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March 7, 1994

Mr. William T. Russell, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Zion Station Unit 1
Cycle 14 Reload
NRC Docket No. 50-295

References: See Attachment 2

Dear Mr. Russell:

Zion Unit 1 has completed its thirteenth cycle of operation and is conducting a refueling and maintenance outage that began on October 21, 1993. Zion Unit 1 Cycle 13 attained a final cycle burnup of approximately 14,340 MWD/MTU. Cycle 14 is expected to commence operation on March 24, 1994. This letter is to advise you of Commonwealth Edison Company's (CECo) plans regarding the Zion Unit 1 Cycle 14 (Z1C14) reload core.

Attachment 1 describes the core reload design. All aspects of the design have been reviewed and compared to the safety parameters assumed in the Reference 1 safety analysis. It has been determined that these safety parameters have not been impacted by the Cycle 14 core design. The Zion Unit 1 Cycle 14 reload review was performed in accordance with the provisions of 10CFR50.59, and it was verified that no unreviewed safety questions exist or Technical Specification changes are required.

The Zion Unit 1 Cycle 14 core has been designed and evaluated using NRC approved methodologies. Commonwealth Edison performed the neutronic portion of the Z1C14 reload design utilizing codes and methods approved by the NRC in Reference 3. The remainder of the reload safety evaluation was performed by Westinghouse in accordance with methodology described in Reference 1.

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In summary, the Zion Unit 1 Cycle 14 reload design, including the development of the Core Operating Limits Report (COLR) pursuant to the requirements of Technical Specification Section 6.6.1.F, was generated and verified by Commonwealth Edison using NRC approved methodology.

Please note that the NRC has recently reviewed and approved two CECo topical reports (References 4,5,6 and 8). The topicals describe CECo's PWR Reload Transient Analysis Methodology. The NRC has found that the CECo transient analysis methodology is acceptable for use in Zion licensing applications and for analysis supporting the COLR. CECo expects to initiate a Technical Specification change submittal later this year to include these topicals in Section 6.6.1.F.2 of the Zion Technical Specifications so they can be used as referenced methodology for determining the Core Operating Limits. Should CECo elect to apply the approved methodology for use in any Zion non-COLR licensing action prior to the approval of the Technical Specification change, the reload safety parameters will be revalidated and the appropriate On-Site and Off-Site Reviews will be completed.

Please direct any questions regarding this notification to this office.

Sincerely,

Terrence W. Simpkin

T.W. Simpkin
Nuclear Licensing Administrator

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

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ATTACHMENT 1

Zion Unit 1 Cycle 14 Reload Description

The Zion Unit 1 Cycle 14 (Z1C14) core employs a "Low-Low Leakage Loading Pattern" design (L^4P) and is similar to the previously installed Cycle 13 core. The Z1C14 design reflects the actual Cycle 13 burnup of 14,340 MWD/MTU.

Z1C14 was originally designed to operate with VANTAGE 5H fuel. For the 15x15 fuel design, the VANTAGE 5H fuel would have added, compared to the standard V5 fuel, IFMs and low pressure drop mid-grids; however, due to recent fuel assembly flow vibration related concerns observed in some plants operating with 17x17 VANTAGE 5H fuel and the concerns expressed by the NRC (Information Notice 93-82), CECo has made the decision to continue to operate with VANTAGE 5 fuel without the IFMs or the low pressure drop mid-grids for Cycle 14. This will ensure that the impact of any fuel design changes and mixed core behavior in the fuel and reload core design process has been properly evaluated. Therefore, the Cycle 14 Region 16A and B feed assemblies are of the same design as the Region 15 feed assemblies utilized for Cycle 13. CECo has informed the NRC of this decision in Reference 7. The Zion UFSAR (July 1993) presently reflects the transition to VANTAGE 5 fuel consisting of both VANTAGE 5 without the IFMs and the VANTAGE 5H fuel.

The Z1C14 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. Re-analyses or re-evaluations have been performed to demonstrate that the limiting postulated UFSAR events which could be adversely affected by the reload are within allowable limits.

During the Cycle 13/14 refueling outage, seventy-six (76) new VANTAGE 5 fuel assemblies will be inserted into the core. The Zion Unit 1 core will then contain a combination of Westinghouse 15x15 VANTAGE 5 fuel assemblies without IFMs and previously irradiated Westinghouse 15x15 Optimized Fuel Assemblies. The NRC approved the use of VANTAGE 5 without IFMs for Zion Units under the provisions of 10CFR50.90 in Reference 2.

The Z1C14 core has been designed and evaluated using NRC reviewed and approved methods. The Cycle 14 neutronic analysis was performed by CECo using methodologies approved by the NRC as described in Reference 3. The remainder of the reload safety evaluation was performed by Westinghouse in accordance with the methods described in Reference 1.

In Cycle 14, two reconstituted fuel assemblies containing four stainless steel filler rods (2 for each assembly) from Cycle 13 will continue to be used. The mechanical evaluation of these assemblies has followed the NRC approved methodology. As stated in the Z1C14 reload safety evaluation, Cycle 14 will continue to use hafnium fuel inserts that serve as Peripheral Power Suppression Assemblies in order to reduce neutron flux on the reactor vessel. These hafnium insert assemblies meet all fuel assembly design criteria.

During the Cycle 13/14 refueling, 36 resident Rod Cluster Control Assemblies (RCCAs) of the original Westinghouse (W) design will be replaced with those supplied by the Babcock and Wilcox Fuel Company (BWFC). The BWFC replacement RCCA has been designed and manufactured to be a like-for-like replacement such that all of the critical parameters important to meet RCCA functional requirements are essentially identical to the W design. The BWFC extended life RCCA design has incorporated similar improved design features as in the W Enhanced-Performance RCCA (EP-RCCA) when compared to the original W design. There are 17 W EP-RCCAs scheduled to return to operation for Cycle 14.

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 1 Cycle 14 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 a mixed core of VANTAGE 5 and OFA fuels used in the Cycle 14 reload core has not significantly changed from that of the previously reviewed and accepted Cycle 13 design. Additionally, the effects on Cycle 14 operations due to fuel rod repositioning in the feed assemblies, thimble plug removal, the use of two reconstituted fuel assemblies containing four stainless steel rods, and the continued use of the hafnium insert assemblies for vessel fluence reduction have each been evaluated. The present Technical Specification FNDH limit of less than 1.65 (for both OFA and VANTAGE 5 assemblies) ensures that the limiting DNB ratio during Normal Operation and Operational Transients (Condition I and Condition II events) will be greater than or equal to the DNBR limit of the DNB correlation being applied.

The thermal and hydraulic effects of the four stainless steel rods contained in two Cycle 14 reconstituted fuel assemblies were evaluated and found to have inconsequential effect on the flow resistance and, therefore the resulting thermal-hydraulic analysis. Additionally, the thermal-hydraulic evaluation has demonstrated the acceptability in the reload analysis for the effects of fuel rod repositioning and improved anti-snag top and bottom grids in Region 16 A and B fuel and the continued use of the hafnium Peripheral Power Suppression Assemblies.

Operation with thimble plugs removed from the fuel assemblies was analyzed and approved for Zion as part of the OFA to VANTAGE 5 transition. For Z1C14, the core bypass flows utilized in the analysis were consistent with thimble plug removal. Any differences between

the bypass flows assumed between the OFA versus VANTAGE 5 fuels were covered with available OFA DNBR margin.

Commonwealth Edison's reload safety evaluation process (RSE/SPIL 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. Z1C14 Reload Safety Evaluation applied both the LOCA and non-LOCA safety analyses as presented in the Zion VANTAGE 5 Reload Transition Safety Report (RTSR), 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 to determine those parameters affecting the postulated accident analyses reported in the Zion UFSAR. Commonwealth Edison verified that accident analyses presented in the UFSAR were not adversely affected by the Z1C14 reload core characteristics.

All the non-LOCA and LOCA SPIL parameters, except 3 items, have been verified by CECo to be bounded by their respective SPIL limits. For those reload parameters which were bounded by the SPIL limits, the previously analyzed and evaluated non-LOCA and LOCA safety analyses remain valid. Each of the three non-conforming SPIL items is addressed below for their resolution such that the conclusions given in the UFSAR remain valid:

Trip Reactivity vs. Position

The reload value for trip reactivity was found to be non-conservative when compared to the current limit in the first 7% of control rod motion; however, there were enough margins and therefore conservatism in the remainder of the trip reactivity curve to offset this small violation such that the licensing basis safety analysis assumptions remain applicable.

Non-IFBA Fuel Average Temperatures vs. KW/FT for LOCA Evaluation

The Zion V5 LOCA analysis for V5 without IFMs fuel had used the Z1C13 as-built fuel margins to establish the SPIL limit since Cycle 13 was the first cycle transitioning to V5 fuel. The Z1C14 as-built fuel parameters have not been utilized in the reload evaluation because they are not yet available at the time SPIL calculations were performed, generic fuel parameters were then used as the SPIL reload values for Z1C14. The use of generic fuel parameter values led to the reload values being not bounded by the current limit values. Westinghouse has performed an evaluation to determine the effects of using generic fuel temperature data and the result was a temporary PCT assessment of 28 °F. The PCT penalty assessment is considered temporary in that once the Z1C14 as-built fuel parameters become available, the Z1C14 as-built fuel data will be compared to the analysis values for V5 without IFMs which established the current limit. The ensuing evaluation is expected to remove part, if not all, of the 28 °F assessment as was the same situation for Z2C13 previously. However, even with the 28 °F temporary assessment, the licensing basis PCT is still within the requirements of 10CFR50.46(b).

IFBA Fuel Average Temperatures vs. KW/FT for LOCA Evaluation

The reload values have exceeded the current limits associated with this item for the same reason as stated in the item above. Although the reload values are non-conservative relative to the limits, Westinghouse has performed a specific evaluation for Zion's fuel parameters to show that the IFBA fuel's [at 200 psig fuel rod fill pressure] PCT is bounded by the non-IFBA fuel's PCT and, therefore, continues to meet the licensing basis PCT as explained above. As such, the 275 psig non-IFBA fuel rod post-LOCA characteristics bounds the 200 psig IFBA fuel rod.

The effects of Economic Generation Control (EGC), including an increase in the temperature deadband uncertainty on the Zion UFSAR accident analyses, have been evaluated by Westinghouse. The results of the evaluation indicated that EGC operation is acceptable in that all applicable safety criteria continue to be met.

Finally, verification of the Zion Unit 1 Cycle 14 reload core design 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 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, CECo's use of VANTAGE 5 fuel and the application of advanced neutronics methods have been approved by the NRC. The effects of the core loading pattern, use of two reconstituted fuel assemblies, operation with thimble plugs removed, and the installation of BWFC-supplied RCCAs have been addressed and that there are no adverse impacts on the conclusions of the 10CFR50.59 reload safety evaluation. On this basis, the reload and the associated changes do not constitute any unreviewed safety questions or require any Technical Specification changes.

ATTACHMENT 2

REFERENCES

1. Westinghouse WCAP-9272-P-A, dated October 1985, "Westinghouse Reload Safety Evaluation Methodology," (originally issued March, 1978).

2. Letter from C. P. Patel (NRC) to T. J. Kovach (CECo), "Issuance of Amendments (TAC Nos. M80044, M80045, M81061, M83241 and M83242)," dated June 26, 1992.

3. Letter from R. M. Pulsifer (NRC) to T. J. Kovach (CECo.), "Topical Report on Benchmark of PWR Nuclear Design Methods Using PHOENIX-P and ANC Computer Codes," dated March 1991.

4. "Transient Analysis Envelope for Zion Units 1 and 2," Commonwealth Edison Nuclear Fuel Services, NFSR-0069 Rev. 0, November 1989.

5. "CECo PWR Transient Analysis Methodology Topical Supplement," Commonwealth Edison Nuclear Fuel Services, NFSR-0087 Rev. 0, January 1991.

6. Letter from Clyde Y. Shiraki (NRC) to D. L. Farrar (CECo), "Zion Station, Units 1 and 2, Safety Eveluation Report for Transient Analysis Methodology (TAC NOS. M76660 and M76661)," dated February 9, 1994.

7. CECo Nuclear Licensing Letter to NRC, T. W. Simpkin to Dr. T. Murley, "Zion Units 1 and 2 Cycle 14 Transition Core Revision," dated October 1, 1993.

8. Safety Evaluation Letter from Clyde Y. Shiraki (NRC) to T.J. Kovach (CECo), "Zion Station, Units 1 and 2, Topical Report Supplement NFSR-0087 to Topical Report NFSR-0069 (TAC NOS. M82603 and M82604)," dated March 17, 1993.