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DEC 27 1973

Docket Nos. 50-438
and 50-439

Tennessee Valley Authority
ATTN: Mr. James E. Watson
Manager of Power
818 Power Building
Chattanooga, Tennessee 37401

Gentlemen:

In order that we may continue our review of your application for a license to construct the Bellefonte Nuclear Plant, Units 1 and 2, we are providing Regulatory staff positions regarding pertinent safety matters. These positions are listed in Enclosure 1. We request that you state your intent regarding compliance with each of these positions and amend your application accordingly. We are prepared to meet with you to facilitate a complete understanding of these safety matters and the bases for our positions.

We have requested in Enclosure 2, additional information needed to clarify and amplify previously submitted information.

In order to maintain our licensing review schedule for those matters dealt with in the enclosures, we will need completely adequate responses by February 6, 1974, to all of these staff positions and requests for information.

Please inform us within 7 days after receipt of this letter of your confirmation of the schedule date or the date you will be able to meet. If you cannot meet our specified date or if your reply is not fully responsive to our request, it is highly likely that the overall schedule for completing the licensing review for the project will have to be extended. Since reassignment of the staff's efforts will require completion of the new assignment prior to returning to this project, the extension will most likely be greater than the delay in your response.

Please contact us if you have any questions regarding the staff positions or the information requested.

Sincerely,

Original Signed by
Irving A. Peltier

A. Schwencer, Chief
Light Water Reactors Branch 2-3
Directorate of Licensing

Enclosure and ccs: See next page

OFFICE ▷	x7886/LWR 2-3	L:C/LWR 2-3				
SURNAME ▷	DDavis:cjb	ASchwencer				
DATE ▷	12/27/73	12/27/73				

Enclosures:
1. Staff Positions
2. Request for Additional Information

ccs: Mr. R. H. Marquis
General Counsel
629 New Sprakle Building
Knoxville, Tennessee 37902

Mr. William E. Garner, Esquire
Route 4
Scottsboro, Alabama 35768

Mr. Lyle A. Taylor
3301 Helena, N. W.
Huntsville, Alabama 35810

OFFICE ▶						
SURNAME ▶						
DATE ▶						

ENCLOSURE NO. 1

POSITIONS REGARDING CONSTRUCTION PERMIT
TENNESSEE VALLEY AUTHORITY
BELLEFONTE NUCLEAR PLANT, UNITS 1 AND 2
DOCKET NOS. 50-438 AND 50-439

2.0 SITE CHARACTERISTICS

2.78 Your response to Request 2.41 regarding the need for protection of the intake structure and approach channel is inadequate. Accordingly, provide analyses that substantiate your contention that riprap or other similar type of protection of the intake structure is not required to prevent adverse erosion. Further, provide similar analyses that substantiate your contention that the slopes of the approach channel do not require riprap or slope protection to maintain their integrity under all conditions. (See also Request 2.64.) If it cannot be positively demonstrated by these analyses that protection is not required, we will require that riprap or some other form of positive slope protection be provided.

2.79 Your response to Request 2.48 appears to indicate that: 1) you do not intend to reserve storage in upstream reservoirs for the specific purpose of maintaining required flows at the site; 2) your design basis low flow is based on the "drought-of-record" instead of the probable minimum low flow that could be the result of an extended severe drought; and 3) although your intake requirements under the conditions indicated in your response to Request 2.48 are only about 151 cfs, you need about 3,400 cfs in the river to provide adequate water level due to your intake structure and approach channel design. Accordingly, it is our position that an adequate water supply to meet safety-related plant requirements has not been assured. We require that an adequate water supply be provided by one of the following alternatives:

(1) Provide alternate source of water of high dependability for extreme low flow conditions;

(2) Reserve upstream reservoir storage specifically to meet required flows at the site under all conditions;

(3) Upgrade your currently proposed intake structure and approach channel design to assure adequate safety-related water supply under probable minimum low flow conditions;

(4) For the currently proposed design, provide assurance that the plant would be shut down while an assured 30-day supply is available, and also provide assurance that you will implement appropriate action to assure a long-term (after 30 days) supply capably of meeting continued shutdown needs; or

(5) Any other acceptable method that would meet the requirements specified above.

ENCLOSURE NO. 2

REQUEST FOR ADDITIONAL INFORMATION
TENNESSEE VALLEY AUTHORITY
BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2
DOCKET NOS. 50-438 AND 50-439

2.0 SITE CHARACTERISTICS

2.58 Indicate the location of greatest displacement on the Sequatchie thrust.

2.59 Describe the evidence for a steep dip on the Sequatchie thrust fault. Milici (1963) claims that the dip is at a low angle.

It is assumed in the PSAR that movements on major geologic structures have not occurred since the end of the Paleozoic era. However, recent concepts from Plate Tectonic theory suggest that the North American continent started separating from the African continent in Triassic time (see Dietz, 1972, for example). Large horizontal stresses must have been involved in this separation of continents; these would be tensional in some zones, and compressional in other zones. Therefore, one would expect that faulting might have continued in the Appalachians area for a considerable time, at least into the Mesozoic era or later. Provide a discussion of this possibility and its relevance to the site.

Unconsolidated deposits on floodplains and terraces are said to be undeformed. Describe the studies that have been made to demonstrate this. Parts of the small-scale longitudinal profiles of terraces prepared by Milici (1968, Fig. 5) might be claimed as suggestive of deformation. Furnish additional documentation and interpretation of such data to demonstrate that post-Paleozoic deposits are not deformed. Discuss the relevance of this to the site.

2.60 A statement is made on page 2.5-10 that the middle 500 feet of the Chickamauga formation was penetrated by drilling at the site. The cross section on Figure 2.5-2, however, indicates that the site is underlain by the lower 600± feet of the Chickamauga formation. If both identifications are correct, folding or faulting at or near the site is suggested. Clarify these data.

2.61 The interpretation of the physiography presented on page 2.5-12 differs from that of Hack (1966) and Milici (1968). The significance of concordant or offset terrace levels is critically dependent upon whether the physiography is interpreted in terms of erosion to base levels (the W. M. Davis school of thought) or in terms of the dynamic equilibrium theory described by Hack (1960, 1966). Provide a more explicit and better supported discussion of the interpretation of the physiography.

2.62 Lack of core disking and distortion of drill holes are not conclusive evidence that no unrelieved stresses are in the bedrock. The directions of the principal stresses and their magnitude relative to the orientation of the drill holes, and the anisotropy of the rock would be critical parameters in producing such visual effects as distortion of drill holes or disking of core. Using state of the art techniques, measure and provide the results of in-situ stresses in bedrock at the site.

2.63 Provide the source of inset (Figure 2.5-1B) showing rates of uplift and subsidence. According to this inset the Bellefonte site is in an area of uplift with a rate of 1-5 mm per year, which is the same as the tectonically active areas of western U.S. If the uplift data are correct, the interpretation that can be made is that the site is in a tectonically active area. This interpretation conflicts with other PSAR statements such as on page 2.5-4 namely: ". . . However, since the close of the Paleozoic era there is no indication of continued structural mobility in the area and the structures can be considered to be 'fossilized.'" Discuss these inconsistencies.

2.64 Provide the source of the geology presented in Figure 2.5-2.

2.65 Provide the source of the geology presented in Figure 2.5-3. Although the contacts shown on this figure are dashed, and presumably approximately located, there should be more indications of the attitude of the stratigraphic units.

2.66 Indicate the axis of the Sequatchie anticline in Figure 2.5-3 Presumably it is northwest of the site as shown on Figure 2.5-2; although on Figure 2.5-1B it is east of the site. Presumably this figure (2.5-3) is to show detailed geology of the site area and if so, it is not adequate. In addition to inaccurate plotting of contacts the map lacks sufficient attitudes of bedding, bedrock-surficial deposit contacts, directions of joints, small faults (if any) and fold symbols. Resolve these inconsistencies and deficiencies.

2.67 Identify the sections shown on Figures 2.5-162 and-163 as to location and extent on Figures 2.5-160 and -161. The sections should be drawn to a larger scale, sufficient to show soil conditions and top of rock. Show excavation limits and proposed channel areas on the sections. The scale should be sufficient to permit showing details of the logs of borings, such as are shown on Figures 2.5A-4 through -9. Discuss the reasons for relatively low blow counts in borings 17, 38 and 22.

2.68 The slope stability analyses illustrated on Figure 2.5-164 assume a horizontal groundwater level equal to the elevation of water in the intake channel. In other sections of the PSAR the groundwater level is described as generally paralleling the top of rock and ground surface, which is reasonable and appropriate in the stability analyses. It appears that the actual depth to groundwater has not been determined. Groundwater level observations made when borings are made can be grossly misleading, but other groundwater level information in the vicinity of the slopes is not presented. Install piezometers to record groundwater levels or alternatively, use conservative assumptions in the stability analyses.

2.69 Details of the pseudostatic slip circle analyses are not presented. Present the details of these analyses including (1) the type of circular arc analyses performed, (2) details of the dynamic shear beam analyses, (3) input ground motions, (4) calculated maximum acceleration at top of ground surface, and (5) computation of average acceleration that was used as the seismic coefficient.

2.70 Table 2.5A-1 contains a footnote, No. d, stating "Triaxial R test results not required for channel slope stability analysis." This table presents the results of triaxial Q, triaxial R, and unconfined compression tests. From this it appears that the only strength data used for analyzing the stability of the slopes are the Q data shown in the table. While such data are applicable for determining slope stability immediately after excavation, they are not applicable for long-term slope stability nor for slope stability during drawdown. Perform consolidated-drained shear tests or use conservative values in stability analyses for long-term stability. In addition, discuss the possible need for long-term stability to be based upon residual shear strength. Discuss the presence or absence of natural slides along slopes in the general area of the plant. Provide stability analyses appropriate for drawdown and for long-term stability, with and without earthquake loadings.

2.71 Cyclic loading triaxial compression tests of soils overlying bedrock were not made. Perform such tests or provide adequate justification for the assumption that the static strength can be used as the dynamic strength for the various wide ranges of materials present in the slopes overlying rock.

2.72 Provide additional information concerning the details of the R triaxial compression tests. This should include (1) magnitude of back pressure, if used to obtain saturation and corresponding B values, (2) pore water pressures if measured during undrained shear, (3) stress-strain and pore pressure data, and (4) constraints placed as regards use of shear strength resulting from negative power water pressures during undrained shear.

2.73 Discuss the need for riprap or slope protection to assure stability in the vicinity of seepage exit from the slopes.

2.74 Sections selected for analyzing stability of slopes should pass through the highest and steepest portions of both flanks of the intake channel; i.e., at about sta 1+50 in the southwest and sta 0+00 on the northeast. The latter section should extend from about the center of the intake structure to about 18+00 and 0a. Present the details of the analyses for the sections.

2.75 Consideration should be given to removing soil above rock on the flank slopes of the intake channel, using these areas as borrow areas, since this would remove many concerns regarding the stability of the slopes.

2.76 It is our understanding that the excavation for the intake structure will be geologically mapped. Provide a commitment to frequently inspect and geologically map the 1 to 3 soil cuts to determine the presence or absence of shear zones near the rock-soil interface. Provide a commitment to geologically map the bedrock exposed at the bottom of the canal and on the centerline trench into rock. In case suspicious zones are found it may be necessary to reexamine and recalculate with appropriate strength parameters and geometry, the slope stability of the intake structures.

2.77 Figure 2.5A-7 shows borings at and in the vicinity of the intake structure. Boring 16 shows numerous cavities in the rock. It is our understanding that borings will be drilled on at least a 50 foot grid at the location of the intake structure. Discuss the foundation treatment in the rock, together with the depth to which the excavation will be taken and the type and extent of grout treatment that will be used. Also, discuss the associated quality control program.