ATTACHMENT 1

Marked Up Technical Specifications Pages

3/4.9-16
5-6
5-7

FIGURE 3.9-1
MINIMUM REQUIRED FUEL ASSEMBLY BURNUP AS A FUNCTION OF INITIAL ENRICHMENT TO PERMIT STORAGE IN REGION2

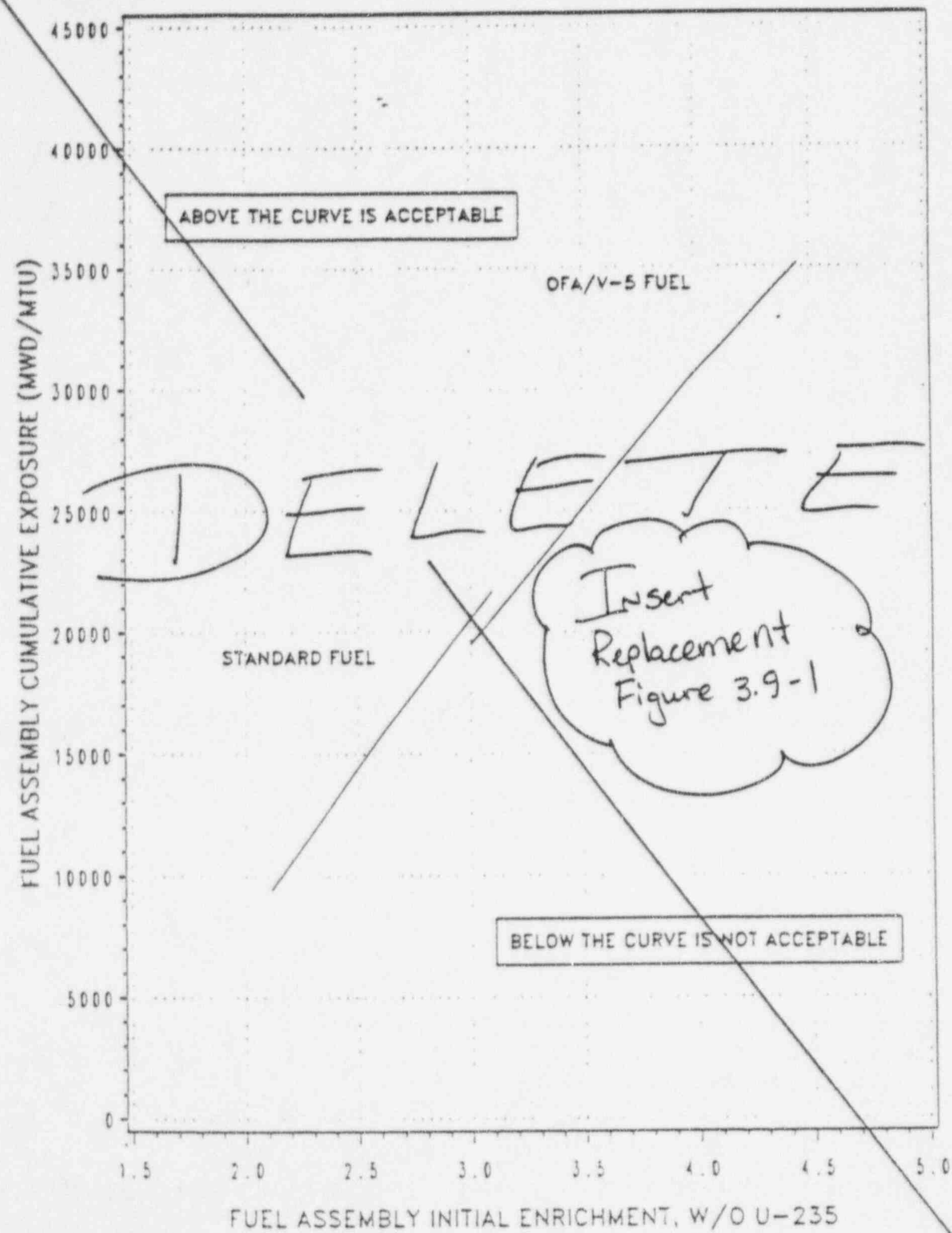
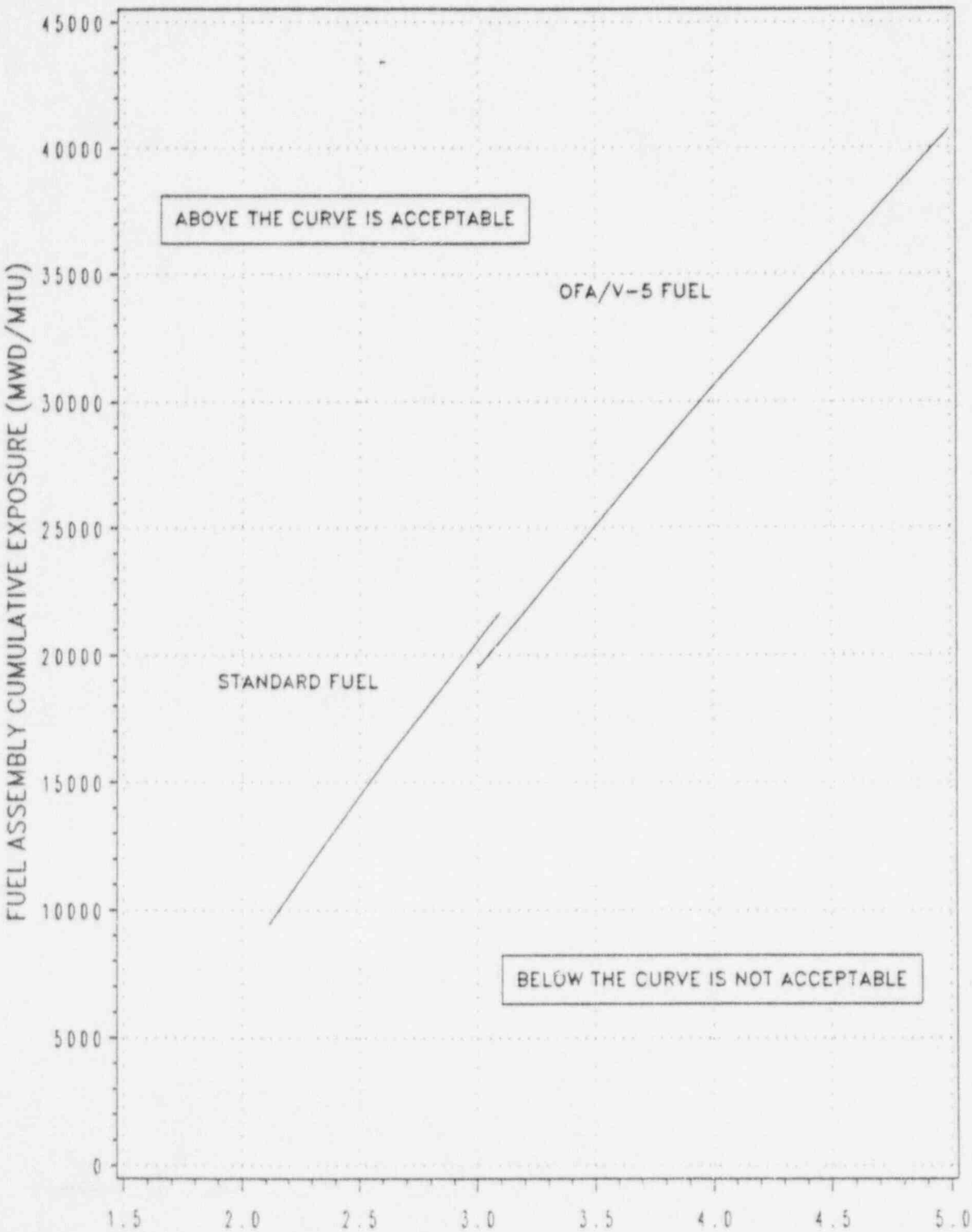


FIGURE 3.9-1
MINIMUM REQUIRED FUEL ASSEMBLY BURNUP AS A FUNCTION OF INITIAL ENRICHMENT TO PERMIT STORAGE IN REGION 2



5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The core shall contain 193 fuel assemblies with each fuel assembly normally containing 264 fuel rods clad with Zircaloy-4, except that limited substitution of fuel rods by filler rods consisting of Zircaloy-4 or stainless steel or by vacancies may be made if justified by a cycle-specific reload analysis. Each fuel rod shall have a nominal active fuel length of 144 inches and contain a maximum total weight of 1766 grams uranium. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of ~~4.45~~ 4.10 weight percent U-235. Fuel with enrichments greater than ~~3.85~~ 5.00 weight percent of U-235 shall contain sufficient integral fuel burnable absorber such that the requirements of Specification 5.6.1.1 are met.

CONTROL ROD ASSEMBLIES

5.3.2 The core shall contain 53 full-length and no part-length control rod assemblies. The full-length control rod assemblies shall contain a nominal 142 inches of absorber material. All control rods shall be hafnium, silver-indium-cadmium, or a mixture of both types. All control rods shall be clad with stainless steel tubing.

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 5.2 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 volume of the Reactor Coolant System, including pressurizer and surge line, is 12,135 ± 100 cubic feet at a nominal T_{avg} of 557°F.

5.5 METEOROLOGICAL TOWER LOCATION

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

5.6 FUEL STORAGE

CRITICALITY

5.6.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. A k_{eff} equivalent to less than or equal to 0.95 when flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the FSAR. This is based on fresh fuel with the maximum initial enrichment of U-235 in Region 1 and on spent fuel with combination of initial enrichment and discharge exposures, shown in Figure 3.9-1, in Region 2, and

b. A nominal 9.24 inch center-to-center distance between fuel assemblies placed in the storage racks, and

c. A maximum reference fuel assembly K_∞ less than or equal to ~~1.455~~ 1.480 at 68°F for storage in Region 1.

5.6.1.2 The k_{eff} for new fuel for the first core loading stored dry in the spent fuel storage racks shall not exceed 0.98 when aqueous foam moderation is assumed.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 2040 feet.

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1344 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

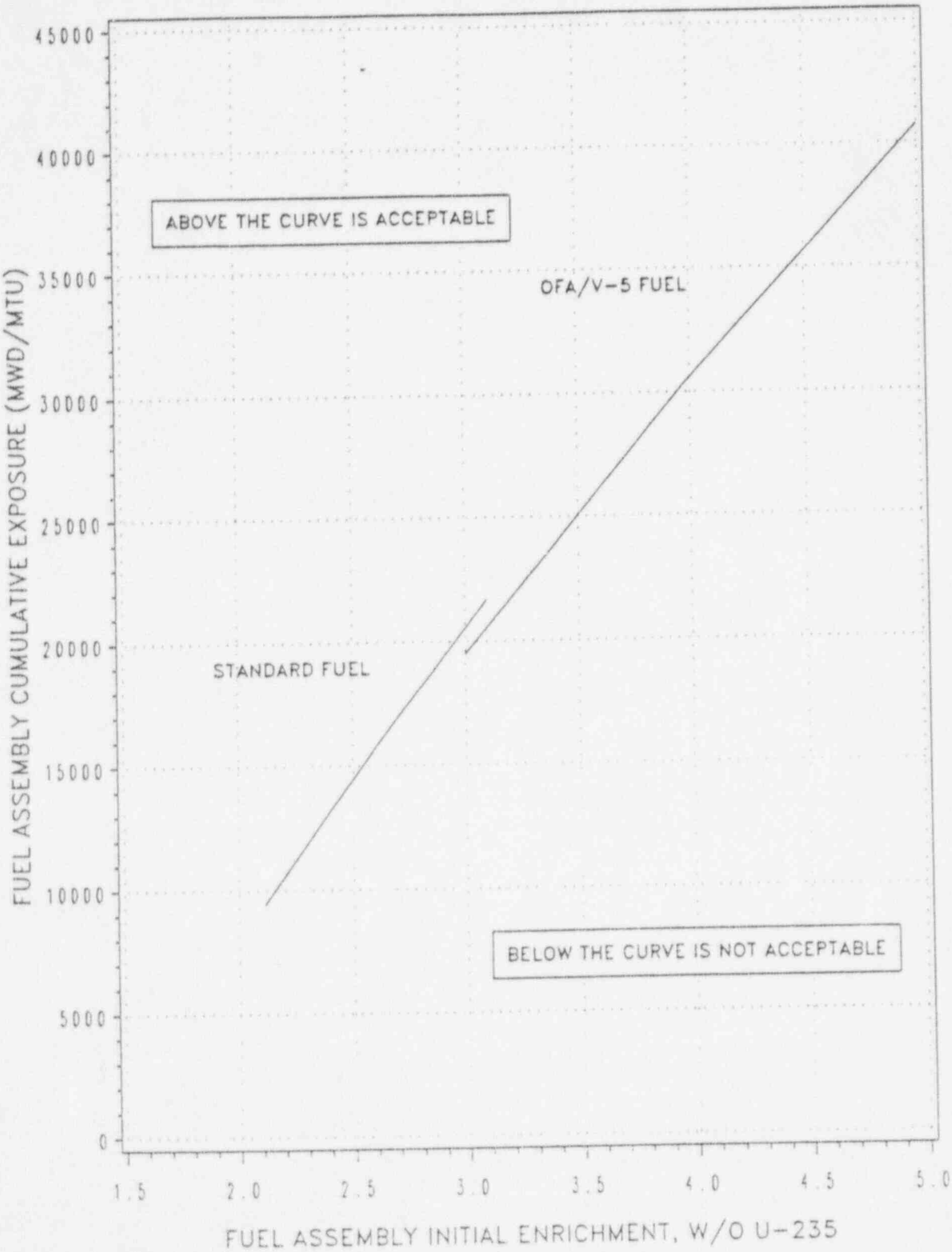
(Next page is 5-9)

ATTACHMENT 2

Retyped Technical Specifications Pages

3/4.9-16
5-6
5-7

FIGURE 3.9-1
MINIMUM REQUIRED FUEL ASSEMBLY BURNUP AS A FUNCTION OF INITIAL ENRICHMENT TO PERMIT STORAGE IN REGION 2



5.3 REACTOR CORE

FUEL ASSEMBLIES

5.3.1 The core shall contain 193 fuel assemblies with each fuel assembly normally containing 264 fuel rods clad with Zircaloy-4, except that limited substitution of fuel rods by filler rods consisting of Zircaloy-4 or stainless steel or by vacancies may be made if justified by a cycle-specific reload analysis. Each fuel rod shall have a nominal active fuel length of 144 inches and contain a maximum total weight of 1766 grams uranium. Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of 5.00 weight percent U-235. Fuel with enrichments greater than 4.10 weight percent of U-235 shall contain sufficient integral fuel burnable absorber such that the requirements of Specification 5.6.1.1 are met.

CONTROL ROD ASSEMBLIES

5.3.2 The core shall contain 53 full-length and no part-length control rod assemblies. The full-length control rod assemblies shall contain a nominal 142 inches of absorber material. All control rods shall be hafnium, silver-indium-cadmium, or a mixture of both types. All control rods shall be clad with stainless steel tubing.

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5.4.1 The Reactor Coolant System is designed and shall be maintained:

a. In accordance with the Code requirements specified in Section 5.2 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 volume of the Reactor Coolant System, including pressurizer and surge line, is 12,135 ± 100 cubic feet at a nominal T_{avg} of 557°F.

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

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a. A k_{eff} equivalent to less than or equal to 0.95 when flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the FSAR. This is based on fresh fuel with the maximum initial enrichment of U-235 in Region 1 and on spent fuel with combination of initial enrichment and discharge exposures, shown in Figure 3.9-1, in Region 2, and

b. A nominal 9.24 inch center-to-center distance between fuel assemblies placed in the storage racks, and

c. A maximum reference fuel assembly K_{∞} less than or equal to 1.480 at 68°F for storage in Region 1.

5.6.1.2 The k_{eff} for new fuel for the first core loading stored dry in the spent fuel storage racks shall not exceed 0.98 when aqueous foam moderation is assumed.

DRAINAGE

5.6.2 The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 2040 feet.

CAPACITY

5.6.3 The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1344 fuel assemblies.

5.7 COMPONENT CYCLIC OR TRANSIENT LIMIT

5.7.1 The components identified in Table 5.7-1 are designed and shall be maintained within the cyclic or transient limits of Table 5.7-1.

(Next page is 5-9)

ATTACHMENT 3

Safety Evaluation

SAFETY EVALUATION

This amendment request is in support of Callaway Refuel 8. During Refuel 8, fuel that does not meet the current IFBA versus enrichment limit of FSAR Figure 9.1A-4 and Technical Specification 5.3.1 is planned to be loaded into the core. This amendment request proposes to modify Technical Specification section 5.3.1 to reflect a change in the maximum initial enrichment to 5.0 w/o U-235 for reload fuel and a change to the maximum fuel enrichment without requiring integral fuel burnable absorbers (IFBAs) for storage in Region 1. We also request that Technical Specification section 5.6.1.1 be revised to reflect a change in the maximum reference K_∞ from 1.455 to 1.480 for storage in Region 1 of the Spent Fuel Pool. Technical Specification Figure 3.9-1 is also to be revised to reflect a maximum initial enrichment of 5.0 w/o for storage in Region 2.

Callaway's second reload core (cycle 3) introduced the Westinghouse Vantage 5 Fuel (V-5) option as a mix with the Westinghouse Standard Fuel Assemblies (STD) and Optimized Fuel Assemblies (OFA). Beginning with cycle 5, Callaway began utilizing only the V-5 fuel design. In order to achieve Union Electric's economic goals, fuel strategies were developed for Cycles 9 and beyond which may require utilizing fuel enrichments up to 4.95 w/o U-235 that do not meet the current IFBA versus enrichment limit of FSAR Figure 9.1A-4. The current limit is 3.85 w/o U-235 with no IFBAs for stored fuel in Region 1. The analysis for the 3.85 w/o U-235 enrichment limit was performed by Westinghouse, however, their analysis was considered very conservative due to the use of "worst case" modeling techniques. To revise the range of the IFBA versus enrichment curve, criticality analyses were performed by Union Electric to support storage of 5.0 w/o U-235 fuel (allowances were made for manufacturing tolerances on enrichment).

The analyses performed to support the storage of higher enrichment fuel in Region 1 concluded that spent fuel criticality limits are maintained when storing fuel to a maximum initial enrichment of 4.10 w/o U-235 with no IFBAs, and up to 5.0 w/o U-235 provided that the number of IFBA rods meets the limits defined in Figure 3 of Attachment 6, Callaway Plant Region 1 Spent Fuel Rack Criticality Analysis, August 1995. Previously approved analyses performed to support the storage of higher enrichment fuel in Region 2 concluded that spent fuel criticality limits are maintained when storing fuel to a maximum initial enrichment of 5.0 w/o U-235, provided that the fuel burnups meet the prescribed limits (reference ULNRC-2647, dated June 12, 1992 and Amendment 82 to Facility Operating License NPF-30, dated July 7, 1993). The previous amendment only addressed fuel enrichments up to 4.45 w/o U-235 due to thermal/hydraulic

constraints. These constraints have been resolved and the current spent fuel pool heat load methodology can be used to support storage of fuel up to a maximum initial enrichment of 5.0 w/o U-235. However, cycle specific decay heat load analyses will still be required.

Description of the Callaway Spent Fuel Pool

The Callaway spent fuel pool utilizes the maximum density rack (MDR) design concept. Under this concept, the spent fuel pool is divided into two separate and distinct regions which for the purpose of criticality considerations may be considered as separate pools. Suitability of this design assumption regarding pool separability is assured through appropriate design restrictions at the boundaries between Region 1 and Region 2 and strict administrative controls. Region 1 of the pool allows storage of fuel assemblies in two out of 4 fuel rack locations, with the unused cells being used as water boxes to allow cooling water flow. Region 1 is designed on the basis of conservative unirradiated fuel assemblies and a full core unloading if that should prove necessary. Region 2 is designed to safely store irradiated fuel assemblies in large numbers, in a three out of four configuration. The only change in criteria between Region 1 and Region 2 is the recognition of actual fuel and fission product inventory accompanied by a system for verifying fuel burnup prior to moving any fuel assembly from Region 1 to Region 2. In both Region 1 and 2, subcriticality ($K_{eff} < 0.95$) is maintained during all normal, abnormal, or accident conditions.

The spent fuel pool is a reinforced concrete structure with a stainless steel liner. Fuel storage rack modules are constructed with square boxes which form a honeycomb structure. The boxes in which no fuel is stored are provided with permanent lead-in guides which prevent insertion of fuel assemblies into the water box, while allowing cooling water to flow through the water box. The rack modules are free-standing on the floor liner plate of the pool. The pool is filled with borated water with a boron concentration of at least 2000 ppm. The fuel pool cooling and cleanup system limits the pool temperature to 140°F with one train operating during normal plant conditions; removes impurities for visual clarity; and limits the radiation dose to operating personnel during normal and refueling operations.

Description of the Callaway Plant Fuel Designs

The physical characteristics of OFA, STD, and V-5 fuel assemblies are similar. The designs employ 17 X 17 fuel rod arrays and the fuel rods are zircaloy clad. The OFA and V-5 designs, however, utilize a smaller fuel rod diameter with chamfered pellets and employ zircaloy rather than inconel mixing vane spacer grids. The V-5 fuel utilizes intermediate flow mixer grids which are

nonstructural zircaloy grids installed between the three uppermost zircaloy grids. The V-5 design also incorporates Integral Fuel Burnable Absorbers (IFBAs), which consist of a thin zirconium diboride coating on the outside of the fuel pellet. As a result, the IFBA is a non-removable and thus integral part of the fuel assembly once it has been manufactured.

With respect to all other components in the active fuel region, the OFA and V-5 fuel types contain approximately the same fuel weight (UO_2). The V-5 weight is slightly different due to incorporation of axial blankets, however the analysis assumed full length enriched fuel for conservatism. IFBA combinations used for cycle 9 are not bounded by the limits used in the previous criticality analyses. For this reason the criticality analyses were re-performed to revise the IFBA versus enrichment curve (FSAR Figure 9.1A-4).

Criticality Analysis

Extensive analyses have been previously performed to support the storage of both STD and OFA/V-5 fuel assemblies under both normal and postulated accident conditions and to store the fuel up to a maximum initial enrichment of 3.85 w/o U-235 with no IFBAs, and up to 5.0 w/o with a prescribed number of IFBAs. To increase the maximum allowable enrichment for the Callaway Region 1 storage, a complete re-analysis was performed.

The analysis used two different and independent sets of code packages. To determine the IFBA versus enrichment curve the SCALE-4 code package, which includes NITAWL and KENO-V.a, was used. In addition, the CASMO-3 code was used in determining a reference K_∞ value which can be used as an alternative for determining the acceptability of fuel storage in the Callaway spent fuel racks. Union Electric utilized these codes for the most recent Region 2 criticality analysis which was approved by the NRC in Amendment 82 to Facility Operating License NPF-30, dated July 7, 1993.

The data points for the IFBA versus enrichment curve (Figure 3 of Attachment 6) were calculated using the NITAWL and KENO-V.a codes from the SCALE 4 package. The NITAWL code compiles selected cross sections from the 27 group master SCALE library in the format required by the Monte Carlo theory code, KENO-V.a. An extensive set of benchmark critical experiments has been analyzed with NITAWL/KENO-V.a. Results of these experiments are given in the Attachment 6, LFNF-95-02, Callaway Plant Region 1 Spent Fuel Rack Criticality Analysis, August 1995. The CASMO-3 code was utilized for developing the reference K_∞ utilized as an alternate method for determining acceptable storage of fuel in Region 1. CASMO-3 is a multi-group, two-dimensional, transport theory code

used for burnup calculations on PWR and BWR fuel assemblies. A 40 energy group nuclear data library based on data from ENDF/B-4 was used with CASMO. This library is a condensation from a 70 group library using typical LWR spectra for the various nuclides.

The CASMO-3 code has been validated by comparisons with experiments where isotopic fuel composition has been examined following discharge from a reactor. Results of these experiments were provided in a previous submittal (reference ULNRC-2647, dated June 12, 1992 and Amendment 82 to Facility Operating License NPF-30, dated, July 7, 1993).

The KENO-V.a code was used for the final multiplication factor predictions of the Callaway spent fuel racks. The calculations considered the details of the fuel assembly and fuel racks. The reference model geometry used for the calculations is a repeating array of 4 stainless steel boxes, two of which contain fuel assemblies, and the remaining two which serve as flux traps (water only). Calculations were initially performed to determine the maximum enrichment with no IFBAs for storage in Region 1. The reference model calculations assumed the Westinghouse 17 X 17 V-5 design fuel assembly which is currently planned to be utilized for future Callaway cores.

The calculational approach was to use the reference model to calculate the reactivity of an infinite array of uniform spent fuel racks. Any deviations of the actual spent fuel rack array from this assumed infinite array were accounted for as uncertainties on the calculated reactivity of the reference model. Calculational biases, manufacturing tolerances, and uncertainties were evaluated in terms of the reactivity changes to the reference model. For example, the reference calculation was performed with nominal dimensions on all the stainless steel boxes. Tolerances on the geometric array representing the racks were treated as uncertainties on the reference calculation. To ensure the calculations were performed at the most conservative fuel pool temperature, the effect of fuel pool temperature was taken into account. The fuel pool temperature can vary from 68°F to 248°F. Calculations determined that the maximum reactivity within the pool operating temperature range for the basic cell occurred at a fuel pool temperature of 68°F; thus the principal calculations were performed at this temperature.

The manufacturing tolerances and uncertainties that were taken into consideration are as follows: (1) fuel rack box spacing; (2) stainless steel thickness; (3) fuel density uncertainty; and (4) fuel enrichment uncertainty. In addition, the calculational method bias and uncertainty had to be included. These tolerances

and uncertainties were combined statistically and then added to the results of the basic cell calculation. Thus the overall results ensure that the maximum K_{eff} will be less than 0.95 with a 95% probability at a 95% confidence level.

Using the results from the NITAWL/KENO-V.a code, it was determined that the maximum enrichment for utilizing zero IFBAs to maintain $K_{eff} < 0.95$ is 4.15 w/o U-235. To provide an additional conservatism, an enrichment of 4.10 w/o U-235 was chosen as the maximum enrichment for zero IFBA rods. This results in a maximum Region 1 K_{eff} of 0.9481, including biases and uncertainties.

The methodology for determining the limiting IFBA versus enrichment curve for storing fuel above the nominal 4.10 w/o in the Callaway Region 1 fuel racks utilizes the concept of reactivity equivalencing. This concept accounts for the decrease in reactivity associated with the addition of IFBA fuel rods and fuel depletion. The reference calculations were performed with a 5.0 w/o U-235 Vantage 5 fuel assembly with various IFBA rod configurations to determine a K_{eff} equivalent to that determined for the zero IFBA case. The calculations utilize the same geometry as described above and are performed at zero burnup.

Once again, the calculational approach was to use the reference model to calculate the reactivity of an infinite array of uniform spent fuel racks. Any deviations of the actual spent fuel rack array from this assumed array were treated as uncertainties on the calculated reactivity of the reference model. Calculational biases, manufacturing tolerances, and uncertainties were evaluated in terms of the reactivity changes to the reference model. Tolerances on the geometric array representing the racks were treated as uncertainties on the reference calculation. The additional IFBA manufacturing tolerances and uncertainties taken into consideration were as follows: (1) B-10 linear loading uncertainty; (2) IFBA length uncertainty; and (3) IFBA rod position uncertainty. In addition, the calculational method bias and uncertainty had to be included. These tolerances and uncertainties were combined statistically and then added to the results of the basic cell calculation.

Using the results from the NITAWL/KENO-V.a code, the final IFBA versus enrichment curve (Figure 3 of Attachment 6) was determined by interpolating for the number of IFBAs to satisfy the above maximum K_{eff} (0.9481). The curve shows the enrichment for zero IFBAs at 4.10 w/o, and at 5.0 w/o enrichment the required number of IFBA rods is 21. This results in a maximum Region 1 K_{eff} of 0.9481, including biases and uncertainties.

As an alternate method for determining acceptability for fuel storage in Region 1, a reference K_{∞} calculation was performed using the CASMO code. This calculation was performed with the nominal zero IFBA enrichment of 4.10 w/o U-235. The calculation was performed in a reactor geometry. The calculated reference K_{∞} from the CASMO code is 1.480. This includes a 1% Δk reactivity bias to account for calculational uncertainties, and is consistent with the standard conservatism included in the Callaway core design refueling shutdown margin calculations. The K_{∞} value of 1.480 replaces the 1.455 value of Technical Specification 5.6.1.1.c.

In addition to the above analyses, Union Electric performed an evaluation of the reactivity consequences for abnormal/accident conditions. The results are documented in Attachment 6, Callaway Plant Region 1 Spent Fuel Rack Criticality Analysis. These analyses confirm that the resulting K_{eff} is ≤ 0.95, including bias and uncertainties, for all credible accident conditions assuming a soluble boron concentration of 2000 ppm. The use of 2000 ppm in the analyses is allowed by application of the double contingency principle of ANSI N16.1-1975.

Previously approved analyses performed to support the storage of higher enrichment fuel in Region 2 of the Callaway spent fuel pool concluded that spent fuel criticality limits are maintained when storing fuel to a maximum initial enrichment of 5.0 w/o U-235, provided that the fuel burnups meet the prescribed limits (reference ULNRC-2647, dated June 12, 1992). The previous amendment only addressed fuel enrichments up to 4.45 w/o U-235 due to thermal/hydraulic constraints. These constraints have been resolved and the current spent fuel pool heat load methodology can be used to support storage of fuel up to a maximum initial enrichment of 5.0 w/o U-235. However, cycle specific decay heat load analyses will still be required.

By application of the methodology described above, the Region 1 criticality analysis meets the requirements of General Design Criterion 62, "Prevention of Criticality in Fuel Storage and Handling," as it relates to the prevention of criticality by physical systems or processes utilizing geometrically safe configurations as referenced in acceptance criterion II.5 of Standard Review Plan 9.1.2, "Spent Fuel Storage." The Region 1 criticality analysis meets this criterion by conforming to position C.1 and C.4 of Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis," Rev. 1, December 1975, and the appropriate paragraphs of ANS 57.2, "Design Objectives for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Stations," approved April 12, 1976.

Thermal-Hydraulic and Fuel Building Ventilation Analysis

An increase in fuel enrichment of the V-5 fuel does not alter the normal performance of the fuel pool cooling and cleanup systems, fuel building ventilation or radiological control systems. Cycle specific Spent Fuel Pool heatup calculations will continue to be performed to justify pool loading below the proposed enrichment limit (5.0 w/o U-235). In Amendment 54 to Facility Operating License NPF-30, dated May 25, 1990 the NRC staff approved the dose estimates for use of 5.292 w/o U-235 and a burnup of 60,000 MWD/MTU. This amendment request does not impact the analyzed burnup value. Cycle specific fuel handling accident analyses will continue to be performed to verify consequences are bounded.

Design Bases

An increase in the maximum initial enrichment level to 5.0 w/o U-235 does not adversely affect the safety design bases, the power generation design bases or the evaluations contained in the FSAR. The design bases are summarized in FSAR Sections 9.1.2.1.1 and 9.1.2.1.2 for Spent Fuel Storage and Sections 9.1.3.1.1 and 9.1.3.1.2 for Fuel Pool Cooling and Cleanup Systems. Spent Fuel Pool temperature limits will not be exceeded.

Evaluation

An increase to a maximum initial enrichment of 5.0 w/o U-235 does not involve an increase in the probability or consequences of an accident or other adverse condition over previous evaluations. Because of the conservative techniques and assumptions used to evaluate the maximum possible neutron multiplication factor, this ensures that criticality safety is maintained when storing fuel assemblies of up to and including 5.0 w/o U-235 in the spent fuel storage racks under both normal and postulated accident conditions. For example, the calculations for non-accident conditions ignored the 2000 ppm soluble boron in the spent fuel pool, resulting in a conservative value of the multiplication factor. A soluble boron concentration of 2000 ppm results in an approximate reduction of 30% Δk. Storing fuel in the Region 1 configuration which meets the IFBA versus enrichment curve results in a maximum multiplication factor of 0.9481, including all biases and uncertainties.

An increase to a maximum initial enrichment of 5.0 w/o U-235 does not create the possibility of a new or different kind of accident or other condition over previous evaluations. An increase to an initial enrichment of 5.0 w/o U-235 involved performing extensive evaluations to develop the IFBA versus enrichment curve for storage of V-5 fuel in Region 1. Use of dual code packages ensures that the criticality limits are not exceeded.

An increase to a maximum initial enrichment of 5.0 w/o U-235 does not increase the probability or consequences of a malfunction of equipment important to safety previously evaluated in the FSAR or create the probability of a malfunction of equipment important to safety different than previously evaluated in the FSAR. An increase in the initial enrichment level of 5.0 w/o U-235 does not adversely impact operation of the various plant systems, i.e., HVAC, spent fuel pool cooling, or radiological control systems.

An increase to a maximum initial enrichment of 5.0 w/o U-235 does not involve a reduction in the margin of safety. As discussed above, in all cases the multiplication factors fall considerably below 0.95 and do not represent any reductions in margin. An increase in the initial enrichment level of 5.0 w/o U-235 does not adversely impact operation of the various plant systems, i.e., HVAC, spent fuel pool cooling, or radiological control systems.

Conclusion

The proposed changes do not involve an unreviewed safety question because operation of the Callaway Plant with the changes would not:

1. Increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety evaluated previously in the safety analysis report. The increase in fuel enrichment does not impact any accident initiators. Cycle specific fuel handling accident analyses will be performed as always to verify that cycle specific enrichment increases up to 5.0 w/o U-235 will not significantly impact accident consequences. Extensive criticality analyses have established IFBA loading requirements, burnup requirements, and a maximum reference K_∞ to assure K_{eff} is less than or equal to 0.95 for all areas of the Spent Fuel Storage Facility.

2. Create a possibility for an accident or malfunction of a different type than any previously evaluated in the safety analysis report. The ability of the Fuel Pool Cooling System to remove decay heat as designed is unaffected. HVAC systems are also unaffected by this change. No new accident initiators are created.

3. Reduce the margin of safety as defined in the basis for any technical specification. The Spent Fuel Storage Facility will continue to meet all design basis requirements. Enriched fuel stored there will not cause K_{eff} to increase above 0.95. The maximum temperatures for the Spent Fuel Pool remain below the limits established in FSAR Appendix 9.1A.

Based on the previous discussions as well as those presented in the Significant Hazards Evaluation, the proposed Technical Specification changes do not adversely affect or endanger the health or safety of the general public or involve a significant safety hazard.

ATTACHMENT 4

Significant Hazards Evaluation

SIGNIFICANT HAZARDS EVALUATION

This amendment request is in support of Callaway Refuel 8. During Refuel 8, fuel that does not meet the current IFBA versus enrichment limit of FSAR Figure 9.1A-4 and Technical Specification 5.3.1 is planned to be loaded into the core. This amendment request proposes to modify Technical Specification section 5.3.1 to reflect a change in the maximum initial enrichment to 5.0 w/o U-235 for reload fuel and a change to the maximum fuel enrichment without requiring integral fuel burnable absorbers (IFBAs) for storage in Region 1. We also request that Technical Specification section 5.6.1.1 be revised to reflect a change in the maximum reference K_∞ from 1.455 to 1.480 for storage in Region 1 of the Spent Fuel Pool. Technical Specification Figure 3.9-1 is also to be revised to reflect a maximum initial enrichment of 5.0 w/o for storage of fuel in Region 2.

The Safety Evaluation supporting this amendment request provides the bases for concluding that the proposed changes are consistent with the licensing bases of the spent fuel pool and verify that the proposed changes do not alter safe operation of the spent fuel pool systems nor violate pool criticality safety limits. The reevaluations further demonstrate that an increase in maximum initial enrichment for Region 1 storage can be up to 5.0 w/o U-235, provided the appropriate number of IFBAs are utilized. Since the criticality safety analyses confirm that the original criteria are met, the possibility of a new or different kind of accident or condition over previous evaluations is not credible. Physically all three fuel types are similar. OFA and V-5 fuel are geometrically compatible with STD. The fuel assembly dimensional envelope, skeletal structure, and internal grid locations are essentially the same. The structural differences, for OFA/V-5 fuel versus Standard fuel, are a smaller fuel rod outer diameter and zircaloy spacer grids rather than inconel. Neutronic differences between the two fuel designs have been analyzed and determined to not alter spent fuel pool criticality safety limits. Basically, the Technical Specification change incorporates an increase in maximum initial enrichment for Region 1 storage to 5.0 w/o U-235, provided the fuel meets the required IFBA credit limit (Figure 3 of Attachment 6) and for Region 2 provided the burnup limits are met. The change to Vantage-5 has been previously approved for Callaway. WCAP 10444 sets forth the Vantage 5 fuel design, and this WCAP has been reviewed and approved by the NRC.

INCREASE IN MAXIMUM INITIAL ENRICHMENT TO 5.0 W/O U-235 FOR FUEL STORAGE IN REGION 1 AND REGION 2 OF THE SPENT FUEL POOL

Extensive analyses were previously performed to support storage of V-5 fuel to maximum enrichments of 4.45 w/o U-235 in both Region 1 and Region 2 of the spent fuel pool. The results of these analyses were submitted in amendment request ULNRC-2130dated December 28, 1989, and amendment request ULNRC-2647, dated June 12, 1992. Increasing the maximum enrichment limit to 5.0 w/o U-235 for storage in Region 1 and Region 2 of the spent fuel pool does not represent a significant hazard in that:

1. An increase to a maximum initial enrichment of 5.0 w/o U-235 does not involve an increase in the probability or consequence of an accident or other adverse condition over previous evaluations. Because of the conservative techniques and assumptions used to evaluate the maximum possible neutron multiplication factor, there is reasonable assurance that criticality safety is maintained when storing fuel assemblies of up to and including 5.0 w/o U-235 in the spent fuel storage racks under both normal and postulated accident conditions. For example, the calculations for non-accident conditions ignore the 2000 ppm soluble boron in the spent fuel pool calculations, thus resulting in conservative values of the multiplication factor. Storing fuel in the Region 1 configuration which meets the IFBA versus enrichment curve (Figure 3 of Attachment 6) results in a maximum multiplication factor of 0.9481, including all biases and uncertainties.

2. An increase to a maximum initial enrichment level of 5.0 w/o U-235 does not create the possibility of a new or different kind of accident or condition over previous evaluations. An increase to the enrichment level of 5.0 w/o U-235 involved performing extensive evaluations to develop the IFBA versus enrichment curve for V-5 fuel. Use of dual code packages ensures that the spent fuel pool Region 1 criticality limits are not exceeded.

3. An increase in the maximum initial enrichment level to 5.0 w/o U-235 does not involve a reduction in the margin of safety. As discussed above, in all cases the multiplication factors for worst case assumptions fall considerably below the criticality limits and do not represent any reductions in margin. An increase to the initial enrichment level of 5.0 w/o U-235 does not adversely impact operation of the various plant systems, i.e. HVAC, spent fuel pool cooling, or radiological control systems.

As discussed above, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated or create the possibility of a new or different kind of accident from any previously evaluated. These changes do not result in a significant reduction in a margin of safety. Therefore, it has been determined that the proposed changes do not involve a significant hazards consideration.

ATTACHMENT 5

Environmental Consideration

ENVIRONMENTAL CONSIDERATION

This amendment request is in support of Callaway Refuel 8. During Refuel 8, fuel that does not meet the current IFBA versus enrichment limit of FSAR Figure 9.1A-4 and Technical Specification 5.3.1 is planned to be loaded into the core. This amendment request proposes to modify Technical Specification section 5.3.1 to reflect a change in the maximum initial enrichment to 5.0 w/o U-235 for reload fuel and a change to the maximum fuel enrichment without requiring integral fuel burnable absorbers (IFBAs) for storage in Region 1. We also request that Technical Specification section 5.6.1.1 be revised to reflect a change in the maximum reference K_∞ from 1.455 to 1.480 for storage in Region 1 of the Spent Fuel Pool. Technical Specification Figure 3.9-1 is also to be revised to reflect a maximum initial enrichment of 5.0 w/o for storage of fuel in Region 2.

The proposed amendment involves changes with respect to the use of facility components located within the restricted areas as defined in 10 CFR Part 20. Union Electric has determined that the proposed amendment involves no significant hazards consideration, no significant increase in the amounts nor significant change in the types of any effluents that may be released offsite, and no significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR51.22 (c) (9). Pursuant to 10 CFR51.22 (b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

ATTACHMENT 6

Callaway Plant Region 1 Spent Fuel Rack Criticality Analysis