VIRGINIA ELECTRIC AND POWER COMPANY Richmond, Virginia 23261

W. L. STEWART VICE PRESIDENT NUCLEAR OPERATIONS

October 9, 1984

Mr. Harold R. Denton, Director Office of Nuclear Reactor Regulation Attn: Mr. D. G. Eisenhut, Director Division of Licensing U. S. Nuclear Regulatory Commission Washington, D. C. 20555 Serial No: 554 E&C/RMB:cdk:2003N Docket Nos. 50-280 50-281 50-338 50-339 License Nos: DPR-32 DPR-37 NPF-4 NPF-7

Dear Gentlemen:

VEPCO USE OF WESTINGHOUSE COMPUTER CODES FOR RELOAD DESIGN AND SAFETY ANALYSIS

NRC representatives assisted by Brookhaven National Laboratory performed a technical audit of Vepco's use of Westinghouse computer codes for nuclear core reload design and safety analysis on May 16 and 17, 1984. The NRC staff found Vepco's use of the Westinghouse codes to be acceptable on an interim basis pending completion of the verification and approval of Vepco codes to be used for this purpose.

In a letter dated June 19, 1984, the NRC requested two letters from Vepco which were to address the following topics:

(a) Quality Assurance

Vepco should provide a detailed description of the quality assurance procedures used to assure an acceptable level of confidence in the results obtained in its usage of Westinghouse methods.

(b) Wesinghouse Methods

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Vepco should provide a detailed description of its core design procedures based on the Westinghouse methods. A step-by-step run-through of, among other things, the calculations performed, the codes used, the results obtained, and the check reviews performed should be provided. VIRGINIA ELECTRIC AND POWER COMPANY TO

The intent of this letter is to respond to item (a) above regarding Quality Assurance. Our specific response is included in Attachment 1 to this letter. As requested, our response to item (b) describing our core design procedures based on Westinghouse methods will be by separate transmittal.

If you require any additional information, please contact us.

Very truly yours,

L. Stewar

Attachment

cc: Mr. James R. Miller, Chief Operating Reactors Branch No. 3 Division of Licensing

> Mr. Steven A. Varga, Chief Operating Reactors Branch No. 1 Division of Licensing

Mr. J. P. O'Reilly Regional Administrator Region II

Mr. Daniel Fieno Core Performance Branch Office of Nuclear Reactor Regulation

Mr. M. W. Branch NRC Resident Inspector North Anna Power Station

Mr. D. J. Burke NRC Resident Inspector Surry Power Station

ATTACHMENT 1

QUALITY ASSURANCE PROCEDURES APPLICABLE TO VEPCO'S USE OF WESTINGHOUSE COMPUTER CODES

I. General Description of Quality Assurance Program

Nuclear core reload design and safety analysis activities performed by Vepco are conducted in accordance with the design and document control requirements of the Vepco Quality Assurance Manual (QAM) and the Vepco Nuclear Power Station Quality Assurance Manual (NPSQAM). The design control responsibilities specified in the Vepco QAM and NPSQAM are implemented by the Engineering and Construction (E&C) Department through the E&C Nuclear Design Control Program. The E&C Nuclear Design Control Program consists of three parts:

- 1. General controlling procedures to be used by E&C to meet the requirements of ANSI N45.2.11 and the Vepco QAM and NPSQAM.
- 2. Engineering discipline implementing procedures.
- 3. Nuclear standards or engineering procedures which describe verified and approved methods to be used in the engineering and design process.

The general controlling procedures applicable to reload design and safety analysis activities specify the requirements for development of design inputs, conduct of the design process, performance of design verifications, and computer software control. These general controlling procedures are implemented by discipline procedures contained in the Nuclear Fuel Engineering (NFE) Policy and Procedures Manual. The NFE Policy and Procedures Manual specifically identifies the requirements for development, verification, documentation, approval, and revision to reload design and safety analysis methods, calculational techniques, and production calculations. In addition, the NFE Policy and Procedures Manual requires the development and maintenance of Nuclear Design and Safety Analysis Manuals which describe the design and safety analysis process by delineating the type of calculations to be performed, the codes and analytical methods to be used, and the process by which each calculation is performed.

- II. Description of Quality Assurance Procedures Related to the Use of Westinghouse Codes For Reload Analysis
 - A. Preparation of the Design Input to the Reload Safety Analysis

Westinghouse nuclear design codes are currently used by Vepco to perform the calculations required to complete the design input to the reload safety analysis. These codes are being used on an interim basis pending completion of the verification and approval of Vepco codes for this purpose. As stated above, the NFE Policy and Procedures Manual requires development and maintenance of a Nuclear Design Manual for Westinghouse codes. The manual contains procedures to describe the design process by delineating the type of calculations to be performed, the Westinghouse codes and analytical methods to be used, and the process by which each calculation is performed. Specifically, the manual provides a detailed description of the methodology necessary to set up the calculational models and perform the calculations required to complete the design input to the reload safety analysis. The methodology described in the Design Manual for Westinghouse codes has been verified through performance of four reload designs in parallel with Westinghouse and directly comparing the calculated results.

Results of reload design production calculations are documented in calculational notes as required by the NFE Policy and Procedures Manual. The procedures require that all production calculations be independently verified by a cognizant engineer to ensure that the calculation was performed in accordance with all applicable instructions, is analytically correct, and meets all acceptance criteria. Verification is completed by the review engineer by determining whether:

- 1. The initialization process was properly conducted and documented.
- 2. Inputs were correctly selected.
- 3. Assumptions were valid.
- 4. Internal interfaces have been satisfied.
- 5. Proper calculational techniques and methods were used.
- 6. Results are defendable and compatible with design bases and/or acceptance criteria.

The review engineer will also determine if there is a need to perform an alternate calculation or a more detailed review. The verification is documented by the review engineer by signing the calculational note. In accordance with NFE procedures, the results of the design input calculations are summarized and transmitted to the Safety Analysis group in order to complete the reload safety analysis.

B. Performance of the Reload Safety Analysis

The reload safety analysis is performed in accordance with the procedural requirements specified in the NFE Policy and Procedures Manual. The key nuclear design, fuel design, and core thermal hydraulic parameters for the reload are documented and compared to the current limits of the existing safety analyses in an NFE Technical Report. When a key nuclear parameter is no longer bounded, the existing safety analyses affected by that parameter may need to be reevaluated or reanalyzed. If the accident is reanalyzed, the non-LOCA safety analysis methods employed when using Vepco codes are as described in the Safety Analysis Manual. This manual provides a detailed description of the assumptions appropriate for the analysis

and a discussion of the setup of important analysis input necessary to perform the required calculations. Where Westinghouse non-LOCA transient or thermal hydraulic codes are used, the analyses are performed in accordance with the Safety Analysis Manual and the Westinghouse Code Manuals. Vepco's capability to use the Westinghouse safety analysis codes has been verified through performance of four reload analyses in parallel with Westinghouse. In addition, analyses of the limiting transients for the North Anna Core Uprating Feasibility Study have been performed and compared to the same set of analyses performed by Westinghouse.

All safety analysis production calculations are documented in calculational notes as required by the NFE Policy and Procedures Manual. Again, the procedures require that all production calculations be independently verified by a cognizant engineer in accordance with the requirements discussed in II.A. above. The results of the evaluation of the key parameters and any reload safety analysis calculations performed are summarized in an NFE Technical Report and approved at the supervisory level.

Finally, the NFE Policy and Procedures require that the core reload design, the results of the nuclear design calculations, and the results of the safety analyses performed be summarized in the Reload Safety Evaluation. The Reload Safety Evaluation is documented in an NFE Technical Report, independently reviewed, and approved at the supervisory level. In addition, the Reload Safety Evaluation is reviewed by the Station Nuclear Safety and Operating Committee and the Safety Evaluation and Control staff.

C. Computer Software Control

The source modules of all Westinghouse codes used by Vepco for reload design and safety analysis are maintained by Westinghouse. Vepco has no access to these source decks and cannot alter or modify them. Procedural requirements for control of these types of computer codes are defined in the Vepco E&C Nuclear Design Control Program. The procedure requires assignment of a Code Manager for each code to maintain the code manual and to ensure that all users are informed of any code revisions. Vepco is notified by Westinghouse through contractual arrangements of any revision to Westinghouse codes to which Vepco has access. Code changes are incorporated into the code manuals and engineering procedures updated as required.

D. Training in the Use of Westinghouse Computer Codes and Methods

The E&C Nuclear Design Control Program and the NFE Policy and Procedures Manual requires that personnel performing nuclear safety related engineering and design activities receive the technical training necessary to perform their tasks. Vepco's engineers and technicians have received extensive formal training in the use of Westinghouse design and safety analysis codes in addition to on-the-job training received in performing four reload designs in parallel with Westinghouse.

III. Quality Assurance Audits

Vepco's Quality Assurance Engineering group conducts periodic audits of safety related computer code applications including reload design and safety analysis codes to verify that adequate controls have been established and implemented when using these computer programs. The following verifications are performed during audits of procedures controlling the development and application of computer codes:

- 1. Code development
- Verification of developed and acquired codes
- 3. Verification of acceptability of input data
- 4. Proper code utilization
- 5. Code revision methodology
- 6. Qualification and training of personnel
- 7. Documentation of training

IV. Summary

The requirements of the Vepco Quality Assurance Program related to nuclear core design and safety analysis activities are implemented by the Engineering and Construction Nuclear Design Control Program and the Nuclear Engineering discipline implementing procedures. Adherence to these procedures combined with extensive training in Westinghouse methods will assure an acceptable level of confidence in the results obtained through use of Westinghouse computer codes for reload design and safety analysis.