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Docket Nos: 50-390
and 50-391

APPLICANT: Tennessee Valley Authority

FACILITY: Watts Bar Nuclear Plant, Units 1 and 2

SUBJECT: SUMMARY OF SEPTEMBER 22-24, 1982, MEETING WITH TVA TO REVIEW GEOTECHNICAL ENGINEERING INFORMATION REGARDING THE WATTS BAR NUCLEAR PLANT, UNITS 1 AND 2

On the morning of September 22, 1982, the NRC staff and its consultants, the U.S. Army Corps of Engineers (COE) visited the Watts Bar site to familiarize themselves with the site and the ground configuration along the alignment of the ERCW pipelines and Class IE electrical conduits. In addition, the staff inspected the remedial work being performed by TVA to strengthen sheetpile wall anchor plates against bending.

In the afternoon of September 22, 1982, the staff and its consultants visited the Singleton Laboratory of the TVA at Knoxville, TN. The purpose of this visit was to inspect the dynamic triaxial testing equipment used by TVA for performing the dynamic strength test on site soils, tour the geotechnical testing laboratory to observe TVA's other soil testing facilities and to discuss with TVA details of the procedure used for exploration, sampling, handling and testing of the soils at the Watts Bar site.

The purpose of the meeting with TVA on September 23 and 24, 1982, at their Knoxville office was to audit the calculations performed by TVA related to the confirmatory issues in the SER (NUREG-0847, September 1982) and obtain clarifications from the applicant about the details of the information needed by the staff to resolve these items.

Meeting attendees for these meetings are listed in Attachment (1).

SUMMARY OF DISCUSSIONS

(1) Liquefaction Potential Evaluation

TVA stated that their current plan is to use the Seed and Idress Simplified Approach to evaluate the liquefaction potential of soils around the ERCW pipelines and Class IE electrical conduits. The peak ground acceleration value to be used in this analysis by TVA would be based on the results of a study being performed by the Woodward-Clyde Consultants. The applicant stated that they would use the results of dynamic triaxial tests performed on samples obtained from the 1981 test pits for the dynamic strength values in their study. The soil strength results from these tests are given in the TVA report on liquefaction potential evaluation submitted to the NRC in March 1982.

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The staff informed TVA that if they plan to use the data from tests on the 1981 test pit samples, the staff would require complete documentation of the bases for the assumption that the tested soil specimens are representative of the loose soil conditions found in the borings along the pipelines.

Some of the other salient activities and discussions at the meeting regarding this issue are as follows:

(i) The staff looked at a report containing raw data charts from the dynamic triaxial tests conducted on the samples taken from the test pits. The staff requested TVA to provide a copy of this report for our review.

(ii) The staff and its consultants, COE, requested TVA to provide a written brief summary of their sampling, handling and testing procedures used for block samples obtained from the 1981 test pits.

(iii) The staff requested TVA to provide detailed information about their soil exploration equipment and standard penetration testing procedures used in all their previous borings at Watts Bar site. TVA provided some information at the time of the meeting and agreed to formally submit detailed information on the following items.

(a) drilling rigs company names and model numbers,
(b) number of turns of rope used aroung the cat head for standard penetration tests,
(c) type of hammer used for blow counts (safety or doughnut),
(d) method of advancing holes, and
(e) composition of the lengths of drill rods used in each case for each hole, if possible.

(2) Sheetpipe Walls Analysis

The staff reviewed the assumptions used in the sheetpile walls design regarding input soil parameters, ground water table and earthpressure coefficients. We informed TVA that their design procedures, assumptions and the input soil parameters used in the analyses are generally acceptable to us. However, TVA was requested to investigate the effects of the following conditions on the stability of sheetpile walls:

(i) reduction in the available soil passive pressures, when the water level rises above the normal water level, due to flooding, and

(ii) the effect of blocked weep holes.

TVA agreed to study the effects of the above mentioned conditions on their analyses results and provide results to us for review. TVA also said that they would ensure that weep holes are free to drain at all times.

(3) Settlement Criteria

The staff discussed TVA's proposed settlement design criteria for differential settlements between rock supported structures. The staff agreed with TVA that the total and differential settlements of rock supported structures observed so far are very small and the design criteria proposed by TVA is reasonable. The staff informed TVA that we consider this Confirmatory Issue to be closed, and we would formally document our evaluation in the forthcoming SSER.

(4) Soil Parameters Used in Seismic Analyses of Buried Pipes

In the seismic analysis of the buried pipelines, TVA used an average shear wave velocity of 1000 ft/sec and soil unit density of 120 pcf. TVA's calculations showed that the bending stresses in the straight lengths of buried pipes due to seismic loads are in the range of 1000 to 2000 psi. The staff noted these are much smaller than the calculated stresses in buried pipelines at many other nuclear power plant sites. The staff stated that it appears that the effect of soil properties has not been properly accounted for in TVA's calculations. The staff agreed with TVA to further review TVA's method of analyses and provide specific comments on their approach.

The staff also requested the applicant to check the pipeline's axial stresses in addition to bending stresses and also use proper intensification factors for calculating stresses at bends.

(5) Soil Amplification

In the soil-structure interaction analyses of soil supported structures, TVA has used the design earthquake (four synthetic time histories) at the bedrock level and amplified or attenuated it through the soil in the free-field to obtain the ground surface motion. In this soil amplification study, TVA used constant shear wave velocity of 1650 ft/sec, and a constant soil damping value of 10 percent. The staff expressed concern that TVA's analyses results may not be conservative in the entire frequency range of interest since TVA has used constant values of soil damping and stiffness in their analysis (and not strain-dependent soil properties). Also, the staff believes that the use of a constant shear modulus value corresponding to the shear wave velocity data in amplification analyses would result in amplification of rock motion through a rigid system, and may not yield conservative results. The staff requested TVA to provide card decks for the four input bedrock time histories, and other relevant details of strain-dependent soil properties and the soil profile used in the analyses. We would then use the computer program SHAKE to further review TVA's amplification results.

TVA said that they have no objection to the staff's review of their amplification results using SHAKE with strain-dependent soil properties input. However, they are presently developing ground surface motions using recorded earthquake time histories for sites similar to that at Watts Bar, and they would use the newly developed ground motion to show that their analytically developed amplified motion is sufficiently conservative. The staff informed the applicant that we will review TVA's submittal when it is provided to us for review. However, we would like to proceed with the review of the analytical approach also and requested TVA to send the desired data as soon as possible.

/s/
Thomas J. Kenyon, Project Manager
Licensing Branch No. 4
Division of Licensing

Enclosure:
As stated

cc: See next page

OFFICE	DL:LB #4	DL:LB #4					
SURNAME	TJKenyon/hmc	EAdensam					
DATE	11/4/82	10/ 8/82					

MEETING ATTENDEES

Watts Bar Nuclear Plant

Units 1 and 2

Watts Bar Site - September 22, 1982

NAME	ORGANIZATION
V. A. Bianco	TVA - EN DES
David P. Ormsby	TVA - Power
S. R. Stout	TVA - EN DES
Samuel D. Stone	TVA - EN DES - CEB
H. Ray Threlkeld	TVA - EN DES - CEB
Joe Hunt	TVA - EN DES
Robert Ramsey	U.S. Corps of Eng. - Tulsa District
Willis Walker	U.S. Corps of Eng. - Tulsa District
Archer S. McDaniel	Civil Quality Control - WBNP
Lynn Colbaugh	Civil Quality Control - WBNP
T. J. Kenyon	NRC - DOL
Lyman Heller	NRC - DE - HGEB
Dinesh Gupta	NRC - DE - HGEB

OFFICE ▶	.....	.....	.....	.....	.....	.....	.....
SURNAME ▶	.....	.....	.....	.....	.....	.....	.....
DATE ▶	.....	.....	.....	.....	.....	.....	.....

MEETING ATTENDEES (Cont.)

Watts Bar Nuclear Plant

Units 1 and 2

Singleton Laboratories , Knoxville, Tennessee - September 22, 1982

NAME	ORGANIZATION
V. A. Bianco	TVA - EN DES
David P. Ormsby	TVA - Power
S. R. Stout	TVA - EN DES
Samuel D. Stone	TVA - EN DES - CEB
H. Ray Threlkeld	TVA - EN DES - CEB
Joe Hunt	TVA - EN DES
Yung Chung	TVA - SME
H. Patrick Matthews	TVA - SME
W. H. Childres	TVA - SME
Robert Ramsey	U.S. Corps of Eng. - Tulsa District
Willis Walker	U.S. Corps of Eng. - Tulsa District
T. L. Kenyon	NRC - DOL
Lyman Heller	NRC - DE - HGEB
Dinesh Gupta	NRC - DE - HGEB

MEETING ATTENDEES (Cont.)

Watts Bar Nuclear Plant

Units 1 and 2

TVA West Towers, Knoxville, Tennessee - September 23, 1982

NAME	ORGANIZATION
V. A. Bianco	TVA - EN DES
David P. Ormsby	TVA - Power
S. R. Stout	TVA - EN DES
Samuel D. Stone	TVA - EN DES - CEB
H. Ray Threlkeld	TVA - EN DES - CEB
Joe Hunt	TVA - EN DES
C. Baker	TVA - EN DES
J. Hoskins	TVA - EN DES
A. Rothes	TVA - EN DES
T. L. Kenyon	NRC - DOL
Lyman Heller	NRC - DE - HGEB
Dinesh Gupta	NRC - DE - HGEB

MEETING ATTENDEES (Cont.)

Watts Bar Nuclear Plant

Units 1 and 2

TVA West Towers, Knoxville, Tennessee - September 24, 1982

NAME	ORGANIZATION
David P. Ormsby	TVA - Power
S. R. Stout	TVA - EN DES
N. E. Stone	TVA - EN DES - CEB
Joe Hunt	TVA - EN DES
G. D. Felpel	TVA - EN DES - CEB
D. R. Denton	TVA - EN DES - CEB
John A. Ellis	TVA - EN DES - CEB
T. L. Kenyon	NRC - DOL
Lyman Heller	NRC - DE - HGEB
Dinesh Gupta	NRC - DE - HGEB

MEETING SUMMARY DISTRIBUTION

NOV 12 1982

Docket No(s): 50-390/391
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