CENTRAL FILES

VIRGINIA ELECTRIC AND POWER COMPANY

RICHMOND, VIRGINIA 23261

June 4, 1979

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USNRC REGION II ATLANTA, GEORGIA

Mr. James P. O'Reilly
Director - Region II
Nuclear Regulatory Commission
Marietta Street, N.W.
Atlanta, Georgia 30303

Serial No. 146/030879A
Docket Nos. 50-280
50-281
D.P.R. Nos. 32
Nos. 37

Dear Sir:

The response to your letter of March 8, 1979, concerning IE Bulletin No. 79-02 "Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts" is provided herein. The specific items of concern identified in the Bulletin, in addition to our responses, are presented for ease of reference.

NRC CONCERN

"For pipe support base plates that use concrete expansion anchor bolts in Seismic Category I systems as identified by Regulatory Guide 1.29, "Seismic Design Classification" Revision 1, dated August 1973 or as defined in the applicable FSAR.

1. Verify that pipe support base plate flexibility was accounted for in the calculation of anchor bolt loads. In lieu of supporting analysis justifying the assumption of rigidity, the base plates should be considered flexible if the unstiffened distance between the member welded to the plate and the edge of the base plate is greater than twice the thickness (2t) of the plate. If the base plate is determined to be flexible, then recalculate the bolt loads using an appropriate analysis which will account for the effects of shear-tension interaction, minimum edge distance and proper bolt spacing. This is to be done prior to testing of anchor bolts. These calculated bolt loads are referred to hereafter as the bolt design loads."

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RESPONSE

The effect of baseplate flexibility was not accounted for in the calculation of anchor bolt loads for Surry Power Station, Unit Nos. 1 and 2. Based on the above criterion for establishing rigidity, many of the installed hanger baseplates are considered to be flexible. We therefore have initiated a program to recalculate design bolt loads. Attachment 2 describes the proposed program for recalculating design bolt loads.

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NRC CONCERN

2. "Verify that the concrete expansion anchor bolts have the following mininum factor of safety between the bolt design load and the bolt ultimate capacity determined from static load tests (e.g. anchor bolt manufacturer's) which simulate the actual conditions of installation (i.e., type of concrete and its strength properties):

   a. Four - For wedge and sleeve type anchor bolts,
   b. Five - For shell type anchor bolts."

RESPONSE

The majority of anchor bolts used at Surry Power Station are of the shell type (Phillips Self-Drilling Anchors). The original minimum factor of safety used for these shell type anchor bolts was four. On subsequent modifications and repairs, wedge type (Hilti Quik) anchors were used. A design factor of safety of at least four was used for these wedge type anchor bolts.

NRC CONCERN

3. "Describe the design requirements if applicable for anchor bolts to withstand cyclic loads (e.g. seismic loads and high cycle operating loads)."

RESPONSE

Cyclic loads were not specifically considered in the design of the presently installed baseplates and anchor bolts. The supports, baseplates, and anchor bolts were designed to withstand the maximum force exerted by seismic and thermal conditions.

NRC CONCERN

4. "Verify from existing QC documentation that design requirements have been met for each anchor bolt in the following areas:

   (a) Cyclic loads have been considered (e.g. anchor bolt preload is equal to or greater than bolt design load). In the case of shell type, assure that it is not in contact with the back of the support plate prior to preload testing.

   (b) Specified design size and type is correctly installed (e.g. proper embedment depth).

   If sufficient documentation does not exist, then initiate a testing program that will assure that minimum design requirements have been met with respect to sub-items (a) and (b) above. A sampling technique is acceptable. One acceptable technique is to randomly select and test one anchor bolt in each base plate (i.e. some supports may have more than one base plate). The test should provide verification of sub-items (a) and (b) above. If the test fails, all other bolts on that base plate should be similarly tested. In any event, the test program should assure that each Seismic Category 1 system will perform its intended function.

RESPONSE

During construction of the Surry Power Station, documentation of anchor bolt installation was not a requirement of quality control procedures in effect at that time. Therefore, it is not possible to verify, by documentation review, the items identified in (a) and (b) above.
An inspection of a representative number of baseplates in seismic Category I systems will be conducted within the next 30 days. This inspection program will confirm that the baseplate and bolting satisfies the original design and installation criteria. For a selected sampling of baseplates, certain parameters will be verified such as bolt size, depth of penetration, etc. In the event a deficiency is identified, appropriate corrective action will be initiated.

NRC CONCERN

5. "All holders of operating licenses for power reactor facilities are requested to complete items 1 through 4 within 120 days of date of issuance of this Bulletin. A reactor shutdown is not required to be initiated soley for purposes of this inspection above. Maintain documentation of any sampling inspection of anchor bolts required by Item 4 on site and available for NRC inspection. Report in writing within 120 days of date of Bulletin issurance, to the Director of the appropriate NRC Regional Office, completion of your verification and describe any discrepancies in meeting Items 1 through 4 and, if necessary, your plans and schedule for resolution. For planned action, a final report is to be submitted upon completion of your action. A copy of your report(s) should be sent to the United States Nuclear Regulatory Commission, Office of Inspection and Enforcement, Division of Reactor Operations Inspection, Washington, D. C. 20555. These reporting requirements do not preclude nor substitute for the applicable requirements to report as set forth in the regulations and license.

RESPONSE:

As indicated in Responses 1 through 4 above, the design and installation of hanger baseplates must be reevaluated to address the concerns in IE Bulletin 79-02. Accordingly, the program described in Attachment 1 will be implemented. Because of the complexity of the analysis, large number of baseplates and lack of "as-built" data, the length of time required to complete the overall program is indeterminate, but a conservative schedule as shown in Attachment 1 is thought to be on the order of one to two years. Attachment 2 contains a preliminary schedule by Phase for the overall program. It should be noted that this schedule represents our best estimate at this time since the actual duration is dependent upon the synergistic effects of the six (6) phases. A more detailed schedule is being prepared. The NRC will be kept apprised of progress, as requested, and a final report will be issued.

Phase I of the program has essentially been completed, Phase II is also currently in progress.

Very truly yours,

C. M. Stallings

C. M. Stallings
Vice President-Power Supply
and Production Operations

Attachment

cc: Director
Office Of Inpsection and Enforcement
Division of Reactor Operations Inspecting
Washington, D. C. 20555

ATTACHMENT 1

SUMMARY OF
VEPCO'S PROGRAM TO ADDRESS
NRC CONCERNS IDENTIFIED IN
IE BULLETIN 79-02
SURRY POWER STATION - UNIT NOS. 1 AND 2

The following outline summarizes the program which the Virginia Electric and Power Company proposes to implement to address the specific Nuclear Regulatory Commission concerns identified in IE Bulletin 79-02 entitled "Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts", dated March 8, 1979 as related to the Surry Power Station, Unit Nos. 1 and 2. The six (6) phase program summarized below, the first phase of which was begun in early May, is intended to indicate the general outline of the program; however, it may be changed as requirements dictate. Although the overall program has been divided into distinct phases, some of the phases will be implemented concurrently.

Phase I - Review Original Data, Design Methods and Criteria.

1. Identify affected Seismic Category I piping systems to be evaluated.

2. Compile available piping, isometric, and hanger drawings.

3. Identify basic anchor bolt types installed.

4. Determine original design criteria.

5. Review quality assurance documentation.

Phase II - Establish Method of Analysis

1. Determine the type of analysis which will be performed, i.e. flexible, rigid or combination thereof.

2. Establish the basic design parameters and methods which will be evaluated by the analysis including shear tension interactions, cone overlap, minimum edge distance, bolt spacing, safety factors, concrete strength, etc.

3. Prepare, review, check and approve calculational models, computer programs, manual techniques, etc. which will be used to perform the analysis.

4. Obtain concurrence of NRC on analysis technique.

Phase III - Establish Analytical Data Base

1. Verify accuracy of piping, hanger and baseplate drawings obtained in Phase I by field inspection.

2. Prepare piping isometric drawings for those Category I Systems for which drawings are not available, including hanger locations and type.

3. Identify pipe hangers that are attached to concrete structural members.

4. Establish identification system for pipe hangers to provide cross-reference between drawings and installed changers, and mark hanger baseplates accordingly.

5. Prepare hanger and baseplate drawings and data sheets for each hanger utilizing concrete anchors, including such information as type of hanger, type of anchor, baseplate dimensions, bolt size and length, etc.

6. Determine concrete strength by reviewing QA documentation or actual measurements.

7. Catagorize hanger regarding its physical accessibility, the radiation field that is in, etc.

Phase IV - Perform Analysis

1. Determine and/or verify hanger loads from piping analyses for systems to be analyzed.

2. Prepare and check input data.

3. Perform benchmark calculations and verify accuracy.

4. Perform baseplate analysis for affected hangers.

5. Check analysis results.

Phase V - Evaluation of Analysis Results

1. Compare baseplate analysis results with as-built conditions.

2. For those baseplates which do not satisfy acceptance criteria, initiate corrective action.

3. Evaluate radiation exposure conditions.

Phase VI - Implement Corrective Modifications

1. Establish schedule for implementing modifications.

2. Prepare "Final Design Packages" for deficient hangers, including drawings, procedures, material lists, etc.

3. Purchase material.

4. Make hanger, baseplate, and/or bolt modifications in Unit Nos. 1 and 2 during operation and/or outages as appropriate.

5. Make final report to NRC upon completion of the program.

ATTACHMENT 2

SCHEDULE FOR VEPCO'S PROGRAM TO ADDRESS

NRC CONCERNS IDENTIFIED IN

IE BULLETIN 79-02

SURRY POWER STATION-UNIT NOS. 1 AND 2

Attachment 1 describes the basic program for addressing the concerns identified in IE Bulletin 79-02. Because of the relatively large number of pipe hangers and baseplates involved, the necessity to obtain and/or verify significant amounts of as-built information, the magnitude and complexity of the piping and baseplate analyses which must be performed, and the potential modifications that might be required, the overall program is very extensive and will require a significant amount of time and expense to complete. Although it is not possible to establish an accurate schedule for the entire program at this time, the following preliminary estimate is presented for information. The schedule presented is for one (1) unit; however, assuming resources are available, the second unit could essentially be worked in parallel.

Phase No.	Description	Estimated Duration (months)
I	Review of Original Data Methods and Criteria	2
II	Establish Method of Analysis	4
III	Establish Analytical Data Base	9
IV	Perform Analysis	12
V	Evaluation of Analysis Results	4
VI	Implement Corrective Action - Design, Engineering and Installation	12