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February 11, 1986

Mr. James G. Keppler
Regional Administrator
U. S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

SUBJECT: Braidwood Station Unit 1
10 CFR 50.55(e) No. 86-01 Report
Misoriented Burnable Poison Assembly.
NRC Docket No. 50-456

Dear Mr. Keppler:

On January 14, 1986, Commonwealth Edison Company notified Mr. W. Little of your office of a deficiency reportable pursuant to 10 CFR 50.55(e) regarding the misorientation of burnable poison rods (A6P2D) in a Westinghouse Fuel Assembly (C54S). This deficiency was assigned number 86-01 for Braidwood Unit 1 for your tracking purposes. This letter fulfills the thirty day reporting requirements of 10 CFR 50.55(e) regarding the matter, and is considered a final report.

Description of Deficiency

Upon inspection of fuel assembly C54S, it was determined that its insert (burnable poison assembly A6P2D) was misoriented with respect to the fuel assembly. A6P2D is an asymmetric burnable poison assembly designed to have its 6 absorber rodlets located along face 4 of the fuel assembly. The "T-bar" at the top of A6P2D was in the correct orientation, but the absorber rodlets were located along face 1 of the fuel assembly rather than face 4 (90° clockwise rotation from the design location, as viewed from the top of the fuel assembly). The insert cannot be physically rotated within the fuel assembly to correct the absorber rodlet locations because its "T-bar" would then be misoriented by 90° in the counterclockwise direction as viewed from the top.

Analysis of Safety Implications

The Westinghouse core design predicts power peaking factors to be less than Technical Specification limits. This analysis, however, was based upon specific locations of the burnable poison (absorber) rodlets. Normally, in an asymmetric burnable poison assembly, the absorber rodlets are oriented toward the center of the reactor core where neutron flux and power density are highest at the

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beginning of core life. This orientation tends to "flatten-out" the radial flux distribution, keeping power peaking factors within limits. With burnup in cycle one, the natural flux distribution within the core becomes flatter (shifting toward the outside of the core) and, at the same time, the poison content of the burnable poison rods is depleted, adding positive reactivity. In other words, the burnable poisons "burn out" as there is less need to control peaking towards the center of the core, allowing the natural flux distribution to become more predominant. These effects are accounted for in the core design. The misorientation of an asymmetric burnable poison assembly could produce an abnormal flux distribution in the core, resulting in its fuel assembly having a different burnup gradient than symmetric assemblies in the core. Since the predicted peaking factors are dependent on absorber location and specific burnup gradient, this could have potentially led to power peaking factors in excess of design limits, especially in subsequent cycles (as the fuel assembly with the misoriented burnable poison is loaded closer to the center of the core).

Section 15.4.7 of the Byron/Braidwood FSAR discusses the inadvertent loading and operation of a fuel assembly in an improper position. Included among possible core loading errors is the inadvertent loading of one or more fuel assemblies into a new core without their required burnable poison rods. The movable incore detector system is capable of revealing any assembly enrichment error or loading error which causes power shapes to be peaked in excess of the design value. The FSAR concludes that the resulting power distribution effects will either be readily detected by the movable incore detector system or will cause a sufficiently small perturbation to be acceptable within the uncertainties allowed between nominal and design power shapes. The FSAR does not discuss the potential effects of using the fuel assembly with a misoriented burnable poison in subsequent cycles.

Westinghouse has analyzed the effects on peaking factor margin and flux distribution perturbation if a fuel assembly with a misoriented burnable poison is moved toward the core center after residing on the core periphery during cycle one. Westinghouse has concluded that there would have been no violation of peaking factor limits for cycle one and all subsequent cycles of operation.

Corrective Action Taken

Burnable poison assembly A6P2D was returned to the Westinghouse manufacturing facility in Columbia, South Carolina for repair. The asymmetric burnable poison assemblies which were previously inspected at Braidwood were all reverified for proper orientation. The orientation of asymmetric burnable poison rodlets will continue to be verified against the core loading plan drawings

throughout fuel receipt at Braidwood Station. Westinghouse has determined that there are no similar misorientation problems at their manufacturing facility for Braidwood fuel. However, they will institute changes in their manufacturing and inspection practices for burnable poisons to prevent recurrence.

Please address any questions that you or your staff may have concerning this matter to this office.

Very truly yours,

Anthony D. Miosi

Anthony D. Miosi
Nuclear Licensing Administrator

cc: NRC Resident Inspector - Byron
NRC Resident Inspector - Braidwood

Director of Inspection and Enforcement
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