UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 98 TO FACILITY OPERATING LICENSE NO. NPF-42

WOLF CREEK NUCLEAR OPERATING CORPORATION

WOLF CREEK GENERATING STATION

DOCKET NO. 50-482

1.0 INTRODUCTION

By letter dated December 13, 1995, as supplemented by letter dated February 5, 1996, Wolf Creek Nuclear Operating Corporation (the licensee) requested changes to the Technical Specifications (Appendix A to Facility Operating License No. NPF-42) for the Wolf Creek Generating Station (WCGS). The proposed changes would revise the minimum and maximum flow requirements for the centrifugal charging pumps (CCPs) and safety injection pumps (SIPs) specified in Technical Specification (TS) Surveillance Requirement 4.5.2.h. Specifically, the proposed changes would:

(1) Decrease the minimum limits on the sum of the injection line flow rates, excluding the highest flow rate, from 346 gallons per minute (gpm) to 330 gpm for the CCPs and from 459 gpm to 450 gpm for the SIPs.

(2) Revise the maximum pump flow rate for the SIPs from 665 to 670 gpm, but retain the CCPs maximum pump flow rate at its current value of 556 gpm.

The February 5, 1996, supplemental letter forwarded information on the effect of the change on the small break loss-of-coolant accident (LOCA) analysis and did not change the staff's original no significant hazards determination published in the Federal Register on January 22, 1996 (61 FR 1639).

2.0 BACKGROUND

The current WCGS TS require tests to be performed during shutdown to assure adequate emergency core cooling system (ECCS) performance following any modification that may alter an ECCS subsystem's flow characteristics. These tests include total pump flow, branch line balance, and verification of system flowrate distribution. The acceptance criteria for these tests are provided in TS Surveillance Requirements 4.5.2.h and i. These specifications provide not only a requirement for the minimum total flow through all SI branch lines, excluding the highest flow line, but also a requirement for the maximum flowrate to preclude the pump from operating beyond its runout conditions. Verification of proper flowrates during the surveillance test ensures that sufficient ECCS flow will be directed to the reactor coolant system (RCS) via the injection points following an event requiring ECCS actuation and that the

total pump flow will not exceed the pump's runout flow limit during a large break LOCA.

The acceptance limits for ECCS pump performance are established based on a large break LOCA event because all ECCS subsystems are taken credit for in the large break LOCA at full power analyses. These acceptance criteria are reflected in the ECCS flow calculations that provide ECCS flow as a function of the RCS pressure in the input to the safety analyses. The total safety injection flow used in the safety analyses is the summation of the flows delivered from one set of ECCS pumps (i.e., CCPs, high head safety injection, and low head RHR). For a postulated primary system pipe break, the assumptions are that one of each of the pumps starts and delivers flow into the RCS through three intact loops, and the injection loop with the least system resistance spills to either RCS or containment backpressure, depending upon the postulated size and location of the pipe break.

Westinghouse has previously identified several potential issues regarding adequacy of ECCS performance. These issues include seal injection, total system and branch line resistances, suction boost during recirculation, and flow measurement inaccuracies. The primary concern is that the actual ECCS subsystem performance may not be consistent with the safety analyses assumptions. If these issues are not properly accounted for, the actual ECCS configuration may result in flow rates being lower than those assumed in the safety analyses or runout flows exceeding the runout limit for the pumps. Revised safety analyses were performed to support the Wolf Creek Power Rerate program. These analyses used revised ECCS flow calculations which provided ECCS flowrate input to the revised safety analyses. The power rerate program was implemented after receiving NRC approval in 1993.

3.0 EVALUATION

3.1 Accident Analysis

The licensee provided an assessment of the impact of the proposed TS changes on the following licensing basis events, identified in Chapter 15 of the Wolf Creek Updated Safety Analysis Report (USAR): LOCAs, main steamline and main feedwater line breaks, inadvertent opening of a steam generator safety or relief valve, cold overpressure mitigating system (COMS) analysis, inadvertent operation of the ECCS at power, and steam generator tube rupture (SGTR) margin to overfill. In addition, the licensee evaluated the SIP performance at the higher calculated flow under pump runout conditions.

For analyses that use minimum values for ECCS flow, i.e., small and large break LOCAs, feedwater line breaks, inadvertent opening of a steam generator safety or relief valve, and steamline break core response, the licensee has stated that the ECCS flow assumptions in the current licensing basis are more limiting (lower) than the proposed surveillance requirement acceptance criteria for the CCPs and SIPs. Therefore, implementation of the reduced flow requirements would have no impact on the results of the analysis in the current licensing basis.

The licensee reviewed the long term mass and energy releases from a postulated LOCA or main steamline break (MSLB) to assess the impact of the proposed changes in ECCS flows on the containment integrity analyses. The most limiting event is from a postulated MSLB. Mass and energy releases were generated assuming full flow of one high head CCP delivering to the RCS via the cold leg header. No credit was taken for the flow available from the operation of the intermediate head SIPs. With the revision to the surveillance requirements for the ECCS minimum flow, the revised ECCS flow available from one CCP would be slightly less than that assumed in the mass and energy release analysis. However, the injection flow available from the operation of the intermediate head SIPs would be more than sufficient to offset the negative effect of the potential CCP flow reduction. Therefore, it is concluded that the proposed changes would not significantly impact the containment environmental response and that relevant design limits continue to be satisfied.

The licensee also evaluated analyses that use higher injection flow rates such as the low temperature overpressure transient analysis for protection systems setpoint determination, inadvertent operation of ECCS, and a steam generator tube rupture (SGTR) event. The licensee evaluated the potential impacts of the proposed change which may result in a higher flow provided by the SIPs. The following is an excerpt from the licensee's submittal:

> "The low temperature overpressure transient analyses provide basis for the determination of power-operated relief valve (PORV) setpoints for the COMS. The mass injection transient used as a design basis envelops the limiting pumps operability configuration permitted per the technical specifications during the mode when COMS is required to be in operation. The analysis considers the maximum charging and letdown flow mismatch resulting from an inadvertent SI actuation event, which leads to both charging pumps and the operable injection pumps injecting water into the RCS. Inadvertent actuation of a SIP was not explicitly analyzed since its operation is prevented by the technical specifications. Since the proposed change will not increase the injection flowrates considered in the design basis mass input transient, the existing COMS with the current PORV setpoint setting will be adequate to relieve RCS pressure and to prevent the RCS pressure from exceeding the limits of Appendix G to 10 CFR Part 50, should a postulated mass input transient occur during low temperature, water-solid operation.
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> Two SGTR scenarios are analyzed in order to ensure that operators can respond to the accident in a timely fashion to minimize the resulting offsite releases and to prevent overfilling of the affected steam line. The SGTR analyses assume injection of the ECCS pumps (i.e., SIPs and CCPs) if the RCS pressure drops below their shutoff heads. To force overfill, the analyses conservatively used the maximum attainable ECCS flow rates determined assuming the ECCS pumps operate as designed and without any single failure in the ECCS subsystem. Maximizing the ECCS flow leads to the maintenance of a higher primary to secondary pressure differential and consequently a higher break flow rate for a longer time

period. This added conservatism, assumed to maximize the potential for steam generator overfill, is more than sufficient to offset any additional injected flow due to the increased SIP runout flow. Therefore, the proposed change would have no adverse impact on the results of SGTR analyses and the resulting offsite doses will be maintained well within the guidelines of 10 CFR Part 100.

The inadvertent or spurious actuation of the ECCS at power can cause an unplanned increase in reactor coolant inventory. Following the actuation signal, the suction of the high head safety injection CCP subsystem will be diverted from the volume control tank (VCT) to the [refueling water storage tank] RWST. The CCPs then inject RWST boric acid solution into the cold leg of each loop. The intermediate head SIPs are also actuated, but deliver no flow since the RCS pressure remains above the shutoff head of the SIPs. As a result, the proposed change that may lead to a higher SI flow would not have adverse impacts on the analysis results calculated for these events."

3.2 Pump Performance

The ECCS is tested and balanced under the configuration corresponding to the injection mode of ECCS operation, i.e., the ECCS pumps take suction from the RWST. However, during the post-LOCA recirculation mode of ECCS operation the CCPs and SIPs are "boosted" by the RHR pumps, which are aligned to the containment sump. This boost increases the suction pressure and causes the CCPs and SIPs to runout further than during injection mode alignment. The WCGS-specific ECCS flow calculations indicate that the CCPs could experience a runout flow increase of up to 24 gpm when aligned in the recirculation phase of ECCS operation. For the SIP, the total pump runout flow increase is less significant (≈ 3 gpm) because the boosting effect would be offset by the closure of the SIP mini-recirculation isolation valve during the recirculation phase. Closure of the isolation valve is intended to prevent the radioactive sump fluid from being released into the RWST, which may be vented to atmosphere.

The runout limit of the ECCS pumps depends on the pump manufacturer, model, impeller type, and impeller casting type. The ECCS pumps supplied to Wolf Creek Generating Station by Westinghouse were manufactured by Dresser/Pacific Pumps. The licensee's records indicate that the CCPs have a design runout limit of 556 gpm and the SIPs have a design limit of 665 gpm. The licensee noted that a higher runout flow limit (580 gpm for CCPs and 675 gpm for SIPs) has been confirmed by the pump manufacturer for acceptable pump operation. This indicates that the runout margin of 24 gpm and 10 gpm is available for the CCPs and SIPs, respectively. Since the required surveillance tests are normally performed with the ECCS aligned in the injection mode of ECCS operation and the pump runout flow is expected to increase under the recirculation phase, only a portion of the runout margin available for the SIPs will be utilized in the proposed change. The available runout margin for the CCPs will be preserved for the anticipated suction boost during the recirculation mode.

3.3 Conclusions

The NRC staff has reviewed the licensee's analyses in support of the proposed changes to the Wolf Creek TS. The changes in ECCS flow rates have been evaluated with respect to the relevant accidents and events analyzed in the Wolf Creek USAR, and the results and conclusions of the safety analyses presented in the current USAR remain valid. The staff has reviewed the ECCS pump operability concerns and determined that the pumps will not be challenged during any phase of operation as a result of implementing the proposed TS change. Therefore, the proposed TS changes are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Kansas State Official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes surveillance requirements. 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 (61 FR 1639). 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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Date: March 5, 1996