MEMORANDUM TO: Frederick J. Hebdon, Director
Project Directorate II-4
Division of Reactor Projects I/II

FEB 28 1995

50-390
50-391

FROM: Goutam Bagchi, Chief
Civil Engineering and Geosciences Branch
Division of Engineering

SUBJECT: RESPONSE TO SEISMIC COMMENTS MADE JANUARY 10, 1995 ON DRAFT SUPPLEMENT TO FINAL ENVIRONMENTAL STATEMENT - WATTS BAR

As requested in your Work Request of February 10, 1995, the Civil Engineering and Geosciences Branch has reviewed the seismic comment made by the individual at the subject public meeting. Our response is contained in the attachment. The staff had reviewed the *Science* article within days after its publication (29 April 1994) and concluded that it had no impact on the nuclear power plants in the eastern Tennessee region.

If you require any additional information with respect to this matter, please contact Robert L. Rothman at telephone number 415-3306. This completes our work on TAC Number M88691.

Attachment: As stated

cc: G. Lainas
S. Flanders
S. Newberry
R. Borchardt
B. Zalcman

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| DATE | 2/28/95 | | 2/28/95 | | | | | | | |

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Attachment

Response To Comments Made At The Public Meeting Of January 10, 1995 On The Draft Supplement To The Final Environmental Statement Related To The Operation Of Watts Bar Nuclear Plant, Units 1 And 2.

At the public meeting held January 10, 1995 on the draft supplement to the Final Environmental Statement related to the operation of Watts Bar Nuclear Plant, Units 1 And 2, an individual offered a comment in the area of earthquake potential. The comment as taken from the transcript is "I'm also curious if you've looked into the new studies coming out of the University of North Carolina dealing with suspected fault lines running down the Tennessee Valley, and how that is going to impact the operation of Sequoya [Sequoyah] and Watts Bar."

The NRC staff identified the likely reference to be a recently published article, "A Seismotectonic Model for the 300-Kilometer-Long Eastern Tennessee Seismic Zone," *Science*, V264, April 29, 1994, pages 686-688. The authors of this article are C.A. Powell of the University of North Carolina; G.A. Bollinger, M.C. Chapman and M.S. Sibol of Virginia Polytechnic Institute and State University; A.C. Johnston of the Center for Earthquake Research and Information, Memphis State University; and R.L. Wheeler of the United States Geological Survey. The comment was mistaken in that the *Science* article does not deal with "fault lines running down the Tennessee Valley" but, rather a model for the seismicity in eastern Tennessee near the North Carolina border.

The NRC has sponsored seismograph networks and geological and seismological research in the region discussed in the *Science* article, for about 20 years. In fact, most of the authors of the article have or had, in the recent past, NRC support to perform seismology research and/or operate seismograph networks. The NRC staff reviewed and evaluated the *Science* article at the time it was published. A lot of the material has been published previously in other journal articles and NUREG/CR reports. The new information in the *Science* article is that the eastern Tennessee seismic zone appears to have narrowed in the last 15 to 20 years. Based on this observation, the article proposes the theory that the eastern Tennessee seismic zone is an evolving seismic zone in which slip on north- and east-striking surfaces is slowly coalescing into a northeast-trending zone. The article then goes on to state that if a throughgoing fault is developing the potential for a future large earthquake may be higher than the historical record suggests. It concludes by stating "[H]owever, the estimation of when a potentially damaging event may occur is speculative."

The design of nuclear power plant must take into account the potential effects of earthquake ground motion. The earthquake postulated for the seismic design of a plant called the Safe Shutdown Earthquake (SSE), defines the maximum ground motion for which certain structures, systems and components necessary for safe

%shutdown are designed to remain functional. For example to ensure decay heat removal after the reactor is shutdown. Appendix A to 10 CFR Part 100, "Seismic And Geologic Siting Criteria For Nuclear Power Plants," requires that the design bases for earthquakes be determined through evaluation of the geologic and seismic history of the site and surrounding region. The largest earthquakes occurring in the site region must be assessed. An evaluation is required to determine whether faults in the site region are active and could generate earthquakes large enough to be of significance to the earthquake design bases. Ground accelerations associated with the SSE used for the design bases of the plant are conservatively selected; as a result, there is an extremely low probability that ground accelerations in excess of the SSE will occur at the site.

In addition, the plants have design margins (capability) well beyond the design basis earthquake. The ability of a nuclear power plant to resist the forces generated by the ground motion during an earthquake is thoroughly incorporated in the design and construction. Industry codes and practices that govern the design and construction of nuclear power plant structures and components are far more stringent than those used for residential and commercial buildings. As a result, nuclear power plants are able to resist earthquake ground motions well beyond their design bases and well beyond the ground motion that would result in damage to commercial buildings.

The largest historical earthquake in the eastern Tennessee seismic zone had a magnitude of 4.6. Because the NRC recognized that the seismicity in this region is higher that in other regions in the eastern United State, it, conservatively, required that the SSE for the nuclear power plants be based on the assumption that a magnitude 5.8 earthquake could occur near each of the plants. A magnitude 5.8 earthquake radiates over 60 times more seismic energy than does a magnitude 4.6 earthquake. Recent probabilistic seismic hazard estimates made for the NRC by Lawrence Livermore National Laboratory show that the median probability of the occurrence of the SSE at the Watts Bar is about once in 10,000 years, or very unlikely.

In summary, based on seismic and geologic investigations performed for the licensing of the eastern Tennessee sites, the seismic design basis for the plants have a very low probability of being exceeded. In addition, the plants have design and construction margins well in excess of the design basis. The *Science* article stated that the potential for a future large earthquake may be higher than the historical record suggests. This has already been addressed by the requirement that the SSE for the nuclear power plants in the region be based on the assumed occurrence of an earthquake larger than the largest historical event.