



Commonwealth Edison  
1400 Opus Place  
Downers Grove, Illinois 60515

February 19, 1993

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

Attn: Document Control Desk

Subject: Zion Station Unit 2 Cycle 13 Reload  
Description and Core Operating Limits Report  
NRC Docket No. 50-304

- References:
- 1) Westinghouse WCAP-9272-P-A, dated October 1985, "Westinghouse Reload Safety Evaluation Methodology," (originally issued March 1978)
  - 2) June 26, 1992 letter from C.P. Patel to T.J. Kovach (NRC Safety Evaluation Report for use of VANTAGE 5 fuel at Zion)
  - 3) March 11, 1991 letter from R.M. Pulsifer to T.J. Kovach, "Topical Report on Benchmark of PWR Nuclear Design Methods Using PHOENIX-P and ANC Computer Codes."

Dear Dr. Murley:

Zion Unit 2 has completed its twelfth cycle of operation and is conducting a refueling outage that began on November 12, 1992. Zion Unit 2 Cycle 12 attained a final cycle burnup of approximately 17,344 MWD/MTU. Cycle 13 is expected to commence operation on February 25, 1993. The purpose of this letter is to advise you of Commonwealth Edison Company's (CECo's) plans regarding the Zion Unit 2 Cycle 13 reload core.

Attachment A describes the core reload design. All aspects of the design have been reviewed and compared to the safety parameters assumed in the safety analysis described in the Reference 2 safety evaluation report. It has been determined that these safety parameters have been not been impacted by the Cycle 13 core design. The Zion Unit 2 Cycle 13 reload review was performed in accordance with the provisions of 10CFR50.59, and verified that no unreviewed safety questions exist and no Technical Specification changes are required.

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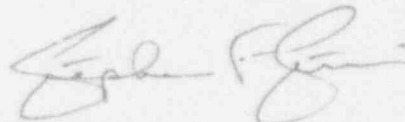
The Zion Unit 2 Cycle 13 core has been designed and evaluated using NRC approved methodologies. Commonwealth Edison performed the neutronic portion of the reload design utilizing codes and methods approved by the NRC via Reference 3. The remainder of the reload safety evaluation was performed by Westinghouse in accordance with the methodology described in Reference 1.

Pursuant to the requirements of Zion Technical Specification 6.6.1.F.4, the Unit 2 Cycle 13 Core Operating Limits Report (COLR) is provided in Attachment B.

In summary, the Zion Unit 2 Cycle 13 reload design, including the development of the COLR was generated and verified by CECO using NRC approved methodology.

Please direct any questions regarding this matter to this office.

Very truly yours,



Stephen F. Stimac  
Nuclear Licensing Administrator

cc: A. Bert Davis, Regional Administrator - RIII  
C.Y. Shiraki, Project Manager - NRR  
J. D. Smith, Senior Resident Inspector - Zion

## ATTACHMENT A

### Zion Unit 2 Cycle 13 Reload Description

The Zion Unit 2 Cycle 13 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 characteristics will be less limiting than those previously reviewed and accepted; or
2. For those postulated incidents analyzed and reported in the Updated Zion 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.

Commonwealth Edison Company performed a detailed review with Westinghouse on the bases, including all the postulated incidents considered in the UFSAR, of the Reload Safety Evaluation (RSE). Based on this review, safety evaluations have been performed and approved pursuant to the requirements of 10CFR50.59.

The Zion Unit 2 Cycle 13 core is a "Low-Low Leakage" design. Commonwealth Edison and its vendor, Westinghouse Electric, have successfully developed and used similar "Low-Low Leakage" designs. The most recent Low-Low Leakage core design was applied to Zion Unit 1 Cycle 13. During the Cycle 12/13 refueling, eighty four (84) VANTAGE 5 fuel assemblies without Intermediate Flow Mixing grids (IFMs) have been inserted into the core. The Zion Unit 2 core will then contain a combination of fresh Westinghouse 15x15 VANTAGE 5 assemblies and previously irradiated 15x15 Optimized Fuel Assemblies (OFAs). The NRC has reviewed and approved the use of 15x15 VANTAGE 5 at Zion Units 1 and 2 for Cycle 13 and beyond, under the provisions of 10CFR50.90 (Reference 2). The licensing submittals described in Reference 2 justified the compatibility of Westinghouse OFA and VANTAGE 5 assemblies in a reload core, and verified compatibility with control rods and reactor internals interfaces. A combination 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 IFBA fuel rods have been used previously by Commonwealth Edison.

The reload VANTAGE 5 fuel assemblies incorporate Westinghouse standardized fuel pellets, reconstitutible top nozzles (RTN), extended burnup design features, and snag resistant grids. Similar features have been successfully utilized previously in Zion Unit 1 and Commonwealth Edison's Byron and Braidwood Units. Additionally, the reload fuel assemblies incorporate the Debris Filter Bottom Nozzle (DFBN). The DFBN, hydraulically and structurally equivalent to the nozzle used on the existing fuel assemblies, is expected to improve fuel performance by reducing the size of air debris that may potentially enter the active fuel region. This feature is currently in operation in Zion Unit 1 and in Commonwealth Edison's Byron and Braidwood Units.

## ATTACHMENT A

### Zion Unit 2 Cycle 13 Reload Description (continued)

The reload fuel's nuclear design is evaluated generically in the UFSAR. 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. The loading pattern dependent parameters (for the Zion Unit 2 Cycle 13 design) were evaluated in detail in the CECO/Westinghouse reload safety evaluation process and verified to satisfy the safety analysis limits and assumptions.

The thermal-hydraulic design for the Cycle 13 reload core has not significantly changed from that of the previously reviewed and accepted design. Tests and analysis have confirmed that the VANTAGE 5 assemblies are hydraulically compatible with the OFA assemblies reloaded as Regions 13 and 14. The FNDH limit of less than 1.65 for both OFA and VANTAGE 5 assemblies ensures that the DNB ratio of the limiting power rod during Condition I and Condition II events are greater than or equal to the DNBR limit of the DNBR correlation being applied.

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. Commonwealth Edison's Zion Unit 2 Cycle 13 Reload Safety Evaluation applied both the LOCA and non-LOCA safety analyses presented in the Zion VANTAGE 5 licensing submittals (described in reference 2), and relied on previously reviewed and accepted analyses reported in the UFSAR, fuel technology reports, and previous reload safety evaluation reports. A detailed review of the core characteristics was performed pursuant to Reference 1 to determine those parameters affecting the postulated accident analyses reported in the Zion UFSAR. Commonwealth Edison verified that accident analyses presented in the UFSAR, as modified by the reanalyses described and approved in Reference 2, were not affected by the reload core characteristics.

In all but one case, it was found that the effects were accommodated within the conservatism of the assumptions used in the applicable safety analysis. A design parameter which describes the non-IFBA fuel average temperature versus Kw/ft for LOCA evaluation, exceeded the current limit. This is because the licensing basis Zion VANTAGE 5 LOCA analysis for Cycle 13 had used Unit 1 Cycle 13 as-built fuel data. Since the Unit 2 Cycle 13 as-built fuel parameters were not available at the time, generic fuel parameters were used as the Unit 2 Cycle 13 SPIL reload values. Using the generic fuel parameters led to the fuel average temperatures not being bounded by the current limit values which constitutes a SPIL violation. An evaluation was performed, however, to determine the effects of this fuel temperature violation. A temporary Peak Clad Temperature (PCT) assessment of 28°F was added to the reference PCT. The PCT penalty assessment is considered temporary in that once the Unit 2 Cycle 13 as-built fuel data becomes available, the as-built fuel parameters will be compared with the current limits. This additional evaluation is expected to remove some of the 28°F penalty. With the temporary penalty included, the licensing basis PCT continues to satisfy the requirements of 10CFR50.46(b). All other applicable design basis criteria were met.

## ATTACHMENT A

### Zion Unit 2 Cycle 13 Reload Description (continued)

The reload safety evaluation demonstrated that no unreviewed safety questions exist and no additional Technical Specification changes, beyond those previously approved, are required for operation of Zion Unit 2 during Cycle 13. Commonwealth Edison has concluded that no unreviewed safety questions, as defined by 10CFR50.59, are involved with the reload.

Finally, verification of the Zion Unit 2 Cycle 13 reload core design has been or will be performed per the standard reload startup physics tests. 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 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.

ATTACHMENT B  
ZION UNIT 2 CYCLE 13  
CORE OPERATING LIMITS REPORT