TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

April 26, 1983

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Ms. Adensam:

In the Matter of the Application of) Docket No. 50-390
Tennessee Valley Authority) 50-391

TVA has reviewed Lawrence Livermore National Laboratory's (LLNL) preliminary systems interaction results from the digraph matrix analysis (DMA) of the Watts Bar Nuclear Plant (WBN) safety injection system (SIS). Enclosed are TVA's comments on the information provided informally by the NRC for TVA review.

If you have any questions concerning this matter, please get in touch with D. P. Ormsby at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 26th day of April 1983
Paulette H. White
Notary Public
My Commission Expires 9-5-84

Enclosures
cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

B001

ENCLOSURE
WATTS BAR NUCLEAR PLANT UNITS 1 AND 2

TVA COMMENTS ON THE LLNL DMA OF THE WBN SIS

1. A clear statement should be made in the introduction that this study is not a full-scope system analysis of the WBN Safety Injection System but is a demonstration of the Digraph Matrix Analysis technique using this system as an example.

2. Modeling the entire accident sequence in a single logic model has merit; however, the necessity of converting to fault trees for quantification is not apparent. Also, automatic conversion from success logic to fault logic is not always accurate for complex logic and should be verified by the analyst.

3. All terminology used in the report that is not common to the industry should be defined or explained at its first use in the report (i.e., nodes, global digraph, connectivity, reachability).

4. All probabilistic risk assessments (PRAs) do not have the same structure as the study appears to assume.

5. Page 15 mentions alternate paths from the charging pumps to the reactor vessel. It should be stated if this is the normal charging to cold leg loop 1 and alternate charging to cold leg loop 4, or the path should be identified. Also, only the safety injection pumps provide water to either the hot or cold legs of the reactor vessel. The charging pumps provide water to the cold legs only. The only hot leg connection is a 1-inch test line which is normally closed.

6. LLNL makes the statement that by "review of the Watts Bar FSAR and by discussions with the Watts Bar reactor operators, it was determined that both safety injection pumps or at least one SI pump and one centrifugal charging pump would be required for successful safety injection in the event of a small LOCA." This statement is incorrect with respect to the FSAR. Figure 15.3-1 shows the composite pump curve for the Watts Bar small break loss of coolant accident (SBLOCA). The curve consists of one charging pump, one safety injection pump, and one RHR pump. Furthermore, technical specification figure 3.2-2 shows the peaking factor multiplier as a function of core height. The right most portion of the curve is based on SBLOCA limits. WCAP 9600 and the Westinghouse Owner's Group emergency response guideline background document discuss SBLOCAs. Core uncovery is a strong function of break size and injection flow. Higher injection flows tend to make larger break sizes limiting and always result in lower peak clad temperature for a given break size. The Watts Bar safety injection pumps can completely substitute for the charging pumps only for those breaks that depressurize the reactor coolant system to less than 900 psig before prolonged core uncovery occurs. If depresurization stops above this pressure, two safety injection pumps deliver less flow than one safety injection pump and one charging pump.

7. Valve FCV-63-22 is listed as forming a doubleton with certain safety injection instrumentation. We believe that categorization is incorrect. At a minimum, the valve would have to be closed and the position indicator lights failed coincident with multiple failures of the pump indicator lights, pump motor ammeters, and flow indicators before the operator would definitely miss the need to bypass FCV-63-22. We believe that this is a highly unlikely situation. In addition, draft technical specifications require that FCV-63-22 be open with power removed during plant operation. The status of the valve is checked once per shift to verify compliance with the technical specifications.

8. Valve FCV-63-5 is listed as forming an unsuppressed singleton. The status of this valve is checked once per shift to verify correct position. This valve was also considered for inclusion in the draft technical specifications like FCV-63-22; however, the decision was made not to remove power to the valve operator because of the fact that this valve must be repositioned during switchover from injection to recirculation mode. The valve must be closed to provide redundant isolation to prevent sump water from being pumped back to the refueling water storage tank by the residual heat removal (RHR) pumps.

9. The stated purpose of the LLNL system interaction study is "to further define and subsequently implement SI regulatory requirements for light water reactors." It is imperative that LLNL understand that the importance of FCV-63-5 and FCV-63-22 has long been recognized by TVA; their study did not shed new light on our understanding of the system. TVA and NRC have taken measures to ensure that these valves are properly positioned for accident injection. It would be unfortunate if the LLNL report led to additional, unnecessary regulatory review because TVA's and NRC's actions have been overlooked.

10. Some typographical errors were noticed:

Page 4, paragraph 2, line 5	-- VC6350	should be	VC63510
Page 4, paragraph 2, line 6	-- VC6350	should be	VC63510
Page 6, paragraph 1, line 6	-- (SIP1B-B)	should be	(SIP1A-A)
Page 7, paragraph 1, line 13	-- Reactors	should be	Generators
Page 22, paragraph 1, line 2	-- FCV 157	should be	FCV-63-157
Page 22, paragraph 1, line 2	-- modified	should be	modeled

In summary, it is felt that the conclusions reached in this study would have been identified by any systematic qualitative analysis. In addition, it is believed that a qualitative method would have provided more insight into alternate flow paths and the impact of operator action.