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April 27, 1992

Dr. Thomas E. Murley, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: USNRC Document Control Desk

SUBJECT: Byron Station Unit 2
Cycle 4 Reload
NRC Docket No. 50-455

REFERENCES: See Attachment 3

Dear Dr. Murley:

Byron Unit 2 is completing a refueling outage that began February 28, 1992 following its third cycle of operation. Byron Unit 2 Cycle 3 attained a final cycle burnup of approximately 17,166 MWD/MTU. Cycle 4 is expected to commence operation in late April, 1992. This letter is to summarize Commonwealth Edison Company's (CECo) plans and evaluations regarding the Byron Unit 2 Cycle 4 (BY2C4) reload core, and to provide the Cycle 4 Core Operating Limits Report (Attachment 2) per Generic letter 88-16.

Attachment 1 describes the Byron 2 Cycle 4 reload and CECo's reload safety evaluation review, which is being performed in accordance with the provisions of 10CFR50.59 as there are no unreviewed safety issues or necessary Technical Specification changes. The reload design has also evaluated the impact on safety analyses resulting from the deletion of 6 upper core plate fuel assembly guide pins at some core locations during the Byron Unit 2 End-of-Cycle 2 refueling outage. These removed fuel assembly guide pins did not present any unreviewed safety questions.

The Byron Unit 2 Cycle 4 core has been designed and evaluated using NRC approved methodologies. Commonwealth Edison performed the neutronic portion of the BY2C4 reload design utilizing NRC approved codes and methods as described in Reference 2. The remainder of the reload safety evaluation was performed by Westinghouse in accordance with the methodology described in Reference 1.

In summary, the Byron Unit 2 Cycle 4 reload design, including the development of the Core Operating Limits Report (COLR) pursuant to the requirements of Technical Specification Section 6.9.1.9, was generated and verified by Commonwealth Edison using NRC approved methodology.

Please direct any questions regarding this subject to this office.

Very truly yours,

D. J. Chrzanowski

David J. Chrzanowski
Nuclear Licensing Administrator

cc: A. H. Hsia - Project Manager, NRR
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ATTACHMENT 1

Byron 2 Cycle 4 Reload Description

The Byron Unit 2 Cycle 4 core is a standard "Low Leakage" design and is similar to the Cycle 3 core loading pattern.

During the End-of-Cycle 3 refueling outage, a total of 89 fuel assemblies, which are composed of 84 VANTAGE 5 fuel assemblies and 5 reinsert OFA assemblies, will be loaded into the core. The BY2C4 core will be composed of 168 Westinghouse 17x17 VANTAGE 5 assemblies (84 new and 84 once-burned) and 25 17x17 OFAs (5 once-burned and 20 twice-burned). The NRC has approved the first use of VANTAGE 5 for Byron Unit 1 Cycle 4 and Byron Unit 2 Cycle 3 and thereafter, under the provisions of 10CFR50.90 in Reference 7. The Byron UFSAR presently reflects the transition to VANTAGE 5 fuel.

The BY2C4 reload core was designed to perform under current nominal design parameters, Technical Specifications and related bases, and current Technical Specification setpoints such that:

1. Core operating characteristics will be equivalent or less limiting than those previously reviewed and accepted; or

2. For those postulated incidents analyzed and reported in the Byron Updated Final Safety Analysis Report (UFSAR) which could potentially be affected by fuel reload, reanalyses or reevaluations have been performed to demonstrate that the results of the postulated events are within allowable limits.

The mechanical design of the new Cycle 4 fuel regions 6A and 6B VANTAGE 5 fuel assemblies is the same as the Cycle 3 fuel regions 5A and 5B VANTAGE 5 fuel assemblies except for:

a. snag-resistant Intermediate Flow Mixing (IFM) grids, and

b. an increased radius on the fuel rod bottom end plug.

The snag-resistant IFM grids prevent assembly hangup due to grid strap interference during an assembly removal. This was accomplished by changing the grid corner geometry and adding guide tabs on the outer grid strap. The bottom end plug has an increased radius in the transition between the chamfer and the end of the plug There are no changes in the critical dimensions of the bottom end plug or to the pressure drop from the previous region. Therefore, these mechanical changes will have no effects on any of the fuel design parameters.

Fifty-three new Westinghouse Enhanced Performance RCCAs (EP-RCCAs) with Ag-In-Cd absorber materials will be installed in BY2C4 replacing the Hafnium RCCAs. The EP-RCCAs have a thin chrome electroplate applied to a specified length of the rodlet cladding surface to provide enhanced cladding wear resistance. The absorber diameter of the EP-RCCA is also reduced slightly at the lower extremity of the rodlets to better accommodate absorber swelling upon irradiation and minimize interactions with the cladding.

The reload fuel's nuclear design has been evaluated generically in the UFSAR and in Reference 6. As OFA and VANTAGE 5 fuel have the same pellet and fuel rod diameters, most reactivity parameters are insensitive to fuel type. Changes in nuclear characteristics due to the transition from OFA to VANTAGE 5 fuel are within the range normally seen from cycle to cycle due to fuel management effects and have been previously evaluated in Cycle 4 in Byron Unit 1's first transition cycle to VANTAGE 5 fuel. The loading pattern dependent parameters have been evaluated in detail in the CECo/Westinghouse reload safety evaluation process.

Commonwealth Edison (CECo) has determined that all neutronic reload parameters remain within the Safety Parameter Interaction List (SPIL) limits. These include, but are not limited to, SPIL items for non-LOCA and LOCA considerations. In addition, CECo has also analyzed the potential increase in local peaking due to postulated larger inter-assembly gaps at some core locations as a result of removed guide pins. In the Cycle 4 design, same as for Cycle 3, TORTISE, an NRC approved code used in CECo's prior nuclear design methodology, was used to calculate a "fuel rod-by-fuel rod" penalty to be overlayed on ANC (Reference 3) fuel rod powers to account for the potential water gap increase. This penalty is applied to FNDH of the corner pins for assemblies adjacent to the increased water gap. Very conservative assumptions were made in the development of the penalty including the increased water gap was assumed to exist over the entire length of the fuel assembly.

The thermal-hydraulic design for the BY2C4 reload core has not significantly changed from that of the previously reviewed and accepted Cycle 3 design. Tests and analysis have confirmed that the VANTAGE 5 assemblies are hydraulically compatible with the OFA assemblies reloaded as Region 4. The VANTAGE 5 core limits are bounded by the OFA core limits. Cycle 4 has a majority (168 out of 193) of VANTAGE 5 fuel assemblies. The present Technical Specification FNDH limits of less than 1.55 for OFA assemblies and 1.65 for VANTAGE 5 assemblies ensure that the limiting DNB ratio during Normal Operation and Operational Transients (Condition I and Condition II events) is greater than or equal to the DNBR limit for the DNBR correlation being applied. The effects of removed fuel assembly guide pins were accounted for and found to have no effect on the six thermal hydraulic analysis.

CECo's reload safety evaluation process (RSE/SPIL review) is a verification to ensure that the previously reviewed and approved UFSAR transient analyses are not adversely impacted by the cycle specific reload core design. CECo's Byron Unit 2 Cycle 4 Reload Safety Evaluation (RSE) relied on previously reviewed and accepted analyses reported in the UFSAR, fuel technology reports, the VANTAGE 5 Reload Transition Safety Report, and previous RSE reports. A detailed review of the core characteristics was performed to determine those parameters affecting the postulated accident analyses reported in the Byron UFSAR. CECo has verified that for the accident analyses presented in the UFSAR, the conclusions were not affected by the reload core characteristics.

Furthermore, operation of the BY2C4 with six fuel assembly guide pins removed was evaluated for the effects on the UFSAR LOCA analyses. The hydraulic effects of both larger and smaller gaps in the region below the removed guide pins during a hypothetical LOCA event was considered. The impact of the altered fuel assembly configurations on the final Peak Clad Temperature (PCT) was negligible and all of the 10CFR50.46 criteria continue to be satisfied.

There are no reload-related changes to the current Technical Specifications required to ensure safe operation during Cycle 4. Therefore, Westinghouse and CECo have concluded in the BY2C4 reload safety evaluation that the core design parameters and assumptions remain appropriate and the conclusions in UFSAR remain applicable.

Finally, the Byron Unit 2 Cycle 4 reload core design will be verified per the standard reload startup physics tests. These tests include, but are not limited to, the following:

1. A core verification by physical inventory of the fuel in the reactor by serial number and location prior to the replacement of the reactor head;

2. Control rod drive tests and drop times;

3. Critical boron concentration measurements;

4. Control/Shutdown bank worth measurements using the rod swap technique;

5. Moderator Temperature Coefficient (MTC) measurements;

6. Startup power distribution measurements using the incore flux mapping system; and

7. Reactor coolant system flow measurement.

In addition, per the requirement of the NRC SER (Reference 3), the BY2C4 startup physics test results will be submitted to the NRC since BY2C4 is the first Byron Unit 2 reload fully analyzed by CECo with the advanced neutronics design methods (Reference 2).

In conclusion, CECo's use of VANTAGE 5 fuel (Reference 6) and use of advanced neutronics methods (Reference 2) have been previously approved by the NRC (References 7 and 3). Therefore, pending completion of the On-Site and Off-Site Reviews, no additional prior NRC review and approval of the reload core analyses or application for amendment to the Byron Unit 2 operating license, is required as a result of the cycle specific reload design for Cycle 4.