstrate valve operability.

NRC Request 3

On page 5 of Attachments 8 and 9, the licensee states that since the valves are rebuilt at the frequency specified for exercising the valves (i.e., every refueling outage for the safety/relief valves and every other refueling outage for the ERVs), stroke timing is not useful for identifying valve degradation over several operating cycles. This implies that as-found stroke time testing will not be performed. However, as-found stroke time testing will reveal the operability of the valves for the past operating period, which is important for determining the degradation which has occurred and whether any corrective actions to maintenance or testing may be necessary. The licensee states that a review of past surveillance testing indicates that no failures of the main valve components to lift have occurred over a ten-year period. However, it is known that the failure rates of components may change as a result of operating conditions, aging, or testing or maintenance practices. Therefore, it would appear that as-found testing should be retained, in addition to testing to verify that the valves perform adequately following rebuilding. If as-found stroke time testing is not performed, provide a description of how necessary corrective actions to maintenance or testing are to be identified.

Response

Currently, as-found stroke time testing is not performed prior to performing maintenance. After completion of maintenance, plant surveillance tests with steam at reduced pressure are performed per site procedures in order to detect gross failures of the ERVs to change position. The tests performed at DNPS and QCNPS are not as refined as the valve response time test performed at the steam test facility. Therefore, the tests performed at DNPS and QCNPS are not refined enough to detect valve performance degradation, other than gross failures to change position. Steam facility as-left test procedures indicate an allowed time delay not to exceed 500 milliseconds. Typical values in recent tests show delay times of approximately 250 to 425 milliseconds.

ERV refurbishment practices at DNPS and QCNPS include complete tear down and rebuild of the main valve every two refueling cycles. Two of the four ERVs per unit are replaced every refueling outage and the remaining valves have their pilot stages replaced. Thus a full visual examination of all installed pilots and two of the four main valve stages are performed every refueling outage. In addition, leakage tests are performed to verify the seat tightness of both main and pilot stages after refurbishment.

ERV as-left stroke delay time measurements during the as-left steam tests will provide an additional verification of proper performance before installation in the plant. If measurement of as-found delay time prior to refurbishment was performed it could show some change from the prior as-left delay time. Such differences would not be a conclusive indication of degradation unless a gross change occurred. The visual and dimensional inspections that are performed during refurbishment will provide a conclusive method of identifying degradations, making an as-found steam test unnecessary. The visual and dimensional inspections will identify maintenance improvements to avoid degradations that might be detrimental to function.

An as-found set pressure test is performed for the safety function of the S/RVs using steam as required by the American Society of Mechanical Engineers (ASME) code, and this test will be retained with the proposed changes. During this test the delay time is measured and compared to acceptance criteria (i.e., maximum delay time 400 milliseconds and maximum main disc opening time 100 milliseconds). A relief function test is also performed to determine the condition of the air operator. Delay time is measured during this test and is reported to the sites.

The S/RVs are subsequently torn down and refurbished regardless of whether they met as-left acceptance criteria during the as-found test. The delay time from the relief test is used for information only. Subsequent refurbishment and associated visual and dimensional verifications are the primary basis for identifying degradation or changes to maintenance practices or frequencies.