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NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

DUKE POWER COMPANY

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

1.0 INTRODUCTION

On June 25, 1990, the NRC staff issued Generic Letter 90-06, "Resolution of Generic Issue 70, 'Power-Operated Relief Valve and Block Valve Reliability,' and Generic Issue 94, 'Additional Low-Temperature Overpressure Protection for Light-Water Reactors,' Pursuant to 10 CFR 50.54(f)." The generic letter represented the technical resolution of the above mentioned generic issues.

Generic Issue (GI) 70, "Power-Operated Relief Valve and Block Valve Reliability," involves the evaluation of the reliability of power-operated relief valves (PORVs) and block valves and their safety significance in pressurized water reactor (PWR) plants. The generic letter discussed how PORVs are increasingly being relied upon to perform safety-related functions and the corresponding need to improve the reliability of both PORVs and their associated block valves. Proposed staff positions and improvements to the plants' technical specifications (TSs) were recommended to be implemented at all affected facilities. This issue is applicable to all Westinghouse, Babcock & Wilcox (B&W), and Combustion Engineering designed facilities with PORVs.

Generic Issue 94, "Additional Low-Temperature Overpressure Protection for Light-Water Reactors," addresses concerns with the implementation of the requirements set forth in the resolution of Unresolved Safety Issue (USI) A-26, "Reactor Vessel Pressure Transient Protection (Overpressure Protection)." The generic letter discussed the continuing occurrence of overpressure events and the need to further restrict the allowed outage time for a low-temperature overpressure protection (LTOP) channel in operating Modes 4, 5, and 6. This issue is only applicable to Westinghouse and Combustion Engineering facilities.

Duke Power Company (DPC or the licensee) responded to Generic Letter (GL) 90-06 in letters dated December 20, 1990, and March 27, 1991, for Oconee, Units 1, 2, and 3. The licensee did not adopt the staff position for GI-70. They proposed an alternative to in-place stroke testing of the PORV and provided their analysis, using the NRC Interim Policy Statement on Technical Specification Improvements (52 FR 3788), that showed TS were inappropriate for the PORVs and block valves.

2.0 EVALUATION

Technical resolution of GI-70 resulted in three recommendations as follows:

Recommendation 1

Include PORVs and block valves within the scope of an operational quality assurance program that is in compliance with 10 CFR Part 50, Appendix B. This program should include the following elements:

a. The addition of PORVs and block valves to the plant operational Quality Assurance List.

b. Implementation of a maintenance/refurbishment program for PORVs and block valves that is based on the manufacturer's recommendations or guidelines and is implemented by trained plant maintenance personnel.

c. When replacement parts and spares, as well as complete components, are required for existing non-safety-grade PORVs and block valves (and associated control systems), it is the intent of this generic letter that these items may be procured in accordance with the original construction codes and standards.

Recommendation 2

Include PORVs, valves in PORV control air systems, and block valves within the scope of a program covered by Subsection IWV, "Inservice Testing of Valves in Nuclear Power Plants," of Section XI of the ASME Boiler and Pressure Vessel Code. Stroke testing of PORVs should only be performed during Mode 3 (Hot Standby) or Mode 4 (Hot Shutdown) and in all cases prior to establishing conditions where the PORVs are used for low-temperature overpressure protection. Stroke testing of the PORVs should not be performed during operation. Additionally, the PORV block valves should be included in the licensees' expanded MOV test program discussed in NRC Generic Letter 89-10, "Safety-Related Motor Operated Valve Testing and Surveillance," dated June 28, 1989.

Recommendation 3

For operating PWR plants, modify the limiting conditions of operation of PORVs and block valves in the technical specifications for Modes 1, 2, and 3 to incorporate the position adopted by the staff in recent licensing actions. These recent technical specifications require that plants that run with the block valve closed (e.g., due to leaking PORVs) maintain electrical power to the block valves so they can be readily opened from the control room upon demand.

Additionally, plant operation in Modes 1, 2, and 3 with PORVs and block valves inoperable for reasons other than seat leakage is not permitted for periods of more than 72 hours.

DPC Position on GI-70 Recommendations and Staff Evaluation

Recommendation 1:

a. The pressure boundary of the PORV and block valves is maintained QA Condition 1 (nuclear safety related). The PORV is actuated by a DC solenoid-operated pilot valve that is connected to a Class 1E DC system. The block valve for the PORV is an AC motor operated valve and is connected to an AC emergency power supply.

b. The maintenance and refurbishment program for PORVs and block valves is based on manufacturers recommendations as modified based on operating experience. Training and qualifications of personnel performing maintenance on PORVs and block valves is in accordance with the Oconee FSAR.

   The Oconee PORVs are removed each refueling outage and sent to Wylie labs for testing. The valves are receipt inspected for damage, then tested with nitrogen. If the valve does not leak nitrogen, the main and pilot seats are tested for operability and seat leakage using steam. If the steam test is satisfactory, then the valve is again tested with nitrogen at 65, 500, and 2200 psia. If the valve fails the first nitrogen test, the valve is rebuilt by Dresser Industries, and then the same series of tests are performed.

c. Replacement parts, spares, and complete components will be procured in accordance with original construction codes and standards as described in the DPC Topical Report "Quality Assurance Program," Duke 1A, and as stated in the response to item a.

The staff finds that the response to this recommendation meets the intent of the generic letter and is, therefore, acceptable.

Recommendation 2:

a. The PORVs and block valves have been included within the scope of the Oconee IST program. The PORVs are stroke tested in accordance with IWV-3400 during cold shutdown. The block valves are stroke tested in accordance with IWV-3400 quarterly. Since the Oconee PORVs are operated by a DC solenoid operated pilot valve, there are no PORV control air system valves.

b. Stroke testing of the PORV is performed during cold shutdown with the reactor coolant system (RCS) pressure approximately 50 psig in accordance with TS 4.2.6.a. Further, as detailed in the response to NRC Recommendation 1.b. during each refueling outage the Oconee PORVs are removed and then sent to Wylie labs for testing. The Oconee PORVs must pass flow to indicate the valve has stroked. Additional testing of the

PORV at hot shutdown or hot standby is therefore considered unnecessary and impractical based on the acceptability of current testing, the increased potential for causing a leaking PORV, and the additional thermal cycles on the pressurizer surge line (reference NRC Bulletin 88-11). The above testing is considered to meet the requirements of ASME Section XI (although relief is required since timing of the PORV stroke is not possible), and is considered to provide equivalent protection as the guidance of GL 90-06.

c. As discussed in b above, the PORV is stroke tested during cold shutdown at approximately 50 psig. Since the PORV must pass flow to indicate stroking, this testing must be performed after the low-temperature overpressure protection (LTOP) region has been entered during heatup from cold shutdown to establish test conditions. An additional stroke test of the PORV prior to entering the LTOP region during cooldown is considered unnecessary and impractical based on the discussion in b above.

d. Stroke testing of the PORV will not be performed during power operation.

e. The block valve motor operator has been included in the GL 89-10 maintenance inspection program.

The staff has reviewed this position and agrees with the licensee's argument that bench testing of the PORV provides reliability assurance equivalent to that intended by GL 90-06. The staff therefore finds the licensee's response acceptable.

Recommendation 3:

Currently, Oconee TS include limiting conditions for operation (LCO) of the PORV for low-temperature overpressure protection (LTOP) only. LCOs are not included for RCS temperatures above which LTOP is required. A Selected Licensee Commitment has been provided in Final Safety Analysis Report (FSAR) Chapter 16 to address the PORV as an RCS high point vent.

The proposed improvements recommended in GL 90-06 show only a small potential decrease in core melt probability considering reliance on the PORV for the following design basis safety related functions:

1. Mitigation of a design-basis steam generator tube rupture (SGTR) accident.

2. Low-temperature overpressure protection (LTOP) of the reactor vessel during startup and shutdown.

3. Plant cooldown in compliance with Branch Technical Position (BTP) RSB 5-1 to Standard Review Plan (SRP) 5.4.7, "Residual Heat Removal (RHR) System."

As described in the Oconee FSAR, mitigation of a SGTR requires that the RCS be cooled and depressurized to terminate the leakage of reactor coolant to the secondary system. The FSAR analysis does not specify the method of depressurization, however several diverse means are available: normal pressurizer spray, auxiliary pressurizer spray, or the PORV.

The provisions of GL 90-06 regarding LTOP and plant cooldown in compliance with BTP RSB 5-1 are not applicable to Oconee. Specifically, the LTOP provisions do not apply since B&W plants maintain a pressurizer gas space as a means of controlling overpressure. Generic Letter 90-06 does not apply to Oconee for plant cooldown in compliance with BTP RSB 5-1 since Oconee was licensed prior to the SRP and BTP RSB 5-1.

The staff has recognized that most of the safety enhancement for the proposed backfit (TS revision) is derived from the increase in feed and bleed capability. Feed and bleed cooling is established by the High Pressure Injection (HPI) system feeding the RCS and discharging through the pressurizer PORV or safety valves. The HPI system is capable of achieving feed and bleed cooling without reliance on the PORV. The PORV was not explicitly considered for feed and bleed cooling in the Oconee probabilistic risk assessment (PRA) since only one of three relief paths is required for success. However, explicit consideration of an inoperable PORV produces a negligible increase in overall plant risk. As a result, any changes to PORV operability requirements based on feed and bleed cooling would not impact the Oconee PRA results.

The recommendation to include TS operability requirements for the PORV and block valve was evaluated against the criteria of the Interim Policy Statement on Technical Specification Improvements. The recommendation clearly did not meet Criterion 1 or 2. Criterion 3 requires TS for a structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a Design Basis Accident (DBA) or Transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. The applicable DBA or Transient is an SGTR, for which the primary success path includes depressurization of the RCS to terminate the leakage of reactor coolant to the secondary system. As described in the Oconee Emergency Operating Procedures, the systems or components used to accomplish this function, in order of preference, are: 1) normal pressurizer spray, 2) auxiliary pressurizer spray, and 3) manual actuation of the PORV. Thus, since several options are available to perform this function, it is inappropriate to identify the PORV as the primary success path for mitigation of an SGTR. Finally, the use of the PORV was evaluated against the risk significance provisions of the Policy Statement. As previously stated, since the HPI system has the capability to pump against the pressurizer safety valves, credit for the PORV was not explicitly taken in the Oconee PRA. Explicit consideration of an inoperable PORV results in only a negligible increase in overall plant risk. Therefore, use of the PORV for feed and bleed cooling is not a constraint of prime importance in limiting the likelihood or severity of the accident sequences that are found to dominate risk. Therefore, the licensee concluded that changes to the Oconee TS based on GL 90-06 were not appropriate.

The staff has reviewed the information provided by DPC on this recommendation. The staff finds the DPC response to this recommendation based on plant specific arguments to be acceptable.

3.0 CONCLUSION

The staff has reviewed DPC's December 20, 1990, response, as supplemented on March 27, 1991, to GL 90-06, "Resolution of Generic Issue 70, 'Power-Operated Relief Valve and Block Valve Reliability,' and Generic Issue 94, 'Additional Low-Temperature Overpressure Protection for Light-Water Reactors,' Pursuant to 10 CFR 50.54(f)." The generic letter made three recommendations for B&W plants aimed at enhancing the reliability of PORVs and PORV block valves. Duke Power's response provided information on how those recommendations are satisfied at Oconee, Units 1, 2, and 3 or, in the case of revising the plant TS to include operability requirements for the PORV and block valve, provided justification why changes are not necessary. The staff has concluded that DPC's response to GL 90-06 is acceptable and that measures to ensure PORV reliability at Oconee are commensurate with safety functions associated with the PORV and block valve.

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