ATTACHMENT I

Marked-up Technical Specification Page:
5-4

5.2.1.2 SHIELD BUILDING

a. Minimum annular space = 4 feet.

b. Annulus nominal volume = 543,000 cubic feet.

c. Nominal outside height (measured from top of foundation base to the top of the dome) = 230.5 feet.

d. Nominal inside diameter = 148 feet.

e. Cylinder wall minimum thickness = 3 feet.

f. Dome minimum thickness = 2.5 feet.

g. Dome inside radius = 112 feet.

DESIGN PRESSURE AND TEMPERATURE

5.2.2 The containment vessel is designed and shall be maintained for a maximum internal pressure of 44 psig and a temperature of 264°F.

PENETRATIONS

5.2.3 Penetrations through the containment structure are designed and shall be maintained in accordance with the original design provisions contained in Sections 3.8.2.1.10 and 6.2.4 of the FSAR with allowance for normal degradation pursuant to the applicable Surveillance Requirements.

5.3 REACTOR CORE

FUEL ASSEMBLIES

between 134.1 and

5.3.1 The reactor core shall contain 217 fuel assemblies with each fuel assembly containing a maximum of 176 fuel rods clad with Zircaloy-4. Each fuel rod shall have a nominal active fuel length of 136.7 inches and contain a maximum total weight of 2250 grams uranium. The initial core loading shall have a maximum enrichment of 2.83 weight percent U-235. Reload fuel shall be similar in physical design to the initial core loading.

5.3.2 Except for special test as authorized by the NRC, all fuel assemblies under control element assemnlies shall be sleeved with a sleeve design previously approved by the NRC.

Individual fuel assemblies shall contain fuel rods of the same nominal active fuel length.

ATTACHMENT 2

SAFETY EVALUATION

Introduction

Florida Power and Light proposes to change St. Lucie Unit 1 Technical Specification 5.3.1. The purpose of this change is to permit the loading of fuel with a nominal active fuel length of between 134.1 and 136.7 inches. Fuel burnt in St. Lucie Unit 1 in cycles 1 through 7 has a nominal active fuel length of 136.7 inches. The slightly shorter active fuel length permits the use of a fuel rod design that is more resistant to fretting type failures than the present design.

Discussion

A slightly shorter active fuel length permits the use of a longer solid zircaloy end cap while retaining the same overall fuel rod length and assembly length and configuration. The longer end cap, which will be lengthened from 0.4 inches to 3.04 inches, will extend approximately half way up through the lower spacer grid assembly at which point it is welded in a standard fashion to the fuel rod cladding.

The purpose of this longer zircaloy end cap and its extension above the lower grid spring contact point is to offer increased protection against fuel clad defects induced by fretting at the lower end of the fuel rod. This protection is particularly important in low burnup fuel because of the strong possibility of fission product releases from clad defects caused by secondary hydriding.

Hydriding occurs when hydrogen reacts with the inside of the clad to form zirconium hydride blisters, which can create clad defects. Secondary hydriding implies that hydrogen, in the form of water, is introduced into the fuel rod via a primary defect such as that caused by fretting. In a fuel pin of low burnup there is a large free volume between the fuel pellets and clad which facilitates the movement of steam and fission products. Hydrogen is able to concentrate in significant quantities and usually attacks the rod near its hottest location (Reference 1).

If a defect forms while there is still a large free volume, then the entire fission product inventory of the volume is theoretically available for release. As burnup increases on a fuel rod the pellet-clad gap will decrease due to a combination of thermal expansion, clad creep and fuel pellet swelling effects. There is evidence (Reference 2) that points of hard contact between the fuel and clad, which cause clad ridging, form after approximately

23 GWd/MTU of exposure. "Soft" contact points, or pellet-clad interaction that create a positive force on the clad without deforming it, occur much earlier in the rod's exposure, at approximately 3.5 GWd/MTU (Reference 3). Both hard and soft contact points will have the effect of limiting the migration of fission products (and hydrogen) to some fraction of the total rod length. Failures occurring at higher burnups do not, therefore, adversely impact fuel rod integrity to the degree that lower burnup failures do.

Pressure drop calculations and industry inspections of fuel assemblies containing fuel pins that have failed due to debris induced fretting demonstrate that spacer grids serve as excellent filters or traps for any debris in the reactor coolant that passes through the core. Conversely, debris-induced perforations seldom occur at locations above the lower spacer grid. By extending the solid zircaloy lower end cap through the grid spring in the lower spacer assembly, FPL is assuring that any debris entrapped in fresh fuel by the lower spacer grid will fret against solid zircaloy instead of cladding material. This will significantly lower the probability of low burnup fuel failures. The purpose of this fuel design change is not to make the presence of debris in the reactor coolant system acceptable, rather, it is to provide additional assurance that any type of fretting-related failures will not occur.

The nominal active fuel length of reload fuel will be reduced from 136.7 to 134.1 inches by removing approximately 2.64 inches of natural uranium from the lower axial blanket. This removal of material reduces the lower axial blanket length from 6.0 inches to 3.36 inches (Figure 1). In cycle 8 the shortening of the axial blanket in the reload fuel will result in a total reduction in the core's active fuel length of approximately 3250 feet, or 0.75%. The impact of this design change on the core power peaking and on the mechanical compatibility of reload fuel has been carefully evaluated by FPL. Results indicate that the proposed design change will have a negligible effect on the safe operation of the plant. These results are discussed below.

Peaking and Power Distribution

The proposed fuel design changes do not significantly affect the core power peaking or power distribution. To quantify these effects, calculations were performed with two three-dimensional PDQ (Reference 4) models that were specially built for this evaluation. In the first model, fuel assemblies incorporating the longer lower end cap design were positioned next to fuel assemblies containing rods of the present design. The second model, which was benchmarked against a representative cycle 8 three-dimensional nodal model, was identical to the first model except all fuel rods were of the present design. Differences between the results of calculations performed using the two models were due to the lower end cap design modification.

The results indicate that the total peaking factor, F_q, increased by less than 1% due to the use of fuel rods with a longer lower end cap design. This was caused by an increase in the axial peaking factor, F_z, which was also calculated to be less than 1%. These small changes in F_z and F_q are much less than the measurement uncertainty of the peaking factors (Reference 5), and will be difficult to discern from normal statistical fluctuations in the measurements. The increase in these peaking factors is due to a combination of effects of the reduced nominal active fuel length. Although the core-average linear heat rate rises due to the shorter total active fuel length (which alone would cause the peaking factors to fall), the removal of fuel is confined to one reload batch, or approximately one-third of the fuel assemblies. This non-uniform removal of material changes the local peak linear heat rate in the affected fuel assemblies by a slightly greater degree than the increase in core-average linear heat rate; thus, the maximum peaking factors experience a slight increase. The maximum linear heat rate, which is the product of the average linear heat rate and the total peaking factor, therefore increases by approximately 1%. The impact of the proposed design change on relative assembly power was also assessed using the PDQ models. It was shown that the relative assembly power does not change as a result of the proposed design change. There is likewise no change in the integrated radial peaking factor, F_R. This is because the shortening of the active fuel length does not significantly affect the relative power produced by the hottest pin in an assembly, and F_R is the product of the relative assembly power and the relative power of the hottest pin. Similarly, the change in Fxy was calculated and is negligible.

The effects of the proposed fuel design change on core power peaking and power distribution are small enough to be accommodated within existing design margins. The revised power distribution will be accounted for in the cycle specific physics inputs to the safety analysis, while the specified acceptable fuel design limits, initial conditions assumed for accident analysis, and safety analysis methodology remain unchanged.

Mechanical Compatibility

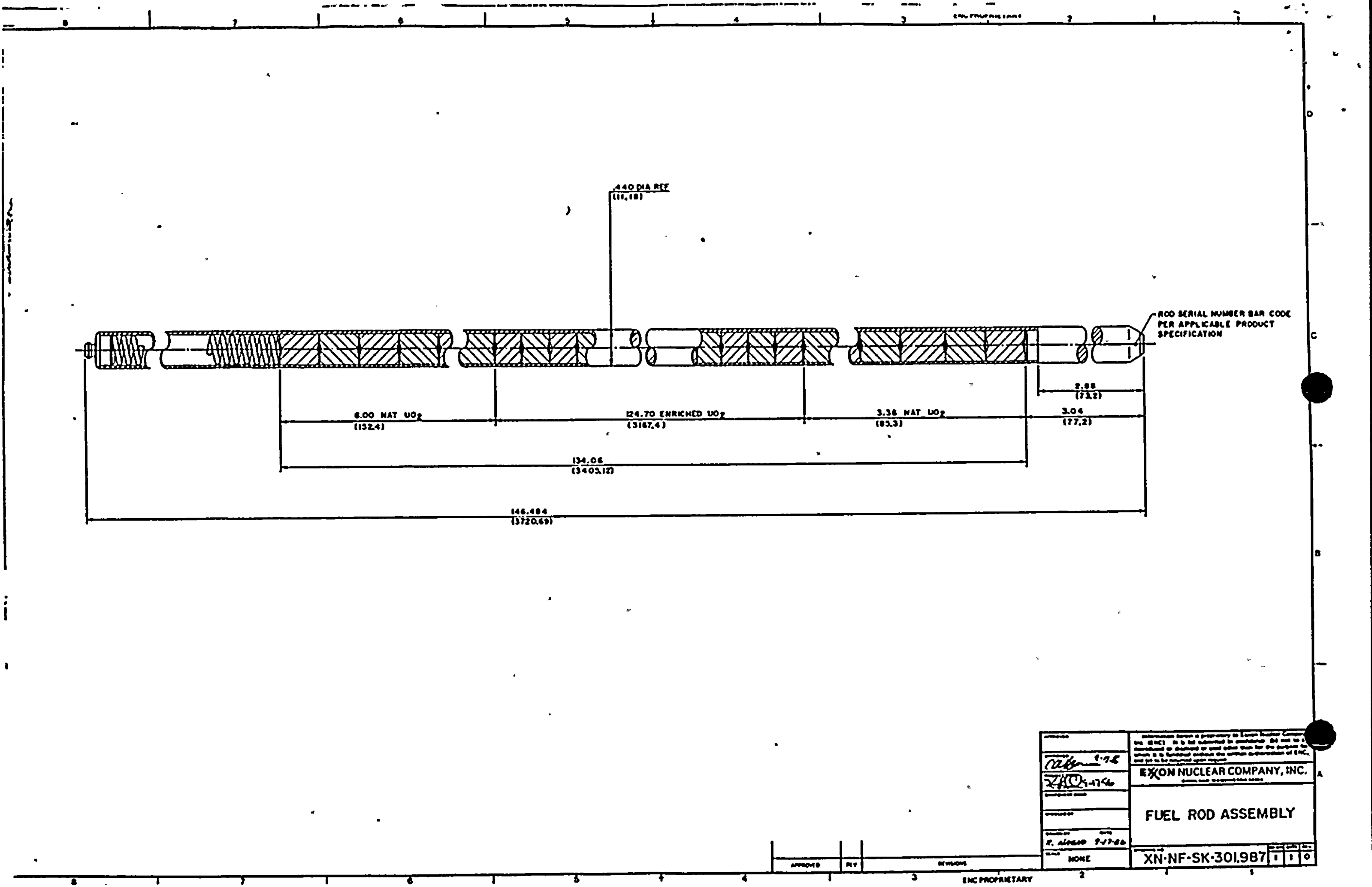
The proposed fuel design changes do not adversely impact the performance of fuel already residing in the core or of the reload fuel itself. The effects of the design change have been closely examined by both FPL and ENC. No fuel rod mechanical properties have been changed with the exception of the cladding length, active fuel length and lower end cap length. Overall fuel rod length remains unchanged. Clad and end cap material composition remain unchanged. The use of longer end caps is not a new concept in the industry. Manufacturers of nuclear fuel for boiling water reactors have had extensive experience in welding long end caps onto fuel cladding. Additional drawing specifications have been written which require that there be very tight angular tolerances between the clad at the lower end of the rod and the lower end cap. This ensures that there is no change in the probability of spacer grid damage during fuel loading due to the proposed fuel design change.

The proposed new dimensions of the lower end cap and zircaloy cladding were selected using two criteria. The first criteria was to minimize the length of axial blanket material removed from the pellet column. The second criteria was to position the cladding end cap weld above the contact point of the lower grid spring (given that the inter-grid spacing not be changed).

The dimensions selected ensure that the lower grid spring will contact the solid end cap, whereas previously the lower grid spring contacted the cladding. This positioning of the contact point on the solid end cap should also help eliminate lower grid spring fretting as a potential failure mechanism.

References:

1. Tong, L.S., Weisman, J., Thermal Analysis of Pressurized Water Reactors, American Nuclear Society, LaGrange Park, Illinois, 1979
2. Djurle, S., "The Studsvik Over-Ramp Project", EPRI-NP-3007, April 1983
3. RODEX2 Fuel Rod Thermal-Mechanical Response Evaluation Model, Revision 2, XN-NF-81-58(P)(A), February 9, 1983.
4. PDQ-7/HARMONY User's Manual, Revision 1, Electric Power Research Institute, March 31, 1983.
5. Johnsonn, A., et all, "INCA/CECOR Power Peaking Uncertainty", CENPD-153-NP, Revision 1-NP-A, May 1980


.440 DIA REF
(11,18)
ROD SERIAL NUMBER BAR CODE PER APPLICABLE PRODUCT SPECIFICATION
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6.00 NAT UO$_2$
(152,4)
124.70 ENRICHED UO$_2$
(3167,4)
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3.04
(77,2)
134.06
(3405,12)
146.484
(3720,69)
EXXON NUCLEAR COMPANY, INC.
FUEL ROD ASSEMBLY
9-17-86
NONE
XN-NF-SK-301,987
1
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APPROVED
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FIGURE 1

ATTACHMENT 3

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

The standards used to arrive at a determination that a request for amendment involves no significant hazards consideration are included in the Commission's regulations, 10 CFR 50.92, which states that no significant hazards considerations are involved if the 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 possiblity of a new or different kind of accident from any accident previously evaluated or (3) involve a significant reduction in a margin of safety. Each standard is discussed as follows:

(1) Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated.

Modification to the nominal active fuel length will result in no changes to the plant procedures as described in the Final Safety Analysis Report (FSAR). There will be no changes to the plant's structure, systems, or components other than the fuel rods in new fuel assemblies. The only change to these fuel rods is to reduce the clad and active fuel length while increasing the lower end cap length. Both the overall fuel rod dimensions and its spatial orientation in the fuel bundle are unchanged.

The core's total active fuel length is shortened by about 0.75%. Analysis of this design change indicates a negligible impact on safe operation of the plant as a result of the design change impacts on the core power peaking and mechanical compatibility of reload fuel.

By extending the lower spacer assembly, FPL is assuring that any debris entrapped in fresh fuel by the lower spacer grid will fret against solid zircaloy instead of fuel cladding material significantly lowering the probability of low burnup fuel failures. This provides additional assurance that any type of fretting-related failures will not occur.

Finally, there is no change in the probability of spacer grid damage during fuel loading.

(2) Use of the modified specification would not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed amendment will result in no changes to the plant's procedures, structures, systems, mode of operation or components other than the fuel rod modification. No new or different materials or manufacture techniques will be used to produce fuel rods. No additional tests or experiments not described in the FSAR are necessary to implement the proposed change.

The proposed fuel design changes do not adversely impact the performance of fuel already residing in the core or of the reload fuel itself. No fuel rod mechanical properties have been changed with the exception of the cladding length, active fuel length and lower end cap length. Overall fuel rod length and clad and cap material composition remain unchanged.

(3) Use of the modified specification would not involve a significant reduction in a margin of safety.

No inputs or results from plant safety analysis require modifications as a result of the proposed change. Neither the plant's procedures, structures, systems, or components have changed other than the fuel rod design. The impact of the design change on core power peaking is not signficant and is well within the measurement uncertainties of these parameters. The difference between fuel safety limits and the results of the safety analysis, which is representative of the margin of safety, is unchanged.

Based on the above, we have determined that the amendment request does not (1) involve a significant increase in the probability or consequences of an accident previsously evaluated, (2) create the probability of a new or different kind of accident from any accident previously evaluated, or (3) involve a significant reduction in a margin of safety; and therefore does not involve a significant hazards consideration.