

September 3, 2009

**UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD**

In the Matter of)

Tennessee Valley Authority)

(Watts Bar Unit 2))

Docket No. 50-391

**PETITIONERS' AMENDED CONTENTION 7
REGARDING TVA AQUATIC STUDY**

I. INTRODUCTION

Pursuant to 10 C.F.R. § 2.309(f)(2), Petitioners Southern Alliance for Clean Energy (“SACE”), Sierra Club, Blue Ridge Environmental Defense League (“BREDL”), Tennessee Environmental Council (“TEC”), and We the People, Inc. (“WTP”)¹ hereby amend Contention 7 (Inadequate Consideration of Aquatic Impacts) to address the information presented in a Tennessee Valley Authority (“TVA”) report entitled “Aquatic Environmental Conditions in the Vicinity of Watts Bar Nuclear Plant During Two Years of Operation, 1996-97” (June 1998) (“Aquatic Study”). This amended contention is supported by the Second Declaration OF Dr. Shawn Paul Young (September 2, 2009) (“Young Second Declaration”), which is attached.

II. BACKGROUND

Contention 7 challenges the adequacy of the TVA’s Final Supplemental Environmental Impact Statement (“FSEIS”) for WBN2 to address the environmental impacts of the proposed plant on aquatic organisms. Petition to Intervene and Request for a Hearing at 31-36 (July 13, 2009) (“Hearing Request”). The contention is supported by the Declaration of Dr. Shawn Paul

¹ Petitioners’ motion to admit the Sierra Club, BREDL, TEC, and WTP as late-filed intervenors is pending with the Board.

Young, Ph.D. (July 11, 2009). Petitioners contend that the FSEIS overstates the current health of aquatic organisms near WBN2 and therefore fails to evaluate the impacts of WBN2 in light of the fragility of the host environment; that the FSEIS relies on outdated and inadequate data to predict thermal impacts and the impacts of entrainment and impingement of aquatic organisms; and that TVA fails to analyze the cumulative effects of WBN2 when taken together with the impacts of other industrial facilities and the effects of the many dams on the Tennessee River. *Id.* at 31-32. With respect to entrainment impacts, Petitioners also argue that TVA's analysis was inadequate because its estimates of entrainment impacts were based on extrapolations from other data rather than actual measurements of entrainment rates. *Id.* at 34. With respect to impingement impacts, Petitioners contend both that the data relied on by TVA were outdated, and that TVA unreasonably relied on impingement data from a different intake than the intake that will be used for WBN2. *Id.* at 35.

In responding to Contention 7, TVA asserts that Petitioners have ignored the Aquatic Study, which provides a “detailed description[] of the existing aquatic environment in the vicinity of WBN Unit 2” and which also reports on “two years of entrainment and impingement monitoring” during operation of WBN1. TVA Answer at 80 n.401 and 85 n.431, respectively. Because TVA had failed to cite the Aquatic Study in the FSEIS' discussion of impacts to aquatic organisms, Petitioners did not request it from TVA or review it in the course of preparing Contention 7. Having been notified of the document's relevance, Petitioners have reviewed it and now discuss its relevance to Contention 7 below.

III. DISCUSSION

As a result of reviewing the Aquatic Study, Petitioners do not make any changes to Contention 7 itself. The Aquatic Study does not cure the problems that the FSEIS overstates the

health of the aquatic environment, or that its analysis of aquatic impacts is based on inadequate and outdated information. However, Petitioners alter the basis of the contention as follows:

1. In the basis of Contention 7, Petitioners argued that TVA had not taken direct measurements of entrainment of aquatic organisms, even though direct measurements are recommended by the U.S. Environmental Protection Agency. Hearing Request at 34-35. The Aquatic Study reports that TVA did conduct entrainment measurements, and thus Petitioners no longer make that assertion.

However, as discussed in Dr. Young's Second Declaration, pars. II.A.3-5, TVA's entrainment monitoring program in 1996 and 1997 provides an inadequate basis for TVA's conclusion that entrainment impacts are insignificant, for several reasons. First, a comparison of TVA's estimate for fish larvae entrainment with TVA's estimate of the number of fish larvae transported past WBN contradicts TVA's conclusion, instead showing that the rate of fish larvae entrainment in 1997 was 17.65%, which is significant. Second, TVA did not conduct entrainment monitoring for an adequate amount of time during each year, or for an adequate number of years, to provide a reasonably reliable or accurate portrait of WBN's aquatic impacts. Finally, the information presented in the Aquatic Study is twelve years old. In light of the fact that aquatic health in the Tennessee River has declined markedly over that time period, TVA must update the information before it can be relied on to assert that impacts are insignificant.

2. In the basis of Contention 7, Petitioners contend that TVA's impingement data is obsolete, that TVA failed to follow up on a survey showing increased impingement rates in the Supplemental Component Cooling Water System, and that TVA inappropriately treats its impingement data for Lake Chickamauga and Watts Bar Reservoir intakes as if they were the same. The Aquatic Study improves somewhat on TVA's impingement monitoring program by

increasing the number of months in a single year over which impingement was monitored, and by actually monitoring impingement at the WBN1 Component Cooling Water intake. Second Young Declaration, par. II.A.6. Nevertheless, TVA's twelve-year old impingement study is outdated, especially in light of the deterioration that has occurred in the aquatic health of the Tennessee River over that time period. *Id.*

3. In the basis of Contention 7, Petitioners criticized the FSEIS for overstating the health of the Tennessee River, for failing to address the impacts of WBN2 in light of the aquatic environment's fragile health, and for failing to adequately address the cumulative impacts of WBN2. The Aquatic Study contains information about the decline in the health of mussels which supports Contention 7 in these respects. Young Declaration, par. II.B.1-4.

IV. CONCLUSION

For the foregoing reasons, the Aquatic Study does not resolve the concerns raised in Petitioners' Contention 7. Therefore, Contention 7 should be admitted.

Respectfully submitted,

Signed electronically by:

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
Tennessee Valley Authority)	
Completion and Operation License)	Docket No. 50-391OL
Watts Bar Nuclear Plant Unit 2)	
_____)	

SECOND DECLARATION OF SHAWN PAUL YOUNG, PH.D.

Under penalty of perjury, I, Shawn Paul Young, declare as follows:

I. STATEMENT OF PURPOSE AND PROFESSIONAL QUALIFICATIONS

1. My name is Shawn Paul Young. I have been retained by the Petitioners as an expert consultant in this matter. A copy of my curriculum vitae was attached to my July 11, 2009, declaration in support of Petitioners' Contention 7.

2. The purpose of my declaration is to provide my professional opinion regarding the adequacy of the report by the Tennessee Valley Authority ("TVA"), entitled, "Aquatic Environmental Conditions in the Vicinity of Watts Bar Nuclear Plant During Two Years of Operation, 1996-1997" (June 1998) ("Aquatic Study") to address the concerns raised in my declaration of July 11, 2009, regarding the inadequacy of TVA's Final Supplemental Environmental Impact Statement ("FSEIS") for the proposed Watts Bar Nuclear Power Plant Unit 2 ("WBN2") to address the environmental impacts of the proposed plant's cooling system on aquatic organisms in the Tennessee River.

II. STATEMENT OF PROFESSIONAL OPINION

A. Entrainment and Impingement Impacts

1. TVA's only statement in the FSEIS regarding entrainment impacts of the Watts Bar Unit 1 ("WBN1") component cooling water ("CCW") system was the following:

Though there are no data on phytoplankton densities in the vicinity of the WBN site, comparisons between preoperational (1976-1985) and operational (1996-1997) densities of fish eggs and larval fish show similar patterns (Appendix C, Table C-1) (TVA 1998d). An entrainment study conducted during the spring and summer of 1975 estimated the average loss of fish larvae in the vicinity of WBF [Watts Bar Fossil plant] as a result of water diversion to the plant was 0.24 percent of the total population (TVA 1976b).

FSEIS at 54. Appendix C, referenced in the above-quoted paragraph, contains only data for fish eggs and larvae collected “in the vicinity” of WBN1. It does not contain any entrainment data.

The reference “TVA 1998d” is for a study of thermal impacts that does not include any entrainment data. In addition, the 1975 “entrainment study” referenced by TVA does not contain any entrainment measurements because the study was done long before WBN1 operation.

Therefore, in my 7/11/09 Declaration, I criticized the FSEIS for failing to support its finding of no significant adverse impacts from entrainment of aquatic organisms without any data or other information showing that TVA had actually measured entrainment of aquatic organisms at WBN1. *Id.*, par. III.D.8.

2. In reviewing TVA’s response to Contention 7, I learned for the first time that in 1996 and 1997, TVA conducted entrainment measurements that are reported in the 1998 Aquatic Study. The Aquatic Study is listed as reference “TVA 1998b” in the FSEIS’s list of reference documents (Chapter 6 of the FSEIS), but it is not mentioned in the discussion of impacts to aquatic organisms. Therefore, until I read TVA’s response, I was unaware of its relevance to Contention 7.

3. In the Aquatic Study, TVA estimates the percentage rate of entrainment of fish eggs and larvae being transported past WBN1 in two years of operational monitoring (1996 and 1997) as 0.1%, an insignificant number. *Id.* at 15. TVA summarizes the input to this estimate of the entrainment rate as follows:

Total transport of fish larvae and eggs past WBN during 1996 was estimated to be 4.5×10^5 and 2.7×10^5 , respectively.

During the second year of operational monitoring, 1997, the total transport of fish larvae and eggs past WBN was estimated to be 7.0×10^4 and 6.8×10^5 , respectively. During 1996, an estimated 449 fish eggs and 267 larvae were entrained at WBN. During 1997, the estimated total entrainment was 1,911 eggs and 120,000 larvae.

4. It is not possible to determine how TVA arrived at an average entrainment rate of 0.1%; and in any event, for reasons discussed in more detail below, the averaging of data for relatively brief periods in two different years is not appropriate. More importantly, a comparison of the Aquatic Study's quantitative estimates of entrainment to total transport of fish eggs and larvae past WBN shows that in 1997, the rate of entrainment of fish larvae at WBN1 exceeded TVA's estimate of 0.1% by more than two orders of magnitude. If one compares the number of fish larvae that were entrained during 1997 operational monitoring to the number that were transported in the river (120,000 larvae entrained divided by 6.8×10^5 (680,000) transported past WBN1) the rate of entrainment of fish larvae was 17.65%.¹ In my professional opinion, an entrainment rate of over 17% of fish larvae is high enough to have a significant adverse impact on fish populations.

5. For the following reasons, before it could reach a supportable conclusion that the environmental impacts of entrainment at WBN2 would be insignificant, TVA needed to conduct at least one year of additional entrainment monitoring, and preferably several.

a. First, although the Aquatic Study suggests that TVA conducted entrainment monitoring at WBN over the course of a full year (Aquatic Study at

¹ In making this comparison, I have accounted for what appears to be a clerical error by TVA. As represented in the Aquatic Study, 120,000 fish larvae were entrained, out of 7.0×10^4 fish larvae transported past WBN1. Dividing 120,000 by 70,000 yields a nonsensical entrainment rate of 171%. Therefore I assume that TVA meant to represent the number of fish larvae transported past WBN1 as 680,000.

ii), TVA never completed a full year entrainment study for the WBN1 CCW system. TVA only monitored operational entrainment during a 3-month sampling period of April – June; and pre-operational entrainment monitoring during a 5-month sampling period of April – August. Aquatic Study at 6, Table 2-1, p.77. Therefore TVA may have missed the peak abundance of eggs and larvae of some fish species that may spawn outside the 3-month window of its sampling, or for which the fish's early life history stages might be transported past WBN outside the 3-month window. For example, at pp. 9-10, TVA discusses the fact that freshwater drum peak spawning extends into early July, and is also triggered by 20°C water temperatures. If freshwater drum spawning is delayed, the timing of egg and larval transport may also have been delayed outside the sampling window. Without annual entrainment and baseline monitoring, TVA cannot be sure that it accurately characterized the seasonal and annual abundance of ichthyoplankton, or that it sampled during the peak of ichthyoplankton abundance when entrainment is likely to be most severe.

b. Second, even if three months of operational entrainment monitoring per year could be considered adequate, it would have been impossible for TVA to conduct operational sampling in April, May, and June of both 1996 and 1997. According to the NRC's website, WBN1 did not begin operating until May 27, 1996:

http://www.eia.doe.gov/cneaf/nuclear/page/at_a_glance/reactors/wattsbar.html.

Therefore, TVA could only have collected one month's worth of data in 1996,

i.e., the month of June. This severe limitation is not acknowledged or explained in the Aquatic Study.

c. Given the significant fish larvae entrainment rate observed in 1997, given the disparity between entrainment levels in 1996 and 1997, and given the brevity of the 1996 monitoring period, TVA should have continued entrainment monitoring after 1997 in order to have a reasonable sense of what constitutes a normal year. My view is consistent with that of the U.S. Environmental Protection Agency, which calls for at least two years of monthly entrainment monitoring during operation, and contemplates subsequent reductions in monitoring only when monitoring data “show that the technologies are consistently performing as projected under all operating and environmental conditions and less frequent monitoring would still allow for the detection of any future performance fluctuations.” National Pollutant Discharge Elimination System: Regulations Addressing Cooling Water Intake Structures for New Facilities; Final Rule, 66 Fed. Reg. 65,256, 65,321 (December 18, 2001).

d. The Aquatic Study is now 12 years old. The overall health of the aquatic community of Chickamauga Reservoir and the Tennessee River has continued to decline. There has been a decline in Reservoir Fish Assemblage Index (RFAI) values, a decline in the number of fish species captured in sampling, and an increased number of species that are threatened and endangered or that are likely candidates for threatened and endangered status, as I have previously stated in paragraphs C.3, C.4, and B.3 of my July 1,, 2009 Declaration, respectively. Given that the aquatic community has changed and reservoir

operations have been adjusted, updated operational entrainment monitoring is needed to characterize current conditions and rates of entrainment at WBN1.

6. At pages 24 and 25, the Aquatic Study reports a very low rate of impingement. TVA's impingement samples were taken throughout the year, which is an improvement over TVA's method for entrainment monitoring. For the same reasons discussed above, however, TVA's twelve-year-old data should be updated in order to provide a reasonably accurate portrayal of impingement impacts at WBN1. It is also important to recognize that the relatively low impingement rates observed at WBN1 should not be extrapolated to a conclusion that entrainment rates will also be low. Impingement is the capture of juvenile and adult fish on traveling and trash screens. Juveniles and adults have the capability to swim away from intake structures and thereby avoid being impinged on the structures by the water-intake velocities. However, fish eggs have no mobility, and fish larvae have very limited mobility to avoid being entrained by water-intake velocities.

7. In conclusion, the Aquatic Study does not support TVA's conclusion that the environmental impacts of entrainment in the WBN2 intake will be insignificant. To the contrary, it shows that the impacts from entrainment may be large and warrant further investigation.

B. Poor Health of Mussels

1. In paragraphs C.7 and 8 of my July 11, 2009 Declaration, I criticized the FSEIS for inaccurately claiming that the health of mussels in the Tennessee River has been "constant" or is "excellent." In Section E, I also criticized the FSEIS' failure to adequately address thermal impacts on mussels. The Aquatic Study provides further support for my conclusions.

2. At page 59 of the Aquatic Study, TVA states that:

Substantially more live mussels were found on the downstream and middle beds in 1996 than in 1997 (35 and 34 percent, respectively, more than in 1997). but only slightly more (8 percent) live mussels than were found on the upstream bed in 1996 than in 1997.

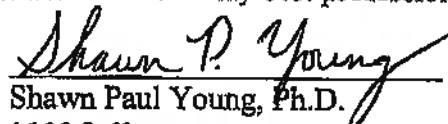
- At page 60, TVA also states that:

Statistical analysis of the mussel abundance data indicates that the three most common species and, probably because of the dominance of those species, the all-species totals demonstrated statistically significant declines in abundance over the years on the downstream bed (TRM 520-521). In contrast to this, only the third most abundant species showed a similar statistically significant decline on the middle bed (TRM 526-527), and none of the five showed a statistically significant decline on the upstream bed (TRM 528-529).

3. Thus, TVA found and reported a 35% decline in mussel abundance just below WBN1 from 1996 to 1997. This was the year following initial plant start-up. I therefore disagree with TVA's conclusion that "there is no indication that operation of WBN during the last two years has had any effect on mussel resources in the river." *Id. at 60.*

4. In my professional opinion, a 35% decline in abundance is alarming, and surely should prompt an acknowledgement that mussel health has declined as a result of WBN1 operation and that this decline has heightened the vulnerability of mussel populations to the impacts of WBN2.

Under penalty of perjury, I declare that the foregoing facts are true and correct to the best of my knowledge, and that the expressions of opinion are based on my best professional judgment.



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Dated: September 2, 2009