WOLF CREEK
NUCLEAR OPERATING CORPORATION

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Vice President Plant Operations

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WO 95-0179

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Mail Station P1-137
Washington, D. C. 20555

Subject: Docket No. 50-482: Revision to Technical Specification Surveillance Requirement 4.5.2.h

Gentlemen:

This letter transmits an application for amendment to Facility Operating License No. NPF-42 for Wolf Creek Generating Station (WCGS). This license amendment request proposes revising the minimum and maximum flow requirements for the centrifugal charging and safety injection pumps specified in Technical Specification Surveillance Requirement 4.5.2.h.

Attachment I provides a Safety Evaluation including a description of the proposed change. Attachment II provides a No Significant Hazards Consideration Determination and Attachment III provides an Environmental Impact Determination. The specific change to the technical specifications proposed by this request is provided in Attachment IV.

In accordance with 10 CFR 50.91, a copy of this application, with attachments, is being provided to the designated Kansas State official. This proposed revision to the WCGS Technical Specifications will be fully implemented prior to startup from the eighth refueling outage, following formal Nuclear Regulatory Commission approval.

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If you have any questions concerning this matter, please contact me at (316) 364-8831, extension 4450, or Mr. Richard D. Flannigan, at extension 4500.

Very truly yours,

Otto L. Maynard

OLM/jra

Attachments: I - Safety Evaluation
II - No Significant Hazards Consideration Determination
III - Environmental Impact Determination
IV - Proposed Technical Specification Change

cc: G. W. Allen (KDHE), w/a
L. J. Callan (NRC), w/a
W. D. Johnson (NRC), w/a
J. F. Ringwald (NRC), w/a
J. C. Stone (NRC), w/a

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Otto L. Maynard, of lawful age, being first duly sworn upon oath says that he is Vice President Plant Operations of Wolf Creek Nuclear Operating Corporation; that he has read the foregoing document and knows the content thereof; that he has executed that same for and on behalf of said Corporation with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Otto L. Maynard
Otto L. Maynard
Vice President
Plant Operations

SUBSCRIBED and sworn to before me this 13 day of Dec., 1995.

DENISE L. WILKINS
NOTARY PUBLIC
STATE OF KANSAS
My Appt. Exp. 1/8/96

Denise L. Wilkins
Notary Public

Expiration Date 1/8/96

ATTACHMENT I

SAFETY EVALUATION

Safety Evaluation

Proposed Change

This change request proposes revising the minimum and maximum flow requirements for the centrifugal charging pumps (CCPs) and safety injection pumps (SIPs) specified in Technical Specification 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.

This amendment request is submitted to address a concern that these pumps may exceed their runout limits during the performance of the surveillance test. The above changes will expand the window between maximum and minimum emergency core cooling system (ECCS) subsystem flows specified in the surveillance requirements and are proposed to minimize the pump runout possibility.

Background

The ECCS provides emergency core cooling and negative reactivity to the RCS to ensure that the reactor core is protected following a postulated loss of primary or secondary coolant accident which results in the actuation of the safety injection. The addition of negative reactivity is designed primarily for the loss of secondary coolant accident where primary cooldown could add enough positive reactivity to achieve criticality and return to significant power.

The ECCS consists of three separate subsystems: centrifugal charging (high head), safety injection (SI) (intermediate head), and residual heat removal (RHR) (low head). Each subsystem consists of two redundant, 100% capacity trains. The ECCS flow paths consist of piping, valves, heat exchangers, and pumps such that water from the refueling water storage tank (RWST) can be injected into the RCS following the previously described accidents. The major components of each subsystem are the CCPs, the RHR pumps, heat exchangers, and the SIPs. Each of the three subsystems consists of two 100% capacity trains that are interconnected and redundant such that either train is capable of supplying 100% of the flow required to mitigate the accident consequences. This interconnecting and redundant subsystem design provides the operators with the ability to utilize components from opposite trains to achieve the required 100% flow to the core.

The ECCS operates in three distinct phases: injection, cold leg recirculation, and hot leg recirculation. In the injection phase, water is taken from the RWST and injected into the RCS through the cold legs. When sufficient water is removed from the RWST to ensure that enough boron has been added to maintain the reactor core subcritical and the containment sumps have enough water to supply the required net positive suction head to the ECCS pumps (i.e., CCPs SIPs and RHR Pumps), suction is switched to the containment sump

for cold leg recirculation. That is, the RHR pump takes suction from the sump and supplies suction flow for the other ECCS pumps. Cold leg recirculation continues for approximately 10 hours, then ECCS flow is shifted to the hot leg recirculation phase to provide a backflush, which would reduce the boiling in the top of the core and any resulting boron precipitation.

During the injection phase of the recovery from a loss of coolant accident (LOCA), a suction header supplies water from the RWST to the ECCS pumps. Separate piping supplies each subsystem and each train within the subsystem. The discharge from the CCPs combines prior to entering the boron injection tank (BIT) and then divides again into four supply lines, each of which feeds the injection line to one RCS cold leg. The discharge from the SI and RHR pumps divides and feeds an injection line to each of the RCS cold legs. Throttle valves and flow restricting orifices are installed in the ECCS branch injection lines. Throttling valves are adjusted during flow balance testing to provide balanced branch line flows to the RCS. This balance ensures sufficient flow to the core to meet the analysis assumptions following a LOCA in one of the RCS cold legs. Flow restricting devices induce a backpressure on the ECCS pumps to ensure that pump runout does not occur in the event that the RCS depressurizes to atmospheric conditions.

The current Wolf Creek Technical Specifications require tests to be performed during shutdown to assure adequate ECCS performance following any ECCS modification that may alter the 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 Technical Specification 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 tests ensures that sufficient ECCS flow will be directed to the RCS via the injection points following an event requiring ECCS actuation and that the total pump flow will not exceed the pumps' 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., centrifugal charging, 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 of these issues is that the actual ECCS subsystem performance may not be consistent with the safety

analyses assumptions. If these issues were 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. The potential impacts of these issues on the original plant safety analyses were evaluated. Subsequent to these evaluations, these issues were considered in the revised ECCS flow calculations which provided ECCS flowrate input to the revised safety analyses. The revised safety analyses were performed to support the Wolf Creek Power Rerate program, which was implemented after receiving the NRC approval in 1993. Note that the revised ECCS flows used in the current licensing basis LOCA analysis were developed using the assumptions of a maximum flow imbalance of 10 gpm and that system resistance was set at the specified runout flow with a maximum pump degradation of 10 percent.

Evaluation:

As stated in the current Technical Specification Bases for ECCS subsystems, the surveillance tests are performed to ensure that the assumptions used in the safety analyses are met and that subsystem operability is maintained. Since the proposed changes of the surveillance requirements will affect the actual ECCS performance during accident conditions, they could potentially impact the ECCS flow assumptions used in the safety analyses and pump performance. For instance, revision to the ECCS minimum flow requirements during surveillance tests may yield a higher system resistance that could result in a decrease in flow delivered to the core during accident conditions. The following sections summarize the evaluation performed to assess the potential impacts of the proposed changes.

Safety Analyses

The large break LOCA event establishes the requirement for the maximum runout flow for the ECCS pumps, as well as the minimum flow for the validity of the analysis assumptions. In proposing changes to the acceptance flow limits for the surveillance tests, a comparison of the ECCS flowrates used in the current licensing basis LOCA analyses was made. As can be seen from Table 1, the revised minimum flow required for the CCPs and SIPs is still greater than assumed in the LOCA analyses. This confirms that the revised ECCS configuration will be capable of delivering adequate coolant water to RCS to mitigate the consequences of a design basis LOCA. Consequently, no peak cladding temperature (PCT) penalty will be assessed against the LOCA analyses and the results of other LOCA-related calculations such as post-LOCA long-term core cooling and subcriticality and hot leg recirculation switchover time would not be invalidated as a result of implementing the proposed changes.

Table 1

PUMP	Tech Spec minimum Requirements* Current Value	Proposed Value	Flowrate assumed in LB LOCA (gpm)
CCPs	346	330	326.85
SIPs	459	450	444.82

*sum of injection flowrates for the (3) intact loops.

The SI flow rates from the ECCS are also explicitly used in the input to the analyses for the events involving loss of secondary coolant, which may result in a SI actuation. The loss of secondary coolant events include Feedwater Line Break, Inadvertent Opening of a Steam Generator Safety or Relief Valve, and Steamline Break Core Response. In order to assess the potential impacts of the proposed changes on the analyses results calculated for these events, the calculations of the safety injection flow used in the analyses were reviewed. The results of the review indicate that revised ECCS flows based on a more conservative minimum flow requirement have already been assumed in these analyses. The revised ECCS flows correspond to full flow (less seal injection flow) of one high head CCP delivering to the RCS via the cold leg header with no credit taken for the operation of the intermediate head SIP. Therefore, the proposed changes on the acceptance flow limits for ECCS pump performance would have no impact on the analysis results calculated for these events.

The long term mass and energy releases from a postulated LOCA or Main Steam Line Break (MSLB) were reviewed to assess the impact of the proposed changes in ECCS flows on the containment integrity analyses. The current licensing basis containment integrity analyses indicate that the most limiting event is from a postulated MSLB, with a peak calculated containment pressure of 48.9 psig (well below the design pressure of 60 psig) from a 0.80 ft^2 split rupture at 50% power. A review of these analyses indicate that mass and energy releases were generated with ECCS flows corresponding to full flow of one high head CCP delivering to the RCS via the cold leg header. No credit has been 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 CCPs 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.

A higher injection flow could potentially impact the analyses which are limiting with a higher ECCS flow. These analyses include mass input transient for the low temperature overpressure transient analysis for protection systems setpoint determination, inadvertent operation of ECCS, and steam generator tube rupture (SGTR). For these analyses, the potential impacts of the

proposed change which may result in a higher flow provided by the SIPs are discussed as follows:

The low temperature overpressure transient analyses provide basis for the determination of power-operated relief valve (PORV) setpoints for the cold overpressure mitigating system (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.

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 CCPs subsystem will be diverted from the volume control tank (VCT) to the 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.

Based on the above evaluations performed for the revised E S flows, it is concluded that the results and conclusions of the safety ana ses presented in the current USAR remain valid.

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. If the system balancing did not account for this boost, the ECCS configuration may result in pump operation beyond the runout limit. Operating a pump beyond its actual runout limit may challenge its operability, cause pump damage, and possibly result in a loss of the safety injection function. 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 ($\approx$ 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. Records indicate that the CCPs have a design runout limit of 556 gpm and the SIPs have a design limit of 665 gpm. Note, 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.

Based on the above discussions, it is concluded that pump operability will not be challenged during any phase of operation as a result of implementing the proposed change because the effect of suction boost during recirculation along with other ECCS performance issues that may affect pump runout has been properly accounted for in developing the revised runout limits for these pumps.

Summary

The analysis results and conclusions of the accidents presented in the current WCGS Updated Safety Analysis Report (USAR) would not be adversely affected by the revised surveillance requirements for the ECCS. This conclusion is drawn based on the evaluation that confirms that the actual ECCS flow characteristics remain consistent with assumptions used in the WCGS accident analyses. Specifically, the accident analyses which are limiting with minimized ECCS flow have already been analyzed using revised ECCS flows that were developed based on a more conservative minimum flow than the proposed minimum ECCS flow requirement. For the analyses which are limiting with a higher ECCS flow, the evaluation indicated that a higher pump runout limit proposed for the SIPs would have insignificant effect on the results and

conclusions of the analyses. The evaluation also indicated that the ECCS pump operability would not be a concern as a result of increasing the SIPs' runout limit because the available runout margin is sufficient to accommodate the cumulative effect of the ECCS performance issues. Based on these reasons, it is concluded that implementation of the proposed changes will have no adverse impacts on the ECCS subsystems' operability and their intended safety function.

Based on the above discussions and the no significant hazards consideration determination presented in Attachment II, the proposed change does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report; or create the possibility for an accident or a malfunction of a different type than any previously evaluated in the safety analysis report; or reduce the margin of safety as defined in the basis for any technical specification. Therefore, the proposed change does not adversely affect or endanger the health or safety of the general public or involve a significant safety hazard.

ATTACHMENT II

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

No Significant Hazards Consideration Determination

This change request proposes revising the minimum and maximum flow requirements for the centrifugal charging pumps (CCPs) and safety injection pumps (SIPs) specified in Technical Specification 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 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 SIP from 665 to 670 gpm, but retain the CCPs maximum pump flow rate at its current value of 556 gpm.

This amendment request is submitted to address a concern that these pumps may exceed their runout limits during the performance of the surveillance test. The above changes will expand the window between maximum and minimum emergency core cooling system (ECCS) subsystem flows specified in the surveillance requirements and are proposed to minimize the pump runout possibility.

This amendment application also provides clarification of when flow balance testing of the ECCS subsystem is required. The CCPs and SIPs inject to the cold legs of the reactor coolant system (RCS) through two separate flow paths. The CCPs inject through the boron injection tank and the SIPs inject through the accumulator injection piping. Therefore, there is no need to perform a flow balance test to both subsystems following any modification to only one of the systems, since any modification to one injection flow path will not affect the system characteristics of the other flow path.

Standard I - Involve a Significant Increase in the Probability or Consequences of an Accident Previously Evaluated

The proposed change will not result in a condition where the material or construction standards applicable prior to the change are altered. The ECCS system integrity is not affected by this change, and this change will not affect the ability of the ECCS to fulfill its design functions. This change will modify the pump surveillance criteria to prevent pump runout during the test, but will not affect the method of operation of the system and will not alter the testing method for the pumps. This change will slightly alter the acceptance criteria of the test, but the changes have been determined to be enveloped by the ECCS pump flow and balance criteria assumed in the safety analyses described in the USAR. This change will not affect the ability of the ECCS to mitigate the consequences of any previously evaluated accident. The proposed change will not alter, degrade or prevent the response of the ECCS to any accident scenarios evaluated in the USAR. Therefore, neither the probability of occurrence nor the consequences of any accident previously evaluated in the USAR will be increased by this change.

Standard II - Create the Possibility of a New or Different Kind of Accident from any Previously Evaluated

The proposed change will alter the existing ECCS pump flow test to prevent pump runout during the test by slightly altering the acceptance criteria of the test. However, the proposed changes have been determined to be enveloped by the ECCS pump flow and balance criteria assumed in the safety analyses described in the USAR. This change will not create a new type of accident or malfunction, and the method and manner of plant operation remains unchanged. This change will not alter the safety functions of the ECCS. The safety design bases in the USAR have not been altered, and no new or different accident scenarios, transient precursors, failure mechanisms, or limiting single failures will be introduced as a result of this change. Therefore, the possibility of a new or different kind of accident other than those already evaluated will not be created by this change.

Standard III - Involve a Significant Reduction in the Margin of Safety

There are no changes being made to any safety limits or safety system settings that would adversely impact plant safety. This proposed change will have no affect on the availability, operability or performance of any safety-related system or component. The analysis results and conclusions of the accidents presented in the current USAR would not be adversely affected by the revised surveillance requirements for the ECCS. This conclusion is drawn based on the evaluation that confirms that the actual ECCS flow characteristics remain consistent with assumptions used in the WCGS accident analyses. Specifically, the accident analyses which are limiting with minimized ECCS flow have already been analyzed using revised ECCS flows that were developed based on a more conservative minimum flow than the proposed minimum ECCS flow requirement. For the analyses which are limiting with a higher ECCS flow, the evaluation indicated that a higher pump runout limit proposed for the SIPs would have insignificant effect on the results and conclusions of the analyses. The evaluation also indicated that the ECCS pump operability would not be a concern as a result of increasing the SIPs runout limit because the available runout margin is sufficient to accommodate the cumulative effect of the ECCS performance issues. Based on these reasons, it is concluded that implementation of the proposed changes will have no adverse impact on the ECCS subsystems' operability and their intended safety function. Therefore, the proposed change would not result in a reduction in a margin of safety.

Based on the above discussions, it has been determined that the requested technical specification change does not involve a significant increase in the probability or consequences of an accident or other adverse condition over previous evaluations; or create the possibility of a new or different kind of accident or condition over previous evaluations; or involve a significant reduction in a margin of safety. Therefore, the requested license amendment does not involve a significant hazards consideration.

ATTACHMENT III

ENVIRONMENTAL IMPACT DETERMINATION

Environmental Impact Determination

This amendment request meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) as specified below:

(i) the amendment involves no significant hazards consideration

As demonstrated in Attachment II, the proposed change does not involve any significant hazards consideration.

(ii) there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite

The proposed change does not involve a change to the facility or operating procedures which would create new types of effluents. The proposed change in the surveillance procedure will not affect system performance or operation. Therefore, all offsite and control room doses will remain within the limits of 10 CFR 100 and 10 CFR 50 Appendix A, General Design Criteria 19.

(iii) there is no significant increase in individual or cumulative occupation radiation exposure

The proposed change affects only acceptance criteria for the ECCS pump flow and flow balance testing. These changes will not alter the test methods used and will not affect system operation. This test affects only the ECCS; no other radioactive systems are affected. Thus, this change will not result in a significant increase in individual or cumulative occupational radiation exposure.

Based on the above, it is concluded that there will be no impact on the environment resulting from the proposed change and that the proposed change meets the criteria specified in 10 CFR 51.22 for a categorical exclusion from the requirements of 10 CFR 51.21 relative to requiring a specific environmental assessment by the Commission.

ATTACHMENT IV

PROPOSED TECHNICAL SPECIFICATION CHANGE