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February 21, 2000  
L-00-020

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. 279**

FirstEnergy Nuclear Operating Company (FENOC) requests NRC review and approval of proposed changes to the Beaver Valley Power Station (BVPS) Unit 1 Updated Final Safety Analysis Reports (UFSAR). The proposed revisions to the UFSAR remove the listing of stainless steel as the material for Reactor Coolant System and reactor coolant pressure boundary component fasteners. This UFSAR change was determined to involve an unreviewed safety question pursuant to 10 CFR 50.59 since a new failure mechanism (for boric acid wastage) would be possible. However, information has been provided that supports a determination that the proposed changes do not involve a significant safety hazard for BVPS Unit No. 1. The boric acid leakage inspection program developed and applied over the past fifteen years provides reasonable assurances that boric acid corrosion will not lead to degradation within borated systems that would be adverse to safety.

The proposed UFSAR changes are presented in Attachment A. The safety analysis (including the no significant hazards evaluation) for the change is presented in Attachment B.

These changes have been reviewed by the Beaver Valley 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 analyses.

In accordance with Generic Letter 91-18, Rev. 1, prior NRC approval is not required for Unit 1 to continue power operation. This is justified by BVPS approved Bases for Continued Operation.

A001

Beaver Valley Power Station, Unit No. 1  
Request for Approval of UFSAR Change  
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If there are any questions concerning this matter, please contact Mr. Mark S. Ackerman,  
Manager, Licensing at 412-393-5203.

Sincerely,



Lew W. Myers

c: Mr. D. S. Collins, 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)

Mary E. O'Reilly  
FirstEnergy Legal Department  
76 South Main Street  
Akron, OH 44308

I, Marc P. Pearson, being duly sworn, state that I am Director, Plant Services 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

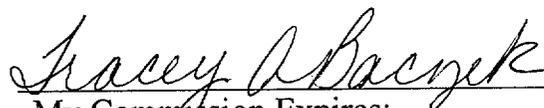


Marc P. Pearson  
Director, Plant Services - FENOC

STATE OF PENNSYLVANIA

COUNTY OF BEAVER

Subscribed and sworn to me, a Notary Public, in and for the County and State above named, this 21 th day of February, 2000.

  
My Commission Expires:

Notarial Seal  
Tracey A. Baczek, Notary Public  
Shippingport Boro, Beaver County  
My Commission Expires Aug. 16, 2001  
Member Pennsylvania Association of Notaries



ATTACHMENT A

Beaver Valley Power Station, Unit No. 1  
License Amendment Request No. 279  
UFSAR SECTION 1.8 REVISION

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The following is a list of the affected pages:

Affected UFSAR Pages: Table 1.8-1, Page 3 of 5  
Table 1.8-2, Page 1 of 3  
Table 1.8-2, Page 2 of 3

**Present and Proposed Words for BVPS-1 UFSAR Section 1.8.1**  
**"Austenitic Stainless Steel Material Control"**

**Present UFSAR Wording**

Table 1.8-1, Reactor Coolant System Major Component/Part Material

Table 1.8-2, Reactor Coolant Pressure Boundary Materials, Class I and II Auxiliary Components

These tables list various stainless steel types for bolting and nuts used on reactor coolant stop valves, motor and manual operated gate and check valves, air operated valves, and other (2 inches and less) miscellaneous valves.

**Proposed UFSAR Wording**

References to stainless steel bolting and nuts will be deleted for the components listed above (see attached marked up UFSAR pages).

TABLE 1.8-1 (CONT'D)

REACTOR COOLANT SYSTEM  
MAJOR COMPONENT/PART MATERIALS

<u>Pressurizer Components</u> <u>(Cont'd)</u>	<u>ASME Code, ANSI or AWS</u> <u>Material<sup>(2)</sup></u>
Cladding	Stainless Steel Weld Metal Analysis A-7
Closure Bolting	SA540
Pressurizer Safety Valve Forgings	SA182 Type F316
Support Skirt	SA516 Grade 70
Instrument Tube Coupling	SA182 F316
Internal Plate	SA240 Type 304
Instrument Tubing	SA213 Type 316
Heater Well Tubing	SA213 Type 316 Seamless
Heater Well Adaptor	SA182 F316
<u>Pressurizer Relief Tank<sup>(1)</sup></u>	
Shell	ASTM A-285 Grade C
Heads	ASTM A-285 Grade C
Internal Coating	Amercoat 55
<u>Reactor Coolant Stop Valves</u>	
Body and Bonnet	SA351 Gr CF8, CF8A or CF8M
Stem	SA564 Gr 630 Cond 1100°F Heat Treatment
<del>Closure Bolting &amp; Nuts</del>	<del>SA453 Gr 660 and SA193 Gr B6</del>
<u>Reactor Coolant Pump</u>	
Pressure Forgings	SA182 Type 304, 316 or 348
Pressure Castings (i.e., impeller, casing)	SA351 Gr CF8, CF8A or CF8M
Tube & Pipe	SA213, SA376 or SA312 - Seamless Type 304 or 316

TABLE 1.8-2

REACTOR COOLANT PRESSURE BOUNDARY MATERIALS  
CLASS I AND II AUXILIARY COMPONENTS

<u>Valves</u>	<u>ASME Code Material</u> <sup>(1)</sup>
<u>Motor and Manual Operated Gate and Check Valves</u>	
Bodys	SA182 Gr F316
Bonnets	SA182 Gr F316
Discs	SA182 Gr F316
Stems	SA564 Type 630 Cond 1100°F Heat Treatment
<del>Closure Bolting &amp; Nuts</del>	<del>SA453 Gr 660 and SA194 Gr B6</del>
<u>Air Operated Valves</u>	
Bodys	SA182 Type F316 or SA351 Gr CF8 or CF8M
Bonnets	SA182 Type F316 or SA351 Gr CF8 or CF8M
Discs	SA182 Type F316 or SA564 Gr 630 Cond 1100°F Heat Treatment
Stems	SA182 Type F318 or SA564 Gr 630 Cond 1100°F Heat Treatment
<del>Closure Bolting &amp; Nuts</del>	<del>SA453 Gr 660 and SA194 Gr B6</del>
<u>Auxiliary Relief Valves</u>	
Forgings	SA182 Type F316
Disc	SA479 Type 316
<u>Miscellaneous Valves (2 inches and less)</u>	
Bodys	SA479 Type 316 or SA351 Gr CF8
Bonnets	SA479 Type 316 or SA351 Gr CF8
Discs	SA479 Type 316
Stems	SA479 Type 410 or Type 304

TABLE 1.8-2 (CONT'D)

REACTOR COOLANT PRESSURE BOUNDARY MATERIALS  
CLASS I AND II AUXILIARY COMPONENTS

ASME Materials<sup>(1)</sup>

<del>Closure Bolting &amp; Nuts</del>	<del>SA453 Gr 660 and SA193 Gr B6</del>
<u>Auxiliary Heat Exchangers</u>	
Heads	SA182 Gr F304 or SA240 Type 304 or 316
Flanges	SA182 Gr F304 or F316
Flange Necks	SA182 Gr F304 or SA240 Type 316 or SA312 Type 304 Seamless
Tubes	SA213 TP304
Tube Sheets	SA240 Type 304 or 316 or SA182 Gr F304 or SA515 Gr 70 with Stainless Steel Weld Metal Analysis A-7 Cladding
Shells	SA351 Gr CF8
Pipe	SA312 Type 304 Seamless
<u>Auxiliary Pressure Vessels, Tanks, Filters, etc.</u>	
Shells & Heads	SA240 Type 304 or SA264 Type 304 Clad to SA516 Gr 70 or SA516 Gr 70 with Stainless Steel Weld Metal Analysis A-7 Cladding
Flanges & Nozzles	SA182 Gr F304 and SA105 or SA350 Gr LF2 with Stainless Steel Weld Metal Analysis A-7 Cladding
Piping	SA312 TP304 or TP316 Seamless
Pipe Fittings	SA403 WP304 Seamless
Closure Bolting & Nuts	SA193 Gr B7 or B8 and SA194 Gr 2H

## ATTACHMENT B

Beaver Valley Power Station, Unit No. 1  
License Amendment Request No. 279  
REACTOR COOLANT SYSTEM BOLTING REVISION

### A. DESCRIPTION OF AMENDMENT REQUEST

The proposed amendment would revise the Unit 1 UFSAR descriptions for bolting used on some Reactor Coolant System (RCS) components.

This amendment is being requested in accordance with 10 CFR 50.59(c) because it has been identified that NRC approval is needed to address a new failure mode of safety related equipment that had not been previously considered for Unit 1.

### B. DESIGN BASES

The RCS consists of three heat transfer loops connected in parallel to the reactor vessel. Chapter 4 of the Beaver Valley Power Station (BVPS) Unit 1 Updated Final Safety Analysis Report (UFSAR) describes the RCS and the reactor coolant pressure boundary design criteria. The RCS design basis information is provided in Section 4.1.

The RCS is of primary importance with respect to its safety function in protecting the health and safety of the public. Those systems and components of the unit which are essential to the prevention, or the mitigation of the consequences, of nuclear accidents which could cause undue risk to the health and safety of the public are identified and designed, fabricated, and erected to quality standards that reflect the importance of the safety function to be performed. Quality standards of material selection, design, fabrication and inspection conform to the applicable provisions of recognized codes and good nuclear practice (Section 4.1.6 of the BVPS Unit 1 UFSAR). Details of the quality assurance programs, test procedures and inspection acceptance levels are given in Section 4.3 and 4.5 of the BVPS Unit 1 UFSAR. The reactor coolant pressure boundary is designed, fabricated, and constructed so as to have an exceedingly low probability of gross rupture or significant uncontrolled leakage throughout its design lifetime.

Section 1.8 of the BVPS Unit 1 UFSAR describes special considerations with regard to the materials used in RCS and reactor coolant pressure boundary.

An Unreviewed Safety Question (USQ) pursuant to 10 CFR 50.59 results from the differences in the body to bonnet fastener materials identified on Tables 1.8-1 and 1.8-2 in UFSAR Revision 13 as compared to the materials that were actually installed during original construction. The as-installed carbon steel fasteners are susceptible to boric acid degradation, while the stainless steel material identified in the UFSAR Tables 1.8-1 and 1.8-2 is highly resistant to corrosive damage by boric acid. Thus a new failure

mechanism has been introduced and the probability of occurrence of a malfunction of equipment important to safety may be increased.

### C. JUSTIFICATION

The condition being reviewed concerns the materials identified for the body to bonnet closure fasteners and their increased susceptibility to boric acid corrosion. The BVPS Unit 1 UFSAR identifies in Tables 1.8-1 and 1.8-2 a corrosion resistant material, ASTM SA453 Grade 660, as the material installed; when in fact, the materials of construction for the body to bonnet fasteners for nearly all the flange joints at BVPS Unit 1 are carbon steel. This information provided in UFSAR Tables 1.8-1 and 1.8-2 originated as part of the response to a 1973 Atomic Energy Commission (AEC) question 5.3.4 concerning the identification of unstabilized stainless steels that were utilized within the Reactor Coolant System. The response to this question was incorporated into the original edition of the UFSAR. Thus the error in the identification of the materials of construction for the body to bonnet fasteners pre-dated Revision 0 of the BVPS Unit 1 UFSAR (1/82).

Although all components within the scope of the references in Table 1.8-1 and 1.8-2 have not been explicitly reviewed for compliance to the materials identified within the Tables, the components explicitly reviewed were found to have materials other than those identified on the Tables. There is not a need to explicitly review the balance of the components for compliance to the Tables 1.8-1 and 1.8-2 since a conservative position was taken in assuming that all the fasteners identified in Tables 1.8-1 and 1.8-2 are carbon steel rather than corrosion resistant material as identified in the tables. Additionally, from a Code perspective, the components were built to ANSI 16.5, ANSI 16.34 or ASME Section III Code and these codes allow the designer to use stainless steel or carbon steel fasteners so either material meets the requirements of the design code. If the designer opted to use stainless steel fasteners no corrosion issue would exist and if the designer opted to use carbon steel fasteners, the Beaver Valley Power Station Boric Acid Corrosion Program would adequately monitor the joint for potential degradation.

There are no additional compensatory measures being recommended or taken to address the identified concern. Beaver Valley Power Station already has in place a Boric Acid Corrosion Program (Procedures QSP 9.4 and VT-510) that includes systematic measures to ensure boric acid corrosion will not lead to the degradation of the reactor coolant pressure boundary. The NRC, in Generic Letter (GL) 88-05, recognized that boric acid solution leaking from the reactor coolant system can cause significant corrosion damage to carbon steel materials. In the GL, the NRC requested that licensees provide assurances that a boric acid monitoring program has been implemented. This program was to consist of systematic measures to ensure that boric acid corrosion does not lead to degradation of the assurance that the reactor coolant pressure boundary will have an extremely low

probability of abnormal leakage, rapidly propagating failure, or gross rupture. The Beaver Valley Power Station response to the GL provided assurance that a program was in place and committed to enhancements to the existing program (Reference: Duquesne Light Company letter dated May 31, 1988). An NRC follow-up review was conducted in August of 1988, and the DLC program was found acceptable and was noted by the NRC as fulfilling the requirements of GL 88-05 (Reference: NRC Inspection Report Nos. 50-334/88-23 and 50-334/88-25 dated August 24, 1988).

Carbon steel materials, such as the installed SA 540, are more susceptible to corrosive damage from borated water leakage than the SA 453 stainless steel materials identified in the UFSAR. This concern is mitigated by the Boric Acid Corrosion Program which has systematic measures to ensure that boric acid corrosion will not lead to degradation of the reactor coolant pressure boundary.

In addition to the Boric Acid Corrosion Program, the body to bonnet configuration for the fasteners identified in Table 1.8-1 and 1.8-2 result in multiple fasteners for each joint. To meet the requirements of the design Codes (ANSI or ASME) for valves, the number of fasteners installed is in excess of the number of fasteners required to perform the structural function of maintaining the pressure boundary. Additionally, it is highly unlikely that all the installed fasteners would corrode in such a manner that catastrophic failure of the body to bonnet joint would result. Therefore, the multiple installed fasteners result in an installed backup to the minimum required number of fasteners necessary to maintain pressure boundary integrity.

Thus, it can be concluded that the Boric Acid Corrosion Program provides adequate assurances that abnormal leakage will be identified and corrective actions taken prior to significant boric acid corrosion degradation of carbon steel pressure boundary components.

#### D. SAFETY ANALYSIS

The identified USQ results from the introduction of a condition that may increase the probability of failure in equipment described in the UFSAR. However, this condition does not represent a condition detrimental to nuclear safety nor adverse to plant operability. The mitigating boric acid leakage inspection programs developed and applied over the past fifteen years provides reasonable assurances that boric acid corrosion will not lead to degradation within the borated systems that would prevent the safe operation of the plant.

Thus, it is recommended that the reference to the materials of construction for the body to bonnet fasteners identified within UFSAR Tables 1.8-1 and 1.8-2 be removed. The revised UFSAR Tables are shown in Attachment A-1.

E. NO SIGNIFICANT HAZARDS EVALUATION

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 use of carbon steel fasteners in a borated system introduces a new failure mechanism for the fasteners, that of boric acid wastage. The materials currently specified in the BVPS Unit 1 UFSAR are not susceptible to boric acid wastage. The probability of failure for all systems may be increased due to the additional failure mode introduced by change from corrosion resistant material to carbon steel for RCS and reactor coolant pressure boundary fasteners.

The design requirements of the ANSI and ASME Codes are conservative in nature, in that, the stress allowable for fastener materials is less than half the yield strength of the material, thus creating a margin in the design of two or greater on structural strength. Therefore, the failure or damage of one or more non-adjacent

fasteners can normally be accommodated. Additionally, the material properties (Yield and Tensile strength) of the installed (SA540 Grade B Class 23 or 24) carbon steel fasteners are higher than that of the material identified in the UFSAR (SA453 Grade 660). It should also be noted that the use of either the carbon steel fasteners (those installed) or the stainless steel fasteners (those identified in the UFSAR) is acceptable by the design Codes (ANSI and ASME), the selection of the material for the fasteners is at the discretion of the designer and is not specified by Code requirements. When compared to carbon steel fasteners, the corrosion resistance of Grade 660 material is pertinent only if leakage is actively occurring.

The boric acid wastage concern is mitigated by the Boric Acid Corrosion Program which has systematic measures to ensure that boric acid corrosion will not lead to degradation of the reactor coolant pressure boundary. This Boric Acid Corrosion Program with its inspections provides adequate assurances that abnormal leakage will be identified and corrective actions taken prior to significant boric acid corrosion degradation of carbon steel pressure boundary components.

The NRC, in Generic Letter (GL) 88-05, recognized that boric acid solution leaking from the reactor coolant system can cause significant corrosion damage to carbon steel materials. In the GL, the NRC requested that licensees provide assurance that a boric acid monitoring program has been implemented. This program was to consist of systematic measures to ensure that boric acid corrosion does not lead to degradation of the assurance that the reactor coolant pressure boundary will have an extremely low probability of abnormal leakage or rupture. The Beaver Valley Power Station response to the GL provided assurance that a program was in place and committed to enhancements to the existing program. An NRC follow-up review was conducted and the Beaver Valley Power Station program was found to be acceptable and fulfilling the requirements of GL 88-05 (Reference: NRC Inspection Report Nos. 50-334/88-23 and 50-334/88-25)

Therefore, the proposed changes to BVPS Unit 1 UFSAR Tables 1.8-1 and 1.8-2 do not significantly increase the probability or consequences of any accident previously evaluated in the BVPS Unit 1 UFSAR.

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

During an evaluation of the fastener material to be used for the replacement of a degraded fastener, it was discovered that the BVPS Unit 1 UFSAR Tables 1.8-1 and 1.8-2 identified that corrosion resistant materials, SA453 Grade 660, were identified as being installed. The use of carbon steel fasteners in lieu of the SA453

Grade 660 fasteners identified in the UFSAR introduces the potential failure mechanism of boric acid corrosion. The corrosion damage that has occurred on MOV-RC-591 and MOV-CH-310 bolting demonstrates that corrosion damage from unchecked borated water leakage is damaging to carbon steel fasteners. Additionally, it should be noted that both of these degraded conditions were identified and repaired prior to an operational or structural concern through the application of the Boric Acid Corrosion Program.

In the design condition (non-corroded), the change to carbon steel fasteners would not affect the design basis accidents described in the UFSAR. The boric acid wastage concern is mitigated by the Boric Acid Corrosion Program which has systematic measures to ensure that boric acid corrosion will not lead to degradation of the reactor coolant pressure boundary.

In addition to the Boric Acid Corrosion Program, the body to bonnet configuration for the fasteners identified in Table 1.8-1 and 1.8-2 result in multiple fasteners for each joint. To meet the requirements of the design Codes (ANSI or ASME) for valves, the number of fasteners installed is in excess of the number of fasteners required to perform the structural function of maintaining the pressure boundary. Additionally, it is highly unlikely that all the installed fasteners would corrode in such a manner that catastrophic failure of the body to bonnet joint would result. Therefore, the multiple installed fasteners result in an installed backup to the minimum required number of fasteners necessary to maintain pressure boundary integrity.

Thus, the assumptions and consequences of the loss of pressure boundary integrity type of accident would be unchanged and would not introduce a new or different kind of accident as currently evaluated in the BVPS Unit 1 UFSAR based on the Boric Acid Corrosion Program preventing any unacceptable boric acid wastage in accordance with GL 88-05.

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

The proposed change in the Unit 1 UFSAR removing criteria requiring stainless steel fasteners for RCS and reactor coolant pressure boundary components would not involve a significant reduction in the margin of safety since current Technical Specification requirements remain unchanged and current plant programs (i.e., Boric Acid Corrosion Program inspections) provide adequate assurance from the likelihood of corroded fasteners causing an operational issue. NRC reviewed the Beaver Valley Power Station Boric Acid Corrosion Program and found the

program to be acceptable to fulfill the requirements of GL 88-05 (Reference: NRC Inspection Report Nos. 50-334/88-23 and 50-334/88-25)

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.

H. UFSAR CHANGES

UFSAR changes are required. See Attachment A-1.