2.0 LIMITING CONDITIONS FOR OPERATION

2.8 Refueling Operations (Continued)

(6) Direct communication between personnel in the control room and at the refueling machine shall be available whenever changes in core geometry are taking place.

(7) When irradiated fuel is being handled in the auxiliary building, the exhaust ventilation from the spent fuel pool area will be diverted through the charcoal filter.

(8) Deleted.

(9) A minimum of 23 feet of water above the top of the core shall be maintained whenever irradiated fuel is being handled.

(10) ~~Storage in Region 1 and Region 2 of the spent fuel racks shall be restricted to fuel assemblies having initial enrichment less or equal to 4.2 weight percent of U-235.~~ Deleted.

(11) Storage in Region 2 of the spent fuel racks shall be restricted to those assemblies whose parameters fall within the "acceptable" area of Figure 2-10. Storage in the peripheral cells of Region 2 shall be restricted to those assemblies whose parameters fall within the noted area of Figure 2-10.

(12) A minimum boron concentration of ~~100~~ 500 ppm shall be maintained in the Spent Fuel Pool whenever storing ~~unirradiated~~ fuel in the Spent Fuel Pool.

If any of the above conditions are not met, all refueling operations shall cease immediately, work ~~shall be initiated to satisfy~~ the required conditions, and no operations that may ~~change the~~ add positive reactivity ~~of~~ to the core shall be made.

A spent fuel assembly may be transferred directly from the reactor core to the spent fuel pool Region 2 provided the independent verification of assembly burnups has been completed and the assembly burnup meets the acceptance criteria identified in Technical Specification Figure 2-10.

Movement of irradiated fuel from the reactor core shall not be initiated before the reactor core has been subcritical for a minimum of 72 hours if the reactor has been operated at power levels in excess of 2% rated power.

Bases

The equipment and general procedures to be utilized during refueling operations are discussed in the USAR. Detailed instructions and the above specifications provide assurance that no incident could occur during the refueling operations that would

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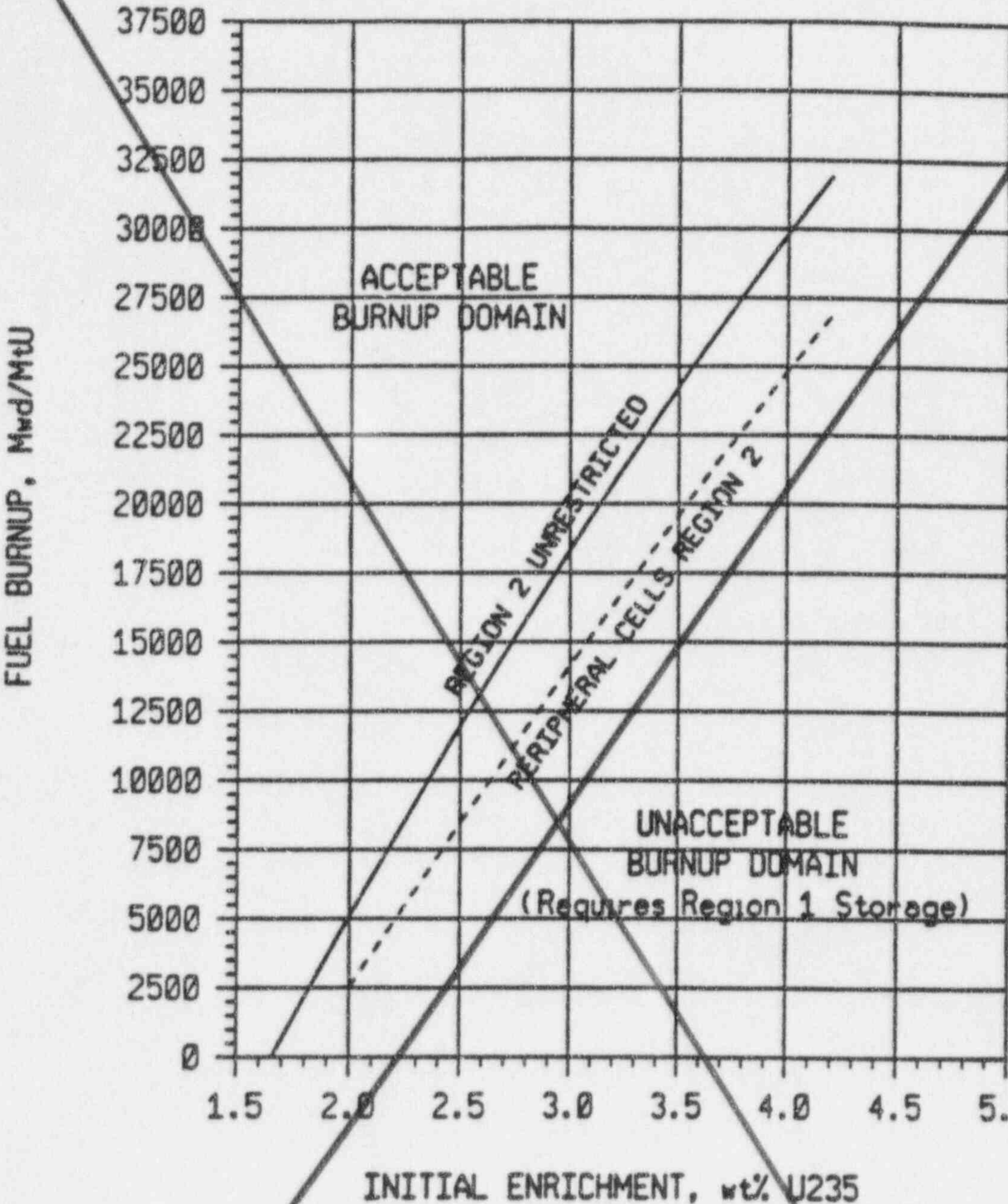
SEE ATTACHED FIGURE 2-10

FIGURE 2-10

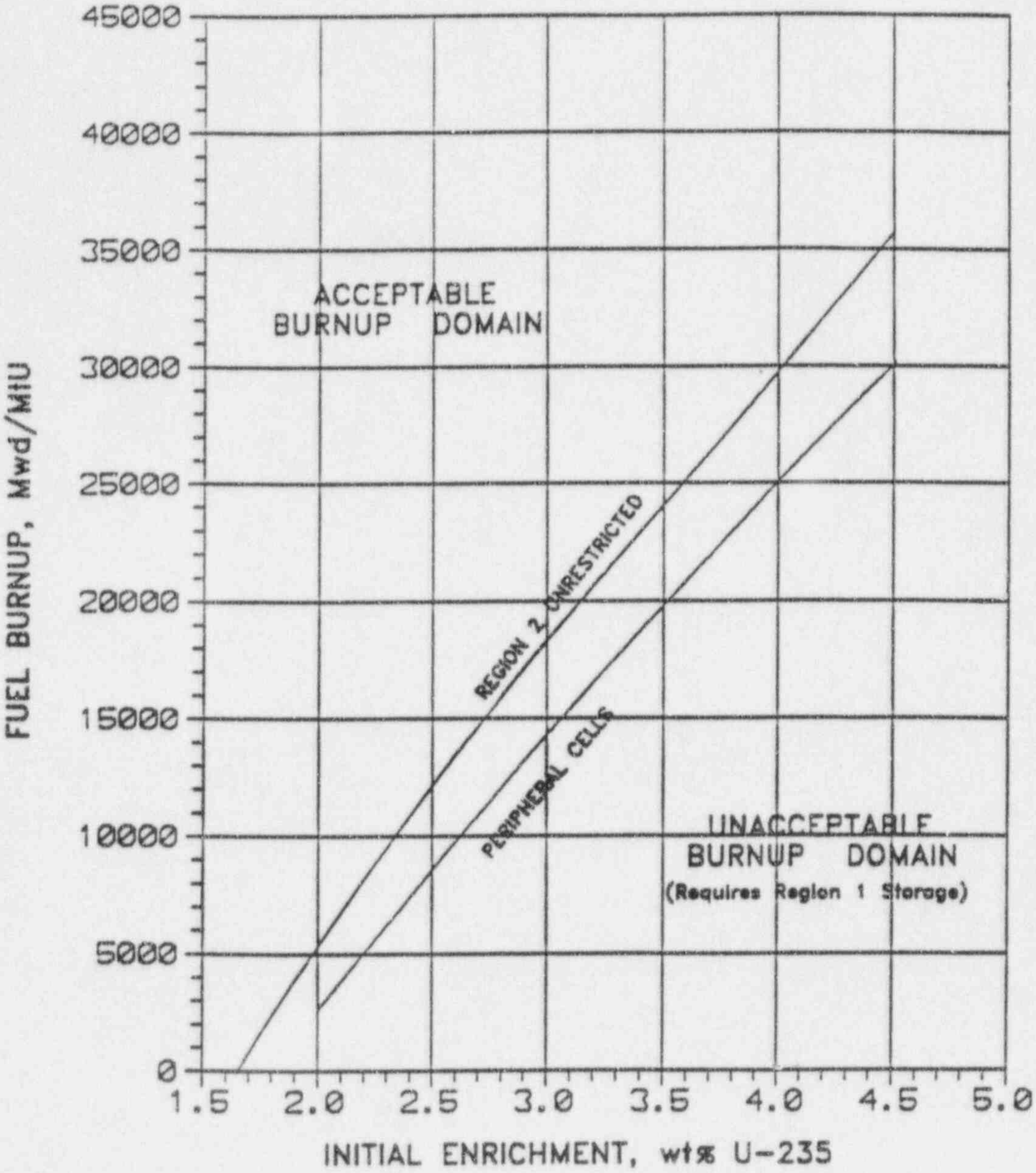


LIMITING BURNUP CRITERIA FOR
ACCEPTABLE STORAGE IN REGION 2

NOTE: 1. Any fuel assembly (≤4.2% U_{235} average) mechanically coupled with a full length CEA may be located anywhere in Region 2.

2. Peripheral cells are those adjacent to the Spent Fuel Pool wall or the cask laydown area.

FIGURE 2-10



LIMITING BURNUP CRITERIA FOR
ACCEPTABLE STORAGE IN REGION 2

NOTES:

1. Any fuel assembly ($\leq$ 4.5% average U-235 enrichment) mechanically coupled with a full length CEA may be located anywhere in Region 2.

2. Peripheral cells are those adjacent to the Spent Fuel Pool wall or the cask laydown area.

2.0 LIMITING CONDITIONS FOR OPERATION

2.8 Refueling Operations (Continued)

result in a hazard to public health and safety. Whenever changes are not being made in core geometry one flux monitor is sufficient. This permits maintenance of the instrumentation. Continuous monitoring of radiation levels and neutron flux provides immediate indication of an unsafe condition. The shutdown cooling pump is used to maintain a uniform boron concentration.

The shutdown margin as indicated will keep the core subcritical even if all CEA's were withdrawn from the core. During refueling operations, the reactor refueling cavity is filled with approximately 250,000 gallons of borated water. The boron concentration of this water (of at least the refueling boron concentration) is sufficient to maintain the reactor subcritical by more than 5%, including allowance for uncertainties, in the cold condition with all rods withdrawn.[1] Periodic checks of refueling water boron concentration ensures the proper shutdown margin. Communication requirements allow the control room operator to inform the refueling machine operator of any impending unsafe condition detected from the main control room board indicators during fuel movement.

The restriction of not moving fuel in the reactor for a period of 72 hours after the power has been removed from the core takes advantage of the decay of the short half-life fission products and allows for any failed fuel to purge itself of fission gases, thus reducing the consequences of fuel handling accident.

The ventilation air for both the containment and the spent fuel pool area flows through absolute particulate filters and radiation monitors before discharge at the ventilation discharge duct. In the event the stack discharge should indicate a release in excess of the limits in the technical specifications, the containment ventilation flow paths will be closed automatically and the auxiliary building ventilation flow paths will be closed manually. In addition, the exhaust ventilation ductwork from the spent fuel storage area is equipped with a charcoal filter which will be manually put into operation whenever irradiated fuel is being handled.

The basis for the ~~100~~ 500 ppm boron concentration requirement with Boral poisoned storage racks is to maintain the k_{eff} below 0.95 in the event a misplaced unirradiated fuel assembly is located next to a spent fuel assembly. A misplaced unirradiated fuel assembly at ~~4.2~~ 4.5 w/o enrichment condition, in the absence of soluble poison, may result in exceeding the design effective multiplication factor. Soluble boron in the Spent Fuel Pool water, for which credit is permitted under these conditions, would assure that the effective multiplication factor is maintained substantially less than the design condition. The boron concentration is periodically sampled in accordance with Specification 3.2.

References

(1) USAR, Section 9.5.1.2

4.0 DESIGN FEATURES

4.4 Fuel Storage

4.4.1 New Fuel Storage

The new unirradiated fuel bundles will normally be stored in the dry new fuel storage rack with an effective multiplication factor of less than 0.9. The new fuel storage rack is located 18'-9" above the main floor of Room 25A which provides for adequate drainage and precludes flooding of the new fuel storage rack.

New fuel may also be stored in shipping containers or in the spent fuel pool racks which have a maximum effective multiplication factor of 0.95 with Fort Calhoun Type C fuel and unborated water.

The new fuel storage racks are designed as a Class I structure.

4.4.2 Spent Fuel Storage

Irradiated fuel bundles will be stored prior to off-site shipment in the stainless steel lined spent fuel pool. The spent fuel pool is normally filled with borated water with a concentration of at least the refueling boron concentration

The spent fuel racks are designed as a Class I structure.

Normally the spent fuel pool cooling system will maintain the bulk water temperature of the pool below 120°F. Under other conditions of fuel discharge, the fuel pool water temperature is maintained below 140°F.

The spent fuel racks are designed and will be maintained such that the calculated effective multiplication factor is no greater than 0.95 (including all known uncertainties) assuming ~~the pool is flooded with unborated water.~~ The racks are divided into 2 regions. Storage in Region 1 and Region 2 of the spent fuel racks shall be restricted to fuel assemblies having initial enrichment less than or equal to 4.5 weight percent of U-235. Region 1 ~~and 2~~ cells are surrounded by Boral. Acceptance criteria for fuel storage in Regions 1 and 2 are delineated in Section 2.8 of these Technical Specifications.

ATTACHMENT B

DISCUSSION, JUSTIFICATION AND NO SIGNIFICANT HAZARDS CONSIDERATION

DISCUSSION AND JUSTIFICATION

The Omaha Public Power District (OPPD) proposes to revise the Fort Calhoun Station (FCS) Unit No. 1 Technical Specifications (TS) to allow storage of unirradiated fuel in Region 1 of the Spent Fuel Pool (SFP) up to a 4.5 weight percent (w/o) Uranium-235 (U^{235}) enrichment. The balance of the SFP, denoted as Region 2, will have a prescribed enrichment/burnup restriction. TS 2.8(10), which currently contains this limit on initial enrichment is being deleted, and the proposed limit for fuel enrichment storage requirements will be relocated to the Design Features TS 4.4. TS 2.8(12) is being revised to increase the boron concentration required to be maintained in the SFP whenever unirradiated fuel is in the SFP.

FCS has one SFP consisting of high density storage racks with a total of 1083 storage cells. These racks utilize Boral® as a neutron absorber in the cell walls. The storage racks store fuel in two discrete regions of the SFP. Region 1 includes two modules with a total of 160 storage cells. Each cell is designed for storage of fuel assemblies with U^{235} initial enrichment up to 4.5 w/o while maintaining the required subcriticality ($k_{eff} < 0.95$). The current TS enrichment limit of 4.2 w/o is based upon the criticality analysis performed for Amendment 155 to the TS. The proposed limit of 4.5 w/o is based upon utilizing the appreciable margin available between the current analysis and the NRC regulatory acceptance limit. Region 2 includes 9 modules with a total of 923 storage cells, which are available for storage of spent fuel assemblies with a prescribed burnup restriction. This region is designed to store fuel which has experienced sufficient burnup, or unirradiated fuel which is of low enough initial enrichment, such that storage in Region 1 is not required. Region 2 also allows storage of a fuel assembly not meeting the requirements of Region 1 provided the assembly contains a control element assembly (CEA).

The Region 1 cells were designed with nominal center-to-center spacing of 9.821 inches in the E-W direction, and 10.363 inches in the N-S direction. The Region 1 cells utilize Boral® panels between the cell wall and the retainer wall with a specified water gap as a flux trap. The Region 2 nominal center-to-center spacing of 8.652 inches in both directions and utilizes the same Boral® panel design with no flux trap.

The proposed changes to the TS would increase the allowable fuel enrichment from 4.2 w/o to 4.5 w/o U^{235} in Region 1 of the SFP and modify the burnup/enrichment restrictions imposed on fuel stored in Region 2 to include fuel with an enrichment up to 4.5 w/o.

DISCUSSION AND JUSTIFICATION (Continued):

The following systems and subsystems were evaluated for potential impact of the proposed change:

a. Storage Racks:

The storage racks provide criticality control of new or spent fuel assemblies in prismatic cell openings. The existing racks are designed to maintain structural integrity during and after a Maximum Hypothetical Earthquake (MHE) or a Design Basis Earthquake (DBE) event. The existing spent fuel storage racks will not be impacted by the increase in enrichment limit, since no new racks, or modifications to the existing racks need to be incorporated. The NRC approved the existing racks in Amendment 155 to the FCS Technical Specifications (TAC No. M85116).

b. SFP Cooling System:

The SFP cooling system removes decay heat from the spent fuel discharged from the reactor. The cooling system maintains the pool water bulk temperature below 140°F under normal full core offload conditions. No changes will be made to storage capacity of the existing spent fuel storage racks. The decay heat load will not be greater than the previously analyzed condition since the thermal hydraulic analysis considered conservative peaking limits which will not be impacted or exceeded by the proposed change to the nominal enrichment limits. The peaking limits established in Amendment 155 are bounding with respect to the heat loading anticipated with the licensed inventory. Therefore, the current design will continue to satisfy its safety function as documented in Amendment 155.

c. SFP Structure:

The SFP 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 safety evaluation for nuclear criticality to address the proposed change is detailed in the Attachment C. As stated above no physical modifications are required to implement the proposed limit.

d. HVAC System:

The HVAC system removes the heat generated by the diffusion of water vapor into the pool environment. The HVAC system also removes radioactive isotopes which could be released to the environment during a fuel handling accident. No changes are anticipated to the existing HVAC system as a result of the proposed revision to the TS, since there is no change in the decay heat loading to the spent fuel pool environment. The radiological consequences of a fuel handling accident are also not impacted as a result of the proposed change as Amendment 155 evaluated fuel handling accidents with fuel enrichments up to 5 w/o.

DISCUSSION AND JUSTIFICATION (Continued):

Therefore, the current design will continue to satisfy its safety function as documented in Amendment 155.

e. SFP Purification System:

The system removes particulate and ionized impurities from the SFP to maintain pool water visibility. This system also helps maintain the boron concentration and desired pH balance in the SFP. The existing design will continue to maintain this non-safety related function. The radionuclides released to the pool water may increase very slightly due to the potential increase in fission product inventory in a fuel assembly. This may affect the ability of the purification system to maintain water purity in the SFP. However, the existing purification system is supplemented as needed with portable filtration systems.

DISCUSSION AND JUSTIFICATION (Continued):

SAFETY EVALUATION

The safety evaluation for the existing SFP storage racks was approved by the NRC in Amendment 155 (TAC M85116). The proposed change will not impact this previously approved evaluation with the exception of the nuclear criticality analysis. Therefore, only a reanalysis of the criticality design was performed.

The safety evaluation for nuclear criticality to address the proposed change is detailed in the Attachment C, "Criticality Safety Evaluation of the Ft. Calhoun Spent Fuel Storage Racks for Maximum Enrichment Capability," Holtec Report HI-951400, dated December 1995.

MARGIN OF SAFETY

The following areas have been reviewed with respect to the issue of margin of safety for the proposed change:

a. Nuclear-Criticality considerations
b. Thermal-Hydraulic considerations
c. Mechanical, Material, and Structural considerations
d. Radiological Release considerations

a. Nuclear-Criticality considerations

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 SFP, such that k_{eff} is always less than or equal to 0.95 at a 95%/95% probability tolerance level, the proposed change from 4.2 w/o to 4.5 w/o U^{235} does not involve a reduction in margin of safety.

As in the previously NRC approved criticality analysis (Amendment 155), a maximum possible moderator density is assumed which corresponds to a moderator temperature of 4°C. The basis for this assumption is that the true reactivity will always be lower over the expected range of water temperatures. To ensure that this calculation is correct, the analysis utilized the "WORKER" interpolation routine developed by Oak Ridge National Laboratories (ORNL) which is available to interpolate between 20°C and 277°C "SCALE" libraries used by "NITAWL-KENO5a." The results of these calculations were then compared to the CASMO-3 code, and MCNP code and verified as reasonable. The reactivity increment between 4°C and 20°C is very small (0.0014dk) and to some extent is lost in the normal statistical variation of KENO calculations. However, trends in the KENO calculations were consistent with, and confirm, the CASMO-3 calculation for 4°C.

DISCUSSION AND JUSTIFICATION (Continued):

MARGIN OF SAFETY (Continued):

Also assumed in the reactivity calculations is the utilization of CEAs which are depleted to 75% of initial boron-10 (B^{10}) loading. This is consistent with the previously approved analysis (Amendment 155). Fort Calhoun Station normally operates in an All Rods Out configuration. The Regulating Group 4 CEAs (five total) are usually not inserted past 25% of core height. Since FCS does not operate with CEAs inserted beyond 25%, assuming a 75% depletion would allow for considerable conservatism in performing the reactivity calculations with CEAs utilized in Region 2 of the SFP.

b. Thermal-Hydraulic considerations

The methods used in Amendment 155 are applicable to the proposed change since the fuel peaking factors used in this analysis will not be impacted. Thus, the margin of safety remains the same.

c. Mechanical, Material and Structural considerations

The methods used in Amendment 155 are applicable to the proposed change since no physical modifications or increased capacity are implemented. Thus, the margin of safety remains the same.

d. Radiological Consequences considerations

The margin of safety for radiological consequences as a result of a fuel handling accident were previously addressed in TAC No. 80635. The margin of safety was established for a fuel handling accident which considered fuel of an initial enrichment of 4.5 w/o U^{235}. The proposed change will not impact the margin of safety previously addressed since fuel loading will not be greater than 4.5 w/o.

ADMINISTRATIVE CHANGES

The requirement of TS 2.8 that states, "no operations that may change the reactivity of the core shall be made," is being revised to state that "no operations that may add positive reactivity to the core." As written, the TS does not allow the addition of negative reactivity, which is incorrect. This revision is consistent with the guidance of CE Standard TS 3.9.1

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION:

The proposed changes do not involve significant hazards consideration because operation of Fort Calhoun Station Unit No. 1 in accordance with these changes would not:

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

The proposed change to the Technical Specifications to increase the enrichment limit for fuel assembly storage requirements does not involve a significant increase in the probability of an accident. The enrichment limit is not a precursor to any analyzed event and therefore cannot impact probability.

The safety evaluation for the existing Spent Fuel Pool (SFP) storage racks was approved by the NRC in Amendment 155 (TAC M85116). This amendment approved the current limit on fuel enrichment, and the mechanical, structural, and thermal/hydraulic design of the fuel racks. This amendment also evaluated the radiological consequences of a fuel handling accident with fuel enrichments equivalent to the proposed change. The proposed change will not impact this previously approved evaluation with the exception of the nuclear criticality analysis. The nuclear criticality analysis supporting the proposed change used calculational methods conforming to NRC guidance, industry codes, standards, and specifications. In meeting the acceptance criteria for criticality in the SFP, such that k_{eff} is always less than or equal to 0.95 at a 95%/95% probability tolerance level, the proposed change from 4.2 weight percent (w/o) to 4.5 w/o Uranium-235 (U^{235}) does not involve an increase in the consequences of an accident previously evaluated.

Therefore, it is concluded that the proposed change to increase the enrichment limit for fuel storage does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

The proposed change 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 sections of the NRC Standard Review Plan, Regulatory Guides, industry codes, and standards. In addition, the NRC Safety Evaluation Report for Amendment 155 was also reviewed with respect to the proposed change.

BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION (Continued):

No new or different mode of operation is proposed. No unproven technology was utilized in the analytical techniques necessary to justify the planned fuel storage change. The analytical techniques used have been developed and used in over 15 applications previously approved by the NRC. Based upon the reviews, it is concluded that the proposed change does not create the possibility of a new or different type accident from any accident previously evaluated.

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

The only margin of safety potentially impacted by the proposed change is related to nuclear criticality 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 proposed change. Therefore the proposed change does not involve a significant reduction in a margin of safety.

Therefore based on the above considerations, it is OPPD's position that this proposed amendment does not involve a significant hazards consideration as defined by 10 CFR 50.92 and the proposed change will not result in a condition which significantly alters the impact of the Station on the environment. Thus, the proposed change meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9) and pursuant to 10 CFR 51.22(b) no environmental assessment need be prepared.

ATTACHMENT C