VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

May 21, 1992

U. S. Nuclear Regulatory Commission
Attn.: Document Control Desk
Washington, D.C. 20555

Serial No. 92-343
NL&P/TAH: R2
Docket Nos.: 50-338
50-339
License Nos.: NPF-4
NPF-7

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
SETTLEMENT MONITORING PROGRAM FOR CLASS 1 STRUCTURES
TAC NOS. M82916 AND M82917

On October 2, 1989, Virginia Electric and Power Company submitted a request for a license amendment (Serial Number 89-682) to revise our Settlement Monitoring Program for Class 1 Structures. By letter dated May 8, 1992, you requested additional information in four specific areas of concern. Attached is the information you requested.

We conclude from the nature of your concerns that the main impetus of your request is reconfirmation that the margin of safety for the safety related piping will not be reduced. As stated in the license amendment request dated October 2, 1989, the margin of safety as defined in the Technical Specification is preserved by ensuring that settlement of safety related structures and piping is within the allowed limits of the Technical Specification. These limits are established to ensure that stresses on the safety related piping remains within the code allowable stress limits. The improved survey methods reduce random errors and improve the accuracy of the surveys thus reducing the survey uncertainty to five percent or less. The reduced uncertainty factor assures that the potential pipe stresses resulting from the proposed Technical Specification Allowable Limits will remain within the code allowable limits. Therefore, the margin of safety for settlement of the safety related piping will not be reduced.

If you have any further questions, please contact us.

Very truly yours,

J P O'Hanlon

For W. L. Stewart
Senior Vice President - Nuclear

Attachment

A001
1/1

pc: U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, N.W.
Suite 2900
Atlanta, Georgia 30323

Mr. M. S. Lesser
NRC Senior Resident Inspector
North Anna Power Station

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION
SETTLEMENT MONITORING PROGRAM FOR CLASS 1 STRUCTURES

Concern 1

Vertical, "translational" differential settlements which are considered as boundary conditions would impose a significant influence on the buried pipe stresses, if anchor rotations are restrained. This fact should be considered in the parametric study of the pipe stress calculation.

Response 1

We agree with the staff position that the differential settlements which are considered as boundary conditions would impose significant influence on the buried pipe stresses, if anchor rotations are restrained. In order to account for that, the anchor rotations were restrained in the supporting stress calculation, Stone and Webster Engineering Calculation #12050-NP(B)-094-X9, Rev. 1 (Reference 1).

It is recognized that the higher the value of the rotational stiffness, the higher the stress due to imposed differential settlement. A conservative value of rotational anchor stiffness was used in the analysis to obtain a conservative estimate of pipe stress. Answer 2 in the attachment of our letter dated September 29, 1989, (Reference 2) provided the basis for determination of anchor stiffness and the reference stiffness calculation of our consultant, Stone & Webster Engineering Corporation. The result of that calculation showed that the rotational stiffness of the anchor was 6.8×10^9 in-lb/radian. It is realized that a rotational anchor stiffness lower than the calculated value will yield a lower estimate of stress. Therefore, to predict a conservative estimate of stress in the pipe due to postulated differential settlement, a conservative rotational anchor stiffness value of 1.0×10^{10} in-lb/radian was used in the analyses. This magnitude of stiffness represents an increase of about 50% over the calculated value. This will account for any perceived uncertainty in the parameters.

The same conservative value of rotational anchor stiffness was uniformly used in calculations starting from the initial Technical Specification basis and proposed basis to the parametric study documented in Reference 2. Results of the parametric study presented as Answer 4 in Reference 2 which utilized the conservative (a 50% larger than the calculated) rotational anchor stiffness demonstrated no significant sensitivity of critical pipe stress level to a reasonable bounding increase or decrease in other parameters.

Concern 2

Currently there is little margin existing to absorb any additional pipe stress. Therefore, complete pipe stress calculations incorporating the above mentioned parametric study and the proposed new Technical Specification permissible differential settlements should be submitted for staff review. The submittal should include a justification of pipe configuration used for the analysis.

Response 2

The settlement induced stress in the pipe for both the current and proposed differential settlement limit is still within the allowable limit of the applicable code. Therefore, the proposed change to the differential settlement limit does not represent any significant reduction in the margin of safety.

The complete pipe stress calculation is documented in Reference 1. The results of the parametric study to document the influence of soil parameters, stiffness of soil springs, soil spring spacings in the model and the anchor stiffness was submitted in Reference 2. The influence of anchor rotational stiffness is addressed in Response 1 (above).

The mathematical model representing the configuration of the pipe is documented in Reference 1. A complete physical layout and technical basis of other input parameters for the analyses were submitted in Reference 2.

Concern 3

Without assurance that the stresses of the buried pipes have been properly calculated, and in light of the potential significant reduction of the margin of safety as a result of the preceding differential settlements, the staff questions the validity of the licensee's 10 CFR 50.92(c) evaluation.

Response 3

Results of the analyses documented in Reference 1 and subsequently submitted in Reference 2 provide adequate technical basis to conclude that the stresses in the buried pipes will not exceed the code allowable value for the proposed limiting value of differential settlement. It is our position that because the stresses have been conservatively calculated and the expected stresses will remain within code allowable limits our 10 CFR 50.92(c) evaluation remains valid and no potential significant reduction in any margin of safety exists.

Concern 4

The acceptance of the above stress calculation is contingent upon the staff acceptance of the survey measurements of the survey points including but not limited to survey points 113 and 117, in connection to total and differential settlements.

Response 4

We agree with the staff concern about the acceptance of the survey measurements, because the level of stress is related to the magnitude of the differential settlement. Our submittal dated October 2, 1989, (Reference 3) fully detailed the survey methodology which is applicable only for the revised allowable differential settlement limits for survey points 113R and 117. Your letter dated March 31, 1992, (Reference 4) states, "The NRC staff also finds acceptable the licensee's proposed method of direct measurement of the future change in the elevation of points 117 and 113R in order to determine the additional differential settlement of these points in the future." The remaining points will be surveyed by standard loop survey methods utilizing improved measurement devices and several shorter loops in place of one long loop. These improvements will enhance the accuracy of the surveys and reduce the additive random errors attendant in past measurements.

References:

1. Stone and Webster Engineering Calculation #12050-NP(B)-094-X9, Rev. 1
2. VEPCO letter to NRC dated September 29, 1989
3. VEPCO letter to NRC dated October 2, 1989
4. NRC letter to VEPCO dated March 31, 1992