DESIGN FEATURES

#### 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 er stainless steels 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 weight percent U-235. Fuel with enrichments greater than 3.85 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.

<u>Note</u>: License Amendment deted September 6,1995 5.4 REACTOR COOLANT SYSTEM Would revise the fuel maximum enrichment from 4.45 to 5.00 weight 2 U-235 and the <u>DESIGN PRESSURE AND TEMPERATURE</u> IFBA fuel enrichment requirement from 3.85 to 4.10 weight 2 U-235. 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  $12,135 \pm 100$  cubic feet at a nominal Tavo of 557°F.

#### 5.5 METEOROLOGICAL TOWER LOCATION

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

CALLAWAY - UNIT 1

5-6

Amendment No. 12,22,24,41,54

or Zirlo

9602130089 960209 PDR ADOCK 05000483

# TECHNICAL SPECIFICATION CHANGES

(RE-TYPED)

#### DESIGN FEATURES

#### 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 or Zirlo, except that limited substitution of fuel rods by filler rods consisting of Zircaloy-4, stainless steel, Zirlo 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 weight percent U-235. Fuel with enrichments greater than 3.85 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

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#### 5.4 REACTOR COOLANT SYSTEM

#### DESIGN PRESSUPE AND TEMPERATURE

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5.4.2 The total volume of the Reactor Coolant System, including pressurizer and surge line, is  $12,135 \pm 100$  cubic feet at a nominal T<sub>ava</sub> of 557°F.

#### 5.5 METEOROLOGICAL TOWER LOCATION

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

# SAFETY EVALUATION

Attachment 3 Page 1 of 6

#### SAFETY EVALUATION

This license amendment requests a revision to Technical Specification 5.3.1, "Fuel Assemblies" to allow the use of an alternate zirconium based fuel cladding material, ZIRLO, for Callaway Plant. Limited substitution of fuel rods by ZIRLO filler rods would also be permitted if justified by a cycle specific reload analysis.

Union Electric is planning to load fuel with ZIRLO cladding during the Callaway Plant refuel outage currently scheduled to begin in October 1996. Therefore, Union Electric respectfully requests that the NRC Staff review and approve this license amendment request no later than June 1, 1996, so that the amendment is in place prior to receipt of new fuel with ZIRLO cladding. A similar request to allow the use of ZIRLO clad fuel rods and ZIRLO filler rods has been submitted by Commonwealth Edison for Byron and Braidwood Nuclear Power Stations.

Changing to ZIRLO cladding is the first phase of a transition to higher burnup fuel. Future core designs may feature longer cycles, higher capacity factors, and ultimately, higher discharge burnups. Using higher discharge burnup in the reactor core design reduces the number of fuel assemblies required per reload. In order to support the required fuel enrichment and burnups, ZIRLO cladding must be used to maintain fuel integrity. The transition cannot be made until all the assemblies in the core have ZIRLO cladding and proper NRC approval of the remaining changes, such as increased discharge burnup limit, is obtained.

#### Background for the Current Specification

Technical Specification 5.3.1 requires fuel rods to be clad with Zircaloy-4. Fuel rods may be substituted by filler rods consisting of Zircaloy-4 or stainless steel, or by vacancies if justified by a cycle specific reload analysis.

The fuel system is designed so that there will not be damage as a result of normal operation and anticipated operational occurrences, fuel damage during postulated accidents would not be severe enough to prevent control rod insertion when it is required, and core cooling will always be maintained, even after severe postulated accidents. The design thereby meets the related requirements of 10 CFR 50.46, 10 CFR 50, Appendix A and K, 10 CFR 100, and General Design Criteria 10, 27, 35.

#### Impact of the Proposed Changes

In Federal Register Volume 57, Number 169, dated August 31, 1992, the NRC published amended regulations to reduce the regulatory burden on nuclear licensees. The NRC revised the acceptance criteria in 10 CFR 50.44 and 10 CFR 50.46 relating to evaluations of emergency core cooling systems and combustible gas control applicable to Zircaloy clad fuel to include ZIRLO clad fuel. ZIRLO is a preferred cladding material since it provides a significant improvement in corrosion margin and fuel integrity. The NRC noted that the revision to include ZIRLO as an acceptable zirconium based cladding material will reduce the licensee burden and will not reduce the protection of the public health or safety.

This change is consistent with 10 CFR 50.44 and 10 CFR 50.46. The change is also consistent with NRC approved topical report, WCAP-13060, "Westinghouse Fuel Assembly Reconstitution Evaluation Methodology," which meets the intent of Supplement 1 of Generic Letter 90-02, "Alternative Requirements for Fuel Assemblies in the Design Section of Technical Specifications." In addition, NUREG-1431, "Standard Technical Specifications for Westinghouse Plants," specifically includes ZIRLO as an acceptable cladding material.

An analysis of the safety implications is provided in an NRC letter to Westinghouse dated July 1, 1991, "Acceptance for Referencing of Topical Report WCAP-12610, 'Vantage+ Fuel Assembly Reference Core Report' (TAC No. 77258)." The report supports the following conclusions:

- (1) The mechanical design bases and limits for the ZIRLO clad fuel assembly design are the same as those for the previously licensed Zircaloy-4 clad fuel assembly design, except that Zirlo cladding improves corrosion performance.
- (2) The neutronic evaluations have shown that ZIRLO clad fuel nuclear design bases are satisfied and that key safety parameter limits are applicable. The nuclear design models and methods accurately describe the behavior of ZIRLO clad fuel.
- (3) The thermal and hydraulic design basis for ZIRLO clad fuel is unchanged.

- (4) The methods and computer codes used in the analysis of the non-loss of coolant accident (LOCA) licensing basis events are valid for ZIRLO clad fuel, and all licensing basis criteria will be met.
- (5) The large break LOCA evaluation model was modified to reflect the behavior of the ZIRLO clad material during a loss of coolant accident. It is concluded that the revised evaluation model satisfies the intent of 10 CFR 50.46 and Appendix K of 10 CFR 50. There is no significant impact on typical large break LOCA analysis results for the ZIRLO model revisions.

In addition, bounding large break LOCA rod heatup cases were evaluated for Callaway and all acceptance criteria were met, including those in 10 CFR 50.46. Adequate margin to the peak clad temperature limit of 2200 °F is maintained.

The effect of ZIRLO on a locked rotor transient was evaluated for Callaway and all acceptance criteria were met and adequate margin to the peak clad temperature limit of 2700 °F is maintained.

The rod control cluster assembly (RCCA) ejection event was analyzed at hot full power and hot zero power. The analysis demonstrated that any consequential damage to the core or the reactor coolant system would not prevent long term core cooling and that the offsite dose would remain within the guidelines of 10 CFR 100. WCAP-12610 includes results of sensitivity analyses performed by Westinghouse that demonstrate that the impact of ZIRLO on RCCA ejection event analyses results in an insignificant change (very small benefit) in both the fraction of fuel melted at the hot spot as well as the peak fuel stored energy.

WCAP-13060 delineates the methodology used to evaluate applicable design criteria associated with reconstituted fuel assemblies that have solid filler rods replacing uranium filled fuel rods. Evaluations and analyses of fuel assembly reconstitution will be performed on a cycle specific basis whenever reconstituted fuel assemblies are used in the reactor core. The WCAP includes proposed technical specification changes based on the WCAP conclusions and the guidelines of Generic Letter 90-02.

Fuel configuration, size, enrichment and cladding material shall be limited to those designs that have been analyzed with applicable NRC-approved codes and methods and shown by

Attachment 3 Page 4 of 6

test or cycle specific reload analyses to comply with all safety design bases. The use of ZIRLO fuel cladding or filler rods will be justified by a cycle specific reload analysis in accordance with NRC approved applications of fuel rod configuration. The justification of the core analysis methods must address the effect on core-wide analyses of permissible core configurations with the reconstituted fuel.

#### Evaluation

This license amendment requests a revision to Technical Specification 5.3.1, "Fuel Assemblies" to allow the use of an alternate zirconium based fuel cladding material, ZIRLO, for Callaway Plant. Limited substitution of fuel rods by ZIRLO filler rods would also be permitted if justified by a cycle specific reload analysis.

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

 Increase the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the Safety Analysis Report.

The methodologies used in the accident analysis remain unchanged. The proposed changes do not change or alter the design assumptions for the systems or components used to mitigate the consequences of an accident. Use of ZIRLO fuel cladding does not adversely affect fuel performance or impact nuclear design methodology. Therefore accident analyses are not impacted.

The operating limits will not be changed and the analysis methods to demonstrate operation within the limits will remain in accordance with NRC approved methodologies. Other than the changes to the fuel assemblies, there are no physical changes to the plant associated with this technical specification change. A safety analysis will continue to be performed for each cycle to demonstrate compliance with all fuel safety design bases.

VANTAGE 5 fuel assemblies with ZIRLO clad fuel rods meet the same fuel assembly and fuel rod design bases as other VANTAGE 5 fuel assemblies. In addition, the 10 CFR 50.46 criteria are applied to the ZIRLO clad

Attachment 3 Page 5 of 6

rods. The use of these fuel assemblies will not result in a change to the reload design and safety analysis limits. Since the original design criteria are met, the ZIRLO clad fuel rods will not be an initiator for any new accident. The clad material is similar in chemical composition and has similar physical and mechanical properties as Zircaloy-4. Thus, the cladding integrity is maintained and the structural integrity of the fuel assembly is not affected. ZIRLO cladding improves corrosion performance and dimensional stability. No concerns have been identified with respect to the use of an assembly containing a combination of Zircaloy-4 and ZIRLO clad fuel rods. Since the dose predictions in the safety analyses are not sensitive to fuel rod cladding material, the radiological consequences of accidents previously evaluated in the safety analysi ' remain valid.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

 Create the possibility for an accident or malfunction of equipment of a different type than any previously evaluated in the Safety Analysis Report.

VANTAGE 5 fuel assemblies with ZIRLO clad fuel rods satisfy the same design bases as those used for other VANTAGE 5 fuel assemblies. All design and performance criteria continue to be met and no new failure mechanisms have been identified. The ZIRLO cladding material offers improved corrosion resistance and structural integrity.

The proposed changes do not affect the design or operation of any system or component in the plant. The safety functions of the related structures, systems or components are not changed in any manner, nor is the reliability of any structure, system or component reduced. The changes do not affect the manner by which the facility is operated and do not change any facility design feature, structure or system. No new or different type of equipment will be installed. Since there is no change to the facility or operating procedures, and the safety functions and reliability of structures, systems or components are not affected, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated. 3. Reduce the margin of safety as defined in the basis for any technical specification.

Use of ZIRLO cladding material does not change the VANTAGE 5 reload design and safety limits. The use of these fuel assemblies will take into consideration the normal core operating conditions allowed in the Technical Specifications. For each cycle reload core, the fuel assemblies will be evaluated using NRCapproved reload design methods, including consideration of the core physics analysis peaking factors and core average linear heat rate effects.

The use of Zircaloy-4, ZIRLO or stainless steel filler rods in fuel assemblies will not involve a significant reduction in the margin of safety because analyses using NRC-approved methodologies will be performed for each configuration to demonstrate continued operation within the limits that assure acceptable plant response to accidents and transients. These analyses will be performed using NRC-approved methods that have been approved for application to the fuel configuration.

#### Conclusion

Given the above discussions as well as those presented in the Significant Hazards Consideration, the proposed change does not adversely affect or endanger the health or safety of the general public or involve an unreviewed safety question.

# SIGNIFICANT HAZARDS EVALUATION

Attachment 4 Page 1 of 6

### SIGNIFICANT HAZARDS EVALUATION

This license amendment requests a revision to Technical Specification 5.3.1, "Fuel Assemblies" to allow the use of an alternate zirconium based fuel cladding material, ZIRLO, for Callaway Plant. Limited substitution of fuel rods by ZIRLO filler rods would also be permitted if justified by a cycle specific reload analysis.

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This change is consistent with 10 CFR 50.44 and 10 CFR 50.46. The change is also consistent with NRC approved topical report, WCAP-13060, "Westinghouse Fuel Assembly Reconstitution Evaluation Methodology," which meets the intent of Supplement 1 of Generic Letter 90-02, "Alternative Requirements for Fuel Assemblies in the Design Section of Technical Specifications." In addition, NUREG-1431, "Standard Technical Specifications for Westinghouse Plants," specifically includes ZIRLO as an acceptable cladding material.

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- (3) The thermal and hydraulic design basis for ZIRLO clad fuel is unchanged.

- (4) The methods and computer codes used in the analysis of the non-loss of coolant accident (LOCA) licensing basis events are valid for ZIRLO clad fuel, and all licensing basis criteria will be met.
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Fuel configuration, size, enrichment and cladding material shall be limited to those designs that have been analyzed with applicable NRC-approved codes and methods and shown by

Attachment 4 Page 4 of 6

test or cycle specific reload analyses to comply with all safety design bases. The use of ZIRLO fuel cladding or filler rods will be justified by a cycle specific reload analysis in accordance with NRC approved applications of fuel rod configuration. The justification of the core analysis methods must address the effect on core-wide analyses of permissible core configurations with the reconstituted fuel.

#### Evaluation

This license amendment requests a revision to Technical Specification 5.3.1, "Fuel Assemblies" to allow the use of an alternate zirconium based fuel cladding material, ZIRLO, for Callaway Plant. Limited substitution of fuel rods by ZIRLO filler rods would also be permitted if justified by a cycle specific reload analysis.

The proposed changes to the TS do not involve a significant hazards consideration because operation of Callaway Plant with this change would not:

 Involve a significant increase in the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the Safety Analysis Report.

The methodologies used in the accident analysis remain unchanged. The proposed changes do not change or alter the design assumptions for the systems or components used to mitigate the consequences of an accident. Use of ZIRLO fuel cladding does not adversely affect fuel performance or impact nuclear design methodology. Therefore accident analyses are not impacted.

The operating limits will not be changed and the analysis methods to demonstrate operation within the limits will remain in accordance with NRC approved methodologies. Other than the changes to the fuel assemblies, there are no physical changes to the plant associated with this technical specification change. A safety analysis will continue to be performed for each cycle to demonstrate compliance with all fuel safety design bases.

VANTAGE 5 fuel assemblies with ZIRLO clad fuel rods meet the same fuel assembly and fuel rod design bases as other VANTAGE 5 fuel assemblies. In addition, the 10 CFR 50.46 criteria are applied to the ZIRLO clad

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rods. The use of these fuel assemblies will not result in a change to the reload design and safety analysis limits. Since the original design criteria are met, the ZIRLO clad fuel rods will not be an initiator for any new accident. The clad material is similar in chemical composition and has similar physical and mechanical properties as Zircaloy-4. Thus, the cladding integrity is maintained and the structural integrity of the fuel assembly is not affected. ZIRLO cladding improves corrosion performance and dimensional stability. No concerns have been identified with respect to the use of an assembly containing a combination of Zircaloy-4 and ZIRLO clad fuel rods. Since the dose predictions in the safety analyses are not sensitive to fuel rod cladding material, the radiological consequences of accidents previously evaluated in the safety analysis remain valid.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

 Create the possibility of a new or different kind of accident from any previously evaluated in the Safety Analysis Report.

VANTAGE 5 fuel assemblies with ZIRLO clad fuel rods satisfy the same design bases as those used for other VANTAGE 5 fuel assemblies. All design and performance criteria continue to be met and no new failure mechanisms have been identified. The ZIRLO cladding material offers improved corrosion resistance and structural integrity.

The proposed changes do not affect the design or operation of any system or component in the plant. The safety functions of the related structures, systems or components are not changed in any manner, nor is the reliability of any structure, system or component reduced. The changes do not affect the manner by which the facility is operated and do not change any facility design feature, structure or system. No new or different type of equipment will be installed. Since there is no change to the facility or operating procedures, and the safety functions and reliability of structures, systems or components are not affected, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

Use of ZIRLO cladding material does not change the VANTAGE 5 reload design and safety limits. The use of these fuel assemblies will take into consideration the normal core operating conditions allowed in the Technical Specifications. For each cycle reload core, the fuel assemblies will be evaluated using NRCapproved reload design methods, including consideration of the core physics analysis peaking factors and core average linear heat rate effects.

The use of Zircaloy-4, ZIRLO or stainless steel filler rods in fuel assemblies will not involve a significant reduction in the margin of safety because analyses using NRC-approved methodologies will be performed for each configuration to demonstrate continued operation within the limits that assure acceptable plant response to accidents and transients. These analyses will be performed using NRC-approved methods that have been approved for application to the fuel configuration.

#### Conclusion

Given the above discussions as well as those presented in the Safety Evaluation, the proposed change does not adversely affect or endanger the health or safety of the general public or involve a significant hazards consideration.

# ENVIRONMENTAL CONSIDERATION

Attachment 5 Page 1 of 1

#### ENVIRONMENTAL CONSIDERATION

This license amendment requests a revision to Technical Specification 5.3.1, "Fuel Assemblies" to allow the use of an alternate zirconium based fuel cladding material, ZIRLO, for Callaway Plant. Limited substitution of fuel rods by ZIRLO filler rods would also be permitted if justified by a cycle specific reload analysis.

The proposed amendment involves changes with respect to the use of facility components located within the restricted area, as defined in 10 CFR 20. Union Electric has determined that the proposed amendment does not involve:

- A significant hazard consideration, as discussed in Attachment 4 of this amendment application;
- (2) A significant change in the types or significant increase in the amounts of any effluents that may be released offsite;
- (3) A significant increase in individual or cumulative occupational radiation exposure.

Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.