CONSUMERS POWER COMPANY
Docket 50-255
Request for Change to the Technical Specifications
License DPR-20

For the reasons hereinafter set forth, it is requested that the Technical Specifications contained in the Facility Operating License DPR-20, Docket 50-255, issued to Consumers Power Company on February 21, 1991, for the Palisades Plant be changed as described in Section I below:

I. Changes

A. In Section 5.4.1.a change the maximum enrichment to an assembly planar average of 4.20 w/o U_{235} for fuel assemblies with 216 UO_2, Gd_2O_3-UO_2 fuel rods or metal rods. Also, change the maximum K_{eff} to ≤ 0.95 and the source of the calculated K_{eff} from CPC letters to Siemens Nuclear Power Corporation report EMF-91-1421(P). (See marked up pages in Attachment 2).

B. In Section 5.4.2.c, change the maximum enrichment for fuel stored in Region I (NUS) storage racks to an assembly planar average U_{235} enrichment of 4.40 w/o. Also add a sentence which requires fuel assemblies having enrichment above 3.27 w/o U_{235} to contain 216 UO_2, Gd_2O_3-UO_2 or solid metal rods. (See marked up pages in Attachment 2)

C. Delete Section 5.4.2.e.

II. Discussion

The proposed change to Section 5.4.1.a will allow storage of new fuel assemblies with an average assembly planar enrichment of 4.20 w/o U_{235} in the new fuel rack and thus permit the more highly enriched fuel assemblies for the next fuel cycle (Cycle 10, Reload N) and subsequent fuel cycles to be stored in the new fuel racks before they are transferred to the fuel pool and eventually to the reactor vessel.

The Palisades new fuel racks are seismically mounted in a dry pit in the same room as the spent fuel pool. The rack is a 3 x 24 array capable of containing 36 fuel assemblies with alternate positions occupied by 8 x 8 inch structural box beams.

Siemens Nuclear Power Corporation report EMF-91-1421(P) "Criticality Safety Analysis for the Palisades New Fuel Storage Array" (Attachment 4) shows the effect of raising the maximum allowed U_{235} enrichment in new fuel stored in the Palisades new fuel racks from 3.317 w/o (stated in the Palisades Technical Specifications as 41.24 grams per centimeter) to 4.20 w/o. The analysis described in EMF-91-1421(P) was performed in accordance with the requirements of Section 9.1.1 of NUREG 0800 and

ANSI/ANS 57.3-1983 "Design Requirements for New Fuel Storage Facilities at Light Water Reactor Plants." The report's conclusion is that the Cycle 10 (Reload N) fuel design with 216 UO_2 fuel rods and a fuel enrichment up to 4.25 w/o U_{235} meets Section 9.1.1 of NUREG 0800, ANSI 57.3-1983 and Palisades Technical Specifications reactivity limit criteria ($K_{eff} \leq 0.95$) for the storage of new fuel in the Palisades new fuel racks.

To account for a 0.05 w/o U_{235} manufacturing enrichment uncertainty, this change proposes a 4.20 w/o U_{235} enrichment for new fuel stored in the Palisades new fuel racks. Other fuel assembly design parameters (clad thickness, pellet diameter, pellet density, dish volume and active fuel length) used in the analysis were set at conservative values within the manufacturing tolerances. Additionally, the most adverse positioning of the fuel assemblies within the new fuel rack was postulated, as illustrated in Figure 3 of the Criticality Safety Analysis EMF-91-1421(P), and the K_{eff} was evaluated for a range of moderator void fractions from zero to .95 to verify that the fully flooded condition is limiting.

The criticality analysis for the Palisades spent fuel pool Region I (NUS) racks (EMF-91-174(P)) analyzed the effects of allowing fuel assemblies having a maximum assembly enrichment of 4.40 w/o U_{235} to be stored in the Region I (NUS) racks in the spent fuel pool. The report's conclusion, based on assuming the most conservative credible conditions and with a 95/95 probability confidence level, is that the maximum K_{eff} will be 0.9131. This meets the Section 9.1.2 of NUREG 0800, ANSI/ANS 57.2 and Palisades Technical Specifications criteria of having $K_{eff} \leq .95$ for spent fuel pools flooded with unborated water. The major conservatisms in the analysis included:

1. The fuel enrichment is modeled as the bundle average in all fuel pin locations. This has been shown to be conservative relative to using the actual enrichment distribution of the fuel pins.

2. The B_4C molded in a carbon matrix poison plates in the Region I racks are modeled as having minimum width and thickness.

3. The modeled spent fuel pool temperature was 20°C. The higher actual temperatures in the spent fuel pool will result in lower K_{eff} values.

4. The spent fuel pool was modeled as flooded with pure water (no dissolved boron).

5. K_{eff} for the NUS storage array was determined assuming a full array with a fuel assembly average enrichment of 4.4 w/o U_{235} and no burnable poisons.

Section 5.4.2.e has been deleted since it is superfluous and could lead to confusion because it specifies the maximum w/o U_{235} in the spent fuel stored in the spent fuel pool without regard to the regions in the pool. Sections 5.4.2.c, 5.4.2.d and 5.4.2.i specify the maximum w/o U_{235} allowable in each region of the pool.

III. Analysis of No Significant Hazards Consideration

Consumers Power Company has determined that activities associated with this change request do not involve a significant hazards consideration per 10CFR50.92(c) and, accordingly, a no significant hazards consideration finding is justified. In support of this determination, necessary background information is first provided, followed by a discussion of each of the no significant hazards consideration factors with respect to the proposed change.

The proposed technical specifications changes are required to allow storage in the new fuel racks and the spent fuel pool of the fuel designed for Cycle 10 (Reload N) operation. The proposed changes are the result of modifications to the fuel design which minimize the fluence effect on the reactor vessel and enable the maintenance of a reasonable length fuel cycle. Cycle 10 is designed for 15 months. We plan to design Cycle 11 and subsequent cycles for 18 months.

The Palisades spent fuel pool is divided into two areas, the main pool area and the north (spare) tilt pit area. Each of these areas (main pool and north tilt pit) is divided in two regions specified as Region I and Region II. By definition, Region I, of either the main pool area or north tilt pit area, is that area containing racks manufactured by NUS Corporation having 10.25" or greater center to center spacing and using B_4C in a carbon matrix as a neutron absorber. Region II is that area containing racks manufactured by the Westinghouse Corporation having a 9.17" center to center spacing and using Boroflex as the neutron absorber. Because of the smaller center to center spacing and the construction of the Region II racks, Technical Specifications Section 5.4.2.d requires that spent fuel must have a minimum burn-up before it is stored in Region II.

Storage of new fuel with greater than 1.5 w/o U_{235} in Region II racks has not been analyzed. Therefore new fuel with greater than 1.5 w/o U_{235} but less than or equal to the proposed new fuel rack maximum of 4.20 w/o U_{235}, will be stored only in the new fuel racks in the new fuel pit or in the Region I racks in the spent fuel pool.

The Palisades new fuel racks are located in a dry pit in the same room as the spent fuel pool and are seismically mounted in a 24 x 3 array 15 feet above the bottom of the pit. Alternate storage positions are filled with stainless steel box beams in a checker board pattern and thus leaves 36 positions for new fuel storage.

Based on our review of the criticality safety analyses of the new fuel racks and Region I spent fuel pool racks, we have determined that the activities associated with this proposed technical specifications change do not involve a significant hazards consideration per 10 CFR 50.92(c) and, accordingly, a no significant hazards consideration finding is justified. The subject criticality safety analyses were accomplished in accordance with and meet the requirements of Sections 9.1.1 and 9.1.2 of NUREG 0800, ANSI/ANS 57.2-1983 and ANSI/ANS 57.3-1983.In support of this determination, the following evaluation of each of the no significant hazards consideration factors is provided which shows that operation of the Palisades Plant in accordance with the proposed changes would not:

1. <u>Involve a significant increase in the probability or consequences of an accident previously evaluated.</u>

   In compliance with ANSI/ANS 57.3-1983, an evaluation was completed on the potential adverse effects of fuel handling accidents in the new fuel storage racks when new fuel of the proposed maximum enrichment is stored in them. The new fuel storage array is a dry storage rack. The consequences of a fuel handling accident (i.e. a fuel assembly lying on top of the racks), is the only previously evaluated accident where the probability and consequences could be affected by this change. The probability of a fuel handling accident is not increased as the method for fuel handling has not changed and as long as the new fuel racks remain dry, the consequences of a fuel handling accident are not affected. As stated in the safety analysis, the infinite multiplication factor (K_∞) for dry 5.0 w/o U_{235} uranium oxide systems is less than 0.8; thus, K_∞ for the proposed maximum 4.20 w/o U_{235} new fuel assemblies stored in the new fuel racks would be less than the 0.95 limit stipulated by ANSI/ANS 57.3-1982 and the Palisades Technical Specifications. Additionally, this change in maximum allowed w/o U_{235} enrichment cannot affect the probability of the racks being flooded.

   The results of a fuel handling accident in the new fuel pit when the new fuel pit is flooded have not been evaluated because the probability of flooding the new fuel pit is very small and the probability of the new fuel pit flooding while fuel handling is taking place is so small as to be considered insignificant. Special features of the new fuel racks which make the probability of their flooding very small are:

   A. All cells and spaces between cells have openings at the bottom to facilitate draining; and
   B. The racks are seismically mounted 3 ft above a steel grating which is 12 ft above the floor of the normally dry new fuel pit.

   This proposed change, which only affects the maximum U_{235} enrichment stored in the new fuel racks, does not change the location of the new fuel racks and thus cannot affect the probability of the new fuel racks being flooded.

   Therefore, since the neutron multiplication factor, K_{eff}, remains below 0.95, the method of handling new fuel is not changed and the probability of flooding is not affected, neither the probability nor the consequences of a previously evaluated accident is significantly increased by the proposed change in the maximum allowed U_{235} enrichment in the new fuel racks.

In the spent fuel pool, the fuel handling (a dropped fuel assembly) accident is the only previously evaluated accident considered credible as being affected by this change. If a fuel assembly were to be dropped on the spent fuel rack and lay horizontally across the top of the rack, the assembly would be approximately seven inches above the active portion of the assemblies in storage. Seven inches of water is enough to neutronically decouple the dropped assembly from those being stored in the racks. Except when a fuel rack is removed to permit cask loading, the rack design prevents a vertical fuel assembly from being placed outside the spent fuel storage rack since the distance between the racks and between the racks and the pool walls is less than the width of the fuel assembly. During cask loading, a Region II rack in the cask loading area of the fuel pool (Northeast corner) is removed to provide space for the cask and a space is opened adjacent to the Region II racks where a fuel assembly could be dropped. Siemens Nuclear Power Corporation is performing an analysis of the criticality result of dropping a fuel assembly having 4.40 w/o U_{235} enrichment adjacent to the Region II (Westinghouse) racks in the space opened for cask loading by removal of the Region II rack in the northeast corner of the spent fuel pool. Until that analysis is complete and the conclusion is that such placement will cause K_{eff} to be ≤ 0.95, no spent fuel racks will be removed from the spent fuel pool. Thus, in the spent fuel pool, neither the probability nor the consequences of a previously evaluated accident is significantly increased.

To summarize, changing the enrichment of the fuel assembly will not change the method of fuel handling and therefore the probability of a fuel handling accident is not increased. Neither will this change, which only affects fuel enrichment, adversely effect the consequences of a previously evaluated fuel handling accident so as to cause K_{eff} in either the new fuel racks or the spent fuel pool to be greater than 0.95. Thus, this proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. <u>Create the possibility of a new or different kind of accident from any accident previously evaluated.</u>

This change only involves the maximum w/o U_{235} enrichment for fuel stored in the new fuel racks and spent fuel pool. The method of handling fuel has not been changed. Although the storage location of certain fuel in the spent fuel pool has been further restricted (fuel with initial enrichment of U_{235} greater than 3.27 w/o is allowed to be stored in Region I only), this change does not create the possibility of a new or different kind of accident (misplaced fuel assembly) from any accident previously evaluated if fuel handling is in accordance with the proposed change. Thus, this proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. <u>Involve a significant reduction in the margin of safety.</u>

The margin of safety, when applied to fuel racks, addresses (1) nuclear criticality concerns, (2) thermal hydraulic considerations, and (3) mechanical, material and structural considerations.

(1) The established criterion in ANSI/ANS 57.2-1983, ANSI/ANS 57.3-1983 and the Palisades Technical Specifications for criticality is that the neutron multiplication factor (K_{eff}) in the spent fuel storage racks and the new fuel storage racks shall be less than or equal to 0.95 including all uncertainties under all conditions. The criticality safety analysis for the spent fuel pool Region I racks concludes this margin of safety is maintained in the spent fuel pool when the maximum enrichment of fuel stored in the Region I is increased from 3.27 w/o U_{235} to 4.40 w/o U_{235}. Similarly, the criticality safety analysis for the new fuel pool Region I racks, concludes that the $\leq$ 0.95 K_{eff} margin is maintained in the new fuel racks when the allowed enrichment of new fuel stored in the new fuel racks is increased from 41.24 grams U_{235} per centimeter (3.317 w/o) to 4.20 w/o U_{235} average assembly planar enrichment.

(2) The change in maximum allowed enrichment has no effect on the thermal hydraulic condition of the new fuel racks since the fuel has not been irradiated. The thermal hydraulic condition of the Region I spent fuel racks will not be significantly affected since decay heat is more a function of the power level, time at power and time subcritical than a function of the enrichment.

(3) The mechanical, material and structural conditions are not significantly affected by the proposed increase in enrichment since the fuel assembly weight, size and shape will not change.

Thus, this proposed change would have no significant effect on the criticality, thermal hydraulic condition, and material, mechanical and structural condition of the new fuel racks and spent fuel storage pool and does not involve a significant reduction in a margin of safety.

In summary, it has been shown that the proposed change to allow storage of new fuel with up to 4.20 w/o U_{235} average planar enrichment in the Palisades new fuel racks and to allow fuel with up to 4.40 w/o U_{235} average planar enrichment to be stored in Region I of the Palisades spent fuel pool does not:

1. 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.

3. Involve a significant reduction in the margin of safety.

Therefore, Consumers Power Company has determined that the proposed change does not involve a significant safety hazard.

IV. Conclusion

The Palisades Plant Review Committee has reviewed this Technical Specifications Change Request and has determined that this change does not involve an unreviewed safety question. Further, the change involves no significant hazards consideration. This change has been reviewed by the Nuclear Performance Assessment Department. A copy of this Technical Specifications Change Request has been sent to the State of Michigan official designated to receive such Amendments to the Operating License.

CONSUMERS POWER COMPANY

To the best of my knowledge, information and belief, the contents of this Technical Specifications Change Request are truthful and complete.

By David P. Hoffman
David P Hoffman, Vice President
Nuclear Operations

Sworn and subscribed to before me this 28th day of October 1991.

Linda L. Bumb
Notary Public
JACKSON, Michigan
My commission expires 9-5-93

ATTACHMENT 1

Consumers Power Company
Palisades Plant
Docket 50-255

TECHNICAL SPECIFICATION CHANGE REQUEST
ENRICHMENT IN NEW AND SPENT FUEL STORAGE

PROPOSED NEW PAGES

October 28, 1991

2 Pages

5.4 FUEL STORAGE

5.4.1 New Fuel Storage

a. The pitch of the new fuel storage rack lattice is ≥9.375 inches, and every other position in the lattice shall be permanently occupied by an 8" x 8" structural steel box beam or core plugs such that the minimum center-to-center spacing of new fuel assemblies in the alternating storage array is 13.26". This distance in the alternating storage lattice is sufficient so that K_{eff} will not exceed 0.95 where fuel assemblies with 216 UO_2 or Gd_2O_3-UO_2 fuel rods or metal rods and a maximum average planar enrichment in the UO_2 or Gd_2O_3-UO_2 fuel rods of 4.20 w/o U_{235} are in place and optimum moderation is assumed. The calculated K_{eff} includes appropriate conservatisms as described in Siemens Nuclear Power Corporation Report EMF-91-1421(P).

b. New fuel may also be stored in shipping containers.

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

5.4.2 Spent Fuel Storage

a. Irradiated fuel bundles will be stored, prior to off-site shipment in the stainless steel-lined spent fuel pool.

b. (Deleted)

c. The spent fuel storage pool and spare (north) tilt pit are divided into two regions identified as Region I and Region II as illustrated in Figure 5.4-1. Region I racks are designed and shall be maintained with a nominal 10.25" center-to-center distance between fuel assemblies with the exception of the single Type E rack which has a nominal 11.25" center-to-center distance between fuel assemblies. The Region I spent fuel storage racks are designed such that fuel having a maximum assembly planar average U_{235} enrichment of 4.40 w/o placed in the racks would result in a K_{eff} equivalent to ≤ 0.95 when flooded with unborated water. The K_{eff} of ≤ 0.95 includes a conservative allowance for uncertainties. For enrichments above 3.27 w/o U_{235}, the fuel assemblies must contain 216 rods which are either UO_2, Gd_2O_3-UO_2 or solid metal.

d. Region II racks have a 9.17 inch center-to-center spacing. Because of this smaller spacing, strict controls are employed to evaluate burnup of the fuel assembly prior to its placement in Region II cell locations. Upon determination that the fuel assembly meets the burnup requirements of Table 5.4-1, placement in a Region II cell is authorized. These positive controls assure the fuel enrichment limits assumed in the safety analyses will not be exceeded.

e. (Deleted)

f. The minimum spent fuel pool water boron concentration shall be 1720 ppm. Boron concentration shall be verified at least once monthly.

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

h. (Deleted)

i. Storage in Region II of the spent fuel pool and spare (north) tilt pit shall be restricted by burnup and enrichment limits specified in Table 5.4-1.

NOTE: Until needed for fuel storage, one Region II rack in the northeast corner of the spent fuel pool may be removed and replaced with the cask anti-tipping device.

References

FSAR Update Chapter 5
FSAR Update Chapter 9

ATTACHMENT 2

Consumers Power Company
Palisades Plant
Docket 50-255

TECHNICAL SPECIFICATION CHANGE REQUEST
ENRICHMENT IN NEW AND SPENT FUEL STORAGE

MARKED UP PAGES

October 28, 1991

2 Pages

5.4 FUEL STORAGE

5.4.1 New Fuel Storage

a. The pitch of the new fuel storage rack lattice is ≥9.375 inches, and every other position in the lattice shall be permanently occupied by an 8" x 8" structural steel box beam or core plugs such that the minimum center-to-center spacing of new fuel assemblies in the alternating storage array is 13.26". This distance in the alternating storage lattice is sufficient so that K_{eff} will not exceed 0.~~98~~ .95 where fuel ~~which contains not more than 41.24 grams of U-235 per axial centimeter of active fuel assembly is~~ assemblies with 216 UO_2 or Gd_2O_3-UO_2 fuel rods or metal rods and a maximum average planar enrichment in the UO_2 or Gd_2O_3-UO_2 fuel rods of 4.20 w/o U_{235} are in place and optimum ~~(ie, aqueous foam)~~ moderation is assumed. ~~and the K_{eff} will not exceed 0.95 when the storage area is flooded with unborated water~~. The calculated K_{eff} includes ~~a conservative allowance for uncertainties as described in CPC letters of 12/18/78 and 1/12/79~~ appropriate conservatisms described in Siemens Nuclear Power Corporation report EMF-91-1421(P).

b. New fuel may also be stored in shipping containers.

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

Amendment No ~~35~~, ~~49~~, ~~105~~
~~July 24, 1987~~

assembly planar average

5.4.2 Spent Fuel Storage

a. Irradiated fuel bundles will be stored, prior to off-site shipment in the stainless steel-lined spent fuel pool.

b. (Deleted)

c. The spent fuel storage pool and spare (north) tilt pit are divided into two regions identified as Region I and Region II as illustrated in Figure 5.4-1. Region I racks are designed and shall be maintained with a nominal 10.25" center-to-center distance between fuel assemblies with the exception of the single Type E rack which has a nominal 11.25" center-to-center distance between fuel assemblies. The Region I spent fuel storage racks are designed such that fuel having a maximum U-235

enrichment ~~loading~~ of ~~3.27~~ w/o ~~of U-235~~ placed in the racks would result in a K_{eff} equivalent to ≤ 0.95 when flooded with unborated water. The K_{eff} of ≤ 0.95 includes a conservative allowance for uncertainties.

4.40

d. Region II racks have a 9.17 inch center-to-center spacing. Because of this smaller spacing, strict controls are employed to evaluate burnup of the fuel assembly prior to its placement in Region II cell locations. Upon determination that the fuel assembly meets the burnup requirements of Table 5.4-1, placement in a Region II cell is authorized. These positive controls assure the fuel enrichment limits assumed in the safety analyses will not be exceeded.

e. After installation of the two-region high density spent fuel racks, the maximum loading for fuel assemblies in the spent fuel racks is 3.27 w/o of U-235.

f. The minimum spent fuel pool water boron concentration shall be 1720 ppm. Boron concentration shall be verified at least once monthly.

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

h. (Deleted)

i. Storage in Region II of the spent fuel pool and spare (north) tilt pit shall be restricted by burnup and enrichment limits specified in Table 5.4-1.

NOTE: Until needed for fuel storage, one Region II rack in the northeast corner of the spent fuel pool may be removed and replaced with the cask anti-tipping device.

References

FSAR Update Chapter 5
FSAR Update Chapter 9

For enrichments above 3.27 w/o U_{235}, the fuel assemblies must contain 216 rods which are either UO_2, Gd_2O_3-UO_2 or solid metal.

Amendment No. 105, ~~111~~
~~March 1, 1988~~

TSP0287-0223-NL04

ATTACHMENT 3

Consumers Power Company
Palisades Plant
Docket 50-255

TECHNICAL SPECIFICATION CHANGE REQUEST
ENRICHMENT IN NEW AND SPENT FUEL STORAGE

SIEMENS NUCLEAR POWER PROPRIETARY REPORT
EMF-91-174(P)

October 28, 1991