Commonwealth Edison
1400 Opus Place
Downers Grove, Illinois 60515

November 8, 1994

Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

SUBJECT: Braidwood Station Unit 2 Cycle 5 Reload
NRC Docket No. 50-457

REFERENCES: See Attachment 3

Braidwood Unit 2 has completed its fourth cycle of operation and is conducting a refueling outage that began October 8, 1994. Braidwood Unit 2 Cycle 4 attained a final cycle burnup of approximately 17,611 MWD/MTU. The Unit is expected to return to service for Cycle 5 on November 16, 1994. This letter summarizes Commonwealth Edison Company's (ComEd) evaluation regarding the Braidwood Unit 2 Cycle 5 reload core.

Attachment 1 describes the core reload including a summary of ComEd's safety evaluation, performed in accordance with the provisions of 10CFR50.59 as there are no unreviewed safety issues or additional Technical Specification changes.

Attachment 2 provides the Core Operating Limits Report (COLR) for Cycle 5 pursuant to Technical Specification 6.9.1.9. ComEd and our vendor (Westinghouse) apply NRC approved reload design methodologies developed by Westinghouse as described in Reference 1. Commonwealth Edison performed the neutronic portion of the reload design using the methods and codes described in References 2 & 4 as approved in References 3 & 5, respectively. Specifically, the Braidwood Unit 2 Cycle 5 reload design, including the development of the core operating limits, was generated by Commonwealth Edison using NRC approved methodologies.

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Please direct any questions regarding this notification to this office.

Very truly yours,

D. M. Saccomando
Nuclear Licensing Administrator

cc: R. Assa - Project Manager, NPR
S. DuPont - Senior NRC Resident Inspector - Braidwood
J. D. Martin - Region III Administrator
Illinois Department of Nuclear Safety - IDNS

ATTACHMENT 1

Braidwood Unit 2 Cycle 5 Reload Description

The Braidwood Unit 2, Cycle 5 reload core was designed to perform under current nominal design parameters, Technical Specifications and related bases, and current Technical Specification set points such that:

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

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

The Braidwood Unit 2 Cycle 5 core is a "Low Leakage" design. Previously, Commonwealth Edison has successfully developed and operated similar "Low Leakage" designs at Braidwood as well as our Byron and Zion stations.

During the Cycle 4/5 refueling, eighty eight (88) VANTAGE 5 fuel assemblies have been inserted into the core. In addition, 4 OFA assemblies discharged from Braidwood Unit 1 Cycle 2 were also inserted for their second cycle of operation. The Braidwood Unit 2 core now contains a mixed core of Westinghouse 17x17 VANTAGE 5 and 17X17 OFA assemblies (88 V5 new, 84 V5 once-burned, 17 twice-burned and 4 OFA assemblies). The NRC approved the use of VANTAGE 5 at Braidwood Unit 2 for Cycle 2 operations and thereafter, under the provisions of 10CFR50.90 (Reference 6). Reference 6 also describes the compatibility of operation with OFA and VANTAGE 5 fuel. The Braidwood/Byron UFSAR describes the compatibility of Westinghouse VANTAGE 5 fuel assemblies in a reload core, and verified compatibility with control rods and reactor internals interfaces. A mixture of Integral Fuel Burnable Absorber (IFBA) rods and Wet Annular Burnable Absorbers (WABAs) will be used as the burnable poison. The IFBA rods contain fuel pellets with an enriched B-10 coating. Both WABAs and IFBAs have successfully been used previously by Commonwealth Edison.

The reload VANTAGE 5 fuel assemblies will incorporate Westinghouse's standardized fuel pellets, reconstitutable top nozzles (RTN), extended burnup design features, modified Debris Filter Bottom Nozzle (DFBN), and snag resistant Intermediate Flow Mixers (IFM) grids. Similar features have been successfully utilized previously in Commonwealth Edison's Byron and Braidwood Units. In addition, mechanical features which have not been previously used at Braidwood Unit 2 have been incorporated as part of the VANTAGE 5 design for Regions 7A and 7B. These changes, which were reviewed by ComEd, include: (1) an extended burnup bottom grid spring to counter the effects of extended burnup, (2) a keyless/cuspless top nozzle and modified hold down spring design to eliminate to potential for hold down spring hang-up, (3) standardized alignment of the fuel rods (a manufacturing simplification), (4) a cast

composite bottom nozzle (a manufacturing process change), (5) WABA absorber repositioning to align fuel and absorbers, (6) the use of debris mitigation features including a bottom protective grid with modified fuel rod end plugs and a protective zirconium dioxide coating over the bottom six inches of the fuel rod, and (7) a variable pitch fuel rod plenum spring designed to provide additional space for gas release.

The Braidwood Unit 2 Cycle 5 core has been designed and evaluated using NRC licensed and approved methods. Commonwealth Edison requested approval to perform the neutronic portion of PWR reload designs using the methods described in Reference 2, and the NRC has approved this request (Reference 3). Specifically, the Braidwood Unit 2 Cycle 5 reload design, including the development of the core operating limits, were generated and verified by Commonwealth Edison using NRC approved methodology.

The reload fuel's nuclear design is evaluated generically in the UFSAR. Braidwood Unit 2 Cycle 5 is a mixed core of VANTAGE 5 and OFA fuel assemblies; as such, the 50°F Peak Clad Temperature (PCT) transition core penalty is valid. The loading pattern dependent parameters were evaluated in detail in the ComEd/Westinghouse reload safety evaluation process. A 100°F PCT penalty will remain in place for Cycle 5 to address the possibility that the Chopped cosine is not the most limiting power shape for the large break LOCA analysis. This PCT penalty will be removed upon the approval of WCAP-12909-P, "Power Shape Sensitivity Methodology." The effect of Economic Generation Control (EGC) including an increase in the temperature deadband uncertainty in Chapter 15 accident analysis, has been evaluated. The results of the evaluations indicated that EGC operation is acceptable in that all applicable safety criteria are met. Specific evaluations for large and small break LOCA resulted in peak clad temperature increases of +4°F and +5°F for large and small break LOCA, respectively. It should be noted that if the dead-band is increased from 1.5 °F to 4.0 °F, the peak LOCA containment pressure would be affected. Westinghouse has determined that a 0.2 psi "penalty" should be added to the previous peak LOCA containment pressure of 44.4 psig. A net peak containment pressure of 44.6 psig would then account for EGC operation with an increased rod control dead-band. Note that there is no peak LOCA containment pressure penalty if EGC is used without an increase in the rod control dead-band.

Commonwealth Edison has determined that all neutronic reload parameters remain within the previously established reload safety and transient Safety Parameter Interaction List (SPIL) limits. These include, but are not limited to, Safety Parameters for UFSAR non-LOCA and LOCA transients.

The thermal-hydraulic design for the Cycle 5 reload core has not significantly changed from that of the previously reviewed and accepted cycle design. The FNDH limits of less than 1.65 for VANTAGE 5 and 1.55 for OFA assemblies ensure that the DNB ratio of the limiting power rod during Condition I and Condition II events is greater than or equal to the DNBR limit of the DNBR correlations (WRB-1 and WRB-2) being applied. The W-3 DNBR Correlation continues to be used for conditions which are outside the WRB-1 and WRB-2 Correlations (e.g., steam line break).

Summary

Commonwealth Edison's reload safety evaluation process (SPIL/RSE review) is a verification to ensure that the previously reviewed and approved accident analyses are not adversely impacted by the cycle specific reload core design. ComEd's Braidwood Unit 2 Cycle 5 Reload Safety Evaluation relied on previously reviewed and accepted analyses reported in the UFSAR, fuel technology reports, the VANTAGE 5 Reload Transition Safety Report (RTSR), and previous reload safety evaluation reports. A detailed review of the core characteristics was performed to determine those parameters affecting the postulated accident analyses reported in the Braidwood UFSAR. The Operation of the Braidwood Unit 2 Cycle 5 has been analyzed in accordance with NRC approved methodologies and satisfies safety analysis limits. The margin of safety, as defined in the bases of the Technical Specifications, is not impacted or reduced.

Finally, verification of the Braidwood Unit 2 Cycle 5 reload core design will be performed per the standard reload startup physics tests (ANSI/ANS 19.6.1). These tests include, but are not limited to:

1. A 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 bank worth measurements using the rod swap technique;

5. Moderator temperature coefficient measurements;

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

In summary, ComEd's use of VANTAGE 5 and OFA fuel and use of advanced neutronics methods (as described in References 7 and 2, respectively) have been previously approved by the NRC (References 6 and 3 respectively). Therefore, no additional NRC review and approval of the reload core analyses or application for amendment to the Braidwood Unit 2 operating license is required as a result of the specific reload design for Cycle 5.