WOLF CREEK
NUCLEAR OPERATING CORPORATION

Donna Jacobs
Vice President Operations and Plant Manager

JUL 2 2 2004

WO 04-0029

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

Subject: Docket No. 50-482: Revision to Technical Specification (TS) Figure 3.5.5-1, "Seal Injection Flow Limits"

Gentlemen:

Pursuant to 10 CFR 50.90, Wolf Creek Nuclear Operating Corporation (WCNOC) hereby requests an amendment to Facility Operating License No. NPF-42 for the Wolf Creek Generating Station (WCGS).

This amendment application would revise Technical Specification (TS) Figure 3.5.5-1, "Seal Injection Flow Limits," to reflect flow limits that allow a higher seal injection flow for a given differential pressure between the charging discharge header and the Reactor Coolant System (RCS) pressure.

Attachments I through IV provide the Evaluation, Markup of Technical Specifications, Retyped Technical Specifications, and Proposed TS Bases Changes, respectively, in support of this amendment request. Attachment IV contains the TS Bases changes (for information only) to assist the staff in its review of the proposed change. Revision to the TS Bases will be implemented pursuant to the TS Bases Control Program, TS 5.5.14, upon implementation of this license amendment. Attachment V contains a list of commitments.

This amendment application was reviewed by the Plant Safety Review Committee and the Nuclear Safety Review Committee. In accordance with 10 CFR 50.91, a copy of this amendment application, with attachments, is being provided to the designated Kansas State official.

A001

WCNOC requests approval of the proposed amendment by February 24, 2005, to allow for repositioning the seal injection throttle valves during Refueling Outage 14. Refueling Outage 14 is currently scheduled to begin on April 9, 2005. It is anticipated that the license amendment, as approved, will be effective upon issuance, to be implemented prior to startup from Refueling Outage 14. Please contact me at (620) 364-4246 or Mr. Kevin Moles at (620) 364-4126 for any questions you may have regarding this application.

Very truly yours,

Donna Jacobs

DJ/rlg

Attachments: I - Evaluation
II - Markup of Technical Specification pages
III - Retyped Technical Specification pages
IV - TS Bases Changes (For Information Only)
V - List of Commitments

cc: V. L. Cooper (KDHE), w/a
J. N. Donohew (NRC), w/a
D. N. Graves (NRC), w/a
B. S. Mallett (NRC), w/a
Senior Resident Inspector (NRC), w/a

STATE OF KANSAS)
) SS
COUNTY OF COFFEY)

Donna Jacobs, of lawful age, being first duly sworn upon oath says that she is Vice President Operations and Plant Manager of Wolf Creek Nuclear Operating Corporation; that she has read the foregoing document and knows the contents thereof; that she has executed the 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 her knowledge, information and belief.

By [signature]
Donna Jacobs
Vice President Operations and Plant Manager

SUBSCRIBED and sworn to before me this 22nd day of July, 2004.

NOTARY PUBLIC STATE OF KANSAS RHONDA L. GLEUE My Appt. Exp. 5-11-2006

Rhonda L. Gleue
Notary Public

Expiration Date May 11, 2006

EVALUATION

1.0 DESCRIPTION

This amendment application would revise Technical Specification (TS) Figure 3.5.5-1, "Seal Injection Flow Limits," to reflect flow limits that allow a higher seal injection flow for a given differential pressure between the charging discharge header and the Reactor Coolant System (RCS) pressure.

2.0 PROPOSED CHANGE

TS Figure 3.5.5-1, "Seal Injection Flow Limits," is being revised to reflect a higher total seal injection flow limit of 90 gpm. The figure is currently based on a total seal injection flow limit of 72 gpm.

3.0 BACKGROUND

The proposed change to Figure 3.5.5-1 is required to resolve operational difficulties in maintaining pressurizer level at 120 gpm letdown when a centrifugal charging pump (CCP) is being used for normal charging. Figure 1 provides a simplified diagram of the charging system during safety injection. The CCP flow control valve (BG FCV-121) approaches the full open position when operating a CCP with 120 gpm letdown. This condition occurs due to the seal injection throttle valve position required to maintain a seal injection flow of 72 gpm during a loss of coolant accident (LOCA).

Two safety related CCPs are used to provide flow to both the high head safety injection portion of the Emergency Core Cooling System (ECCS) and to the reactor coolant pump (RCP) seals. The function of the seal injection throttle valves during an accident is similar to the function of the ECCS throttle valves covered in TS 3.5.2 in that they function to restrict flow from the CCP header to the RCS. The TS 3.5.5 Limiting Condition for Operation (LCO) limits the amount of ECCS flow that could be diverted from the safety injection flow path to the seal injection flow path following a LOCA. The seal injection flow limit supports safety analysis assumptions that are required because RCP seal injection flow is not isolated by a safety injection signal and RCP seal injection is not credited for core cooling in the minimum safety injection flow cases. The seal injection flow limit is met by controlling seal injection flow path resistance. The intent of LCO 3.5.5 is to control that resistance through proper positioning of the seal injection throttle valves.

Seal injection flow is determined based on seal injection line system resistance. The flow line resistance is established by adjusting the RCP seal injection throttle valves such that the analyzed ECCS flow to the RCP seals is limited to 72 gpm with one CCP operating. This accident analysis limit is met by positioning the valves so that flow to the RCP seals is within the limits of TS Figure 3.5.5-1. The CCP discharge header pressure remains essentially constant during normal operating conditions. Therefore, a reduction in RCS pressure would result in more flow being diverted to the RCP seal injection line than at normal operating pressure. The valve settings established at the prescribed CCP discharge header pressure result in a conservative valve position should RCS pressure decrease. The seal injection flow limits specified in TS Figure 3.5.5-1 supports the safety analysis assumptions for ECCS flow determination.

If the actual seal injection line resistance is significantly less than that assumed in the safety analysis, additional charging/safety injection flow would be pumped through the seal injection line. For a large break LOCA scenario, this could result in CCP runout and/or a reduction of flow injected into the core. For a small break LOCA scenario, a reduction of flow injected into the core would result.

Surveillance test procedure STS BG-004, "CVCS Seal Injection and Return Flow Balance," is performed periodically in accordance with Surveillance Requirement (SR) 3.5.5.1 to verify that the manual seal injection throttle valves are properly positioned and hence, proper seal injection flow is maintained. This surveillance ensures the validity of the ECCS performance assumptions utilized in the safety analysis. Acceptable seal injection flow is verified by comparing the measured seal injection flow at the pressure differential between the charging header (BG PT-120) and the RCS to a calculated value specified in procedure STS BG-004.

It should be noted that the seal injection flow delivered to the RCPs is not credited for core cooling calculations in the minimum ECCS flow case. Seal injection flow is considered in the maximum ECCS flow case only because it is conservative to do so for that case which intentionally maximizes core flow. The primary purpose of the seal injection flow rate limit is to limit the amount of injection flow that could be diverted to the seals without cooling the reactor core. A secondary purpose of the seal injection flow rate limit is to ensure that flow delivered to the seals would not result in unacceptable runout of the CCPs, during a large break LOCA which could damage the pumps.

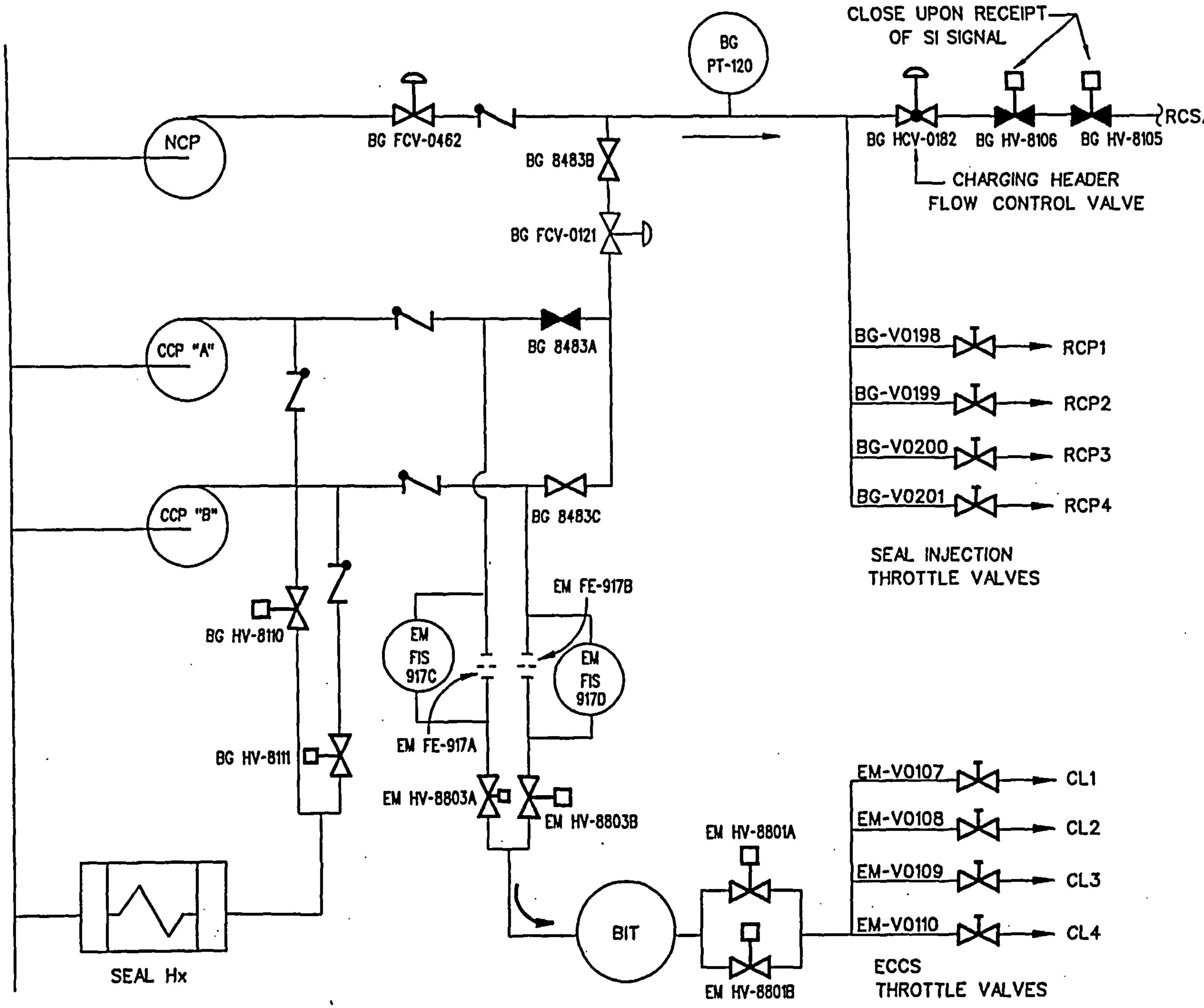

FIGURE 1.
SCHEMATIC FOR CHARGING/SI LINEUP DURING SAFETY INJECTION

4.0 TECHNICAL ANALYSIS

Opening the seal injection throttle valves further reduces the hydraulic resistance for the seal injection line. This reduction in the hydraulic resistance is modeled by re-adjusting the loss coefficient for the seal injection line iteratively until a flow diversion of 90 gpm, as compared to the current flow diversion of 72 gpm to the RCP seal injection lines under totally depressurized RCS conditions is reached. It should be noted that the hydraulic resistance for each safety injection loop is unchanged from current values. Using the re-defined loss coefficient for the seal injection line, the reduced charging/safety injection flowrates were determined based on the original hydraulic analysis model used to generate the flowrates in the current LOCA analysis of record. This model included the major conservative assumptions such as minimum safeguards, 10% pump head degradation, mini-flow recirculation line remaining open, water spilled from the broken loop to 0 psig containment back pressure, etc. A summary of the calculated charging/safety injection flowrates, along with the seal injection flow and mini-flow recirculation flow, as a function of the RCS pressure, is presented in Table 1.

As shown in Table 1, the reduction in charging/safety injection flow due to increasing the seal injection flow diversion to 90 gpm is less than 10 gpm when compared with that used in the current analysis of record. As this reduction in flow is small relative to accumulator and Residual Heat Removal (RHR) System flow, no large break LOCA penalty is anticipated. However, as the small break LOCA analysis is more sensitive to reductions in the charging/safety injection flow than the large break LOCA analysis, because the CCPs and Safety Injection pumps are the only pumps which inject during the small break LOCA transient, a reduction in flow from one or both of the pumps can result in an increased calculated peak clad temperature.

Table 1 Calculated Charging/Safety Injection Flowrates, Seal Injection Flow, and Mini-Flow Recirculation as a Function of RCS Pressure

RCS Pressure (psig)	Seal Injection Flow (gpm)	Mini-Flow Recirculation (gpm)	Charging/Safety Injection Flowrate (gpm) Reduced/Current Analysis of Record
0	90.13	29.33	317.48/ 326.85
100	86.36	31.21	301.07/ 310.35
200	82.62	33.03	284.72/ 293.88
300	78.90	34.81	268.39/ 277.39
400	75.18	36.54	252.01/ 261.61
500	71.46	38.23	235.50/ 244.07
600	67.73	39.88	218.82/ 227.15
700	63.98	41.51	201.92/ 209.99
800	60.22	43.10	184.73/ 192.52
900	56.45	44.67	167.18/ 174.67
1000	52.66	46.22	149.19/ 156.36
1100	48.86	47.75	130.67/ 137.49
1200	45.08	49.27	111.45/ 117.95
1300	41.34	50.77	91.40/ 97.56
1400	37.70	52.27	70.27/ 76.11
1500	34.28	53.77	47.68/ 53.27
1600	31.30	55.28	23.08/ 28.54
1800	7.41	57.67	0.00/ 0.00

Development of Revised Seal Injection Flow Curve (TS Figure 3.5.5-1)

TS Figure 3.5.5-1 was developed using a conservative combination of plant data to establish a maximum flow rate for the seal injection line versus delta pressure between the RCS and charging pump header pressure. As a result of proposing to reduce the hydraulic resistance for the seal injection line by opening the associated throttling valves further, the correlation used to establish the seal injection flow limits is revised. Based on the maximum calculated seal injection flow of 90 gpm under post-LOCA situations, the revised correlation is derived as follows:

CRANE Technical Paper No. 410, Equation 3-14, specifies that the pressure loss through valves, fittings, and a pipe be calculated as:

$$\Delta P \text{ (psi)} = 1.799\text{E-5 } K\rho Q^2/d^4$$

where K = resistance coefficient,
ρ = density (lb/ft^3), ρ = 62.0 lb/ft^3 at 100°F
Q = rate of flow (gpm), and
d = pipe ID (1.687 in)

Given charging header pressure = 1700' (total pump developed head at design runout flow of 556 gpm)
+ 65' (elevation head = RWST 2044.6' @ Hi Level Alarm - pump suction 1979.6')
= 1765'
= 760 psi (based on ρ = 62.0 lb/ft^3 at 100°F)

For a maximum seal injection flow of 22.5 gpm per loop, the resistance coefficient,

$$K = 760 / [1.799E\text{-}5 * 62.0 * (22.5)^2 / (1.687)^4]$$
$$= 10901.5$$

Combining the constants for pipe size, throttle resistance, and fluid density, the equation used to construct TS Figure 3.5.5-1 is:

Q = SQRT(0.6661*DP),
where Q = seal injection flow per loop in gpm, and
DP = charging pump discharge header pressure minus RCS pressure in psid

Using this equation, some selective points utilized in procedure STS BG-004 were recalculated for determining the curve in Figure 3.5.5-1 and are presented in the table below.

Maximum Flow		
Current TS	**Proposed TS**	**DP**
8.51	10.64	170
8.64	10.80	175
8.76	10.95	180
8.88	11.10	185
9.00	11.25	190
9.12	11.40	195
9.23	11.54	200
9.35	11.69	205
9.46	11.83	210
9.57	11.97	215
9.69	12.11	220
9.79	12.24	225
9.90	12.38	230
10.01	12.51	235
10.12	12.64	240

Seal Injection Flow Change

The RCP shaft seal assembly is discussed in USAR Section 5.4.1. The shaft assembly provides a pressure breakdown from the RCS pressure to ambient conditions. The largest pressure drop occurs across the number one RCP seal in each pump. During normal operation, seal injection flow with a slightly higher pressure than the reactor coolant, from the Chemical and Volume Control System enters the pump shaft through a connection of the thermal barrier flange. The flow splits with a portion flowing down the shaft through the radial bearing and into the RCS; the remainder flows up the shaft through the seals to the volume control tank, reactor coolant drain tank, or the containment normal sump, but not into the RCS. Only the seal injection flow that does not enter the RCS would not be available during an accident to mitigate the effects of the accident in the RCS; however, no credit is taken for the portion of the seal injection flow that enters the RCS.

The normal operating range of seal injection flows to each RCP is specified in the pump instruction manual as 8 to 13 gpm, with a minimum of 6 gpm and a maximum of 20 gpm. Historically, the Westinghouse fluid systems group had placed an upper flow bound of approximately 20 gpm delivered to each RCP from the CCP ECCS subsystem at 0 psig RCS pressure during a large break LOCA. This would allow a total diversion of safety injection flow to the RCPs of 80 gpm.

The 20 gpm per pump and 80 gpm total were not based on mechanical limitations of the RCPs or the RCP seals. During a large break LOCA with a depressurized RCS, the injection flow passes downward through the labyrinth within the RCP across the thermal barrier and into the RCS, rather than through the seals. The seal leak-off flow is driven by the prevailing RCS pressure, not by the seal injection flow rate. This is true at normal operating plant conditions, as well as during a large break LOCA. Excess injection flow delivered to the RCP seals during normal operation passes, by design, down into the RCS through the labyrinth. During normal operation of the RCP, the seal injection flows are nominally controlled by procedure to the normal range of seal injection flow. Prolonged operation during power operation with greater than 20 gpm seal injection to the RCPs could represent a long-term erosion concern; however, this is not a problem during a short duration event such as a large break LOCA. During a large break LOCA, the seal injection flow rate will increase due to the reduced RCS pressure. The amount of seal injection flow delivered to the RCPs during a large break LOCA is accounted for in the evaluation of CCP runout flow limits. Seal injection flow rates (total to four pumps) which may reach typical values of approximately 105 to 110 gpm do not represent a mechanical concern for the RCPs or the seals during a postulated accident.

Impact on Licensing Basis LOCA and Non-LOCA Analysis

The specific effect due to actual charging/safety injection flow being less than that assumed in the licensing basis analyses has been evaluated, with the results summarized in the following sections.

Large Break LOCA Analysis

The WCGS licensing basis large break LOCA analysis was performed with the 1981 Evaluation Model with BASH. Analyses were performed for a range of RCS operating temperature corresponding to T_{avg} between nominal (588.4°F) and reduced (570°F) temperature conditions in order to determine the limiting operating conditions. Calculations for both nominal and reduced

T_{avg} were performed for the limiting Moody break discharge coefficient (C_d=0.4). The limiting peak clad temperature (PCT) of 1916°F was calculated for a limiting Moody break discharge coefficient (C_d=0.4) at reduced T_{avg} under minimum safeguards assumptions.

Westinghouse has assessed the effect that the revised charging/safety injection flows have on the LOCA analyses and the PCT.

A review of "Reduced Charging/Safety Injection Flowrate" vs. "Current Analysis of Record Charging Safety Injection Flowrate" listed in Table 1 shows that the largest difference between the flows is less than 10 gpm. A 10 gpm reduction in the charging/safety injection flow compared to the total safety injection flow available is considered insignificant and will have a negligible effect on the large break LOCA results. Therefore, the reduced charging/safety injection flows will have negligible impact on the large break LOCA results, including PCT.

Small Break LOCA Analysis

The WCGS licensing basis small break LOCA analysis was performed using the Westinghouse NOTRUMP Evaluation Model, for a range of RCS operating temperature corresponding to T_{avg} between nominal (588.4°F) and reduced (570°F) temperature conditions. Analyses were performed for a spectrum of cold leg breaks ranging from 2-inch to 6-inch equivalent diameter. The limiting PCT of 1510.0°F was calculated for a 3-inch equivalent diameter cold leg break initiating from the high T_{avg} conditions.

The 2-inch, 3-inch and 4-inch break cases were evaluated and compared to the analysis of record flows. The method of evaluation for the safety injection shortfall involves the calculation of the integrated safety injection reduction from safety injection initiation to PCT time based on the revised charging/safety injection flow rates. Then, the PCT penalty for each break size is determined based on the time it will take to make up for the mass shortfall and the PCT heat up rate for each break size. The results of this evaluation showed that the 3-inch break case resulted in a 35°F PCT penalty. The 2-inch and the 4-inch breaks resulted in a lower than 35°F PCT penalty. Therefore, there is no shift in the 3-inch limiting break size. The penalty of 35°F will be applied to the small break LOCA PCT rackup sheet. The new PCT is 1672°F, which remains well below the 10 CFR 50.46 regulatory limit of 2200°F.

Post-LOCA Long Term Core Cooling/Subcriticality and Hot Leg Switchover Time

The post-LOCA long term core cooling critical boron is determined to confirm that the reactor core will not return to a critical state following a large break LOCA. A hot leg recirculation switchover time analysis is performed to determine the time following a LOCA that hot leg recirculation should be initiated to avoid boron precipitation in the core following the accident. Safety injection flows are not modeled in the post-LOCA long term core cooling critical boron or hot leg switchover time calculations, therefore changes to the reduced charging/safety injection flows have no adverse impact on subcriticality or hot leg switchover time calculations. The post-LOCA minimum flow requirement has been reviewed and it has been determined that the reduced charging/safety injection flows are still sufficient to keep calculated core temperatures at acceptably low values.

LOCA Hydraulic Forces

The blowdown vessel and loop forcing functions used as input to the design basis analysis for the effects of a postulated LOCA on the integrity of the reactor vessel internals and loops are documented in Updated Safety Analysis Report (USAR) Sections 3.6.2 and 3.9(N). Safety injection flows are not modeled in the LOCA hydraulic forces analysis. Therefore, changes to the charging/safety injection flows have no impact on the LOCA hydraulic forces analysis.

LOCA Mass and Energy Releases

The reduction in charging/safety injection flow will have a small impact on the post-blowdown LOCA mass and energy release and will have a subsequent small impact on the containment pressure response. The reduction in sensible heating due to the reduced safety injection flow rate will result in a slightly higher steam flow rate and a lower liquid flow rate through the break. The charging/safety injection flow curve is generated based on minimum safeguards conditions with one line spilling to 0 psig containment back pressure. Typically, evaluations are performed with no lines spilling so this flow rate is lower than would be used for a containment peak pressure analysis, but is acceptable to use for this estimate.

The small decrease in charging/safety injection flow is estimated to produce an approximate 0.28 lbm/sec increase in the release of saturated steam flow to the containment at a pressure of about 60 psia. The result is a 327.4 BTU/sec increase in the steam energy release. As a result of the decrease in charging/safety injection flow rate of 1.31 lbm/sec and the increase in the steaming rate of 0.28 lbm/sec due to the reduction in sensible heating, there is a corresponding decrease in the liquid flow out of the break of 1.59 lbm/sec and the spilled liquid energy decrease of 416.9 BTU/sec. These changes are considered to be small for LOCA mass and energy releases when compared to the much larger break mass and energy release rates. Therefore, the impact of these changes on the containment peak pressure and equipment qualification is judged to be insignificant.

Control Systems Analyses

The revised flows are slightly lower (3 to 4%) than the current flows. The effect of the revised flows on the control systems analyses are evaluated below. The analyses of the control systems include the NSSS design transients, Cold Overpressure Mitigation System (COMS) setpoint analyses and the plant OPERABILITY margin to trip analyses. The evaluation concluded that the revised flows are acceptable for the control systems analyses. The safety injection flow is used in the NSSS design transients. A higher safety injection flow is conservative for the NSSS design transients. Therefore, the current NSSS design transients (Inadvertent Safety Injection and the Reactor Trip Case C) remain conservative for the revised charging/safety injection flows and no changes to the NSSS design transients are required.

The design basis mass input transient considered in the determination of the maximum allowable PORV setpoints for the COMS has been analyzed assuming an operational configuration in which the normal charging pump is used for charging with one CCP remaining OPERABLE during shutdown modes. Under this situation, the most severe mass input transient would occur if the OPERABLE CCP were inadvertently started by either operator or instrument error in conjunction with simultaneous letdown isolation and failure of charging flow control. This postulated failure mode results in the maximum charging/letdown flow mismatch and subsequently the maximum RCS pressure overshoot from the mass input transient.

Therefore, the revised charging/safety injection flow will not impact the COMS setpoint analysis and the current COMS/PORV setpoints are not affected.

The safety injection flow is not used in the plant OPERABILITY margin to trip analyses. Therefore, the margin to trip analysis is not affected.

Steam line Break Mass and Energy Releases

The mass and energy releases from a postulated main steam line break (MSLB) were reviewed to assess the impact of the reduced charging/safety injection flows on the containment integrity analyses. The current licensing basis containment integrity analyses indicate that the most limiting event is from a postulated MSLB and a peak calculated containment pressure of 48.9 psig (well below the design pressure of 60 psig) is from a 0.80 ft^2 split rupture at 50% power. A review of these analyses indicates 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 safety injection pumps. With the revision to the seal injection flow limits, 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 safety injection pumps 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.

Steam Generator Tube Rupture (SGTR)

Two SGTR scenarios are analyzed in order to ensure that operators can respond to the accident in a timely fashion so as 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., safety injection pumps and CCPs) if the RCS pressure drops below their shutoff head. 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 bound any variation in the RCS inventory due to the increased seal injection 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.

Centrifugal Charging Pump and ECCS Performance

The amount of seal injection flow delivered to the RCPs during a large break LOCA is accounted for in the evaluation of CCP runout flow limit. With the hydraulic resistance being re-adjusted for the seal injection line to yield a flow diversion of 90 gpm under totally depressurized RCS conditions, the maximum flow is expected to increase slightly. However, calculation indicates that this maximum flow rate is found to be maintained within the pump's design runout limit of 556 gpm. It should be noted that this runout flow limit is verified periodically during shutdown by surveillance procedure STS EM-003A, "ECCS (CCP) Flow Balance."

It should be noted that 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 refueling water storage tank. However, during the post-LOCA recirculation mode of ECCS operation the CCP and safety injections pumps are "boosted" by the RHR pumps, which are aligned to the containment recirculation sumps. This boost increases the suction pressure and causes the CCP and safety injection pumps 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 supplied by that pump(s). The WCGS specific ECCS flow calculations indicate that the CCP could experience a runout flow increase of up to 24 gpm when aligned in the recirculation phase of ECCS operation.

The runout limit of the CCPs depend on the pump manufacturer, model, impeller type, and impeller casting type. The pumps supplied to WCGS by Westinghouse were manufactured by Dresser/Pacific Pumps. Records indicate that the pumps have a design runout limit of 556 gpm. A higher runout flow limit of 580 gpm for the CCPs has been confirmed by the pump manufacturer for acceptable pump operation. This indicates that the runout margin of 24 gpm is available for the CCPs. 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, the available runout margin for the CCPs is preserved for the anticipated suction boost during the recirculation mode.

Based on the above discussion, 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 pump's maximum flow will not exceed its design runout flow limit and the effect of suction boost during recirculation has been properly accounted for by preserving the available margin.

<u>Conclusion</u>

The impact of the proposed change to the seal injection flow limit on the design/licensing basis analyses and evaluations has been assessed and summarized in the preceding sections. Based on the assessment, it is concluded that the analysis results and conclusion presented in the current USAR would not be adversely affected by the revision to the seal injection flow limit. This conclusion is drawn based on the evaluation that reviews the charging/safety injection flows used in the current analysis of record. Specifically, the accident analyses which are limiting with minimized ECCS flow, LOCA-related analyses and calculations, in particular, may potentially be affected by the reduction in charging/safety injection flows due to more flow diverting to the seal injection line. However, the reduction in charging/safety injection flow compared to the total available ECCS flow is considered insignificant in most cases and therefore the effect is negligible, except for the limiting small break LOCA scenario. An evaluation has been performed and a PCT penalty of 35°F is assessed and will be applied to the small break LOCA PCT rackup sheet.

The evaluation also indicated that the OPERABILITY of the seal injection system and the CCP OPERABILITY will not be challenged during any phase of operation as a result of implementing the proposed change because the available margins are still sufficient to accommodate the increase in seal injection flow.

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.

5.0 REGULATORY ANALYSIS

5.1 NO SIGNIFICANT HAZARDS CONSIDERATION

WCNOC has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of Amendment," as discussed below:

(1) Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The restriction on reactor coolant pump (RCP) seal injection flow limits the amount of Emergency Core Cooling System (ECCS) flow that would be diverted from the injection path following an accident. This limit is based on safety analysis assumptions that are required because RCP seal injection flow is not isolated during safety injection. The intent of the Limiting Condition for Operation (LCO) limit on seal injection flow is to make sure that flow through the RCP seal water injection line is low enough to ensure sufficient centrifugal charging pump injection flow is directed to the Reactor Coolant System (RCS) via the injection points.

There are no hardware changes nor are there any changes in the method by which any safety related plant system performs its safety function. The proposed change does not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, or configuration of the facility or the manner in which plant is operated and maintained. The proposed change does not alter or prevent the ability of structures, systems, and components from performing their intended safety function to mitigate the consequences of an initiating event within the assumed acceptance limits. The proposed change does not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated. Further, the proposed change does not increase the types or amounts of radioactive effluent that may be released offsite, nor significantly increase individual or cumulative occupational/public radiation exposures. The proposed change is consistent with the safety analysis assumptions and resultant consequences.

Since the change continues to ensure 100 percent of the assumed charging flow is available, the proposed change does not involve a significant increase in the probability or consequences of an accident previously analyzed.

(2) Does the proposed change create the possibility of a new or different accident from any accident previously evaluated?

Response: No

There are no hardware changes nor are there any changes in the method by which any safety related plant system performs its safety function. This amendment will not affect the normal method of plant operation. The proposed change does not introduce any new equipment into the plant or alter the manner in which existing equipment will be operated. No performance requirements or response time limits will be affected. The change is consistent with assumptions made in the safety analysis and licensing basis regarding limits on RCP seal injection flow.

No new accident scenarios, transient precursors, failure mechanisms, or limiting single failures are introduced as a result of this amendment. The will be no adverse effect or challenges imposed on any safety related system as a result of this amendment.

Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

(3) Does the proposed change involve a significant reduction in a margin of safety?

Response: No

The proposed change does not affect the acceptance criteria for any analyzed event. There will be no effect on the manner in which safety limits or limiting safety system settings are determined nor will there be any effect on those plant systems necessary to assure the accomplishment of protection function. Increasing the total seal injection flow limit to 90 gpm does not significantly impact the assumed ECCS flow that would be available for injection into the RCS following an accident.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Conclusion:

Based on the above, WCNOC concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

6.0 ENVIRONMENTAL CONSIDERATION

WCNOC has evaluated the proposed amendment for environmental considerations. The review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

ATTACHMENT II
MARKUP OF TECHNICAL SPECIFICATION PAGES

No changes this page.
Included for information only.

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 Seal Injection Flow

LCO 3.5.5 Reactor coolant pump seal injection flow to each RCP seal shall be within the limits of Figure 3.5.5-1.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. Seal injection flow not within limit.	A.1	Adjust manual seal injection throttle valves to give a flow within the limits of Figure 3.5.5-1.	4 hours
B. Required Action and associated Completion Time not met.	B.1	Be in MODE 3.	6 hours
	AND		
	B.2	Be in MODE 4.	12 hours

No changes this page.
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SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.5.5.1	-----NOTE----- Not required to be performed until 4 hours after the Reactor Coolant System pressure stabilizes at ≥ 2215 psig and ≤ 2255 psig. ---------- Verify manual seal injection throttle valves are adjusted to give a flow within the limits of Figure 3.5.5-1.	18 months

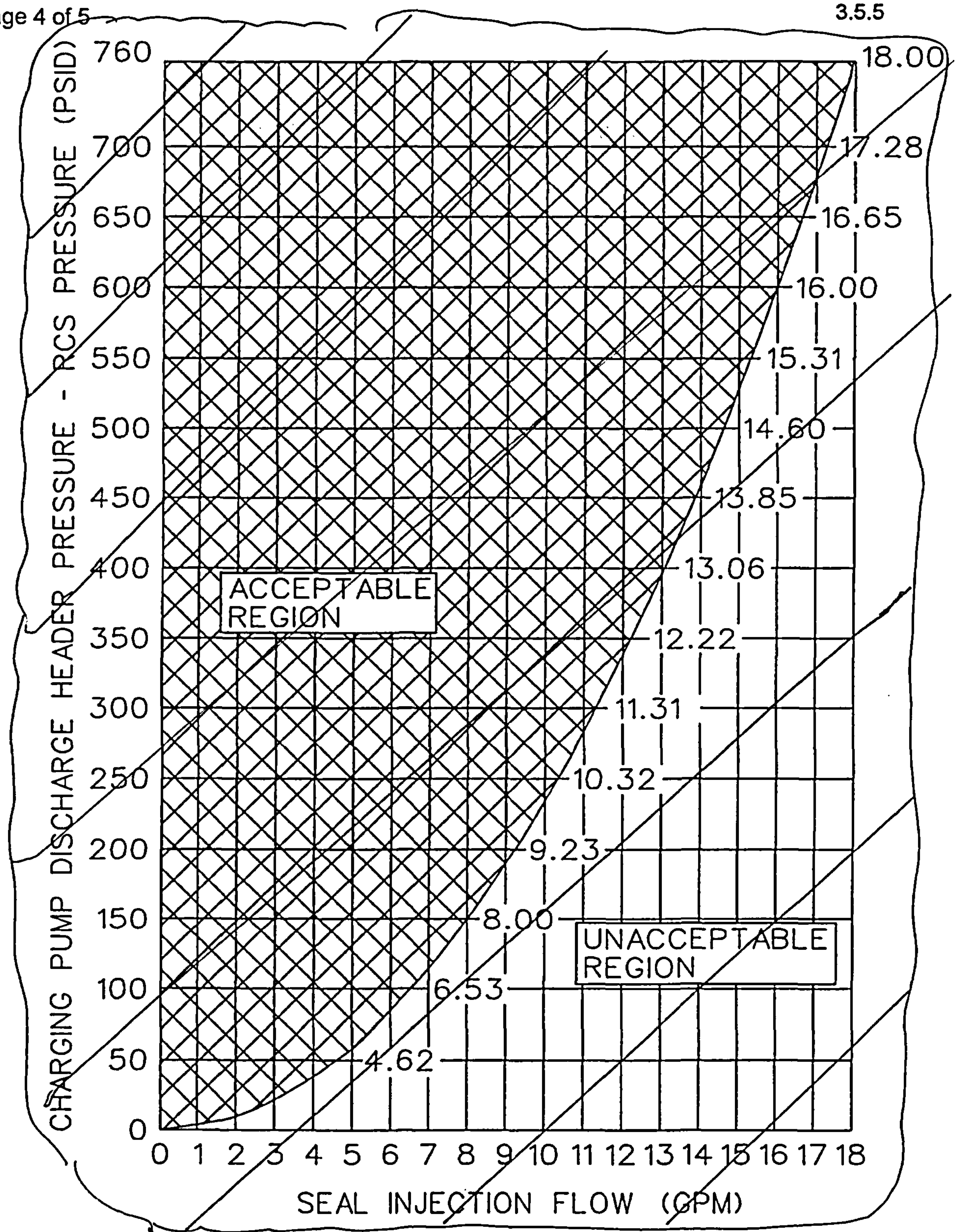

Figure 3.5.5-1 (page 1 of 1)
Seal Injection Flow Limits

INSERT REVISED FIGURE 3.5.5-1

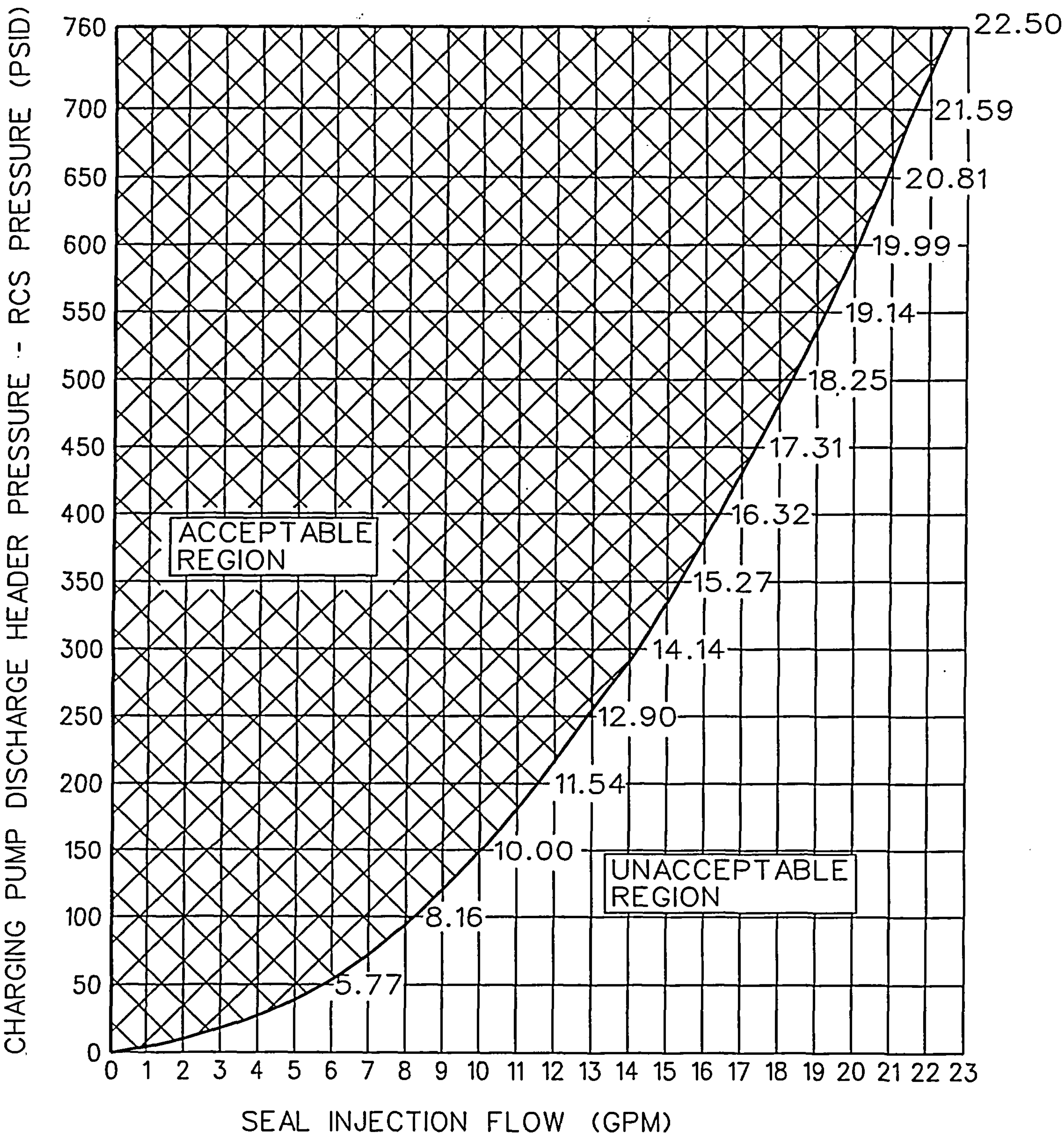

Figure 3.5.5-1 (page 1 of 1)
Seal Injection Flow Limits

ATTACHMENT III
RETYPED TECHNICAL SPECIFICATION PAGES

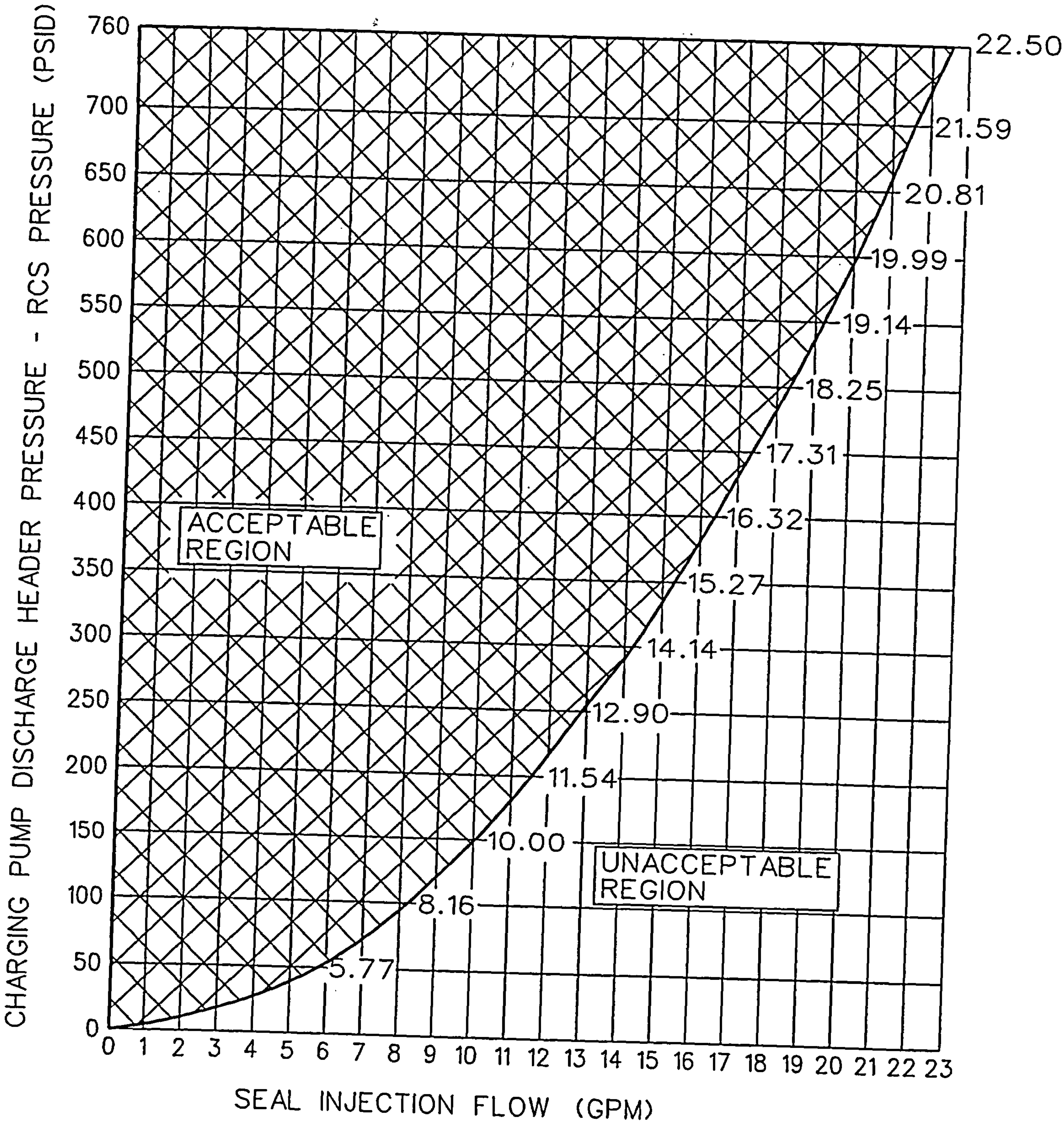

Figure 3.5.5-1 (page 1 of 1)
Seal Injection Flow Limits

ATTACHMENT IV
TS BASES CHANGES (FOR INFORMATION ONLY)

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Seal Injection Flow

BASES

BACKGROUND

The function of the seal injection throttle valves (BG-V0198 through BG-V0201) during an accident is similar to the function of the ECCS throttle valves in that each restricts flow from the centrifugal charging pump header to the Reactor Coolant System (RCS).

The restriction on reactor coolant pump (RCP) seal injection flow limits the amount of ECCS flow that would be diverted from the injection path following an accident. This limit is based on safety analysis assumptions that are required because RCP seal injection flow is not isolated during safety injection (SI).

APPLICABLE SAFETY ANALYSES

All ECCS subsystems are taken credit for in the large break loss of coolant accident (LOCA) at full power (Ref. 1). The LOCA analysis establishes the minimum flow for the ECCS pumps. The centrifugal charging pumps are also credited in the small break LOCA analysis. This analysis establishes the flow and discharge head at the design point for the centrifugal charging pumps. The steam generator tube rupture and main steam line break event analyses also credit the centrifugal charging pumps, but are not limiting in their design. Reference to these analyses is made in assessing changes to the Seal Injection System for evaluation of their effects in relation to the acceptance limits in these analyses.

The LCO ensures that seal injection flow will be sufficient for RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the centrifugal charging pumps will deliver sufficient water for a small LOCA and sufficient boron to maintain the core subcritical. For smaller LOCAs, the charging pumps alone deliver sufficient fluid to overcome the loss and maintain RCS inventory. Figure 3.5.5-1 was developed using a conservative combination of plant data to establish a maximum flow rate for the seal injection line versus delta pressure between the RCS and charging pump header pressure. Based on the conservative data, Figure 3.5.5-1 ensures adequate flow to the reactor coolant pump seals while ensuring the safety analysis assumption for minimum ECCS flow is maintained while avoiding charging pump runout conditions. This figure is constructed from the equation $Q = \sqrt{0.4264 * DP}$ where Q =seal injection flow

0.6661

BASES

APPLICABLE SAFETY ANALYSIS (continued)

flow in gpm, and DP=charging pump discharge header minus RCS pressure in units of psid (Ref. 3). The constant inside the square root is a function of pipe size, throttle valve resistance (position) and fluid density. Seal injection flow satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The intent of the LCO limit on seal injection flow is to make sure that flow through the RCP seal water injection line is low enough to ensure that sufficient centrifugal charging pump injection flow is directed to the RCS via the injection points (Ref. 2).

The LCO is not strictly a flow limit, but rather a flow limit based on a flow line resistance. In order to establish the proper flow line resistance, a pressure and flow must be known. The flow line resistance is established by adjusting the RCP seal injection ~~flow in the acceptable region of Figure 3.5.5-1 at a given pressure differential between the charging header and the RCS.~~ throttle valves such that the analyzed ECCS flow to the RCP seals is limited to 90 gpm with one centrifugal charging pump operating at its runout condition. This accident analysis limit is met by positioning the valves so that the flow to the RCP seals is within the limits of Figure 3.5.5-1. The centrifugal charging pump discharge header pressure remains essentially constant through all the applicable MODES of this LCO. A reduction in RCS pressure would result in more flow being diverted to the RCP seal injection line than at normal operating pressure. The valve settings established at the prescribed centrifugal charging pump discharge header pressure result in a conservative valve position should RCS pressure decrease. The flow limits established by Figure 3.5.5-1 ensures that the minimum ECCS flow assumed in the safety analyses is maintained.

The limit on seal injection flow must be met to render the ECCS OPERABLE. If this condition is not met, the ECCS flow may be less than that assumed in the accident analyses.

APPLICABILITY

In MODES 1, 2, and 3, the seal injection flow limit is dictated by ECCS flow requirements, which are specified for MODES 1, 2, 3, and 4. The seal injection flow limit is not applicable for MODE 4 and lower, however, because high seal injection flow is less critical as a result of the lower initial RCS pressure and decay heat removal requirements in these MODES. Therefore, RCP seal injection flow must be limited in MODES 1, 2, and 3 to ensure adequate ECCS performance.

ACTIONS

A.1

With the seal injection flow exceeding its limit, the amount of charging flow available to the RCS may be reduced. Under this Condition, action must

No changes this page.
Included for information only.

BASES

ACTIONS

A.1 (continued)

be taken to restore the flow to below its limit. The operator has 4 hours from the time the flow is known to be above the limit to correctly position the manual seal injection throttle valves and thus be in compliance with the accident analysis. The Completion Time minimizes the potential exposure of the plant to a LOCA with insufficient injection flow and provides a reasonable time to restore seal injection flow within limits. This time is conservative with respect to the Completion Times of other ECCS LCOs; it is based on operating experience and is sufficient for taking corrective actions by operations personnel.

B.1 and B.2

When the Required Actions cannot be completed within the required Completion Time, a controlled shutdown must be initiated. The Completion Time of 6 hours for reaching MODE 3 from MODE 1 is a reasonable time for a controlled shutdown, based on operating experience and normal cooldown rates, and does not challenge plant safety systems or operators. Continuing the plant shutdown begun in Required Action B.1, an additional 6 hours is a reasonable time, based on operating experience and normal cooldown rates, to reach MODE 4, where this LCO is no longer applicable.

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

Verification every 18 months that the manual seal injection throttle valves are adjusted to give a flow within the limit ensures that proper manual seal injection throttle valve position, and hence, proper seal injection flow, is maintained. To verify acceptable seal injection flow, the following is performed; differential pressure between the charging header (PT-120) and the RCS is determined and the seal injection flow is verified to be within the limits of Figure 3.5.5-1. The Frequency of 18 months is based on engineering judgment, the controls placed on the positioning of these valves and is consistent with other ECCS valve Surveillance Frequencies in SR 3.5.2.7. The Frequency has proven to be acceptable through operating experience.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1 (continued)

As noted, the Surveillance is not required to be performed until 4 hours after the RCS pressure has stabilized within a ± 20 psig range of normal operating pressure. The RCS pressure requirement is specified since this configuration will produce the required pressure conditions necessary to assure that the manual valves are set correctly. The exception is limited to 4 hours to ensure that the Surveillance is timely.

REFERENCES

1. USAR, Chapter 6 and Chapter 15.

2. 10 CFR 50.46.

3. Calculation SA-91-016-0-000-CN001, "ECCS Design Basis Injection Flowrates Re-analysis in Supporting of the WCGS Power Re-Rating project."

LIST OF COMMITMENTS

The following table identifies those actions committed to by WCNOC in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Kevin Moles at (620) 364-4126.

COMMITMENT	Due Date/Event
It is anticipated that the license amendment, as approved, will be effective upon issuance, to be implemented prior to startup from Refueling Outage 14. Revision to the TS Bases will be implemented pursuant to the TS Bases Control Program, TS 5.5.14, upon implementation of this license amendment.	Prior to startup from Refueling Outage 14.