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TECHNICAL EVALUATION REPORT ON THE
TESTS CONDUCTED TO VERIFY THE
ANALYSES PERFORMED ON THE
ADEQUACY OF STATION ELECTRIC
DISTRIBUTION SYSTEM VOLTAGES FOR THE
ARKANSAS NUCLEAR ONE, UNIT 1

(Docket No. 50-313)

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Lawrence
Livermore
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ABSTRACT

This report supplements the technical evaluation documented in a separate report dated December 16, 1981 (UCID-19113) on the adequacy of station electric distribution system voltages for the Arkansas Nuclear One, Unit 1. The evaluation is to determine the adequacy of the tests conducted to verify the accuracy of the assumptions and system models used in the distribution system voltage analyses.

The verification tests resulted in small percentage error differences which demonstrates the accuracy of the assumptions and system models used in the analytical voltage profiles.

FOREWORD

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1. INTRODUCTION

The Nuclear Regulatory Commission (NRC) by a letter dated August 8, 1979 [Ref. 1], expanded its generic review of the adequacy of the station electric distribution systems for all operating nuclear power facilities. The review was to determine if the onsite distribution system, in conjunction with the offsite power sources, has sufficient capacity and capability to automatically start and operate all required safety loads within the equipment voltage ratings. In addition, the NRC requested each licensee to follow suggested guidelines and to meet certain requirements in the analysis.

By a letter dated August 17, 1983 [Ref. 2] and a telephone conference [Ref. 3], Arkansas Power and Light Company (AP&L), the licensee, submitted the results of the tests conducted to verify the accuracy of their analysis and conclusion regarding the adequacy of the electrical distribution system voltages at Arkansas Nuclear One, Unit 1.

The purpose of this report is to evaluate the licensee's submittal with respect to the NRC criteria and present the reviewer's conclusion on the accuracy of the voltage analysis performed to determine the adequacy of the station electric distribution system to maintain the voltage for the required Class 1E equipment within acceptable limits for the worst case starting and load conditions.

This report is a supplement to the technical evaluation documented in a separate report dated December 16, 1981 (UCID-19118) [Ref. 3], based on new information submitted in Reference 2.

2. ANALYSES VERIFICATION

The licensee completed the voltage verification tests during the refueling outage in March 1983 with the plant shutdown and the available grid voltage through Startup Transformer No. 2 [Ref. 3]. A one-line diagram of the buses used in the tests is shown in Figure 1. This train of buses experienced the worst case voltages identified in the voltage profile analyses [Ref. 4].

The tests (two) were conducted according to the criteria outlined in the March 9, 1982 Safety Evaluation Report [Ref. 2]. The buses, with the exception of the 120/208-volt Class 1E buses, were loaded to at least 30%. The 120/208-volt Class 1E buses are fed from inverters which are battery backed and are therefore not subject to degradation. The two tests were conducted for steady state conditions, starting of a large Class 1E load, and the starting of a large non-Class 1E load.

The first test scenario was steady state (30% loading), start of a 350 Hp service water pump (Bus A3), steady state, start of a 600 Hp main chiller pump (Bus A1), then steady state [Ref. 3]. The second test reversed the sequence in the starting of the two large motors.

The results of the two tests showed a worst case percentage error during steady state conditions of 1.09% on 4160-volt Bus A3 and -0.83% on 480-volt Bus B5. For starting transients, the worst case percentage errors on 4160-volt Bus A3 ranged from -0.51% to 0.38% and on 480-volt Bus B5 of -1.08%. A minus percentage error difference indicates the measured voltages were lower than the analytical values.

Applying these percentage errors to the worst case voltages presented in Reference 3, demonstrates that acceptable voltages will be supplied to the Class 1E equipment under worst-case conditions. Thus, these small percentage error differences verifies the accuracy of the program model used in the voltage analyses.

3. CONCLUSION

Based on the information submitted by Arkansas Power and Light Company for the Arkansas Nuclear One, Unit 1, it is concluded that the tests conducted and the resultant small percentage error differences verifies the accuracy of the computer program models and assumptions used to determine the adequacy of the station electric distribution system voltages under worst case starting and load conditions.

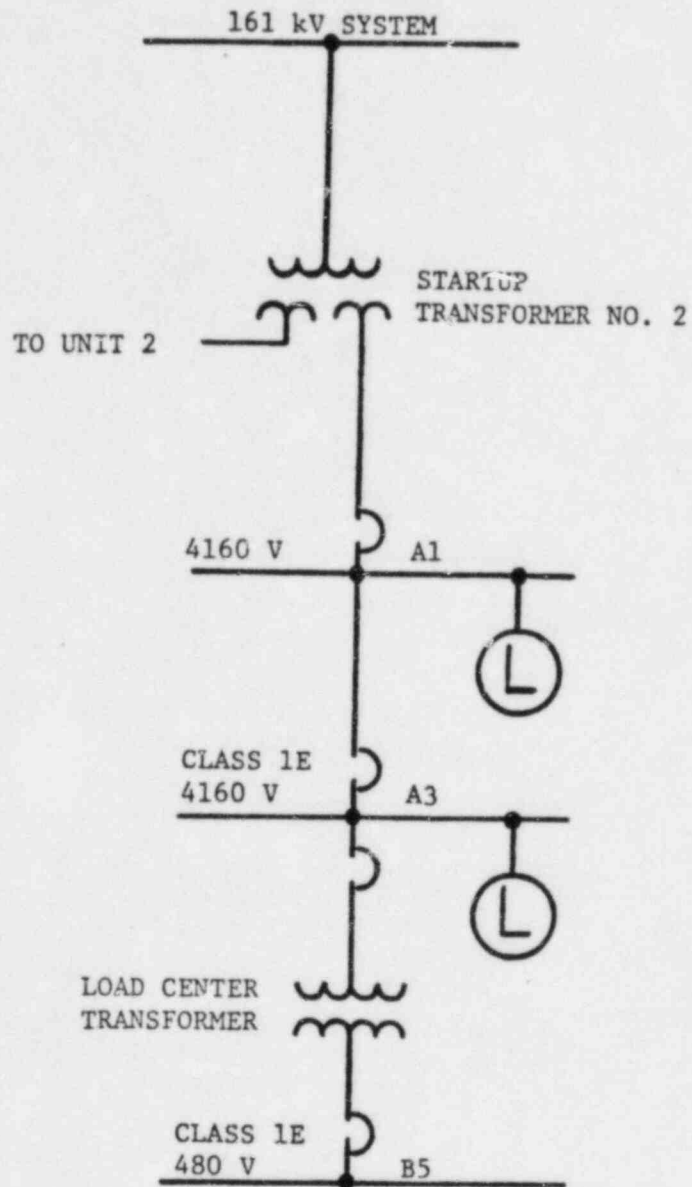


FIGURE 1 - TEST VERIFICATION BUS TRAIN

REFERENCES

1. NRC letter (W. Gammill) to all power reactor licensees, dated August 8, 1979.
2. AP&L letter (J. R. Marshall) to the NRC (J. F. Stolz), dated August 17, 1983.
3. Telephone conference; Ted Enos (AP&L), Guy Vissing and H. Emami (NRC), and James Selan (LLNL), dated September 16, 1983.
4. LLNL Report, UCID 19118, "Technical Evaluation of the Adequacy of Station Electric Distribution System Voltages for the Arkansas Nuclear One, Unit 1," dated December 16, 1981.

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