ENCLOSURE 1

SAFETY EVALUATION
ARKANSAS NUCLEAR ONE UNIT 2
DOCKET NO. 50-368
ADEQUACY OF STATION ELECTRIC DISTRIBUTION SYSTEM VOLTAGES

INTRODUCTION AND SUMMARY

Arkansas Power and Light Company (AP&L) was requested by NRC letter dated August 8, 1979 to review the electric power system at Arkansas Nuclear One Unit 2. The review was to consist of:

a) Determining analytically the capacity and capability of the offsite power system and onsite distribution system to automatically start as well as operate all required loads within their required voltage ratings in the event of 1) an anticipated transient, or 2) an accident (such as LOCA) without manual shedding of any electric loads.

b) Determining if there are any events or conditions which could result in the simultaneous or, consequential loss of both required circuits from the offsite network to the onsite electric distribution system and thus violating the requirements of GDC 17.

The August 8, 1979 letter included staff guidelines for performing the required voltage analysis and the licensee was further required to perform a test in order to verify the validity of the analytical results. AP&L responded by letters dated March 30, 1978 and March 13, 1979.

A detailed review and technical evaluation of the submittals was performed by LLL under contract to the NRC, with general supervision by NRC staff. This work is reported by LLL in Technical Evaluation Report (TER), "Adequacy of Station Electric Distribution System Voltages, Arkansas Nuclear One Unit 2, " dated March 10, 1982 (attached). We have reviewed this report and concur in the conclusions that the offsite power system and the onsite distribution system are capable of providing acceptable voltages for worst case station electric load and grid voltages.

EVALUATION CRITERIA

The criteria used by LLL in this technical evaluation of the analysis includes GDC 5 ("Sharing of Structures, Systems, and Components"), GDC 13 ("Instrumentation and Control"), GDC 17 ("Electric Power Systems") of Appendix A to 10 CFR 50; IEEE Standard 308-1974 ("Class 1E Power Systems for Nuclear Power Generating Stations"), ANSI C84.1-1977 ("Voltage Ratings for Electric Power Systems and Equipment - 60 Hz"), and the staff positions and guidelines in NRC letter to AP&L dated August 8, 1979.

ANALYSIS AND TEST FEATURES

AP&L analyzed each offsite power source to the onsite distribution system under maximum and minimum load conditions with the offsite power sources at maximum and minimum anticipated voltage, 105% and 100% of nominal (1.05 & 1.0 p/u) on both the 500 kv and 161 kv systems. An analysis was also performed with both units (1 and 2) transferring their station load to the alternate source,

startup transformer 2. The analysis included the transient effects on the Class 1E equipment from starting a large Class 1E and non-Class 1E load. It has been established that the 4160 volt and 480 volt emergency loads will operate within allowable voltage limits when supplied from the offsite power system. AP&L, in a letter from John R. Marshall, AP&L to J. F. Stolz, NRC, dated February 28, 1982 committed to perform verification tests on Unit 1 during the refueling outage presently scheduled for January, 1983. Due to the close similarity in electrical design and bus loading of Units 1 and 2, we have agreed to accept this test on Unit 1 as adequate verification of the analytical techniques and assumptions used in the Unit 2 analysis as well. Therefore, separate verification testing for Unit 2 will not be required. The results of the verification testing for Unit 1 will be evaluated by the NRC Region IV.

DESIGN CHANGES

As a result of the voltage analysis AP&L proposed the following design changes:

1. During an automatic fast transfer from the unit auxiliary transformer to the offsite source, with a safety injection signal present, all non-Class 1E loads except the reactor coolant pumps (RCP) are shed. Idle Class 1E loads are sequenced on the offsite source and selected Class 1E loads are delayed starting. Should the automatic fast transfer fail (with offsite power available), all Class 1E and non-Class 1E loads are shed with subsequent Class 1E load sequencing and delayed starting of selected Class 1E loads.

2. Install interlocks to prevent the simultaneous automatic transfer of Unit 1 and Unit 2 loads to startup transformer 2.

3. Remove the automatic slow transfer from the unit auxiliary transformer to startup transformer 3 to prevent simultaneous starting of all station auxiliary loads.

4. Install manual blocking circuitry to prevent operation of the second level undervoltage relays during the starting of a reactor coolant pump or circulating water pump.

5. Install a second-level undervoltage protection scheme on each 480 volt Class 1E bus.

6. Replacement of all undersized control transformers.

7. Install interposing relays in eleven motor starters.

8. Install larger size feeder cable to two 480 volt loads.

9. Replace existing 92% second level undervoltage relays with solid state types.

CONCLUSIONS

We have reviewed the LLL Technical Evaluation Report and concur in the findings that:

1. Upon completion of the proposed modifications acceptable voltages will be provided to all Class 1E equipment during the postulated worst case conditions.

2. Spurious separations from the offsite power system will not occur during the start of a reactor coolant pump or circulating water pump.

3. The modifications will ensure that ANO Unit 2 is in conformance with GDC 17.

4. The requirements of GDC 5 for multi-unit stations was met by installing the interlock to prevent simultaneous automatic transfer of both units station loads to startup transformer 2.

5. The voltage analysis verification test is scheduled for January 1983. The results of the tests will be evaluated by the NRC Region IV Office.

We therefore find Arkansas Nuclear One Unit 2 design to be acceptable with respect to adequacy of station electric distribution system voltages.

Dated:

The principal contributor to this SE was R. Prevatte.

References

1. Letter J. F. Stolz, NRC, to W. Cavanaugh, III, AP&L Co. dated January 19, 1982 transmitting position on need for verification testing (50-313 docket).

2. Letter, J. R. Marshall, AP&L Co, to J. F. Stolz, NRC, dated February 23, 1982 transmitting committment to perform ANO-1 verification test (50-313 docket).

3. Letter J. F. Stolz, NRC, to W. Cavanaugh, III, AP&L Co. dated March 9, 1982 transmitting Safety Evaluation for ANO-1 (50-313 docket).