



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

May 27, 1988

Docket No. 50-260

LICENSEE: Tennessee Valley Authority

FACILITY: Browns Ferry Nuclear Plant, Units 1, 2 and 3

SUBJECT: SUMMARY OF MAY 18, 1988 MEETING WITH THE TENNESSEE VALLEY AUTHORITY  
(TAC NO. 63178)

On May 18, 1988, members of the Office of Special Projects met with representatives of the Tennessee Valley Authority (TVA or the licensee). The purpose of the meeting was to discuss the resolution of a Restart Item identified as the Browns Ferry's Probabilistic Risk Assessment (PRA). Specifically, the meeting discussed the staff's letters to the licensee dated October 1, 1987 and May 11, 1988.

Enclosure 1 is a list of attendees. The slides used by TVA in its presentation are contained in Enclosure 2.

The primary focus of the licensee's presentation was to discuss issues raised by the staff's October 1, 1987 letter. In particular, TVA presented slides with revisions to Tables 1 and 2 of the staff's letter based upon a September 1987 revision to the draft PRA. This draft has not yet been approved by TVA management or subjected to peer review and, therefore, has not been requested or provided to the NRC. The staff's October 1, 1987 letter provided a limited scope review of an earlier draft version of the PRA. The revised Tables from the September 1987 draft PRA showed a substantive reduction in the estimated core melt frequency when compared to the earlier draft version.

The staff's major concern for Unit 2 restart is whether the Browns Ferry plant as modeled in the earlier draft PRA staff is an outlier in terms of core melt frequency when compared to similar plants of similar vintage. The staff believes that resolution of this issue requires a review of the changes in the September 1987 draft PRA as outlined in TVA's presentation (Tables 1 and 2). The staff indicated that timely resolution of its concerns is contingent upon the licensee providing sufficient supporting documentation on the revised Tables 1 and 2 using the revised September 1987 PRA.

The staff requested the following from TVA:

- ° Provide TVA's rationale for concluding that the revised PRA will reflect the configuration of Unit 2 at the time of restart.
- ° Provide a summary document indicating the changes made between the January 1986 draft PRA reviewed by the staff in its October 1, 1987 letter and the September 1987 revision.

May 27, 1988

Because the development of NRC guidance concerning the use of an Individual Plant Examination (IPE) using the IDCOR methodology (i.e., licensee's letters dated June 9, 1987 and February 4, 1988) is still under way, the staff's review and assessment of the above information will be needed prior to restart. The staff and TVA discussed in details the level of informational requirements needed in the above responses. Based upon TVA's understanding of the staff's needs, TVA committed to provide this information no later than August 30, 1988. Upon completion of its scoping review of the licensee's submittal, the staff will conduct an audit of the September 1987 revised draft PRA and supporting documentation. This review audit is scheduled to occur approximately one month after the receipt of the licensee's August 30, 1988 submittal.

Gerald E. Gears, Project Manager  
TVA Projects Division  
Office of Special Projects

Enclosures:

1. List of Attendees
2. TVA Slides Used in Presentation

cc w/enclosures:  
See next page

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\*cc: Licensee/Applicant and Service List

ENCLOSURE 1

TVA/NRC MEETING  
BROWNS FERRY PRA  
MAY 18, 1988

<u>Name</u>	<u>Organization</u>
Don L. Williams	TVA - DNLRA
B. D. Liaw	NRC - OSP
Gerry Gears	NRC - OSP
Mark A. Linn	TVA - RPS
Wang Lau	TVA - RPS
Phil Polk	TVA - Rockville
Fred L. Moreadith	TVA - Engr. Mgr.
M. J. May	TVA - BFN - Licensing
Hugo Pomrehn	TVA - S.D. - BFN
Jane Axelrad	NRC - OSP
Steve Richardson	NRC - OSP
Angelo Marinos	NRC - OSP
J. A. Murphy	NRC - RES
E. Chelliah	NRC - RES
J. P. Stapleton	TVA - SDO

TVA/NRC STAFF DISCUSSION OF  
THE BROWNS FERRY NUCLEAR PLANT (BFN)  
PROBABILISTIC RISK ASSESSMENT (PRA)

ROCKVILLE, MARYLAND

MAY 18, 1988

BFN PRA - TVA/NRC MEETING

PURPOSE

DISCUSS OCTOBER 1, 1987, NRC LETTER AND  
PROVIDE RESPONSES TO TABLES 1, 2, AND 3  
IN SUPPORT OF BFN RESTART

MAY 18, 1988

BFN PRA - TVA/NRC MEETING

AGENDA

- |                 |         |
|-----------------|---------|
| 1. INTRODUCTION | TVA/NRC |
| 2. PRESENTATION | TVA     |
| 3. DISCUSSION   | TVA/NRC |
| 4. CONCLUSION   |         |

MAY 18, 1988

BFN PRA - TVA/NRC MEETING

RESPONSE TO OCTOBER 1, 1987, NRC LETTER

NRC COMMENT

- (1) "THERE IS NO REASON TO SUSPECT THAT ADDITIONAL IMMEDIATE REGULATORY ACTION IS WARRANTED, BECAUSE THE PRA DID NOT IDENTIFY SIGNIFICANT SAFETY PROBLEMS. HOWEVER, THE ASSESSED CORE DAMAGE FREQUENCY IS VERY HIGH AND WE ENCOURAGE RAPID SUBMITTAL OF THE REVISED AND UPDATED FINAL PRA."

TVA RESPONSE

THE CURRENT BFN CORE DAMAGE FREQUENCY IS WITHIN INDUSTRY VALUES FOR SIMILAR PLANTS AND IS NOT AN OUTLIER.

MAY 18, 1988



BFN PRA - TVA/NRC MEETING

RESPONSE TO OCTOBER 1, 1987, NRC LETTER

NRC COMMENT

- (2) "FROM AN INITIAL READING OF THE PRA, THE STAFF DID NOT IDENTIFY ANY NEW SIGNIFICANT GENERIC SAFETY ISSUES. THE STAFF'S FINAL REVIEW OF THE FINAL PRA COULD POTENTIALLY IDENTIFY NEW GENERIC SAFETY ISSUES, IF THEY EXIST. HOWEVER, THIS CONCLUSION IS TENTATIVE AND COULD CHANGE AFTER OUR DETAILED REVIEW."

IVA RESPONSE

NO NEW GENERIC SAFETY ISSUES HAVE BEEN IDENTIFIED IN THE CURRENT ANALYSES.

MAY 18, 1988

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BFN PRA - TVA/NRC MEETING

RESPONSE TO OCTOBER 1, 1987, NRC LETTER

NRC COMMENT

- (3) "THE BROWNS FERRY PRA PROVIDES EXTENSIVE SAFETY INFORMATION ON DOMINANT POTENTIAL CORE DAMAGE SEQUENCES. BECAUSE THESE DOMINANT SEQUENCES ORIGINATE FROM SYSTEM DEPENDENCIES, THE STAFF HAS GAINED A SIGNIFICANT OVERVIEW OF THE BROWNS FERRY PLANT SAFETY AND UNDERSTANDING OF THOSE IMPROVEMENTS WHICH COULD REDUCE THE DOMINANT SEQUENCE FREQUENCY."

TVA RESPONSE

TVA AGREES THAT THE BFN PRA PROVIDES EXTENSIVE INFORMATION REGARDING DOMINANT CORE DAMAGE SEQUENCES AND RISK-IMPORTANT EQUIPMENT. THIS INFORMATION IS BEING USED TO IMPROVE BFN SAFETY AND PERFORMANCE.

MAY 18, 1988

BFN PRA - TVA/NRC MEETING

RESPONSE TO OCTOBER 1, 1987, NRC LETTER

NRC COMMENT

- (4) "OUR INITIAL READING OF THE PRA INDICATES THAT CORE DAMAGE IS MORE LIKELY TO BE INDUCED BY MEANS OF SCRAM FAILURE EVENTS THAN BY OTHER EVENTS . . . . BASED ON OUR CURRENT KNOWLEDGE OF THE ADVERSE CONSEQUENCES OF ATWS INDUCED CORE DAMAGE EVENTS AND MARK I CONTAINMENT CAPABILITY TO WITHSTAND THE ATWS EVENTS, IT IS PRUDENT TO EXPEDITE ATWS RELATED MODIFICATIONS (USI A-9) AND TO CONSIDER CAREFULLY THE STAFF'S RECOMMENDATIONS OUTLINED IN TABLE 3."

IVA RESPONSE

THE ATWS EVENTS NO LONGER REPRESENT A SIGNIFICANT CONTRIBUTOR TO CORE MELT FREQUENCY. SCRAM FREQUENCY REDUCTION PROGRAM IS BEING IMPLEMENTED. SPECIFIC COMMENTS RELATED TO ATWS MODIFICATIONS ARE ADDRESSED IN TVA'S RESPONSE TO TABLE 3.

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BFN PRA - TVA/NRC MEETING

RESPONSE TO OCTOBER 1, 1987, NRC LETTER

NRC COMMENT

- (5) "WE FIND THAT THE AIR SYSTEM (A SUPPORT SYSTEM) PLAYS A MAJOR ROLE IN THE BROWNS FERRY PLANT OPERATION. THE PRA INDICATES THAT IT IS NOT A HIGHLY RELIABLE SYSTEM, AND IT PROVIDES A WIDE RANGE OF INTERSYSTEM DEPENDENCIES RESULTING IN THE LOSS OF SAFETY FUNCTIONS. SIMILAR ISSUES RELATED TO AIR SYSTEM PROBLEMS WERE BROUGHT TO THE ATTENTION OF THE INDUSTRY AND ARE DOCUMENTED IN "NRC INFORMATION NOTICE NO. 87-28: AIR SYSTEMS PROBLEMS TO U.S. LIGHT WATER REACTORS," DATED JUNE 22, 1987. THUS, THE STAFF BELIEVES THAT THE AIR SYSTEM DEPENDENCIES COULD BE MINIMIZED (REFER TO TABLE 3 IMPROVEMENTS) BY DESIGN IMPROVEMENTS, IF NECESSARY."

IVA RESPONSE

AIR SYSTEM NO LONGER PLAYS A MAJOR ROLE IN THE BFN DOMINANT SEQUENCES. (DISCUSSED FURTHER IN TVA RESPONSE TO ITEM 4 OF TABLE 3).

MAY 18, 1988

BFN PRA - TVA/NRC MEETING

RESPONSE TO OCTOBER 1, 1987, NRC LETTER

NRC COMMENT

- (6) "IT APPEARS THAT THE TVA MANAGEMENT AND ITS STAFF ARE MAKING USE OF THE PRA-BASED SYSTEMS INFORMATION TO FACILITATE THE RESOLUTION OF THE PLANT CONFIGURATION MANAGEMENT PROBLEMS AND TO ESTABLISH SOME PRIORITIZATION METHODS NEEDED FOR RESOURCE ALLOCATION PURPOSES. BOTH THE TVA AND OSP STAFFS COULD ENCOURAGE AND MONITOR CLOSELY THE USE OF PRA BY THE LICENSEE."

IVA RESPONSE

PRA CONSIDERATIONS HAVE BEEN FACTORED INTO BFN RESTART EFFORTS.

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BFN PRA - TVA/NRC MEETING

RESULTS

(UPDATE OF TABLE 1 OF OCTOBER 1, 1987, NRC LETTER)

CORE MELT FREQUENCY	(EVENTS/REACTOR YEAR)	
	<u>JANUARY 86</u>	<u>CURRENT*</u>
INTERNAL EVENTS	1.5 E-3	4.7 E-4
SEISMIC EVENTS	1.4 E-4	3.7 E-5
FIRES	1.5 E-4	7.7 E-5
INTERNAL FLOODING	<u>1.2 E-6</u>	<u>1.2 E-6</u>
TOTAL	1.8 E-3	5.85 E-4

NO SEQUENCE CONTRIBUTES GREATER THAN 5% TO CORE MELT FREQUENCY.

\*SEPTEMBER 1987 REVISION: SUBJECT TO COMPLETION OF TVA MANAGEMENT AND PEER REVIEWS.

MAY 18, 1988

DOMINANT SEQUENCES

(REVISED TABLE 2 OF OCTOBER 1, 1987, NRC LETTER)

	<u>FREQUENCY*</u>
1. LOSS OF FEEDWATER TRANSIENT, FAILURE OF HPCI AND RCIC, FAILURE OF MANUAL ADS BLOWDOWN, ELECTRIC POWER STATE 16, CAS STATE 1. NO RECOVERY.	2.25 E-5/YEAR
2. SMALL LOCA, FAILURE OF TORUS COOLING, ELECTRIC POWER STATE 16, CAS STATE 1, NO RECOVERY	2.05 E-5/YEAR
3. MAIN STEAM ISOLATION VALVE CLOSURE, FAILURE OF HPCI AND RCIC, FAILURE OF MANUAL ADS BLOWDOWN, ELECTRIC POWER STATE 16, CAS STATE 1, NO RECOVERY	2.04 E-5/YEAR
4. TRANSIENT WITH 1-3 STUCK OPEN RELIEF VALVES, FAILURE OF TORUS COOLING, ELECTRIC POWER STATE 16, CAS STATE 1, NO RECOVERY	1.58 E-5/YEAR
5. LOSS OF OFFSITE POWER, FAILURE OF HPCI AND RCIC, FAILURE OF LPCI INJECTION, FAILURE OF TORUS COOLING, FAILURE OF CORE SPRAY, ELECTRIC POWER STATE 1, CAS STATE 1, RECOVERY	1.25 E-5/YEAR

\*SUBJECT TO COMPLETION OF TVA MANAGEMENT AND PEER REVIEWS

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DOMINANT SEQUENCES

(REVISED TABLE 2 OF OCTOBER 1, 1987, NRC LETTER)

	<u>FREQUENCY*</u>
6. PRESSURE REGULATOR FAILS CLOSED, FAILURE OF HPCI AND RCIC, FAILURE OF MANUAL ADS BLOWDOWN, ELECTRIC PWOER STATE 16, CAS STATE 1, NO RECOVERY	1.09 E-5/YEAR
7. LOSS OF CONDENSER VACUUM, FAILURE OF HPCI AND RCIC, AND FAILURE OF MANUAL ADS BLOWDOWN, ELECTRIC POWER STATE 16, CAS STATE 1, NO RECOVERY	9.91 E-6/YEAR
8. LOSS OF OFFSITE POWER RESULTING IN 1-3 STUCK OPEN RELIEF VALVES, FAILURE OF EECW, ELECTRIC POWER STATE 3, CAS STATE 1, RECOVERY	9.37 E-6/YEAR
9. MAIN STEAM ISOLATION VALVE CLOSURE, FAILURE OF HPCI AND RCIC, FAILURE OF THE CONDENSATE SYSTEM, AND FAILURE OF MANUAL ADS BLOWDOWN, ELECTRIC POWER STATE 16, CAS STATE 1, NO RECOVERY	8.67 E-6/YEAR
10. TRANSIENT WITH 1-3 STUCK OPEN RELIEF VALVES, FAILURE OF HPCI, FAILURE OF CORE SPRAY, AND FAILURE OF RHR, ELECTRIC POWER STATE 16, CAS STATE 3, RECOVERY	8.09 E-6/YEAR

\*SUBJECT TO COMPLETION OF TVA MANAGEMENT AND PEER REVIEWS

MAY 18, 1988



BFN PRA - TVA/NRC MEETING

SUMMARY OF POSSIBLE PLANT IMPROVEMENTS

(TABLE 3 OF OCTOBER 1, 1987, NRC LETTER)

POSSIBLE PLANT IMPROVEMENT

1. CHANGES TO MSIV ISOLATION SETPOINTS (L2 TO L1).
2. CHANGES TO PROVIDE ONLINE TEST CAPABILITY OF THE SBLC SYSTEM.

TVA RESPONSE

CHANGES BEING INSTALLED AT PLANT. PRA DOES NOT TAKE CREDIT.

CONSERVATIVE ESTIMATES OF AVAILABILITY OF POWER CONVERSION SYSTEM IN PRA.

CHANGES NOT PLANNED AT PLANT. PRA DOES NOT TAKE CREDIT.

IMPORTANCE OF ATWS AND SBLC GREATLY REDUCED FROM INITIAL WORK. REDUCTION OF SBLC UNAVAILABILITY NOT HIGH PRIORITY.

MAY 18, 1988

BFN PRA - TVA/NRC MEETING

SUMMARY OF POSSIBLE PLANT IMPROVEMENTS  
(TABLE 3 OF OCTOBER 1, 1987, NRC LETTER)

POSSIBLE PLANT IMPROVEMENT

3. CHANGES TO FACILITATE AUTOMATIC  
ADS ACTUATION UPON LOW WATER OR  
HIGH DRYWELL PRESSURE

4. CHANGES TO PROVIDE MINIMIZED  
CONTROL AIR SYSTEM DEPENDENCE

IVA RESPONSE

CHANGES TO BE INSTALLED  
AT PLANT. PRA DOES NOT TAKE  
CREDIT.

PRA REFLECTS CURRENT DESIGN  
AND EMERGENCY OPERATING  
PROCEDURES.

AIR SYSTEM DESIGN BEING  
REVIEWED BY TVA. PRA MORE  
CLOSELY REFLECTS CURRENT  
PLANT CONFIGURATION.

IMPORTANCE OF AIR SYSTEM HAS  
BEEN GREATLY REDUCED DUE TO  
INCORPORATION OF SOME EXISTING  
PLANT FEATURES IN PRA MODEL.

MAY 18, 1988

BFN PRA - TVA/NRC MEETING

CONCLUSIONS

- BFN is NOT an outlier with respect to severe accidents.
- TVA undertaking voluntary actions to implement changes to the plant to improve plant reliability.
  - Scram Reduction
  - Maintenance Upgrade

May 18, 1988

May 27, 1988

Because the development of NRC guidance concerning the use of an Individual Plant Examination (IPE) using the IDCOR methodology (i.e., licensee's letters dated June 9, 1987 and February 4, 1988) is still under way, the staff's review and assessment of the above information will be needed prior to restart. The staff and TVA discussed in details the level of informational requirements needed in the above responses. Based upon TVA's understanding of the staff's needs, TVA committed to provide this information no later than August 30, 1988. Upon completion of its scoping review of the licensee's submittal, the staff will conduct an audit of the September 1987 revised draft PRA and supporting documentation. This review audit is scheduled to occur approximately one month after the receipt of the licensee's August 30, 1988 submittal.

Gerald E. Gears, Project Manager  
TVA Projects Division  
Office of Special Projects

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Browns Ferry Nuclear Plant,  
Units 1, 2 and 3

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