5.2.1.2 REACTOR BUILDING

a. Nominal annular space = 5 feet.

b. Annulus nominal volume = 427,000 cubic feet.

c. Nominal outside height (measured from top of foundation base to the top of the dome) = 177 feet.

d. Nominal inside diameter = 125 feet.

e. Cylinder wall minimum thickness = 3 feet.

f. Dome minimum thickness = 2.25 feet.

g. Dome inside radius = 87 feet.

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The reactor containment is designed and shall be maintained for a maximum internal pressure of 15.0 psig and a temperature of 250°F.

5.3 REACTOR CORE

ROD LOCATIONS. FUEL ROD LOCATIONS MAY AT ANY TIME DURING PLANT LIFE HAVE, AS JUSTIFIED BY ANALYSES USING NRC APPROVED METHODOLOGY AND/OR 10 CFR 50.59, ANY COMBINATION OF: 1) FUEL RODS CLAD WITH ZIRCALOY-4, 2) FILLER RODS FABRICATED FROM ZIRCALOY-4 OR STAINLESS STEEL, OR 3) VACANCIES.

FUEL ASSEMBLIES

5.3.1 The core shall contain 193 fuel assemblies with each fuel assembly containing 264 fuel ~~rods clad with Zircaloy-4, except that limited substitutions of fuel rods by filler rods consisting of Zircaloy-4 or stainless steel, or by vacancies, may be made in peripheral fuel assemblies if justified by cycle-specific reload analyses.~~ 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 4.0 weight percent U-235.

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. The nominal values of absorber material for Unit 1 control rods shall be 80% silver, 15% indium, and 5% cadmium. The nominal values of absorber material for Unit 2 control rods shall be 100% boron carbide (B_4C) for 102 inches and 80% silver, 15% indium, and 5% cadmium for the 40-inch tip. All control rods shall be clad with stainless steel tubing.

ATTACHMENT 1B

Proposed Catawba Unit 1 and 2
Technical Specification Changes

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The reactor containment vessel is designed and shall be maintained for a maximum internal pressure of 15 psig and a temperature of 328°F.

5.3 REACTOR CORE

FUEL ASSEMBLIES

ROD LOCATIONS. FUEL ROD LOCATIONS MAY AT ANY TIME DURING PLANT LIFE HAVE, AS JUSTIFIED BY ANALYSES USING APPROVED METHODOLOGY AND/OR 10CFR 50.59, ANY COMBINATION OF: 1) FUEL RODS CLAD WITH ZIRCALOY-4, 2) FILLER RODS FABRICATED FROM ZIRCALOY-4 OR STAINLESS STEEL, OR 3) VACANCIES.

5.3.1 The core shall contain 193 fuel assemblies with each fuel assembly containing 264 fuel ~~rods clad with Zircaloy-4.~~ Each fuel rod shall have a nominal active fuel length of 144 inches. ~~The initial core loading shall have a maximum enrichment of 3.5 weight percent U-235.~~ Reload fuel shall be similar in physical design to the initial core loading and shall have a maximum enrichment of 3.5 weight percent U-235.

CONTROL ROD ASSEMBLIES

5.3.2 The core shall contain 53 full-length control rod assemblies. The full-length control rod assemblies shall contain a nominal 142 inches of absorber material of which 102 inches shall be 100% boron carbide and remaining 40-inch tip shall be 80% silver, 15% indium, and 5% cadmium. 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 a 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 12,040 ± 100 cubic feet at a nominal T_{avg} of 525°F.

5.5 METEOROLOGICAL TOWER LOCATION

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

ATTACHMENT 2

Justification and Safety Analysis

McGuire Nuclear Station Technical Specification 5.3.1 (Units 1 and 2) addresses the design features related to the reactor core fuel assemblies, including the number of fuel rods per fuel assembly and the maximum total weight of uranium per rod. The proposed amendments would broaden the scope of modifications allowed to fuel assemblies involving the fuel rod locations, and delete the specified maximum total fuel rod uranium weight limit, for both McGuire Units 1 and 2. Similar wording regarding modifications to fuel assemblies involving the fuel rod locations is also proposed for Catawba Nuclear Station Units 1 and 2 Technical Specification 5.3.1 (the Catawba specification has previously been amended to delete the specified maximum total fuel rod uranium weight limit), as well as the deletion of an obsolete provision in the specification. These changes are individually discussed below.

I. Broader scope of modifications allowed to fuel assemblies (McGuire):

As a result of fuel assembly problems due to "baffle jetting" at peripheral assemblies discovered during the McGuire Unit 1/Cycle 4 reload, McGuire Units 1 and 2 Technical Specification 5.3.1 was revised to provide for limited substitutions of fuel rods by filler rods (consisting of zircaloy-4 or stainless steel) or vacancies in peripheral fuel assemblies if justified by cycle-specific reload analyses (ref. amendments 60(Unit 1)/41(Unit 2)). The proposed rewording of this specification basically eliminates the "limited substitutions" and "peripheral fuel assemblies" provisos (along with redefining the justifying analyses' qualifications), thus allowing the currently permitted types of fuel rod substitutions without limit as to quantity or location within the core (note that no new types of substitutions/modifications are proposed). The proposed wording changes are being requested to allow flexibility in loading pattern designs and repair of leaking or damaged fuel rods (in addition to damage resulting from "baffle jetting") during a refueling outage.

The "limited substitutions" and "peripheral fuel assemblies" provisos of the current specification (along with the "cycle-specific reload" analyses qualifier) are reflective of the fact that the previous amendments were related to specific modifications involving "baffle jetting" at peripheral core locations, justified by a cycle-specific reload safety evaluation. However, fuel rod failures due to causes other than "baffle jetting" can occur and consequently require repair (for example, replacement of leaking fuel rods with stainless steel rods may be necessary to meet INPO and Duke Power Company fuel performance goals and would result in reduced radiation exposure to Duke personnel in subsequent outages). The term "limited substitutions" is nebulous and thus provides no useful restriction as to the quantity of fuel rod substitutions, and further is unnecessary since any limits as to the quantity of any fuel rod substitutions would be determined by the justifying analyses (i.e. there is no inherent technical limitation as to the quantity of fuel rod substitutions). Similarly, there is no inherent technical reason any fuel rod substitutions should be limited to peripheral fuel assemblies, as any such limitations would again be determined by the justifying analyses.

The qualifier "peripheral" unduly forces all assemblies which are repaired to be placed on the reactor periphery. This restriction could result in loading pattern designs which 1) may reduce optimal margins to safety limits, and 2) must be performed after shutdown. Current reload cores are developed to achieve optimal margins to Fq, $F_{\Delta H}$, required shutdown capability, and other safety-related parameters through extensive analyses. If peripheral placement is required, these optimized margins could be reduced; or if the peripheral placement causes a severe reduction of safety margin, the unit may be forced to derate in power to regain adequate margin. Thus removal of the qualifier "peripheral" allows the maintenance of optimized margins to safety parameters, and also maintains good fuel performance through the use of optimally designed reload cores. Fuel rod failures, other than due to "baffle jetting", occur randomly and cannot be remedied until reactor shutdown and subsequent fuel assembly inspection/repair occur. Peripheral placement of repaired fuel assemblies will, therefore, require loading pattern design, cycle-specific reload safety evaluations, and possible technical specification changes be performed on an emergency basis. These analyses and submittals require extensive time and may hinder plant startup. Removal of the peripheral placement requirement will enable the loading pattern design and safety evaluation to proceed on a more timely and orderly basis, with only a supplemental safety evaluation being performed which would address the impacts of any newly repaired assemblies.

The qualifier "cycle-specific reload" needlessly limits the type of safety analyses justifying any fuel rod locations modifications. The proposed rewording would allow the effect of any modifications to be either generically analyzed (e.g. via 10CFR 50.59) or analyzed on a cycle specific basis (e.g. via cycle-specific reload safety evaluation). The "using NRC approved methodology and/or 10CFR 50.59" qualifier ensures that any such analyses meets acceptable standards. Precedence for the use of the general "using NRC approved methodology" analysis qualifier is contained in current McGuire Units 1 and 2 Technical Specification 3.9.12 (ref. amendments 69(Unit 1)/50(Unit 2)), and the acceptability of analyses performed under 10CFR 50.59 is self evident. If a change to technical specifications or an unreviewed safety question is identified then appropriate changes and analyses will be provided to the NRC for review and approval.

In summary, the proposed rewording to more generally allow certain modifications to fuel assemblies involving the fuel rod locations providing they are justified by acceptable safety analyses enables the specification to better allow the various potential fuel assemblies and loading patterns that could be determined acceptable for utilization in the McGuire Units 1 and 2 reactor cores.

II. General allowance of modifications to fuel assemblies (Catawba):

Similar wording to that addressed in Part I above for McGuire regarding allowance of certain modifications to fuel assemblies involving the fuel rod locations is proposed for Catawba Units 1 and 2. Although the current Catawba specification 5.3.1 does not provide for even limited modifications to fuel assemblies such as the current McGuire specification does, the justification and safety analyses for Catawba is similar to that for McGuire; i.e. the general precepts of the appropriate portions of the previous McGuire license amendments 60/41 (excluding the McGuire 1/Cycle 4 specific modification aspects), as well as that provided in Part I above.

In addition to the above mentioned rewording, a sentence in the specification addressing the maximum enrichment of the initial core loading is being deleted in view of its obsolescence since Catawba Unit 1 is currently on its third core loading and Unit 2 is on its second core loading. Because this sentence applies only to the initial cores, its deletion has no effect upon safety and is administrative in nature. Note that a similar sentence was deleted from the McGuire specification via the previously referenced license amendments 60/41.

III. Deletion of specified maximum total fuel rod uranium weight limit (McGuire):

McGuire Units 1 and 2 Technical Specifications Design Features Section 5.3.1 specifies a maximum total weight of uranium in each fuel rod (i.e. 1766 grams). Recent improvements by Westinghouse to fuel design (such as chamfered pellets with reduced dish and a nominal density increase), have increased fuel weight slightly (although still within the specification's limit). In addition, future reloads at McGuire are expected to use B&W fuel assemblies (which have heavier rods and heavier uranium loadings, although again within the specification's limit). While neither the current Westinghouse or B&W fuel designs exceed the McGuire specified limit of 1766 grams, the possibility exists for future designs to exceed the limit. Further, the maximum total fuel rod uranium weight limit is not significant to the safe operation of the plant. Consequently, the proposed deletion of this specified maximum weight limit from the McGuire Units 1 and 2 technical specification is to permit potential future use of assemblies with fuel rods over the weight limit and also to reflect the relative insensitivities of this technical specification parameter in the safety analyses. Deletion of this unnecessary limit from the technical specifications is preferable to potentially changing the Tech. Specs. for various cycles to accommodate the applicable weight or to specifying an artificial upper value of the weight to bound future variations.

Design Features Section 5.3.1 is the only reference to fuel rod uranium weight in the Technical Specifications (in addition, note that the FSAR identifies nominal core total weights of UO-2 (in pounds) for Westinghouse standard or optimized fuel assemblies (ref. FSAR Table 4.1-1)). The value stated in this section was intended to be descriptive and representative of the fuel loading and has not been used as a direct input to any safety analysis. Although a number of safety analyses are affected indirectly by fuel weight, the areas of safety significance have their own limits which are reflected in the FSAR and Technical Specifications. These analyses are more sensitive to fuel configuration, length, enrichment, and physical design which are also specified in the plant Technical Specifications. The Technical Specifications limit power and power distribution, thus controlling the fission rate and the rate of decay heat production. The actual fuel rod uranium weight has no bearing on the power limits, power operating level, or decay heat rate. The composition of the fuel is closely monitored to assure acceptable fuel performance for such things as thermal conductivity, swelling, densification, etc. The fuel weight changes that could be made without a technical specification limit are not of sufficient magnitude to cause a significant difference in fuel performance as analyzed by Westinghouse. The important fuel parameters have been considered and are addressed in Attachment 2A as pertaining to Westinghouse supplied components and services. There are no expected observable changes in normal operation due to the postulated fuel rod weight changes, and the remaining fuel parameters listed in the technical specifications are to be considered in cycle-specific reload safety evaluations. Other Design Basis Events were examined to assess the effects of possible changes in fuel rod weight. Fuel rod weight will only change as a result of a specific change in the physical design, which would be addressed in the cycle specific Reload Safety Evaluations, or within the manufacturing tolerances, in which case the changes in fuel rod weight are relatively insignificant. Changes in nuclear design resulting from fuel rod weight changes are controlled as discussed above. For these changes, the effect on new and spent fuel criticality and fuel handling analyses remain bounded by the existing analyses and Technical Specification Design Feature limits (e.g. T.S. 5.6). Fuel-handling equipment and procedures should not be affected by these postulated weight changes. However, information on the fuel assembly weight is transmitted to the station by the fuel vendor. These are noted by station personnel upon receipt of new fuel, while lifting it with a calibrated scale. Any postulated increase or decrease in the amount of Uranium in the fuel rods would be evaluated by the Station Personnel as to its impact on fuel handling equipment. Procedures would be changed, and load limits adjusted if necessary. Seismic/LOCA analyses contain sufficient conservatism to bound these weight changes. Other accident analyses are not affected by rod weight as a direct parameter, and the existing analyses remain bounding.

In summary, it is judged that the postulated fuel rod weight changes do not have a significant impact on the safety analyses. Other Technical Specifications cover more important fuel related parameters, therefore, deletion of the maximum fuel rod weight limit in the McGuire Units 1 and 2 Technical Specifications is proposed because the limit is not significant to the safe operation of the plant. In addition, please note that the NRC has previously reviewed and approved a similar amendment on Catawba Nuclear Station (ref. Amendments No. 22 to facility operating license NPF-35 (Unit 1)/No. 12 to facility operating license NPF-52(Unit 2)).

Based upon the preceding justification and safety analysis, Duke Power Company concludes that the proposed amendments are necessary and will not be inimical to the health and safety of the public.

ATTACHMENT 2A

Safety Evaluation Regarding Fuel Rod Uranium Weight as Pertaining to Westinghouse Supplied Components and Services

Seismic Effects on Fuel/Internals and New and Spent Fuel Storage Racks

The fuel rod uranium weight as stated in the Technical Specifications is not a direct input to the analyses of maximum seismic/LOCA fuel assembly dynamic response, seismic response of reactor vessel and internals, or seismic analyses of new and spent fuel storage racks.

Radiological Source Terms

Fission product generation is not sensitive to the mass of fuel involved but to the power level. As long as the power generated by the core is unaffected, there will be no significant impact on the radiological source terms.

Fuel Handling

Any postulated increase in the amount of uranium in the fuel rods would not have a significant impact on the fuel handling equipment. The spent fuel pit bridge and hoist is designed with a load limit of approximately twice the weight of a nominal fuel assembly. The manipulator crane is provided with two load sensors. One load sensor provides primary protection of the fuel assemblies from structural damage if any assembly were to "hang-up". A second load sensor provides backup protection against high lift force with a setpoint above that of the first load sensor. If the setpoints were unchanged despite a slight overall increase in uranium weight, the impact would be to decrease the potential for fuel damage since reducing the difference between the fuel assembly weight and the lift force limit reduces the amount of stress the fuel assembly structure would be exposed to if the assembly were to "hang-up". The manipulator crane margin to capacity limit far exceeds any potential increase in assembly weight due to increases in the fuel rod uranium weight.

LOCA Safety Analysis

Uranium mass has no impact on ECCS LOCA analyses. LOCA analyses are sensitive to parameters such as pellet diameter, pellet-clad gap, stack height shrinking factor and pellet density as they relate to pellet temperature and volumetric heat generation. Fuel mass is not used in ECCS LOCA analyses.

Non-LOCA Safety Analysis

Individual fuel rod uranium weight, as reported in the Technical Specifications, is not explicitly modeled in any non-LOCA event. Total uranium present in the core is input into the transient analyses, but is generated using a methodology independent of the value presented in the Technical Specifications. Thus, any change in the number currently in the Technical Specifications does not impact the non-LOCA transient analyses.

Core Design

.e mass of uranium is explicitly accounted for in the standard fuel rod design through appropriate modeling of the fuel pellet geometry and initial fuel density. Variations in uranium mass associated with allowable as-built variations but within the specification limits for the pellet dimensions and initial density are accounted for in the reactor core design analyses. The Technical Specification uranium mass value has no impact on margin to reactor core design criteria.

The conclusion of these evaluations is that there is no unreviewed safety question associated with operation of the unit(s) with a fuel rod weight in excess of that defined in Section 5.3.1 of the Technical Specifications.

ATTACHMENT 3

Analysis of Significant Hazards Consideration

As required by 10CFR 50.91, this analysis is provided concerning whether the proposed amendments involve significant hazards considerations, as defined by 10CFR 50.92. Standards for determination that a proposed amendment involves no significant hazards considerations are 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.

I. Broader scope of modifications allowed to fuel assemblies (McGuire):

The proposed rewording of McGuire Units 1 and 2 Technical Specifications Design Features Section 5.3.1 basically eliminates unnecessary restrictions as to quantity, location, and type of justifying analysis to more generally allow certain modifications to fuel assemblies involving the fuel rod locations providing they are justified by acceptable safety analyses. This rewording is an administrative type change enabling the specification to better allow the various potential fuel assemblies and loading patterns that could be determined acceptable for utilization in the McGuire Units 1 and 2 cores. The proposed amendment itself does not constitute a significant hazards consideration since it is administrative in nature and does not represent an actual modification to the plant or change to its safety analyses. The proposed wording of the specification merely provides a broader blanket under which any future specific modifications to the plant or changes to its safety analyses may be performed, while still requiring that any such modifications/changes meet the same standards and criteria that they would have been subject to if they were proposed on an individual basis. Consequently, since acceptable standards/criteria will continue to be met, the proposed change itself does not involve a significant hazards consideration (any future specific modifications/changes performed in accordance with the provisions of this specification would be subject to individual assessment of unreviewed safety question/significant hazards consideration as warranted).

The commission has provided examples of amendments likely to involve no significant hazards considerations (48FR14870). One example of this type is (vi), "A change which either may result in some increase to the probability or consequences of a previously analyzed accident or may reduce in some way a safety margin, but where results of the change are clearly within all acceptable criteria with respect to the system or component specified in the standard review plan: for example, a change resulting from the application of a small refinement of a previously used calculational model or design method". This example can be applied to the rewording of the Design Features specification allowing a broader scope of modifications to fuel assemblies since the specification requires that the results of any change performed under the provisions of the specification be justified by acceptable analyses (i.e. within acceptance criteria).

II. General allowance of modifications to fuel assemblies (Catawba):

Since similar wording to that addressed in Part I above for McGuire regarding allowance of certain modifications to fuel assemblies involving the fuel rod locations is proposed for Catawba Units 1 and 2, the analysis of significant hazards consideration for the proposed Catawba amendments is similar to that of the appropriate portions of the previous McGuire license amendments 60/41 (excluding the McGuire 1/Cycle 4 specific modification aspects), and that in Part I above. Consequently the proposed Catawba amendments also involve no significant hazards considerations.

Another Commission provided example of actions not likely to involve a significant hazards consideration is (i), "A purely administrative change to technical specifications: For example, a change to achieve consistency throughout the technical specifications, correction of an error, or a change in nomenclature". Accordingly the changes to the design features specification (applicable to Units 1 and 2) deleting the sentence addressing the obsolete initial core loading maximum enrichment requirements involve no significant hazards considerations. Again, a similar change to the McGuire Nuclear Station specifications (via the previously referenced amendments 60/41) was determined to involve no significant hazards considerations.

III. Deletion of specified maximum total fuel rod uranium weight limit (McGuire):

The deletion of the fuel rod uranium weight limit does not significantly increase the probability or consequences of previously evaluated accidents. The variation in fuel rod weight that can occur even without a Technical Specification limit is small based on other fuel design constraints, e.g., rod diameter, gap size, UO-2 density and active fuel length; all of which provide some limit on the variation in rod weight. The current safety analyses are not based directly on fuel rod weight, but rather on design parameters such as power, and fuel dimensions. These parameters are either (1) not affected at all by fuel rod weight, or (2) are only slightly affected. However, a review of design parameters which may be affected indicates that a change in fuel weight does not cause other design parameters to exceed the values assumed in the various safety analyses, or to cause acceptance criteria to be exceeded. The effects are not significant with respect to measured nuclear parameters (power, power distribution, nuclear coefficients), i.e., they remain within their Technical Specification limits. Thus, it is concluded that the Technical Specification modification does not involve a significant increase in the probability or consequences of a previously evaluated accident.

The creation of a new or different kind of accident from any previously evaluated accident is not considered a possibility. All of the fuel contained in the fuel rod is similar to and designed to function similar to previous fuel. Thus, the existing new and spent fuel storage criticality analyses bound the changes observed. This change is considered as administrative in nature and does not create the possibility of a new or different kind of accident.

The margin of safety is maintained by adherence to other fuel related Technical Specification limits and the FSAR design bases. The deletion of fuel rod weight limits in the Technical Specifications Design Features Section 5.3.1 does not directly affect any safety system or the safety limits, and thus does not affect the plant margin of safety.

Example (vi) of amendments likely to involve no significant hazards considerations cited in Part I above can also be applied to the deletion of the fuel rod maximum uranium weight limit since as discussed above the results of any postulated fuel rod weight changes are clearly within all acceptance criteria. In addition, please note that the Commission determined that a similar amendment on Catawba nuclear Station which has been approved (ref. Amendment Nos. 22/12) involved no significant hazards consideration.

Based on the preceding analyses, Duke Power Company concludes that the proposed amendments do not involve a significant hazards consideration.