UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 45 TO FACILITY OPERATING LICENSE NO. NPF-21

WASHINGTON PUBLIC POWER SUPPLY SYSTEM

WPPSS NUCLEAR PROJECT NO. 2

DOCKET NO. 50-397

1.0 INTRODUCTION

By letter from Mr. G. Sorensen, Washington Public Power Supply System, to the Nuclear Regulatory Commission (Ref. 1), technical specification changes were proposed for the operation of Washington Nuclear Plant No. 2 (WNP-2) for Cycle 3 (N2C3) with a fuel reload using Advanced Nuclear Fuels (ANF) Corporation fuel assemblies and ANF analyses and methodologies. Enclosed were the proposed Technical Specification changes and several reports (References 2-4) discussing the reload and analyses which support and justify the third cycle operation with General Electric (GE) and ANF fuel and the proposed technical specification changes.

A subsequent letter (Ref. 5) was submitted which provided a discussion and results of a plant-specific Loss of Feedwater Heating Transient analysis and other information requested by the NRC. Cycle 3 is the second use of the ANF (previously Exxon Nuclear Company) 8x8C fuel assemblies and analytical methodologies for this reactor. Similar reloads with the ANF fuel type have been done for Dresden Units 2 and 3 and Susquehanna Steam Electric Station, Units 1 and 2. These reloads and the associated ANF methodologies have been extensively reviewed and approved by the NRC staff and are generally applicable for N2C3 analyses.

2.0 EVALUATION

2.1 Reload Description

The N2C3 reload will retain 488 General Electric (GE) and 128 Exxon Nuclear Company (ENC) XN-1 fuel assemblies from the previous cycle and will add 148 ANF manufactured 8x8C, 2.72 percent average, 2.89 percent peak radial average U235 enriched fuel assemblies. The ANF 8x8C fuel assemblies are essentially the same as the ENC XN-1 assemblies loaded in the previous Cycle 2 reload. The loading pattern will be a conventional scatter pattern with low reactivity fuel on the periphery.

2.2 Fuel Mechanical Design

The ANF 8x8C fuel assemblies used for N2C3 are the same as those previously designated XN-1 and have been approved generically by the NRC staff for ANF reload cores (Ref. 6). There are slight differences in the fuel and plug designs, but the enrichment, gadolinium placement

and significant mechanical and thermal-hydraulic design elements are the same and the power distributions are similar. The methodologies used for the fuel design and analysis are the same as those used for the prior Cycle 2 reload for this facility (see Ref. 7 for detailed discussion). The design and analyses of the ANF fuel assembly as used in N2C3 are thus acceptable.

Some of the N2C3 8x8C reload fuel assemblies will be channeled with new 100 mil channels fabricated by ASEA-ATOM. Based on our review of additional information provided by the licensee in Attachment 4 to Reference 5 relative to physical data for the new channels and the previous use of the channels in other facilities, the staff concludes that the performance of the ASEA-ATOM channels will be the same as the original GE channels and that the use of the new channels is acceptable.

2.3 Nuclear Design

The nuclear design for N2C3 has been performed with ANF methodologies previously reviewed and approved, and were used in the Cycle 2 (N2C2) analysis. The overall methodology is described in the ENC (now ANF) Licensing Topical Report XN-NF-80-19(A), Volume 4, Revision 1 (Ref. 8). The fuel loading pattern is given in Figure 4.2 of Reference 3. The shutdown margin (SDM) at the beginning of the cycle and at minimum conditions is 1.18 percent delta k, well in excess of the required 0.38 percent delta k. The Standby Liquid Control System also fully meets shutdown requirements. Since these results have been obtained by the use of previously approved methods and fall within the expected range, we conclude that the nuclear design of the N2C3 reload core is acceptable.

2.4 Thermal Hydraulic Design

The ANF thermal hydraulic methodology and criteria used for the N2C3 design and analysis is the same as the prior N2C2 reload. The previous review concluded that hydraulic compatibility between GE and ANF fuel is satisfactory and the calculation of core bypass flow and the Safety Limit Minimum Critical Power Ratio (SLMCPR) are acceptable. The methodology for Cycle 3 is based on ANF's revised critical power methodology in XN-NF-524, Revision 1 (Ref. 9) which incorporates a constant flow MCPR for formulation for BWR applications. The staff has completed its generic review of XN-NF-524 and has concluded that the methodology for arriving at a SLMCPR is acceptable. The XN-3 correlation used to develop the SLMCPR has been approved for application to both the ANF 8x8C and GE 8x8R fuel types (Ref. 10). The staff approval of References 9 and 10 includes approval of the values for generic nuclear uncertainties. The staff questioned the licensee's value of 1.06 for the SLMCPR as applied to GE 8x8R reload fuel types, since the value represents a decrease in thermal margin over that specified in GESTAR II, Section S.2.1 (Ref. 11). In response to staff questions, the licensee provided additional discussion (Attachment 3 to Ref. 5) to justify the decrease in thermal margin over that specified in GESTAR-II which would be required for reloads involving only GE fuel

types. Based on the staff review of the additional material provided by the licensee, which describes reduced uncertainties in the TIP readings associated with the use of the POWERPLEX core simulator employed in the WPPSS core power distribution technique, and the previous acceptance of the POWERPLEX system in N2C2, the staff finds the additional considerations sufficient to justify the SLMCPR of 1.06 for GE fuel and the value is acceptable for N2C3.

2.5 Transient and Accident Analyses

The ANF transient methodology is basically the same as that used and approved for the previous reload Cycle 2 (N2C2). Certain aspects of the methodology as identified in the following discussion have received more recent NRC approval.

ANF examined the standard transient events and the N2C3 Transient Analysis Report (Ref. 4) which presented the results for the more limiting events. The most limiting core wide transients were the Load Rejection Without Bypass (LRWB) and the Feedwater Controller Failure (FWCF). These events were analyzed at increased core flow (106 percent) and both normal and standard Technical Specification (TS) required scram times, and with Recirculation Pump Trip (RPT) operable and inoperable. The concept of normal and TS scram times was discussed and approved as part of the N2C2 reload review (Ref. 7). The additional aspect of the ANF plant transient model recently approved by the staff is the XCOBRA-T code (Ref. 12) which is used in the determination of the thermal margins for the transients. The analyses were all done with approved methodologies and the results are acceptable.

The original reload submittal included an analysis of the Loss of Feedwater Heating (LOFWH) transient based on a generic approach proposed by ANF. Since the staff has not approved a generic ANF analytical methodology, the licensee provided a plant-specific analysis in Attachment 1 to Reference 5 which the staff finds as an acceptable approach for Cycle 3 only.

Two local events, Control Rod Withdrawal Error (CRWE) and Fuel Loading Error (FLE), were analyzed using approved methodology with the result that the CRWE was shown to have a limiting OLMCPR for a certain portion of the fuel cycle. The values are included as part of the proposed Technical Specification changes.

Compliance with overpressurization criteria was demonstrated by analysis of Main Steam Isolation Valve (MSIV) closure with MSIV position switch failure. Six safety-relief valves were assumed out of service. Maximum pressure was 105 percent of vessel design pressure, well under the 110 percent criterion. The calculation was done with approved methodology and the results are acceptable.

The LOCA analysis for the Cycle 2 was performed for a full core of ANF 8x8C fuel and remains applicable for the Cycle 3 residual and reload ANF fuel. This LOCA analysis has covered an acceptable range of conditions, has been performed with approved methodology and the resulting technical specification MAPLHGR values for the ANF fuel remain acceptable.

The rod drop accident was analyzed with approved ANF methodology. The resulting maximum fuel enthalpy of 170 cal/gm is within the established limit of 280 cal/gm. The analysis and results are acceptable.

Our review of the transient and accident analyses done for N2C3 indicated that appropriate methodology and input have been used and the results provide a suitable basis for the proposed N2C3 technical specifications.

3.0 TECHNICAL SPECIFICATION CHANGES

The following WNP-2 Technical Specifications and Bases changes have been proposed for operation during reload Cycle 3:

(1) Bases pages B 2-1 and B 2-2, Limiting Conditions of Operation (LCO) pages 3/4 1-8 and 3/4 2-1, Figure 3.2.1-3 on page 3/4 2-4, Figure 3.2.1-6 on page 3/4 2-4C, LCO page 3/4 2-9, Figure 3.2.4-1 on page 3/4 2-10, and Bases pages B 3/4 1-2, B 3/4 2-3 and B 3/4 7-4: Changes were made to reflect the corporate change from Exxon Nuclear Company (ENC) to Advanced Nuclear Fuel (ANF) Corporation, to identify the new fuel designation from ENC XN-1 to ANF 8x8C and to incorporate editorial changes. A reference to the approved thermal margin methodology report, XN-NF-84-105(A) was added. These changes are administrative only and have no safety significance, and are, therefore, acceptable.

It is also noted, based on a statement in Reference 5, that LCO page 3/4 2-1 contains changes related to the previous Cycle 2 reload analysis which were inadvertently omitted in Amendment 28. The correct, acceptable replacement page 3/4 2-1 is provided as Attachment 2 to Reference 5 and is included in this amendment's technical specification page changes.

(2) Table 3.2.3-1, page 3/4 2-7: The previous table of MCPR operating limits for rated core flow is deleted and replaced with a table stating the approved values for Cycle 3. This change is acceptable.

(3) LCO page 3/4 - 102: An ACTION statement (b) was added which states:

With reactor power/core flow in the crosshatched region of Figure 3.3.10-1, initiate corrective action within 15 minutes to reduce power by control rod insertion to a reactor power/core flow below the crosshatched region within 2 hours."

This statement applies to the single loop mode of operation (SLO) which has been approved since the first cycle of operation of WNP-2, and serves to specify the time limits for corrective action to be consistent with the presently approved action statement of TS Section 3.3.10. The proposed statement is similar to that for SLO Technical Specifications which have been approved on other facilities by the staff and is acceptable.

(4) Section 4.3.10.4, page 3/4 3-103: A phrase was added to the surveillance requirement for SLO to require that the reactor power/core flow shall be verified to lie outside the crosshatched region of Figure 3.3.10-1. This is a companion requirement to the additional statement in item (3) above to identify the region for corrective action. The addition is acceptable.

4.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change in the installation and use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes in surveillance requirements. The staff has determined that this amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released off-site, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this 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.

5.0 CONTACT WITH STAFF OFFICIAL

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (52 FR 13352) on April 22, 1987, and consulted with the State of Washington. No public comments were received, and the State of Washington did not have any comments.

6.0 CONCLUSIONS

We have reviewed the reports submitted for the Cycle 3 reload of WNP-2 with ANF fuel and with ANF methodology and analysis. Based on this review we conclude that appropriate material was submitted and that the fuel design, nuclear design, thermal-hydraulic design and transient and accident analyses are acceptable. The proposed technical specification changes submitted for this reload suitably reflect the use of acceptable methodology and the operating limits associated with those changes and reload parameters.

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The staff has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security nor to the health and safety of the public.

The Commission made a proposed determination that the amendment involves no significant hazards consideration which was published in the Federal Register (50 FR 29021) on July 17, 1985, and consulted with the state of Washington. No public comments were received, and the state of Washington did not have any comments.

We have concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: M. McCoy

Dated:

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Dated: June 2, 1987