UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1 AND 3

DOCKET NOS. 50-259 AND 50-296

1.0 INTRODUCTION

The Browns Ferry Nuclear Plant (BFN), Units 1, 2 and 3, were shut down in 1985. At that time, the Tennessee Valley Authority (the licensee) committed to remaining shut down until the NRC approved restarting the units. After implementing numerous NRC-approved restart programs, BFN Unit 2 was restarted in May, 1991. The licensee has recently submitted several restart programs to the NRC for BFN Units 1 and 3. For some of these programs, the licensee stated that it intends to implement the same program as was implemented on BFN Unit 2, and therefore, there is no need for staff review. However, for several programs, the licensee has proposed significant deviations from the BFN Unit 2 precedent, and these programs require staff review and approval. This evaluation addresses the proposed programs for BFN Units 1 and 3 small-bore piping and instrument tubing.

2.0 DISCUSSION AND EVALUATION

Small Bore Piping Program

The licensee's BFN Unit 2 restart program for small bore piping is a two-phase program, utilizing operability criteria and final design criteria. The BFN Unit 2 program included piping in common areas which is required to support operation of the unit. Phase 1 included all BFN Unit 2 and common area seismic Class I small bore piping within the Design Baseline Verification Program (DBVP) safe shutdown boundary. The Phase 1 program was completed prior to BFN Unit 2 restart. Phase 2 includes all remaining BFN Unit 2 and common area seismic Class I small bore piping, and will be implemented prior to BFN Unit 2 Cycle 6 restart. The licensee committed to performing detailed as-built walkdowns and rigorous analyses of a 10% biased sample of the BFN Unit 2 and common area seismic Class I small bore piping population. The analysis was used to identify generic attributes which contributed to overstresses, and the remaining 90% of the population were, or will be, screened for the presence of the attributes. The licensee proposed this method to qualify all BFN Unit 2 and common area seismic Class I small bore piping in lieu of performing a 100% detailed reanalysis effort. The staff reviewed and accepted this program.

By letter dated February 27, 1991, (Reference 1), the licensee submitted its restart program for BFN Units 1 and 3 small bore piping. The licensee proposed to walk down and evaluate BFN Units 1 and 3 using the attribute-based walkdown procedure developed for the BFN Unit 2 program. Where the attributes are found to exist, the piping and supports will be further evaluated to

determine if design criteria are satisfied. Interim operability criteria will not be used. Prior to restart, modifications and/or repairs will be made to all items which do not meet the design criteria. The most significant change from the BFN Unit 2 program is the elimination of any as-built walkdowns and rigorous analyses of the small bore piping in BFN Units 1 and 3. This approach assumes that only those attributes identified from the BFN Unit 2 sample population will exist in BFN Units 1 and 3. However, the problems with small bore piping at BFN are due to the failure of the licensee to adequately implement its own design and installation criteria. The licensee did not present an adequate technical justification to conclude that the engineering and installation problems were consistent throughout the construction of all three units. For this reason, the staff did not accept the licensee's program.

The staff discussed this concern with the licensee during a meeting on September 18, 1991, and during several conference calls. By letter dated December 12, 1991, (Reference 2), the licensee submitted a revised program which addressed the staff's concern. The revised program combined the small bore piping program and the instrument tubing program into one program. According to the licensee, the programs were combined for efficiency since both programs use similar walkdown procedures and the same design criteria. The licensee's revised program, as it pertains to small bore piping, is to walk down the seismic Class I small bore piping populations in BFN Units 1 and 3 using the BFN Unit 2 attribute-based walkdown procedure, and perform rigorous analysis of the as-built configuration of a 10% sample of the small bore piping from each unit (i.e., 10% of the piping and supports from BFN Unit 1, and 10% of the piping and supports from BFN Unit 3). The sample will be selected using the same criteria used to select the BFN Unit 2 sample, and will be used to identify attributes which may not have been identified during the BFN Unit 2 restart program. The staff has reviewed the licensee's revised submittal as it pertains to BFN Units 1 and 3 small bore piping, and has determined that it is essentially equivalent to the program which the staff approved for BFN Unit 2 restart. The staff finds that the licensee's revised program is an acceptable basis for restart of BFN Units 1 and 3, provided that the licensee also evaluates the seismic Class I small bore piping populations in all units for any new attributes which may be identified during the implementation of the revised program.

Instrument Tubing Program

The licensee's BFN Unit 2 restart program for instrument tubing originally consisted of as-built walkdowns and rigorous analyses of all BFN Unit 2 and common area seismic Class I instrument tubing installations. Following the implementation of this program, the licensee discovered that the seismic Class I instrument tubing population was much larger than initially determined. In addition, new seismic design criteria required that a reevaluation be made of the tubing installations previously evaluated. The licensee then submitted a revised, three-phase program which was based on a sampling approach similar to the small bore piping program. The revised program also utilized operability and final design criteria. Phase 1

consisted of the instrument tubing population which had been walked down and evaluated prior to discovering the additional configurations. According to the licensee, this sample represented over 20% of the total population. Based on the sample, generic attributes which contributed to overstresses were identified. Phase 2 included a reevaluation of the sample population against the new seismic design criteria, and an attribute-based evaluation of all remaining BFN Unit 2 and common area seismic Class I instrument tubing within the DBVP restart boundary. Phase 3 will be completed prior to BFN Unit 2 Cycle 6 restart, and will include an attribute-based evaluation of all remaining seismic Class I instrument tubing configurations outside of the DBVP restart boundary.

By letter dated February 27, 1991 (Reference 3), the licensee submitted its restart program for BFN Units 1 and 3 seismic Class I instrument tubing. The licensee initially proposed to walk down and evaluate BFN Units 1 and 3 solely against the generic attributes developed during the BFN Unit 2 program. The proposed program was similar to the initial program proposed for BFN Units 1 and 3 small bore piping in that it did not include any additional as-built walkdowns and rigorous analyses of the instrument tubing configurations in BFN Units 1 and 3. However, as was the case with small bore piping, the problems with instrument tubing at BFN are due to the failure of the licensee to adequately implement its own design and installation criteria. The licensee did not present an adequate technical justification to conclude that the engineering and construction problems were consistent throughout the construction of all three units. For this reason, the staff did not accept the licensee's program.

The licensee revised its instrument tubing program in the Reference 2 submittal dated December 12, 1991. The licensee's revised instrument tubing program walks down the seismic Class I instrument tubing populations in BFN Units 1 and 3 using the BFN Unit 2 attribute-based walkdown procedure. The program includes rigorous analysis of the as-built configuration for a 10% sample of the instrument tubing from each unit (i.e., 10% from BFN Unit 1 and 10% from BFN Unit 3). The sampling will be used to identify attributes which may not have been identified during the BFN Unit 2 restart program. Prior to restart, modifications and/or repairs will be made to any items which do not meet the final design criteria. Operability criteria will not be used.

The licensee stated in Reference 2 that there are approximately 100 tubing problems in the BFN Unit 3 scope, and that approximately 20 of these problems were rigorously analyzed during the BFN Unit 2 and common area program. The licensee proposed to use these 20 problems as the sample population for the BFN Unit 3 program. The licensee also indicated that the BFN Unit 2 sample included some tubing configurations located in BFN Unit 1, and proposed to credit these towards the BFN Unit 1 sample. The staff concurs with this approach provided the final samples are representative of tubing configurations found throughout BFN Units 1 and 3, and that each sample includes 10% of the tubing and 10% of the supports. With the exception of the smaller sample size (10% for BFN Units 1 and 3 versus 20% for BFN Unit 2), this program is essentially equivalent to the instrument tubing program approved

for BFN Unit 2 restart. The staff finds that the smaller sample size is adequate to determine if any new attributes need to be evaluated. The staff further finds that the licensee's revised program is an acceptable basis for restart of BFN Units 1 and 3, provided that the licensee also evaluates the seismic Class I instrument tubing populations in all units for any new attributes which may be identified during the implementation of the revised program.

3.0 CONCLUSION

For BFN Units 1 and 3 seismic Class I small bore piping and instrument tubing, the licensee has proposed to implement a combined restart program which essentially encompasses the two separate programs which were approved for BFN Unit 2 restart. This program will consist of walkdowns using the critical attributes identified during the BFN Unit 2 programs. The program also includes rigorous as-built configuration analyses for 10% samples from BFN Units 1 and 3 to determine if any additional attributes need to be evaluated. This combined program is essentially equivalent to the two separate programs approved for BFN Unit 2 restart. The staff finds that the licensee's revised program is an acceptable basis for restart of BFN Units 1 and 3, provided that the licensee also evaluates the seismic Class I small bore piping and instrument tubing populations in all units for any new attributes which may be identified during the implementation of the revised program.

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REFERENCES

1. Letter, E. G. Wallace, TVA, to NRC, "Browns Ferry Nuclear Plant (BFN), Action Plan to Disposition Concerns Related to Units 1 and 3 Small Bore Piping," dated February 27, 1991.

2. Letter, O. J. Zeringue, TVA, to NRC, "Browns Ferry Nuclear Plant (BFN), Small Bore Piping Program, Tubing, And Conduit Support Plans for Units 1 and 3 - Additional Information," dated December 12, 1991.

3. Letter, E. G. Wallace, TVA, to NRC, "Browns Ferry Nuclear Plant (BFN) - Action Plan to Disposition Concerns Regarding the Seismic Qualification of Units 1 and 3 Instrument Tubing," dated February 27, 1991.