ATTACHMENT A

Beaver Valley Power Station, Unit No. 1
Proposed Technical Specification Change No. 202
MARKED UP PAGES

Revise the Technical Specification as follows:

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3/4.9.14 SPENT FUEL STORAGE POOL

LIMITING CONDITION FOR OPERATION

3.9.14 Fuel is to be stored in the spent fuel storage pool with:

a. The boron concentration in the spent fuel pool maintained greater than or equal to 1050 ppm when moving fuel in the spent fuel pool; and

b. Fuel assembly storage in Region 1 restricted to fuel with an enrichment less than or equal to 5.0 w/o U235; and

~~1) 4.5 w/o stored in a 2 of 4 checkerboard configuration; or~~

~~2) 4.0 w/o stored in a 3 of 4 checkerboard configuration; and~~

c. Fuel assembly storage in Region 2 restricted to fuel which has been qualified in accordance with Table 3.9-1 or a criticality analysis.

APPLICABILITY: During storage of fuel in the spent fuel pool.

ACTION:

a. Suspend all actions involving movement of fuel in the spent fuel pool if it is determined a fuel assembly has been placed in the incorrect Region until such time as the correct storage location is determined. Move the assembly to its correct location before resumption of any other fuel movement.

b. Suspend all actions involving the movement of fuel in the spent fuel pool if it is determined the pool boron concentration is less than 1050 ppm, until such time as the boron concentration is increased to 1050 ppm or greater.

c. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.14.1 Prior to placing fuel or moving fuel in the spent fuel pool, verify through fuel receipt records for new fuel, ~~or~~ by burnup analysis and comparison with Table 3.9-1, or by a criticality analysis that fuel assemblies to be placed into or moved in the spent fuel pool are within the above enrichment limits.

4.9.14.2 Verify the spent fuel pool boron concentration is ≥ 1050 ppm:

a. Within 8 hours prior to and at least once per 24 hours during movement of fuel in the spent fuel pool, and

b. At least once per 31 days.

TABLE 3.9-1

BEAVER VALLEY FUEL ASSEMBLY MINIMUM BURNUP VS. INITIAL U235 ENRICHMENT FOR STORAGE IN REGION 2 SPENT FUEL RACKS

Initial U235 Enrichment	Assembly Discharge Burnup (MWD/MTU)
~~3.1~~ 2.0	~~0~~ 2585
~~3.3~~ 2.5	~~1.6~~ 9551
~~3.5~~ 3.0	~~3.0~~ 15784
~~3.7~~ 3.5	~~4.4~~ 21643
~~3.9~~ 4.0	~~5.8~~ 27260
~~4.1~~ 4.5	~~7.2~~ 33710
~~4.3~~ 5.0	~~8.5~~ 40000
~~4.5~~	~~9.7~~

~~NOTE: Linear interpolation yields conservative results.~~

NOTE: The data in the above table may be either interpreted linearly or may be calculated by the conservative equation below. This equation provides a linear fit to the design burnup limits.

Limiting burnup, MWD/MTU = 12100 * E% - 20500

where E = Enrichment (E ≤ 5%)

3/4.9.10 AND 3/4.9.11 WATER LEVEL - REACTOR VESSEL AND STORAGE POOL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the accident analysis.

3/4.9.12 and 3/4.9.13 FUEL BUILDING VENTILATION SYSTEM

The limitations on the storage pool ventilation system ensure that all radioactive material released from an irradiated fuel assembly will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the accident analysis. The spent fuel pool area ventilation system is non-safety related and only recirculates air through the fuel building. The SLCRS portion of the ventilation system is safety- related and maintains a negative pressure in the fuel building. The SLCRS flow is normally exhausted to the atmosphere without filtering, however, the flow is diverted through the main filter banks by manual actuation or on a high radiation signal.

3/4.9.14 FUEL STORAGE - SPENT FUEL STORAGE POOL

The requirements for fuel storage in the spent fuel pool ensure that: (1) the spent fuel pool will remain subcritical during fuel storage; and (2) a uniform boron concentration is maintained in the water volume in the spent fuel pool to provide negative reactivity for postulated accident conditions under the guidelines of ANSI 16.1-1975. The value of 0.95 or less for keff which includes all uncertainties at the 95/95 probability/confidence level is the acceptance criteria for fuel storage in the spent fuel pool.

The Action Statement applicable to fuel storage in the spent fuel pool ensures that: (1) the spent fuel pool is protected from distortion in the fuel storage pattern that could result in a critical array during the movement of fuel; and (2) the boron concentration is maintained at ≥ 1050 ppm (this includes a 50 [650] ppm conservative allowance for uncertainties) during all actions involving movement of fuel in the spent fuel pool.

The Surveillance Requirements applicable to fuel storage in the spent fuel pool ensure that: (1) the fuel assemblies satisfy the analyzed U-235 enrichment limits or an analysis has been performed and it was determined that Keff is ≤ 0.95; and (2) the boron concentration meets the 1050 ppm limit.

The enrichment limitations for storage of fuel in Region 1 of ~~a 3 of 4 array in~~ the spent fuel pool is based on a nominal region average enrichment with individual fuel assembly tolerance of + or - 0.05 w/o of 5.0 w/o U-235.

FUEL STORAGE - SPENT FUEL STORAGE POOL (Continued)

INSERT 1

The results of the spent fuel pool criticality analysis (August 1986) for Westinghouse STD/Vantage 5H and OFA/Vantage 5 fuel in three of four storage locations show that there is more than 0.3% margin to the keff limit of 0.95 with all uncertainties included. Based on the sensitivity study completed with this analysis, an increase in the maximum allowed enrichment for fuel stored in the spent fuel storage racks from 4.00 to 4.05 w/o will increase the maximum rack keff by less than 0.002. Therefore, with Westinghouse 17 x 17 STD/Vantage 5H and OFA/Vantage 5 fuel enriched at 4.05 w/o stored in the spent fuel racks in three of four storage locations and with all of the assumptions and conservatisms presented in the criticality analysis, the maximum rack keff will be less than 0.95.

3/4.9.15 CONTROL ROOM EMERGENCY HABITABILITY SYSTEMS

The OPERABILITY of the control room emergency habitability system ensures that the control room will remain habitable for operations personnel during and following all credible accident conditions. The ambient air temperature is controlled to prevent exceeding the allowable equipment qualification temperature for the equipment and instrumentation in the control room. The OPERABILITY of this system in conjunction with control room design provisions is based on limiting the radiation exposure to personnel occupying the control room to 5 rem or less whole body, or its equivalent. This limitation is consistent with the requirements of General Design Criteria 19 of Appendix "A", 10 CFR 50.

Insert 1

Bases 3/4.9.14 FUEL STORAGE - SPENT FUEL STORAGE POOL

The reracked spent fuel consists of two discrete regions. Region 1 is configured to store fuel with a maximum enrichment of 5.0 w/o. The most reactive of the Westinghouse 17 X 17 STD/Vantage 5H and OFA fuel assemblies yielded a maximum Keff of 0.940 including all biases and uncertainties.

Region 2 racks are designed to store fuel with burnup consistent with its initial enrichment. A table of enrichment and corresponding required burnup is provided in the Technical Specification. A conservative value of the required burnup is given by the following linear equation:

> Minimum burnup for unrestricted storage in Region 2 in MWD/MTU = 12100 * E% - 20500, where E is the initial enrichment in w/o.

The maximum reactivity in Region 2 is 0.945 if all cells are loaded with fuel with minimum allowable burnup. This includes all biases and uncertainties and appropriate allowance for uncertainty in depletion calculations.

Storage cells in Region 2 which face the pool wall are capable of maintaining the Keff below 0.95 with fuel which does not meet the foregoing burnup restriction. A separate calculation to establish the admissibility of storing low burnup fuel in a Region 2 peripheral cell will be required on a case-by-case basis. The calculation to demonstrate subcriticality for the proposed storage of low burnup fuel will be performed using the same analytical models and computer codes which were used in the high density rack design.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 4.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 9370 cubic feet at a nominal Tavg of 525°F.

5.5 EMERGENCY CORE COOLING SYSTEMS

5.5.1 The emergency core cooling systems are designed and shall be maintained in accordance with the original design provisions contained in Section 6.3 of the FSAR with allowance for normal degradation pursuant to the applicable Surveillance Requirements.

5.6 FUEL STORAGE

CRITICALITY

5.6.1 The spent fuel storage racks are designed ~~with a minimum of 12.0625 inch center-to-center distance between fuel assemblies placed in the storage racks.~~ in a two region configuration. Region 1 racks are of the poisoned flux-trap type with the storage cells arranged at 10.82 inch pitch. The Region 2 racks are of the poisoned non-flux-trap construction with a cell-to-cell pitch of 9.02 inches. The fuel will be stored in accordance with the provisions described in UFSAR Sections 3.3 and 9.12 to ensure a keff equivalent to ≤0.95 with the storage pool filled with unborated water.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 750' - 10".

CAPACITY

5.6.3 The fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than ~~833~~ 1627 fuel assemblies. |

5.7 SESIMIC CLASSIFICATION

5.7.1 Those structures, systems and components identified as Category I Items in Appendix "B" of the FSAR shall be designed and maintained to the original design provisions with allowance for normal degradation pursuant to the applicant Surveillance Requirements.

5.8 METEOROLOGICAL TOWER LOCATION

5.8.1 The meteorological tower shall be located as shown on Figure 5.1-1.

ATTACHMENT B

Beaver Valley Power Station, Unit No. 1
Proposed Technical Specification Change No. 202
REVISION OF TECHNICAL SPECIFICATIONS 3.9.14, 5.6.1, 5.6.3
RERACKING SPENT FUEL POOL

A. DESCRIPTION OF AMENDMENT REQUEST

The proposed amendment would allow the fuel rack storage capacity in the spent fuel pool to be increased to 1625 locations. A total of 13 free-standing rack modules in a Discrete Zone Two Region storage system will be installed in the BV-1 fuel pool. Two modules containing a total of 162 storage cells shall be defined as Region 1, which would permit storage of fresh fuel up to 5% (nominal) U-235 enrichment. The balance of the cells, Region 2, will have an enrichment/burnup restriction on them.

B. BACKGROUND

Beaver Valley Power Station Unit 1 (BV-1) has a spent fuel pool (SFP) which at the present time contains spent fuel storage racks with 832 total storage cells. The present racks provide adequate capacity for storage of spent fuel while maintaining reserve full core discharge capacity through 1996. Therefore, to ensure that sufficient spent fuel storage capacity continues to exist at BV-1, we have contracted for high density spent fuel storage racks from Holtec International whose design incorporates Boral as a neutron absorber in the cell walls. The new racks have an ultimate storage capacity of 1625 fuel assemblies (excluding two storage cans for defective fuel), which is expected to extend the full core reserve storage capability until the year 2013.

The new free-standing high density spent fuel storage racks will store fuel in two discrete regions of the SFP. Region 1 includes two modules having a total of 162 storage cells. Each cell is designed for storage of fuel assemblies with Uranium-235 initial enrichments up to 5.0 wt% while maintaining the required subcriticality ($k_{eff} \leq 0.95$). Region 2 includes 11 modules having a total of 1463 storage cells, which are available for storage of spent fuel assemblies. This region is designed to store fuel which has experienced sufficient burnup such that storage in Region 1 is not required.

The high density spent fuel storage rack cells are fabricated from 0.075" thick type 304L stainless steel sheet material. In Region 1, panels of the Boral neutron absorber material are between the cell walls and stainless steel retainers, and the cells are separated by a specified water gap. In Region 2, the Boral panels are located between the stainless steel walls without a water gap. The cells are welded together in a specified manner resulting in a free-standing structure which is structurally qualified for all postulated seismic events. The nominal center-to-center spacings of the cells within Region 1 are 10.82" in both orthogonal directions. The nominal pitch in Region 2 is 9.02".

Since spent fuel is presently stored in the BV-1 SFP, special administrative controls and/or procedures will be developed to minimize radiation exposure during the installation of the new spent fuel racks. The evaluation of postulated accidents with respect to nuclear criticality and/or radioactivity release has shown acceptable results, in that k_{eff} does not exceed 0.95, including uncertainties, and postulated radiological releases do not exceed 10 CFR 100 acceptance criteria.

C. JUSTIFICATION

The proposed change to the Technical Specification entails increasing the storage cell count to 1625, increasing the allowable fuel enrichment to 5%, and modifying the burnup restrictions imposed on fuel stored in Region 2.

The new storage system will differ from the existing storage in the following key aspects:

1. The existing racks are of the End Connected Construction (ECC) which are quite limited in their structural strength. As such, the existing racks provide a rather small margin against increased seismic loadings or increased fuel weights (such as a consolidated fuel bundle). The new racks are designed to withstand considerably higher seismic loads than those postulated for BV-1.

2. The existing racks are of anchored construction; the new racks are free-standing. The anchored racks induce thermal stresses in the pool structure due to differential expansion between the racks and the pool slab. The new racks will free the pool structure from this avoidable loading.

3. The new racks can withstand considerably higher impact loads than the existing racks.

4. The fuel storage pattern in the new racks is simpler than that for the existing racks because it does not require checkerboarding of fuel in Region 1.

5. The new racks employ a proven neutron absorber material (Boral) with prior application in over 30 plants. The old racks relied on water alone for neutron attenuation.

In summary, the reracked BV-1 pool will embody numerous features which enhance safety and reliability. As the safety analysis in the following section indicates, there is adequate justification for proceeding with the proposed changes to the BV-1 storage system.

D. SAFETY ANALYSIS

1. Affected Systems

The following systems and subsystems are potentially affected by the proposed modification:

a. <u>Storage Racks</u>

The spent fuel storage array in the pool is directly affected since the existing racks will be replaced with free-standing new high density racks.

b. <u>Spent Fuel Pool Cooling System</u>

Because the stored quantity of fuel in the BV-1 fuel pool will be greater than the presently licensed inventory, the decay heat load will be greater than the licensing basis value. A reassessment of the fuel pool cooling system has indicated its adequacy.

c. <u>Pool Structure</u>

No modification to the pool structure itself is necessary to accommodate the proposed expansion. However, the wall attachments will be trimmed if under the top of the racks.

d. <u>HVAC System</u>

The rate of water evaporated from the fuel pool will increase due to elevated pool water temperature. The increased moisture load on the HVAC system has been determined to be acceptable.

e. <u>Purification System</u>

The radionuclides released to the pool water may increase due to the increase in the stored fuel inventory. This may affect the ability of the purification system to maintain water purity in the fuel pool. Radiological evaluations show that the existing system is adequate to handle the purification load.

2. Safety Functions

The safety function or functions of the affected systems, subsystems or components listed are described herein.

a. Storage Racks: The storage racks provide for vertical upright storage of new or spent fuel assemblies in prismatic cell openings. The racks are designed to maintain structural integrity during and after a DBE or OBE event.

b. Cooling System: Two trains of the spent fuel pool cooling system remove decay heat from the spent fuel discharged from the reactor. The single train of the cooling system maintains the pool water bulk temperature below 165°F, low enough to prevent boiling under normal full core offload condition.

c. Spent Fuel Pool: The spent fuel pool provides wet storage for spent fuel which is stored inside the rack. The racks are designed to store the spent fuel in such a manner as to maintain subcriticality during normal and abnormal conditions. The pool floor slab provides the requisite support for the storage rack and fuel assembly system during normal and seismic conditions.

d. HVAC System: The HVAC system removes the heat and humidity generated by the diffusion of water vapor into the pool environment.

e. Purification System: The Purification System removes particulate and ionized impurities from the spent fuel pool to maintain pool water visibility. This system also helps maintain the desired pH balance in the fuel pool.

3. Safety Evaluations

The safety evaluations are detailed in the attached licensing report, "Spent Fuel Pool Modifications for Increased Storage Capacity", Beaver Valley Power Station Unit 1, Docket No. 50-334, Holtec Report HI-92791.

The mechanical design of the racks meets all required safety functions stipulated for this equipment in the BV-1 UFSAR. Details of the mechanical configuration are described in Section 6.0 of the licensing report.

The proposed rack arrays have been analyzed to establish their structural integrity under OBE and DBE loadings. Details of the analysis are described in Section 6.0 of the licensing report.

The proposed storage expansion will increase the heat load in the pool. However, analysis has shown that the maximum cladding temperature is kept low enough by the existing spent fuel pool cooling system such that nucleate boiling or voiding of coolant on the surface of the fuel rod cladding is precluded. The increased pool bulk temperature increases the thermal loading on the reinforced concrete structure and liner of the fuel pool. The increase occurred for both normal and abnormal conditions. Reanalysis of the pool structure, however, demonstrated that the integrity of the pool structure and the pool liner is maintained. Details of the analysis are presented in Section 8.0 of the licensing report.

It has been determined that the existing purification system is adequate to handle the increased radiological burden in Section 9.0.

The increased evaporation from the pool due to elevated water temperature is safely handled by the HVAC System in Section 11.0.

The planned expansion will not increase crud deposition in the spent fuel pool since crud deposition occurs during refueling outages and new fuel racks will not affect operation of clean-up system and/or handling of fuel during refueling outages. The pool clean-up system effectively maintains water clarity and no increase in activity of the clean-up system filters or resins is anticipated.

4. Safety Margins

The NRC Staff Evaluation Review process has established that the issue of margin of safety, when applied to a reracking modification, should address the following areas:

a. Nuclear criticality considerations

b. Thermal-hydraulic considerations

c. Mechanical, material and structural considerations

The established acceptance criterion for criticality is that the neutron multiplication factor in spent fuel pools shall be less than or equal to 0.95, including all uncertainties, under all conditions. This margin of safety has been adhered to in the criticality analysis methods for the new rack design.

The methods used in the criticality analysis conform to the applicable portions of the appropriate NRC guidance and industry codes, standards, and specifications. In meeting the acceptance criteria for criticality in the spent fuel pool, such that k_{eff} is always less than 0.95 at a 95%/95% probability tolerance level, the proposed amendment does not involve a reduction in the margin of safety for nuclear criticality, as defined in the UFSAR.

The finite element method was used to evaluate the margins of the spent fuel pool concrete structure. The analysis is in accordance with SRP 3.8.4. The evaluation demonstrates that the strength margin of safety of the fuel pool structure is maintained.

Conservative methods were used to calculate the maximum fuel temperature and the increase in temperature of the water in the spent fuel pool. The thermal-hydraulic evaluation used the methods previously employed for evaluations of the present spent fuel racks to demonstrate that the temperature margins of safety are maintained. The proposed modification will increase the heat load in the spent fuel pool. The evaluation shows that the existing spent fuel cooling system will maintain the bulk pool water temperature at or below 165°F. Thus, it is demonstrated that the peak value of the pool bulk temperature is considerably lower than the pool bulk boiling temperature (212°F). The evaluation also shows that maximum local water temperatures along the hottest fuel assembly are below the nucleate boiling condition value. Thus, there is no reduction in the margin of safety for thermal-hydraulic or spent fuel cooling concerns, as defined in the UFSAR.

The main safety function of the spent fuel racks is to maintain the spent fuel assemblies in a safe configuration through all normal or abnormal loadings. Abnormal loadings which have been considered are the effect of an earthquake and the impact due to the drop of a spent fuel assembly. The mechanical, material, and structural design of the new spent fuel racks is in accordance with applicable portions of NRC "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications", dated April 14, 1978, as modified January 18, 1979; and other applicable NRC guidance and industry codes. The rack materials used are compatible with the spent fuel pool and the spent fuel assemblies. The structural considerations of the new racks address margins of safety against tilting and deflection or movement, such that the racks do not impact each other during the postulated seismic events. In addition, the spent fuel assemblies remain intact and no criticality concerns exist. Thus, the margins of safety as defined in the UFSAR are not reduced by the proposed rerack.

E. NO SIGNIFICANT HAZARDS EVALUATION

The no significant hazard considerations involved with the proposed amendment have been evaluated, focusing 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 proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   In the course of the analysis, the following potential accident scenarios have been considered:

   a. A spent fuel assembly drop in the spent fuel pool

   b. Loss of spent fuel pool cooling system flow

   c. A seismic event

   d. A spent fuel cask drop

   e. A construction accident

   The increased storage capacity of the BV-1 Spent Fuel Pit has been analyzed for the existing fuel handling equipment and procedures, spent fuel pit cooling system, and seismic events. The movement of the spent fuel shipping cask is conducted by the cask crane, which passes only over the isolated cask loading area. No cask movement is contemplated as part of this modification. The cask crane will be used to bring the racks into the Fuel Building. Thus, the proposed modification does not increase the <u>probability</u> of any of the first four accidents.

With regard to the construction accident, the BV-1 Technical Specifications prohibit loads heavier than the weight of a single spent fuel assembly plus the tool for moving that assembly from being carried over fuel stored in the spent fuel pool. All work in the spent fuel pool area will be controlled and performed in strict accordance with specific written procedures and administrative controls to preclude the movement of a rack directly over any fuel. Therefore the probability of a construction accident occurring is not significant as a result of the proposed reracking.

In addition, Sections 5.1.1, 5.1.2 and 5.1.6 of NUREG-0612, entitled "Control of Heavy Loads at Nuclear Power Plants", provide guidance for heavy load handling operations pursuant to a spent fuel storage rack replacement. Section 5.1.2 provides four alternatives for assuring the safe handling of heavy loads during a fuel storage rack replacement. Alternative (1) of Section 5.1.2 provides that the control of heavy loads guidelines can be satisfied by establishing that the potential for a heavy load drop is extremely small. The provisions of alternative (1) will be met during implementation of the subject application.

The load handling system over the BV-1 pool consists of a movable platform with two 5-ton electric hoists. A temporary crane with an ultimate load capacity greater than 10 times the maximum lift load will be installed for the reracking operation. The maximum weight of an individual new rack or existing rack is less than 13 tons. The weight of the lifting fixture is less than 2 tons. Therefore, the temporary crane will have an ultimate capacity of more than 150 tons. As per NUREG-0612, Appendix B, the substantial safety factor margin ensures that the probability of a rack drop is extremely low.

Accordingly, the proposed modification does not involve a significant increase in the probability of a load drop accident since NUREG-0612 guidelines for defense-in-depth to prevent load drop accidents have been satisfied.

The consequences of a spent fuel assembly drop in the spent fuel pool were evaluated and it was found that the criticality acceptance criterion, $k_{eff} \leq 0.95$, is not violated. In addition, it was found that there was no significant change in the radiological consequences of a fuel assembly drop from the previous analyses. Our analyses found that the calculated doses are well within 10 CFR 100 guidelines. The results of an analysis show that a dropped spent fuel assembly on the racks will not distort the racks such that they would not perform their safety function. Thus, the consequences of this type of accident are not significantly changed from the previously evaluated spent fuel assembly drops.

The consequences of a loss of spent fuel pool cooling system flow have been evaluated and it was found that sufficient time is still available to provide an alternate means for cooling in the event of a complete failure of the cooling system. Thus, the consequences of this type accident are not significantly increased from previously evaluated loss-of-cooling system flow accidents.

The consequences of a seismic event have been evaluated. The new racks will be designed and fabricated to meet the requirements of applicable portions of the NRC Regulatory Guides and published standards. The new free-standing racks are designed, as are the existing racks, so that the integrity of the racks and the pool structure is maintained during and after a seismic event. Thus, the consequences of a seismic event are not increased from previously evaluated events.

The probability and consequences of a spent fuel cask drop will not be affected by the replacement of the racks. The design of the cask loading crane prevents any cask movements over any region of the spent fuel pool which contains irradiated fuel.

The consequences of a construction accident have been considered. A heavy load will not be carried in the spent fuel pool area until all fuel in the pool has decayed for a minimum of two months. This provides sufficient time for decay of gaseous radionuclides in the fuel (gap activity) such that an assumed accidental release of gases from fuel damaged by a construction accident would result in a potential off-site dose less than 10% of 10 CFR 100 limits. In addition, there is no equipment which is essential to the safe shutdown of the reactor or employed to mitigate the consequences of an accident which is beneath, adjacent to, or otherwise within the area of influence of any loads that will be handled during the expansion modification. Therefore, the consequences of a construction accident are not significantly increased from previously evaluated events.

Therefore, it is concluded that the proposed amendment to replace the spent fuel racks in the spent fuel pool does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

The proposed modification was evaluated in accordance with the guidance of the NRC Position Paper entitled, "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications", appropriate NRC Regulatory Guides, appropriate NRC Standard Review Plans, and appropriate industry codes and standards. In addition, several previous NRC Safety Evaluation Reports for rerack applications similar to this proposed modification have been reviewed.

No unproven technology will be utilized either in the construction process or in the analytical techniques necessary to justify the planned fuel storage expansion. The basic reracking technology in this instance has been developed and demonstrated in over 80 applications for fuel pool capacity increases previously approved by the NRC.

The change to a two-region spent fuel pool requires the performance of additional evaluations to ensure that the criticality criterion is maintained. These include the evaluation of the limiting criticality condition, i.e., misplacement of an unirradiated fuel assembly of 5.0% enrichment into a Region 2 storage cell or outside and adjacent to a Region 2 rack module. The evaluation for this case shows that when the boron concentration meets the proposed technical specification requirement, the criticality criterion is satisfied. Although this change does pose the need to address additional aspects of a previously analyzed accident, it does not create the possibility of a previously unanalyzed accident.

Based upon the foregoing, it is concluded that the proposed reracking does not create the possibility of a new or different type accident from any accident previously evaluated.

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

The NRC Staff Safety Evaluation Review process has established that the issue of margin of safety, when applied to a reracking modification, should address the following areas:

a. Nuclear criticality considerations

b. Thermal-hydraulic considerations

c. Mechanical, material and structural considerations

The established acceptance criterion for criticality is that the neutron multiplication factor in spent fuel pools shall be less than or equal to 0.95, including all uncertainties, under all conditions. This margin of safety has been adhered to in the criticality analysis methods for the new rack design.

The methods used in the criticality analysis conformed to the applicable portions of the appropriate NRC guidance and industry codes, standards, and specifications, as listed in the Licensing Report. In meeting the acceptance criteria for criticality in the spent fuel pool, such that k_{eff} is always less than 0.95, including uncertainties at a 95%/95% probability confidence level, the proposed amendment does not involve a significant reduction in the margin of safety for nuclear criticality.

Conservative methods were used to calculate the maximum fuel temperature and the increase in temperature of the water in the spent fuel pool. The thermal-hydraulic evaluation used the methods previously employed for evaluations of the present spent fuel racks to demonstrate that the temperature margins of safety are maintained. The proposed modification will increase the heat load in the spent fuel pool. The evaluation shows that the existing spent fuel cooling system will maintain the bulk pool water temperature below 165°F. Thus, a margin of safety exists such that the maximum allowable temperature for bulk boiling is not exceeded for the calculated increase in pool heat load. The evaluation also shows that maximum local water temperatures along the hottest fuel assembly are below the nucleate boiling condition value. Thus, there is no significant reduction in the margin of safety for thermal-hydraulic or spent fuel cooling concerns.

The main safety function of the spent fuel pool and the racks is to maintain the spent fuel assemblies in a safe configuration through all normal or abnormal loadings. Abnormal loadings which have been considered are the effect of an earthquake, the impact due to a spent fuel cask drop, the drop of a spent fuel assembly, or the drop of any object used in the rerack modification. The mechanical, material, and structural design of the new spent fuel racks is in accordance with applicable portions of "OT Position for Review and Acceptance of Spent Fuel Storage and Handling Applications", dated April 14, 1978, as modified January 18, 1979; Standard Review Plan 3.8.4; and other applicable NRC guidance and industry codes. The rack materials used are compatible with the spent fuel pool and the spent fuel assemblies. The structural considerations of the new racks address margins of safety against tilting and deflection or movement, such that the racks do not impact each other in

the cellular region during the postulated seismic events. In addition, the spent fuel assemblies remain intact and no criticality concerns exist. Thus, the margins of safety are not significantly reduced by the proposed rerack.

Additionally, the proposed amendment most closely resembles example (X) of "Amendments That Are Considered Not Likely to Involve Significant Hazards Considerations" as provided in the final NRC adoption of 10 CFR 50.92, 51 FR 7751 (March 6, 1986).

This example indicates that an amendment is not likely to involve a significant hazards consideration as follows:

(X) An expansion of the storage capacity of a spent fuel pool when all of the following are satisfied:

1. The storage expansion method consists of either replacing existing racks with a design which allows closer spacing between stored spent fuel assemblies or placing additional racks of the original design on the pool floor if space permits.

   The BV-1 spent fuel pool rerack involves the replacement of the present capacity racks with a design which, by requiring only burned fuel be stored in Region 2, allows closer spacing of the stored spent fuel cells. Region 1 is designed for allowing safe storage of fuel enriched to 5 wt%.

2. The storage expansion method does not involve rod consolidation or double tiering.

   The BV-1 racks are not double tiered and all racks will sit on the spent fuel pool floor. Additionally, the amendment application does not involve consolidation of spent fuel.

3. The k_{eff} of the pool is maintained less than or equal to 0.95.

   The design of the spent fuel racks contains a neutron absorber, Boral, to ensure that the k_{eff} remains less than 0.95 under all conditions (with unborated water in the pool). Additionally, the water in the spent fuel pool contains at least 1050 ppm of boron, providing further assurance that k_{eff} remains less than 0.95. The analysis demonstrates that 400 ppm boron is required to meet the reactivity requirement for the accident condition.

4. No new technology or unproven technology is utilized in either the construction process or the analytical techniques necessary to justify the expansion.

   The rack design has been licensed at least 15 times. The technology for the construction processes and analytical techniques remain substantially the same as these other 15 storage rack projects. Thus no new or unproven technology is utilized in the construction or analysis of the proposed BV-1 spent fuel racks.

Thus, this submittal meets example (X) as presented in the supplementary information accompanying publication of the Final Rule as an example of situations which are considered not to involve significant hazards considerations.

Based on the foregoing, it is concluded that all criteria for issuance of a no significant hazards statement are satisfied.

F. NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

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

ATTACHMENT C

Beaver Valley Power Station, Unit No. 1
Proposed Technical Specification Change No. 202

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3/4.9.14 SPENT FUEL STORAGE POOL

LIMITING CONDITION FOR OPERATION

3.9.14 Fuel is to be stored in the spent fuel storage pool with:

a. The boron concentration in the spent fuel pool maintained greater than or equal to 1050 ppm when moving fuel in the spent fuel pool; and

b. Fuel assembly storage in Region 1 restricted to fuel with an enrichment less than or equal to 5.0 w/o U235; and

c. Fuel assembly storage in Region 2 restricted to fuel which has been qualified in accordance with Table 3.9-1 or a criticality analysis.

APPLICABILITY: During storage of fuel in the spent fuel pool.

ACTION:

a. Suspend all actions involving movement of fuel in the spent fuel pool if it is determined a fuel assembly has been placed in the incorrect Region until such time as the correct storage location is determined. Move the assembly to its correct location before resumption of any other fuel movement.

b. Suspend all actions involving the movement of fuel in the spent fuel pool if it is determined the pool boron concentration is less than 1050 ppm, until such time as the boron concentration is increased to 1050 ppm or greater.

c. The provisions of Specifications 3.0.3 and 3.0.4 are not applicable.

SURVEILLANCE REQUIREMENTS

4.9.14.1 Prior to placing fuel or moving fuel in the spent fuel pool, verify through fuel receipt records for new fuel, by burnup analysis and comparison with Table 3.9-1, or by a criticality analysis that fuel assemblies to be placed into or moved in the spent fuel pool are within the above enrichment limits.

4.9.14.2 Verify the spent fuel pool boron concentration is ≥ 1050 ppm:

a. Within 8 hours prior to and at least once per 24 hours during movement of fuel in the spent fuel pool, and

b. At least once per 31 days.

TABLE 3.9-1

BEAVER VALLEY FUEL ASSEMBLY MINIMUM BURNUP VS. INITIAL U235 ENRICHMENT FOR STORAGE IN REGION 2 SPENT FUEL RACKS

Initial U235 Enrichment	Assembly Discharge Burnup (MWD/MTU)
2.0	2585
2.5	9551
3.0	15784
3.5	21643
4.0	27260
4.5	33710
5.0	40000

NOTE: The data in the above table may be either interpreted linearly or may be calculated by the conservative equation below. This equation provides a linear fit to the design burnup limits.

Limiting burnup, MWD/MTU = 12100 * E% - 20500
Where E = Enrichment ($E \leq 5\%$)

3/4.9.10 AND 3/4.9.11 WATER LEVEL - REACTOR VESSEL AND STORAGE POOL

The restrictions on minimum water level ensure that sufficient water depth is available to remove 99% of the assumed 10% iodine gap activity released from the rupture of an irradiated fuel assembly. The minimum water depth is consistent with the assumptions of the accident analysis.

3/4.9.12 and 3/4.9.13 FUEL BUILDING VENTILATION SYSTEM

The limitations on the storage pool ventilation system ensure that all radioactive material released from an irradiated fuel assembly will be filtered through the HEPA filters and charcoal adsorber prior to discharge to the atmosphere. The OPERABILITY of this system and the resulting iodine removal capacity are consistent with the assumptions of the accident analysis. The spent fuel pool area ventilation system is non-safety related and only recirculates air through the fuel building. The SLCRS portion of the ventilation system is safety- related and maintains a negative pressure in the fuel building. The SLCRS flow is normally exhausted to the atmosphere without filtering, however, the flow is diverted through the main filter banks by manual actuation or on a high radiation signal.

3/4.9.14 FUEL STORAGE - SPENT FUEL STORAGE POOL

The requirements for fuel storage in the spent fuel pool ensure that: (1) the spent fuel pool will remain subcritical during fuel storage; and (2) a uniform boron concentration is maintained in the water volume in the spent fuel pool to provide negative reactivity for postulated accident conditions under the guidelines of ANSI 16.1-1975. The value of 0.95 or less for keff which includes all uncertainties at the 95/95 probability/confidence level is the acceptance criteria for fuel storage in the spent fuel pool.

The Action Statement applicable to fuel storage in the spent fuel pool ensures that: (1) the spent fuel pool is protected from distortion in the fuel storage pattern that could result in a critical array during the movement of fuel; and (2) the boron concentration is maintained at ≥ 1050 ppm (this includes a 650 ppm conservative allowance for uncertainties) during all actions involving movement of fuel in the spent fuel pool.

The Surveillance Requirements applicable to fuel storage in the spent fuel pool ensure that: (1) the fuel assemblies satisfy the analyzed U-235 enrichment limits or an analysis has been performed and it was determined that Keff is ≤ 0.95; and (2) the boron concentration meets the 1050 ppm limit.

FUEL STORAGE - SPENT FUEL STORAGE POOL (Continued)

The reracked spent fuel consists of two discrete regions. Region 1 is configured to store fuel with a maximum enrichment of 5.0 w/o. The most reactive of the Westinghouse 17 X 17 STD/Vantage 5H and OFA fuel assemblies yielded a maximum Keff of 0.940 including all biases and uncertainties.

The enrichment limitations for storage of fuel in Region 1 of the spent fuel pool is based on a nominal region average enrichment with individual fuel assembly tolerance of + or - 0.05 w/o of 5.0 w/o U-235.

Region 2 racks are designed to store fuel with burnup consistent with its initial enrichment. A table of enrichment and corresponding required burnup is provided in the Technical Specification. A conservative value of the required burnup is given by the following linear equation:

> Minimum burnup for unrestricted storage in Region 2 in MWD/MTU = 12100 * E% - 20500, where E is the initial enrichment in w/o.

The maximum reactivity in Region 2 is 0.945 if all cells are loaded with fuel with minimum allowable burnup. This includes all biases and uncertainties and appropriate allowance for uncertainty in depletion calculations.

Storage cells in Region 2 which face the pool wall are capable of maintaining the Keff below 0.95 with fuel which does not meet the foregoing burnup restriction. A separate calculation to establish the admissibility of storing low burnup fuel in a Region 2 peripheral cell will be required on a case-by-case basis. The calculation to demonstrate subcriticality for the proposed storage of low burnup fuel will be performed using the same analytical models and computer codes which were used in the high density rack design.

3/4.9.15 CONTROL ROOM EMERGENCY HABITABILITY SYSTEMS

The OPERABILITY of the control room emergency habitability system ensures that the control room will remain habitable for operations personnel during and following all credible accident conditions. The ambient air temperature is controlled to prevent exceeding the allowable equipment qualification temperature for the equipment and instrumentation in the control room. The OPERABILITY of this system in conjunction with control room design provisions is based on limiting the whole body radiation exposure to personnel occupying the control room to 5 rem or less, or its equivalent. This limitation is consistent with the requirements of General Design Criteria 19 of Appendix "A", 10 CFR 50.

5.4 REACTOR COOLANT SYSTEM

DESIGN PRESSURE AND TEMPERATURE

5.4.1 The reactor coolant system is designed and shall be maintained:

a. In accordance with the code requirements specified in Section 4.2 of the FSAR, with allowance for normal degradation pursuant to the applicable Surveillance Requirements,

b. For a pressure of 2485 psig, and

c. For a temperature of 650°F, except for the pressurizer which is 680°F.

VOLUME

5.4.2 The total water and steam volume of the reactor coolant system is 9370 cubic feet at a nominal Tavg of 525°F.

5.5 EMERGENCY CORE COOLING SYSTEMS

5.5.1 The emergency core cooling systems are designed and shall be maintained in accordance with the original design provisions contained in Section 6.3 of the FSAR with allowance for normal degradation pursuant to the applicable Surveillance Requirements.

5.6 FUEL STORAGE

CRITICALITY

5.6.1 The spent fuel storage racks are designed in a two region configuration. Region 1 racks are of the poisoned flux-trap type with the storage cells arranged at 10.82 inch pitch. The Region 2 racks are of the poisoned non-flux trap construction with a cell-to-cell pitch of 9.02 inches. The fuel will be stored in accordance with the provisions described in UFSAR Sections 3.3 and 9.12 to ensure a keff equivalent to ≤0.95 with the storage pool filled with unborated water.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 750' - 10".

CAPACITY

5.6.3 The fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1627 fuel assemblies. |

5.7 SEISMIC CLASSIFICATION

5.7.1 Those structures, systems and components identified as Category I Items in Appendix "B" of the FSAR shall be designed and maintained to the original design provisions with allowance for normal degradation pursuant to the applicant Surveillance Requirements.

5.8 METEOROLOGICAL TOWER LOCATION

5.8.1 The meteorological tower shall be located as shown on Figure 5.1-1.

ATTACHMENT D

Beaver Valley Power Station, Unit No. 1
Proposed Technical Specification Change No. 202

Licensing Report

SPENT FUEL POOL MODIFICATION

for

INCREASED STORAGE CAPACITY

BEAVER VALLEY POWER STATION

UNIT 1