FENOC

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March 28, 2001
L-01-036

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: Beaver Valley Power Station, Unit No. 1
Docket No. 50-334, License No. DPR-66
License Amendment Request No. 288

Pursuant to 10 CFR 50.90, FirstEnergy Nuclear Operating Company (FENOC) requests an amendment to the above license in the form of changes to the technical specifications (TS). The license amendment request proposes to revise the Technical Specification limits for boron concentration in the Refueling Water Storage Tank, Accumulators, Boron Injection Tank (BIT), and the Reactor Coolant System/Refueling Canal during Mode 6. In conjunction with the reduction in the maximum boron concentration in the BIT, the temperature controls on the BIT are being eliminated.

The proposed TS changes for BVPS Unit No. 1 are presented in Attachment A. The justification/safety analysis (including the no significant hazards evaluation) is presented in Attachment B.

These changes have been reviewed by the BVPS review committees. The changes were determined to be safe and do not involve a significant hazard consideration as defined in 10 CFR 50.92 based on the attached safety analysis. An implementation period of up to 60 days is requested following the effective date of this amendment.

Because of the nature of the proposed Technical Specification changes, which support the next core reload design, the changes are required in sufficient time to be implemented during the BVPS Unit 1 14th refueling outage (1R14) which is planned for the fall of 2001. Therefore, FENOC requests that the Nuclear Regulatory Commission approve the proposed Technical Specification changes in a time frame to support the above schedule.

A001

If you have any questions regarding this matter, please contact Mr. Thomas S. Cosgrove, Manager, Regulatory Affairs at 724-682-5203.

Sincerely,

Lew W. Myers

c: Mr. L. J. Burkhart, Project Manager
Mr. D. M. Kern, Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

Subject: Beaver Valley Power Station, Unit No. 1
BV-1 Docket No. 50-334, License No. DPR-66
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I, Lew W. Myers, being duly sworn, state that I am Senior Vice President of FirstEnergy Nuclear Operating Company (FENOC), that I am authorized to sign and file this submittal with the Nuclear Regulatory Commission on behalf of FENOC, and that the statements made and the matters set forth herein pertaining to FENOC are true and correct to the best of my knowledge and belief.

FirstEnergy Nuclear Operating Company

Lew W. Myers
Senior Vice President - FENOC

COMMONWEALTH OF PENNSYLVANIA

COUNTY OF BEAVER

Subscribed and sworn to me, a Notary Public, in and for the County and State above named, this 28 th day of March, 2001.

My Commission Expires:

Notarial Seal
Sheila M. Fattore, Notary Public
Shippingport Boro, Beaver County
My Commission Expires Sept. 30, 2002
Member, Pennsylvania Association of Notaries

ATTACHMENT A

Beaver Valley Power Station, Unit No. 1
License Amendment Request No. 288

The following is a list of the affected pages:

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REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.1.2.7 As a minimum, one of the following borated water sources shall be OPERABLE:

a. A boric acid storage system with:

1. A minimum contained volume of 5000 gallons,

2. Between 7000 and 7700 ppm of boron, and

3. A minimum solution temperature of 65°F.

b. The refueling water storage tank with:

1. A minimum contained volume of 175,000 gallons,

2. A minimum boron concentration of ~~2000~~ 2400 ppm, and

3. A minimum solution temperature of 45°F.

APPLICABILITY: MODES 5 and 6.

ACTION:

With no borated water source OPERABLE, suspend all operations involving CORE ALTERATIONS or positive reactivity changes until at least one borated water source is restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

4.1.2.7 The above required borated water source shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1. Verifying the boron concentration of the water,

2. Verifying the water level of the tank, and

3. Verifying the boric acid storage tank solution temperature when it is the source of borated water.

b. At least once per 24 hours by verifying the RWST temperature when it is the source of borated water and the outside ambient air temperature is <45°F.

REACTIVITY CONTROL SYSTEMS

BORATED WATER SOURCES - OPERATING

LIMITING CONDITION FOR OPERATION

3.1.2.8 As a minimum, the following borated water source(s) shall be OPERABLE as required by Specification 3.1.2.2.

a. A boric acid storage system with:

1. A minimum contained volume of 11,336 gallons,
2. Between 7000 and 7700 ppm of boron, and
3. A minimum solution temperature of 65°F.

b. The refueling water storage tank with:

1. A contained volume between 439,050 gallons and 441,100 gallons of borated water,
2. A boron concentration between ~~2000~~ 2400 and ~~2100~~ 2600 ppm, and
3. A solution temperature of ≥ 45°F and ≤ 55°F.

APPLICABILITY: MODES 1, 2, 3 & 4.

ACTION:

a. With the boric acid storage system inoperable, restore the storage system to OPERABLE status within 72 hours or be in at least HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to at least 1% $\Delta k/k$ at 200°F within the next 6 hours; restore the boric acid storage system to OPERABLE status within the next 7 days or be in COLD SHUTDOWN within the next 30 hours.

b. With the refueling water storage tank inoperable, restore the tank to OPERABLE status within one hour or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.1.2.8 Each borated water source shall be demonstrated OPERABLE:

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

ACCUMULATORS

LIMITING CONDITION FOR OPERATION

3.5.1 Each reactor coolant system accumulator shall be OPERABLE with:

a. The isolation valve open, 2600

2300 b. Between 7664 and 7816 gallons of borated water,

c. Between ~~1900~~ and ~~2100~~ ppm of boron, and

d. A nitrogen cover-pressure of between 605 and 661 psig.

APPLICABILITY: MODES 1, 2 and 3.*

ACTION:

a. With one accumulator inoperable, except as a result of a closed isolation valve, restore the inoperable accumulator to OPERABLE status within one hour or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN within the following 6 hours.

b. With one accumulator inoperable due to the isolation valve being closed, either immediately open the isolation valve or be in HOT STANDBY within one hour and be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.5.1 Each accumulator shall be demonstrated OPERABLE:

a. At least once per 12 hours by:

1. Verifying, by the absence of alarms, the contained borated water volume and nitrogen cover-pressure in the tanks, and

2. Verifying that each accumulator isolation valve is open.

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* Pressurizer Pressure above 1000 psig.

EMERGENCY CORE COOLING SYSTEMS

3/4.5.4 BORON INJECTION SYSTEM - BORON INJECTION TANK $\geq$ 350°F

LIMITING CONDITION FOR OPERATION

2600

3.5.4.1.1 The boron injection tank shall be OPERABLE with:

2400

*a. A minimum contained volume of 900 gallons of borated water,

+*b. Between ~~2,000~~ and ~~7,700~~ ppm of boron.~~, and~~

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~~#*c. A minimum solution temperature of 120°F.~~

* 1 hour deviation is permitted to correct the out of specification condition.

\+ To permit adequate recirculation and sampling following actions taken to correct the boron concentration, 4 hours is allowed for verification of the sample results providing corrective action was taken within the first hour.

~~# With the Boron Injection Flow Path temperature $<$120°F but $>$65°F, verify Recirculation Flow Path temperature and stagnant piping temperature by local monitoring of the ambient air temperature in the 1) Blender Cubicle (722 elevation PAB), and 2) Safeguards Penetration Area A (722 elevation Safeguards building) hourly.~~

APPLICABILITY: MODES 1, 2, 3.

Delete

ACTION:

With the boron injection tank inoperable ~~or $<$65°F~~, be in HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to 1% $\Delta k/k$ at 200°F within the next 6 hours; restore the tank to OPERABLE status within the next 7 days or be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.5.4.1.1 The boron injection tank shall be demonstrated OPERABLE by:

a. Verifying the water level in the surge tank at least once per 7 days.

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b. Verifying the boron concentration of the water in the surge tank at least once per 7 days.

~~c. Verifying the water temperature and recirculation flow at least once per 24 hours, and~~

~~d. Verifying that the injection flow path temperature is $>$120°F (no low temperature alarms or by local monitoring of temperature) each shift.~~

~~NOTE: This specification applicable for N & N-1 loop operation with all Loop stop valves open.~~

3/4.9 REFUELING OPERATIONS

BORON CONCENTRATION

LIMITING CONDITION FOR OPERATION

3.9.1 With the reactor vessel head unbolted or removed, the boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained uniform and sufficient to ensure that the more restrictive of the following reactivity conditions is met:

a. Either a Keff of 0.95 or less, which includes a 1% Δk/k conservative allowance for uncertainties, or

b. A boron concentration of ~~2000~~ ≥ 2400 ppm, which includes a 50 ppm conservative allowance for uncertainties.

APPLICABILITY: MODE 6*.

ACTION:

With the requirements of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at ≥ 30 gpm of 7000 ppm boric acid solution or its equivalent until Keff is reduced to ≤ 0.95 or the boron concentration is restored to ≥ ~~2000~~ 2400 ppm, whichever is the more restrictive. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.1.1 The more restrictive of the above two reactivity conditions shall be determined prior to:

a. Removing or unbolting the reactor vessel head, and

b. Withdrawal of any full length control rod in excess of 3 feet from its fully inserted position.

4.9.1.2 The boron concentration of the reactor coolant system and the refueling canal shall be determined by chemical analysis at least 3 times per 7 days with a maximum time interval between samples of 72 hours.

* The reactor shall be maintained in MODE 6 when the reactor vessel head is unbolted or removed.

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REACTIVITY CONTROL SYSTEMS

BASES

3/4.1.2 BORATION SYSTEMS (Continued)

2400

The boration capability of either system is sufficient to provide a SHUTDOWN MARGIN from all operating conditions of 1.0% Δk/k after xenon decay and cooldown to 200°F. The maximum boration capability requirements occur at BOL from full power peak xenon conditions and requires 11,336 gallons of 7000 ppm borated water from the boric acid storage tanks or 65,000 gallons of ~~2000~~ ppm borated water from the refueling water storage tank.

With the RCS temperature below 200°F, one injection system is acceptable without single failure consideration on the basis of the stable reactivity condition of the reactor and the additional restrictions prohibiting CORE ALTERATIONS and positive reactivity change in the event the single injection system becomes inoperable.

The boration capability required below 200°F is sufficient to provide a SHUTDOWN MARGIN of 1% Δk/k after xenon decay and cooldown from 200°F to 140°F. This condition requires either 5000 gallons of 7000 ppm borated water from the boric acid storage tanks or 175,000 gallons of ~~2000~~ ppm borated water from the refueling water storage tank.

3/4.1.3 MOVABLE CONTROL ASSEMBLIES

The specifications of this section ensure that (1) acceptable power distribution limits are maintained, (2) the minimum SHUTDOWN MARGIN is maintained, and (3) the potential effects of rod misalignment on associated accident analyses are limited. OPERABILITY of the movable control assemblies is established by observing rod motion and determining that rods are positioned within ± 12 steps (indicated position), of the respective group demand counter position. The OPERABILITY of the rod position indication system is established by appropriate periodic CHANNEL CHECKS, CHANNEL FUNCTIONAL TESTS and CHANNEL CALIBRATIONS. OPERABILITY of the control rod position indicators is required to determine control rod position and thereby ensure compliance with the control rod alignment and insertion limits. The OPERABLE condition for the analog rod position indicators is defined as being capable of indicating rod position within ± 12 steps of the associated group demand indicator. For power levels below 50 percent, the specifications of this section permit a one hour stabilization period to permit stabilization of known thermal drift in the analog rod position indicator channels. During this stabilization period, greater reliance is placed upon the group demand position indicators to determine rod position. Above 50 percent power, rod motion is not expected to induce thermal transients of sufficient magnitude to exceed the rod position indicator instrument accuracy of ± 12 steps. Limited use of rod position indication primary detector voltages is allowed as a backup method of determining control rod positions. Comparison of the group demand indicator to the calibration curve is sufficient to allow determination that a control rod is indeed misaligned from its bank when primary voltage measurements are used. Comparison of the group demand counters to the bank insertion limits with verification of rod position with the analog rod

EMERGENCY CORE COOLING SYSTEMS

BASES

3/4.5.4 BORON INJECTION SYSTEM

The OPERABILITY of the boron injection system as part of the ECCS ensures that sufficient negative reactivity is injected into the core to limit any positive increase in reactivity caused by RCS system cooldown. RCS cooldown can be caused by inadvertent depressurization, a loss-of-coolant accident or a steam line rupture.

The boron injection tank is required to be isolated when RCS temperature is ≤ the enable temperature set forth in Specification 3.4.9.3 to prevent a potential overpressurization due to an inadvertent safety injection signal.

The analysis of a main steam pipe rupture is performed to demonstrate that the following criteria are satisfied:

1. Assuming a stuck rod cluster control assembly, with or without offsite power, and assuming a single failure in the engineered safeguards, there is no consequential damage to the primary system and the core remains in place and intact.

2. Energy release to containment from the worst steam pipe break does not cause failure of the containment structure.

3. Radiation doses are not expected to exceed the guidelines of the 10 CFR 100.

The limits on injection tank minimum volume and boron concentration ensure that the assumptions used in the steam line break analysis are met.

~~Verification of 120°F in the injection flow path assures an 8-hour margin to the time at which precipitation of a 7700 ppm boric acid solution would occur without benefit of the building heating system.~~

~~Verifying the recirculation flow path and stagnant piping temperatures, when the Boron Injection Flow Path temperature is less than 120°F and greater than 65°F, by monitoring the ambient air temperatures in the building areas containing that piping provides assurance that boron precipitation will not occur.~~

Delete

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3/4.9 REFUELING OPERATIONS

BASES

3/4.9.1 BORON CONCENTRATION

2400

The limitations on minimum boron concentration (~~2000~~ ppm) ensure that: 1) the reactor will remain subcritical during CORE ALTERATIONS, and 2) a uniform boron concentration is maintained for reactivity control in the water volume having direct access to the reactor vessel. The Limitation of Keff of no greater than 0.95 which includes a conservative allowance for uncertainties, is sufficient to prevent reactor criticality during refueling operations.

3/4.9.2 INSTRUMENTATION

The OPERABILITY of the source range neutron flux monitors ensures that redundant monitoring capability is available to detect changes in the reactivity condition of the core when performing those evolutions with the potential to initiate criticality. Suitable detectors used in place of primary source range neutron flux monitors N-31 and N-32 are recognized as alternate detectors. Alternate detectors may be used in place of primary source range neutron flux monitors as long as the required indication is provided. Since installation of the upper internals does not involve movement of fuel or a significant positive reactivity addition to the core, one primary or alternate source range neutron flux monitor with continuous visual indication in the control room provides adequate neutron flux monitoring capability during this evolution.

3/4.9.3 DECAY TIME

The minimum requirement for reactor subcriticality prior to movement of irradiated fuel assemblies in the reactor vessel ensures that sufficient time has elapsed to allow the radioactive decay of the short lived fission products. This decay time is consistent with the assumptions used in the accident analyses.

3/4.9.4 CONTAINMENT BUILDING PENETRATIONS

The requirements on containment penetration closure and operability of the containment purge and exhaust system HEPA filters and charcoal adsorbers ensure that a release of radioactive material within containment will be restricted from leakage to the environment or filtered through the HEPA filters and charcoal adsorbers prior to discharge to the atmosphere within 10 CFR 100 limits. The OPERABILITY and closure restrictions are sufficient to restrict radioactive material release from a fuel element rupture based upon the lack of containment pressurization potential while in the REFUELING MODE. Operations of the containment purge and exhaust

ATTACHMENT B

Beaver Valley Power Station, Unit No. 1
License Amendment Request No. 288
INCREASE OF RWST/ACCUMULATOR BORON CONCENTRATION LIMITS

A. DESCRIPTION OF AMENDMENT REQUEST

This proposed license amendment for Beaver Valley Power Station (BVPS) Unit No. 1 would increase the limits for boron concentration in the Refueling Water Storage Tank (RWST) and in the Reactor Coolant System (RCS) Accumulators. This proposed license amendment would also revise the limits and associated surveillance requirements on boron concentration in the Boron Injection Tank (BIT) to be consistent with the limits specified for the RWST. This proposed amendment would revise the RCS minimum boron concentration limit for Mode 6 to make it consistent with the RWST boron concentration limit.

The increase in the boron concentration limits in the RWST and Accumulators is needed to address higher reactor core reactivity levels associated with core operation with higher plant capacity factors. Fuel cycle design would be restricted imposing less than full power operating restrictions during future operating cycles if operating margins for these boron requirements are not increased. The RCS boron concentration limit in Mode 6 during refueling needs to be revised whenever the RWST/Accumulator minimum boron concentration limit is adjusted, for consistency.

Boron concentrations above the upper limit of the RWST are not needed in the BIT in order to satisfy applicable safety analyses. Therefore, revising the boron concentration limits in the BIT to be consistent with the RWST boron concentration limits removes the need to maintain associated temperature controls and their associated surveillance requirements on the BIT.

The following table summarizes the proposed changes to boron concentration:

Parameter	Tech Spec	Current Value	Proposed Value
RWST	3.1.2.7.b	2000	2400
RWST	3.1.2.8.b	2000-2100	2400-2600
Accumulator	3.5.1.c	1900-2100	2300-2600
BIT	3.5.4.1.1.b	2000-7700	2400-2600
RCS Mode 6	3.9.1.b	2000	$\geq$ 2400
RCS Mode 6	3.9.1.Action	$\geq$ 2000	$\geq$ 2400

The Note at the bottom of Technical Specification 3/4.5.4.1.1 is being deleted since N-1 loop operation during Modes 1, 2 and 3 (when this Specification is applicable) is not permitted by Technical Specification 3/4.4.1.4.1.

B. DESIGN BASES

The Refueling Water Storage Tank (RWST) is a vertical cylindrical tank filled with borated water at atmospheric pressure. The RWST is a source of borated water which can be supplied to the suction of the high-head safety injection pumps, the low-head safety injection pumps and the quench spray pumps. Maximum tank volume is approximately 441,000 gallons.

The Accumulators are three pressure vessels filled with borated water and pressurized with nitrogen gas. During normal operation, each accumulator is isolated from the RCS by two check valves in series. If the RCS pressure falls below the accumulator pressure, the check valves open and borated water is forced into the RCS. Mechanical operation of the swing-disc check valves by means of differential pressure is the only action required to open the injection path from the accumulators to the reactor core via the cold legs. The accumulators are passive engineered safety features.

The Boron Injection Tank (BIT) is a tank filled with borated water which is located on a discharge path of the high-head safety injection charging pumps. The discharge from the high-head safety injection charging pumps provides the motive force to inject the boric acid solution from the BIT into the RCS via the cold legs.

During refueling operations, all filled portions of the RCS and the refueling canal must be maintained at a uniform boron concentration to ensure that the core will remain subcritical ($K_{eff} \leq 0.95$).

C. JUSTIFICATION

FirstEnergy Nuclear Operating Company's (FENOC's) operating strategy is to maximize electrical generation. Due to increased plant operating availability and capacity and the desire to avoid final end-of-cycle coastdowns, fuel management plans require higher reactor core reactivity levels. While end-of-cycle coastdowns are fully evaluated from a safety analysis perspective, they represent a deviation from the desired operating strategy. However, increased core reactivity will require higher boron concentrations than previous cycles to meet increased shutdown requirements needed to satisfy all safety analyses considerations. This requires higher boron concentrations than currently permitted by Technical Specifications. Therefore, FENOC is proposing changes to the Technical Specifications to increase the boron concentration limits in the RWST and the Accumulators and to revise the boron concentration limits in the BIT.

The following evaluations involving increased boron concentration limits in the RWST and Accumulators and revised boron concentration limits in the BIT have been completed.

<u>Loss of Coolant Accident (LOCA) Analyses</u>

1. Peak Cladding Temperature Calculations

   In accordance with 10 CFR Part 50, Appendix K, the BVPS Unit No. 1 Large Break LOCA (LBLOCA) analyses do not rely upon boron concentration for control of the core. Rather the LBLOCA analyses rely upon voiding during the initial blowdown phase of the accident. During the refill/reflood phase, credit for void reactivity is gradually replaced by credit for boron concentration. However, the LBLOCA analyses show that the peak cladding temperature (PCT) occurs prior to the time the boron concentration becomes significant in maintaining core shutdown. Therefore, the proposed increases in RWST, Accumulator and BIT boron concentrations have no adverse effect on the calculated PCT results for LOCA. Similarly, the proposed changes in boron concentrations have no adverse effect on the calculated PCT results for Small Break LOCA analyses since the analysis credits the control rods.

2. Post-LOCA Sump and Containment Spray pH Profile

   a. <u>Radioiodine</u>: Increasing the boron concentration limits in the RWST, Accumulators and BIT allows more boric acid to enter the containment sump following a postulated LOCA. More boric acid supplied in the same volume of water will lower pH. A minimum pH limit is placed on the containment sump and containment spray pH to ensure adequate post-LOCA radioiodine removal and retention and to minimize the potential for stress corrosion cracking of stainless steel components in containment. A maximum pH limit is placed to minimize the potential for stress corrosion cracking of stainless steel components in containment and to minimize release of hydrogen from corrosion of aluminum.

The fluid in the RWST will be used in the containment spray systems (Quench Spray and Recirculation Spray) following a postulated LOCA. The Chemical Addition System adds a predetermined amount of sodium hydroxide solution to the Quench Spray in order to increase the pH of the sprays in the containment and ensure effective removal and retention of radioactive iodine from the containment atmosphere following a LOCA.

The pH of the post-LOCA sump was determined by evaluating the boric acid concentration of the RCS with the proposed new boron concentration limits for the RWST, the BIT and the three Accumulators, plus the addition of caustic from the Chemical Addition System via the Quench Spray System. The pH of the Quench Spray System was determined to remain at or above the minimum limit of at least 8.5 (maximum of 11.0) as described in UFSAR Section 6.4.2. Similarly, the final pH in the containment sump after a LOCA was determined to remain at or above the minimum pH limit of 8.0 as described in UFSAR Section 14.3.5. Minimum sump pH provides the limiting flow rate requirement for the Chemical Addition Pumps. Minimum sump pH limits are maintained without altering the Chemical Addition System pump required flow rates.

b. <u>Material Compatibility</u>: The primary consideration for material compatibility is the potential for an increase in corrosion on the RWST, Accumulators, and the connecting pipes, pumps, valves that are part of the Emergency Core Cooling System (ECCS) during normal operation. Increasing the boron concentration limits will decrease the pH of the stored water making it more acidic, but will remain within the current limits. The surfaces in contact with the fluid are stainless steel and are not adversely affected by this decrease in pH.

Following a design basis LOCA accident, the increased boron concentration limits will also lower the sump solution pH making it less caustic, but will remain within the current limits. Therefore, the lower pH of the containment sump and spray fluid resulting from the increased minimum boron concentration limit of the RWST, Accumulators and BIT will not have an adverse effect on the coating on the structural steel inside containment and will not have a measurable effect on the corrosion rate of unprotected carbon steel.

c. Equipment Qualification: Equipment qualified to operate inside containment following a postulated LOCA evaluated the environment for consideration of coming into contact with containment spray. Increasing the boron concentration in the RWST, Accumulators and BIT will not adversely affect the equipment qualification of qualified containment components since the containment sump and spray fluid pH will remain within the limits described in the UFSAR.

3. Boron Solubility Requirements

The highest proposed allowable boron concentration in the RWST, Accumulators or the BIT is 2600 ppm. This boron concentration does not approach the solubility limit at the lowest operating temperatures of the RWST, Accumulators or the BIT. Water with boron concentrations of less than 4000 ppm remains soluble at temperatures above 32°F. Existing requirements for freeze protection are adequate.

With the proposed reduction in the upper limit of boron concentration in the BIT, there will no longer be any need for the temperature controls on the BIT. The BIT and associated piping are currently adequately protected from freezing without the temperature controls (e.g., heat tracing) addressed in Technical Specification 3/4.5.4.1.1. This tank and piping are located within safety-related buildings which house other safety related piping or are underground and are not exposed to temperatures below 32°F. These controls were previously needed when the boron concentration in the BIT was allowed to exceed 4000 ppm.

4. Cold Shutdown Boration Requirements

The boration capability of either the RWST and the Boric Acid Storage Tanks (BASTs) is currently sufficient to provide a shutdown margin from all operating conditions of 1.0% $\Delta k/k$ after xenon decay and cooldown to 140°F, as described in the Technical Specification Bases. The maximum boration capability requirements occur at Beginning Of Life (BOL) from full power peak xenon conditions. Boration analyses are performed on a cycle-specific basis and are based on minimum boron concentrations. Higher RWST boron concentrations provide additional margin. Therefore, the proposed increase in the RWST boron concentration limits provide additional margin to maintain the required shutdown margin with the same volume of RWST volume to offset future fuel cycle reactivity increases.

The BVPS Unit No. 1 Appendix R analyses were reviewed to ensure that cold shutdown mode shutdown-margins can be achieved using Appendix R event assumptions and conditions. The shutdown margin requirements at BVPS Unit No. 1 for an Appendix R fire is based upon all control rods in, 0.99 K-effective, and injection of water from the RWST via the Reactor Coolant Pump seals from one operating charging pump to provide sufficient makeup to the RCS to account for RCS volume shrinkage during cooldown. An increase in the RWST boron concentration from a minimum of 2000 ppm to 2400 ppm will provide additional boric acid during injection which provides additional shutdown margin. Therefore, an increase in RWST boron concentration adds conservatism to the Appendix R Shutdown Margin analysis. The proposed changes to the Accumulators and the BIT have no impact on the Appendix R Shutdown Margin since these components are not utilized to provide boric acid during an Appendix R Shutdown event and are thus not covered in the Appendix R analysis.

5. Post-LOCA Long Term Core Cooling Minimum Boron Requirements (LTCC)

Following a postulated LOCA, fluid from various volumes accumulates in the containment sump. This would include fluid from the RCS, RWST, Accumulators, BIT, the Chemical Addition System, and ECCS piping. It is necessary for the sump to contain sufficient boric acid concentration to ensure that the reactor remains subcritical. All of these fluid volumes entering the sump include boric acid solution, except for the Chemical Addition System, which contains sodium hydroxide solution. It is assumed in the sump boron analysis that all of the liquid in these volumes reach the containment sump. Although the fluid in the BIT is assumed to reach the sump, no credit was conservatively taken for the boric acid contained therein.

The post-LOCA sump boron concentration was recalculated using the proposed boron concentration limits for the RWST, Accumulators and BIT. The proposed RWST, Accumulator and BIT boron ranges will provide additional margin at the most limiting point over the current analysis. This analysis uses minimum boron concentrations and borated water volumes.

6. Hot Leg Switchover Time (HLSO)

Following a postulated LOCA, borated water from the RWST, Accumulators and BIT could enter the core through the RCS cold legs during the injection phase of the accident. The fluid volumes are assumed to mix and are distributed between the vessel and the containment sump. During the recirculation phase, and assuming a cold leg break, borated coolant enters the vessel from the intact cold legs and excess safety injection coolant spills out the cold leg break. Steam generated in the core exits through the broken loop's hot leg, passes through the steam generator and exits through the cold leg break. Although the water vapor exits the core and condenses in the containment, only a small fraction of the dissolved boron is carried off in the steam. Therefore, the concentration of boron increases over time in the reactor vessel. If the boron concentration reaches the solubility limit, boron will begin to precipitate out of solution, forming a solid that could block the coolant flow channels in the core. This could lead to inadequate core cooling.

If the break is in the hot leg or in the pressurizer, safety injection coolant will flow into the core and then out the break. This would continuously replace the boric acid solution in the core region. In this situation, switchover to hot leg injection is not necessary. However, since there is no unambiguous way to locate the pipe break by plant operators, switchover from cold leg to hot leg injection is required at a specified time for all LOCAs.

Because of the proposed boron concentration increases, the switchover from cold leg to hot leg injection must occur sooner to avoid boron precipitation in the reactor vessel. A revised reduced cold-to-hot leg switchover time of 8.0 hours will be implemented in the BVPS Unit 1 Emergency Operating Procedures upon approval and implementation of the proposed increased Technical Specification boron concentrations. At the reduced hot leg switchover time, the minimum ECCS flow requirements will continue to be met. The analysis supporting the reduced hot leg switchover time uses maximum boron concentrations and borated water volumes. The BIT water volume was assumed to remain in place (within the piping system), but was conservatively assumed to have a boron concentration range from 0 ppm to 2600 ppm.

The proposed decrease in the maximum limit of the BIT will not adversely affect any accident analyses results since a decreased maximum limit makes the result less severe. With the proposed maximum limit, there will be no concerns for boron precipitation within the BIT or piping since the highest proposed allowable boron concentration in the BIT is 2600 ppm. This boron concentration does not approach the solubility limit at the lowest operating temperatures of the BIT. In fact, water with boron concentrations of less than 4000 ppm remains soluble at temperatures above 32°F. Although decreasing the upper limit for BIT boron concentration reduces operational flexibility, it allows the removal of temperature controls on the BIT. Existing requirements for freeze protection are adequate. Therefore, all requirements for temperature controls on the BIT are being removed from Technical Specification 3.5.4.1.1 since they are no longer necessary.

A Westinghouse Nuclear Safety Advisory Letter identified a potential concern regarding the possibility of inadvertent re-criticality following switchover from cold leg to hot leg safety injection. The accumulation of boron in the reactor vessel following a postulated LOCA, and prior to cold leg to hot leg switchover, results in a decrease in the sump boron concentration. Westinghouse postulated that switchover from cold leg to hot leg injection may wash out the concentrated boric acid in the core region, and replace it with sump fluid which is depleted in boric acid. If the reduction in sump boron concentration during cold leg injection is sufficient, the cold leg to hot leg switchover may result in inadvertent re-criticality. Westinghouse currently believes that there is sufficient margin by crediting other available parameters to maintain subcriticality at the time of cold leg to hot leg switchover. The Westinghouse Owners Group (WOG) is addressing this issue generically. BVPS Unit No. 1 is part of WOG and will address this issue following the WOG action.

7. Post-LOCA Hydrogen Generation

   The BVPS Unit 1 calculation addressing hydrogen generation in containment following a postulated LOCA was reviewed with regard to increased boron concentration limits in the RWST, Accumulators and the BIT. It was determined that the calculated corrosion hydrogen generation rates will not be adversely affected since the sump pH was not reduced from the previously analyzed range of pH.

8. Radiological Consequences

   The total doses from a postulated LOCA include contributions from 1) containment leakage, 2) Engineered Safety Features leakage, 3) RWST recirculation back leakage, and 4) external sources (for gamma doses). The method used to determine the dose contribution due to RWST recirculation back leakage is dependent upon RWST, Accumulator and BIT boron concentrations. In the radiological consequence calculations, a higher boron concentration results in lower RWST and sump pH values, which in turn, results in an increased iodine concentration in the RWST gas space and an increased iodine release to the atmosphere. Since the contribution of the RWST recirculation back leakage to the total dose is minor, the proposed increased boron concentration limits (and resulting minor iodine releases from the RWST) have no significant impact on the site boundary (EAB/LPZ) doses. The control room thyroid dose from RWST recirculation back leakage contribution resulting from the proposed increased boron concentration limits would increase from 5.5 Rem to 5.6 Rem, while the associated whole body and beta doses remain unchanged. This increase in control room thyroid doses due to RWST recirculation leakage is small compared to the overall dose value and has no appreciable impact on the current analysis value. The LOCA doses remain less than the 30 Rem acceptance limit for the control room and less than the 300 Rem acceptance limit for offsite doses.

Non-LOCA Analyses

The non-LOCA transients in Chapter 14 of the BVPS Unit No. 1 UFSAR were found to not be adversely affected by the proposed changes in the boron concentration limits. The non-LOCA design basis accidents were either not impacted or were made less severe as a result of the changes in boron concentrations. For example, an increased boron concentration in the RWST and, hence, in the Emergency Core Cooling System, would make the Major Secondary System Pipe Rupture (described in UFSAR Section 14.2.5) less limiting.

Increasing the boron concentration in the RWST does not affect the Uncontrolled Boron Dilution accident (described in UFSAR Section 14.1.4) during Hot Shutdown, Cold Shutdown or Refueling because a boron dilution event in these operational modes is precluded by administrative controls. These administrative controls isolate the primary grade water system from the Chemical and Volume Control System, except during planned boron dilution or makeup activities. Increasing the boron concentrations does not directly affect the Uncontrolled Boron Dilution accident analyses during Startup or Power Operation for the current operating core. The Boron Dilution accident analysis is a function of operating conditions and core reactivity at Beginning-of-Life (BOL). For the current operating core, these conditions are unchanged by the proposed boron concentration Technical Specification limit increases. However, the proposed increase in boron concentration limits may indirectly affect the Uncontrolled Boron Dilution accident analyses for a future core because the proposed increases in the Technical Specification limits for boron concentrations are being pursued to allow the core to be designed with more reactivity. This would require higher initial RCS boron concentrations at BOL to offset the higher core reactivity, which would require these accident analyses to be re-evaluated with higher initial operating RCS boron concentrations. RCS initial and critical boron concentrations are explicitly considered in reload evaluations of the Uncontrolled Boron Dilution at Startup and at Power accidents. As required, the reload evaluations for any future core with a higher reactivity will address the Uncontrolled Boron Dilution at Startup and at Power to ensure that UFSAR safety analyses acceptance criteria remain valid.

Thus, the proposed changes to raise the boron concentration limits for RWST, Accumulators and BIT will not adversely affect the acceptance criteria of all non-LOCA design basis accidents.

<u>Technical Specification 3/4.5.4.1.1</u>

The Note at the bottom of Technical Specification 3/4.5.4.1.1 is being deleted since N-1 loop operation during Modes 1, 2 and 3 (when this Specification is applicable) is not permitted by Technical Specification 3/4.4.1.4.1. Therefore, this note is no longer needed.

D. SAFETY ANALYSIS

The safety analyses results in Chapter 14 of the BVPS Unit 1 UFSAR will remain bounding values for all LOCA and non-LOCA design basis accidents.

The proposed changes to the boron concentration limits for RWST, Accumulators, BIT, and the RCS in Mode 6 will not adversely affect the acceptance criteria of all LOCA and non-LOCA design basis accidents. LOCA considerations for Appendix K PCT results, post-LOCA sump and containment spray pH, equipment qualification, boron solubility requirements, cold shutdown boration requirements, post-LOCA long term core cooling minimum boron requirements, and post-LOCA hydrogen generation were evaluated to continue to provide acceptable results with the proposed amendment changes. Hot leg switchover time was evaluated and determined to be acceptable with a revision to the Emergency Operating Procedures for a shorter switchover time frame. The offsite thyroid, gamma and beta and control room gamma and beta radiological consequences are negligible. The control room thyroid radiological dose would increase by a small amount compared to the overall dose value and has no appreciable impact on the current analysis value. The LOCA doses remain less than the 30 Rem acceptance limit for the control room and less than the 300 Rem acceptance limit for offsite doses.

It has been determined that boron precipitation will not occur for the proposed revised boron concentration limits and the removal of temperature controls on the BIT. Equipment subject to chemical spray qualification will not be adversely affected by the increased boron concentrations. The RWST and Accumulators were evaluated and determined to remain adequate to meet their design requirements established in Technical Specification Bases 3/4.1.2 and 3/4.5.1 since the proposed boron increase is conservative with regard to their design functions.

The non-LOCA transients in Chapter 14 of the BVPS Unit No. 1 UFSAR were found to not be adversely affected by the proposed increased boron concentration limits. The non-LOCA design basis accidents were either not impacted or were made less severe as a result of the increased boron concentrations. The proposed increase in boron concentration limits may indirectly affect the Uncontrolled Boron Dilution accident analyses for a future core since the analyses assume normal operating RCS boron concentration at event initiation. However, the reload evaluations for any future core will address the Uncontrolled Boron Dilution at Startup and at Power to ensure that UFSAR safety analyses acceptance criteria remain valid.

Based on these evaluations, this requested license amendment has been determined to not adversely affect the current licensing bases or the safe operation of the plant.

E. NO SIGNIFICANT HAZARDS EVALUATION

This proposed license amendment for Beaver Valley Power Station (BVPS) Unit No. 1 would increase the limits for boron concentration in the Refueling Water Storage Tank (RWST) and in the Reactor Coolant System (RCS) Accumulators. This proposed license amendment would also revise the limits and associated surveillance requirements on boron concentration in the Boron Injection Tank (BIT) to be consistent with the limits specified for the RWST. This proposed amendment would revise the RCS minimum boron concentration limit for Mode 6 to make it consistent with the RWST boron concentration limit.

The increase in the boron concentration limits in the RWST and Accumulators is needed to address higher reactor core reactivity levels associated with core operation with higher plant capacity factors. Fuel cycle design would be restricted imposing less than full power operating restrictions during future operating cycles if operating margins for these boron requirements are not increased. The RCS boron concentration limit in Mode 6 during refueling needs to be revised whenever the RWST/Accumulator minimum boron concentration limit is adjusted, for consistency. Boron concentrations above the upper limit of the RWST are not needed in the BIT in order to satisfy applicable safety analyses. Therefore, revising the boron concentration limits in the BIT to be consistent with the RWST boron concentration limits removes the need to maintain associated temperature controls and their associated surveillance requirements on the BIT. The Note at the bottom of Technical Specification 3/4.5.4.1.1 is being deleted since N-1 loop operation during Modes 1, 2 and 3 (when this Specification is applicable) is not permitted by Technical Specification 3/4.4.1.4.1.

The no significant hazard considerations involved with the proposed amendment have been evaluated. The evaluation focused on the three standards set forth in 10 CFR 50.92(c), as quoted below:

> The Commission may make a final determination, pursuant to the procedures in paragraph 50.91, that a proposed amendment to an operating license for a facility licensed under paragraph 50.21(b) or paragraph 50.22 or for a testing facility involves no significant hazards consideration, if

operation of the facility in accordance with the proposed amendment would not:

(1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or

(2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or

(3) Involve a significant reduction in a margin of safety.

The following evaluation is provided for the no significant hazards consideration standards.

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

   The proposed change to the BVPS Unit 1 RWST, Accumulators, BIT and in the RCS during Mode 6 will maintain the safety analyses results in Chapter 14 of the BVPS Unit 1 UFSAR as bounding values for all Loss Of Coolant Accident (LOCA) and non-LOCA design basis accidents. The proposed changes do not invalidate the RWST, accumulators or BIT's ability to meet its design bases.

   Increased boron concentration limits for the RWST, Accumulators, BIT and RCS in Mode 6 will not increase the consequences of an accident previously analyzed. The increased boron concentration limits reduce the time to switchover from cold leg to hot leg recirculation, which will prevent boron precipitation in the reactor vessel following a LOCA. The post-LOCA long term core cooling minimum boron requirements have been determined to continue to be adequate to ensure adequate post-LOCA shutdown margin. The post-LOCA containment sump and containment spray pH remain within the limits specified in the UFSAR. All other transients either were not impacted or were made less severe as a result of the increased boron concentrations.

   The deletion of the Note in Technical Specification 3/4.5.4.1.1 does not alter the safety analyses as evaluated in the UFSAR since N-1 operation is currently prohibited by Technical Specification 3/4.4.1.4.1. With the reduced upper limit on boron concentration in the BIT, the controls on temperature for the BIT are eliminated since boron precipitation is precluded above freezing.

Therefore, this change will not increase the probability of occurrence of a postulated accident or the consequences of an accident previously evaluated since the change would continue to comply with the current BVPS Unit 1 licensing basis as it relates to the peak cladding temperature criteria of 10 CFR Part 50, Appendix K and the dose limits of GDC 19 and 10 CFR Part 100.

2. Does the change create the possibility of a new or different kind of accident from any accident previously evaluated?

The proposed increase in boron concentration does not add new or different equipment to the facility. The proposed Technical Specification changes also do not alter the manner in which plant equipment is being operated. Although the increased boron concentration requires procedure changes to ensure that cold leg to hot leg recirculation after a LOCA occurs quicker, there are no changes to the methods utilized to respond to plant events. The proposed Technical Specification changes do not alter instrument or control setpoints that initiate protective or mitigative actions. These increased boron concentration limits are conservative and do not alter the RCS or Emergency Core Cooling Systems' ability to perform their design bases.

The deletion of the Note in Technical Specification 3/4.5.4.1.1 does not alter the safety analyses as evaluated in the UFSAR since N-1 operation is currently prohibited by Technical Specification 3/4.4.1.4.1. With the reduced upper limit on boron concentration in the BIT, the controls on temperature for the BIT are eliminated since boron precipitation is precluded above freezing.

Therefore, these proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated accident since the RCS and steam generator will continue to operate in accordance with their design bases.

3. Does the change involve a significant reduction in a margin of safety?

The LOCA considerations, including Peak Cladding Temperature calculations, containment sump and spray pH requirements, boron solubility requirements, cold shutdown boration requirements, post-LOCA long term core cooling minimum boron requirements, hot leg recirculation switchover requirements, post-LOCA hydrogen generation requirements, and radiological requirements have been evaluated and determined to be acceptable. The acceptance criteria of all non-LOCA design basis accidents continue to be met.

The proposed amendment does not involve revisions to any safety limits or safety system setting that would adversely impact plant safety. The proposed amendment does not adversely affect the ability of systems, structures or components important to the mitigation and control of design bases accident conditions within the facility. In addition, the proposed amendment does not affect the ability of safety systems to ensure that the facility can be maintained in a shutdown or refueling condition for extended periods of time.

Based upon the above evaluations, the margin of safety is not adversely affected.

F. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

Based on the considerations expressed above, it is concluded that the activities associated with this license amendment request satisfy the requirements of 10 CFR 50.92(c) and, accordingly, a no significant hazards consideration finding is justified.

G. ENVIRONMENTAL CONSIDERATION

This license amendment request changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. It has been determined that this license amendment request 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. This license amendment request may change requirements with respect to installation or use of a facility component located within the restricted area or change an inspection or surveillance requirement; however, the category of this licensing action does not individually or cumulatively have a significant effect on the human environment. Accordingly, this license amendment request 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 this license amendment request.