ARKANSAS POWER & LIGHT COMPANY
POST OFFICE BOX 551 LITTLE ROCK, ARKANSAS 72203 (501) 371-4000

July 20, 1981

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Mr. Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Arkansas Nuclear One - Units 1 & 2
Docket No. 50-313 and 50-368
License No. DPR-51 and NPF-6
Generic Letter No. 81-04
Emergency Procedures and Training
for Station Blackout Events
(File: 1510, 2-1510)

Gentlemen:

In accordance with your letter of February 25, 1981, we herein provide to you under 10CFR50.54(f) our written response to Generic Letter No. 81-04.

The Arkansas Power & Light Company's (AP&L) electric system extends over an area which provides service to over 390,000 customers in 62 of Arkansas' 75 counties. The system consists of over 3500 miles of transmission lines ranging from 115 to 500 kV.

The Company is a part of the Middle South Utilities System which operates as an entity with a highly integrated system consisting of hydro, fossil-fired, and nuclear fueled generating plants. Figure 1 depicts the Middle South Utilities Transmission System.

AP&L benefits from over 50 points of interconnection either directly or through the Middle South System. These points of interconnection are with the following systems: Oklahoma Gas & Electric Company; Southwestern Electric Power Company; Gulf States Utilities Company; Central Louisiana Electric Company; Mississippi Power Company; Union Electric Company; Empire District Electric Company; Missouri Utilities; Tennessee Valley Authority; Southwestern Power Administration; Arkansas Electric Cooperative Corporation; and Associated Electric Cooperatives, Inc.

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Each unit at Arkansas Nuclear One (ANO) generates electrical power at 22 kV which is fed through an isolated phase bus to the respective unit's main transformer bank, consisting of three single-phase transformers, where it is stepped up to 500 kV transmission voltage and delivered to the station switchyard. The 500 kV switchyard is a two-bus design consisting of two breakers each for Unit 1 and Unit 2 generators and a breaker and one-half for the lines. The 500 kV station switchyard includes three outgoing 500 kV lines; one 500 kV line 86 miles in length, to the Mabelvale EHV Substation, one 500 kV line 93 miles in length, to the Fort Smith O.G. & E. EHV Substation and one 500 kV line 61 miles in length, to the Mayflower EHV Substation.

A bus tie autotransformer bank consisting of three single phase autotransformers interconnects the 500 kV and 161 kV systems in the station switchyard. The 161 kV switchyard at the generating station is a ring bus design and includes one line to the Russellville East 161 kV Substation and one line to the Morrilton East 161 kV Substation. The 22 kV tertiary of the autotransformer bank supplies Startup Transformers No. 1 and 3 which are identical to the auxiliary transformer of each unit. Startup Transformer No. 2, which serves both units is supplied from the 161 kV ring bus. One spare single-phase autotransformer is provided to replace any single-phase unit in the autotransformer bank in case of a transformer failure.

Operating problems on the 500 kV lines out of the plant switchyard, due to rugged terrain, vibration, or galloping conductor problems; icing or heavy load conditions; and high thunderstorm occurrence rate were all considered in design of the lines. The 500 kV structures exceed the requirements of the National Electrical Safety Code heavy loading conditions with the appropriate safety factors, in that the structures are also designed for 100 mile per hour winds with a 1.10 safety factor and one inch radial ice on conductors with a 1.10 safety factor. Additional torsional or stringing loads are also included in the structure design.

The Arkansas Nuclear One Switchyard consists of a 500 kV yard and a 161 kV yard connected by a 600 MVA autotransformer. The 161 kV portion of the switchyard is a four element ring bus. Two 161 kV transmission lines, the autotransformer, and the line to Startup Transformer No. 2 are connected to the 161 kV ring bus. The ring bus is arranged so the autotransformer and the line to Startup Transformer No. 2 are not connected to a common 161 kV breaker. Likewise the two 161 kV transmission lines are not connected to a common 161 kV breaker. The 22 kV tertiary winding of the autotransformer connects to two 22 kV breakers. One breaker feeds Startup Transformer No. 1 via underground cable. The other breaker feeds Startup Transformer No. 3 via underground cable. Figure 2 depicts the ANO Switchyard.

The offsite power to the plant is supplied by the 161 kV circuit to the plant and by the autotransformer 22 kV tertiary bus. The 161 kV circuit to the plant is separated from the autotransformer by two 161 kV circuit breakers. Therefore, the failure of any one of the 161 kV breakers will trip the adjacent breakers and interrupt only one of the plant offsite

power sources. The failure of a 500 kV breaker which feeds the autotransformer will trip the two 161 kV breaker connected to the autotransformer, but will not interrupt the 161 kV circuit to the plant. Each breaker in the switchyard has a separate control circuit and a failure of one circuit to operate properly will not affect any other breaker control circuit.

The control power for the 500 kV and 161 kV switchyard breakers can be supplied form the three following sources: (1) the 125V d-c battery located in the switchyard control building; (2) the battery charger located in the switchyard control building: and (3) the Unit 1 d-c bus "D01". The battery and battery charger operate in parallel continuously. The Unit 1 d-c bus may be connected to the switchyard d-c bus by manual throwover switch. Three sources of a-c power are available for the battery charger. These are : (1) the auxiliary power transformers on the 22 kV bus; (2) the plant 480 V load center bus "B3"; and (3) the plant 480 V engineered safeguard bus "B6".

The switchyard d-c control bus is isolated from ground, the detectors are provided to alarm when a ground exists on either side of the bus. All equipment will function properly when one side of the d-c bus is grounded. If the battery charger fails, the battery will carry the switchyard d-c load without interruption for a minimum of eight hours.

The high voltage systems are protected from lightning and switching surges by lightning protection equipment and by overhead electrostatic shield wires. System stability is maintained on simultaneous tripping of the main generators of Units 1 and 2.

System studies have been conducted to test the performance of the Arkansas Power & Light Company/Middle South Utilities System in both the steady-state mode and under transient conditions. The conditions studied included, but were not limited to: outages of multiple circuit lines using common towers; coincidental, but not simultaneous, loss of one transmission line and one generator, loss of two generators, or loss of two transmission lines.

The results of these studies indicate that under steady-state conditions no loss of power would occur; and adequate system voltage and acceptable loading of equipment would be maintained. Under the transient conditions, the studies indicate that the system is transiently stable and no loss of power or cascading type conditions would occur.

As of this date, there have been five loss of offsite power events that have affected plant operation. Four events were initiated by natural phenomena and one event was initiated by an engineering error. The longest time offsite power has been lost is 55 minutes which is more than twice the duration of the second longest event. We therefore conservatively conclude that should offsite power be lost, it would be restored within two hours following the initiating event.

The most probable occurrence which would instigate the loss of all AC power would be one of natural phenomena such as a tornado or lightning. The phenomenon would of course initiate the event by the loss of offsite power followed by the failure of both diesel generators. However, the ANO operating procedures were modified after offsite power on April 7, 1980, as a result of tornado damage. Both units are now required to start at least one diesel generator per unit whenever the plant is included in an area under a tornado warning. If one diesel generator and the redundant diesel generator should fail to start, there should be sufficient time for preparation and corrective action prior to the loss of offsite power.

The offsite and onsite power sources at ANO are designed in compliance with 10CFR50, Appendix A, General Design Criterion 17. This criterion provides for electrical and physical separation of the onsite and offsite power sources. Therefore, a malfunction of the onsite power circuitry will not induce a loss of offsite power.

Each unit at Arkansas Nuclear One is equipped with two emergency diesel generators which are tested monthly in accordance with their respective technical specifications. If one of the ANO-1 diesel generators is inoperable for seven days in any one month, the availability of the other diesel generator is demonstrated immediately and daily thereafter during the 7-day period in accordance with the ANO-1 technical specifications. It further states that in the event that one of the offsite power sources is inoperable, reactor operation may continue for up to 24 hours if the availability of the diesel generators is immediately verified. The ANO-2 technical specifications state that with either an offsite circuit or a diesel generator inoperable, the operability of the remaining AC power sources is demonstrated within one hour and at least once per 8 hours thereafter. If the diesel generator or the offsite circuit is not restored to an operable status within 72 hours, the unit will be in hot standby within the next 6 hours and in cold shutdown within the following 30 hours.

In addition to the emergency diesel generators, the onsite power system for each unit is further enhanced by redundant DC powered batteries. The batteries are designed to supply DC power to all ESF equipment necessary for the safe shutdown of the unit for a minimum of two hours following the loss of all AC. Besides supplying power to the ESF equipment, the batteries also supply power for emergency lighting. In our letter of March 19, 1981, we stated that we plan to install independent emergency lighting units in areas of the plant needed for operation of safe shutdown equipment. Also, handheld units are available for emergency lighting.

ANO-2 is presently equipped with a DC operated emergency feedwater train. Unit 1 is scheduled for an outage this September to install a DC powered emergency feedwater train. This system will provide the necessary heat removal capability during the station blackout as natural circulation of the reactor coolant would be provided by the heat removal process. The loss of component cooling water will not adversely affect the emergency feedwater system or the integrity of the reactor coolant pressure boundary.

We concur with your position that there appears to be sufficient time available to restore AC power following a station blackout. However, in the unlikely event of a complete station blackout, Arkansas Nuclear One should be able to mitigate the effects of the postulated event.

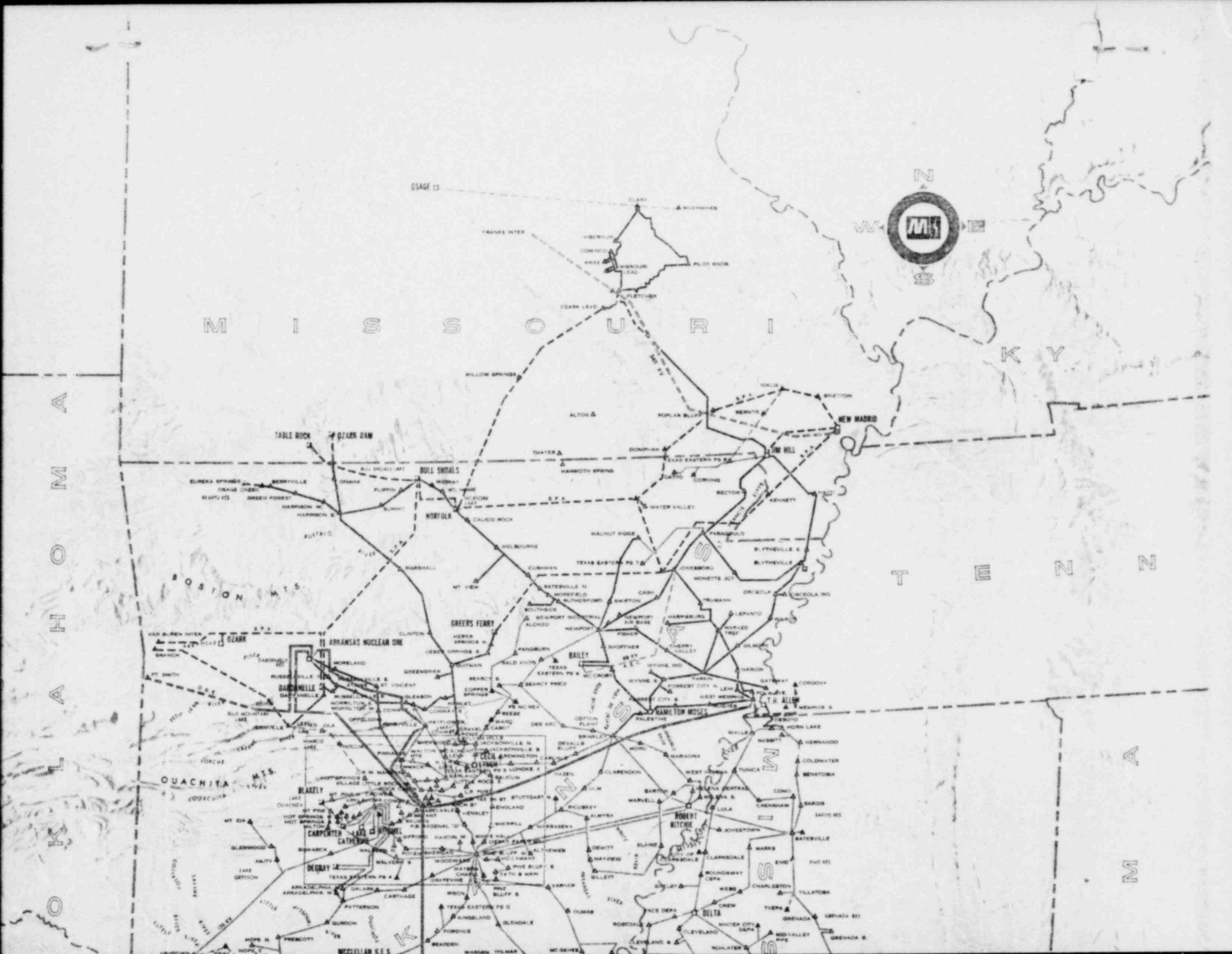
Very truly yours,

David C. Trimble

David C. Trimble
Manager, Licensing

DCT:PMH:sl

Attachments



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OZARK DAM
BULL SHOALS
NORFOLK
GREERS FERRY
ARKANSAS NUCLEAR ONE
DARDANELLE
OZARK
BOSTON MTS.
OUACHITA MTS.
BLAKELY
CARPENTER
DEGRAY
BAILEY
HAMILTON MOSES
T.H. ALLEN
ROBERT RITCHIE
DELTA
McCLELLAN S.E.S.

Figure 1.

THE MIDDLE SOUTH UTILITIES SYSTEM

ARKANSAS POWER & LIGHT CO. • ARKANSAS-MISSOURI POWER CO. • LOUISIANA POWER & LIGHT CO.
MISSISSIPPI POWER & LIGHT CO. • NEW ORLEANS PUBLIC SERVICE INC. • MIDDLE SOUTH SERVICES INC.

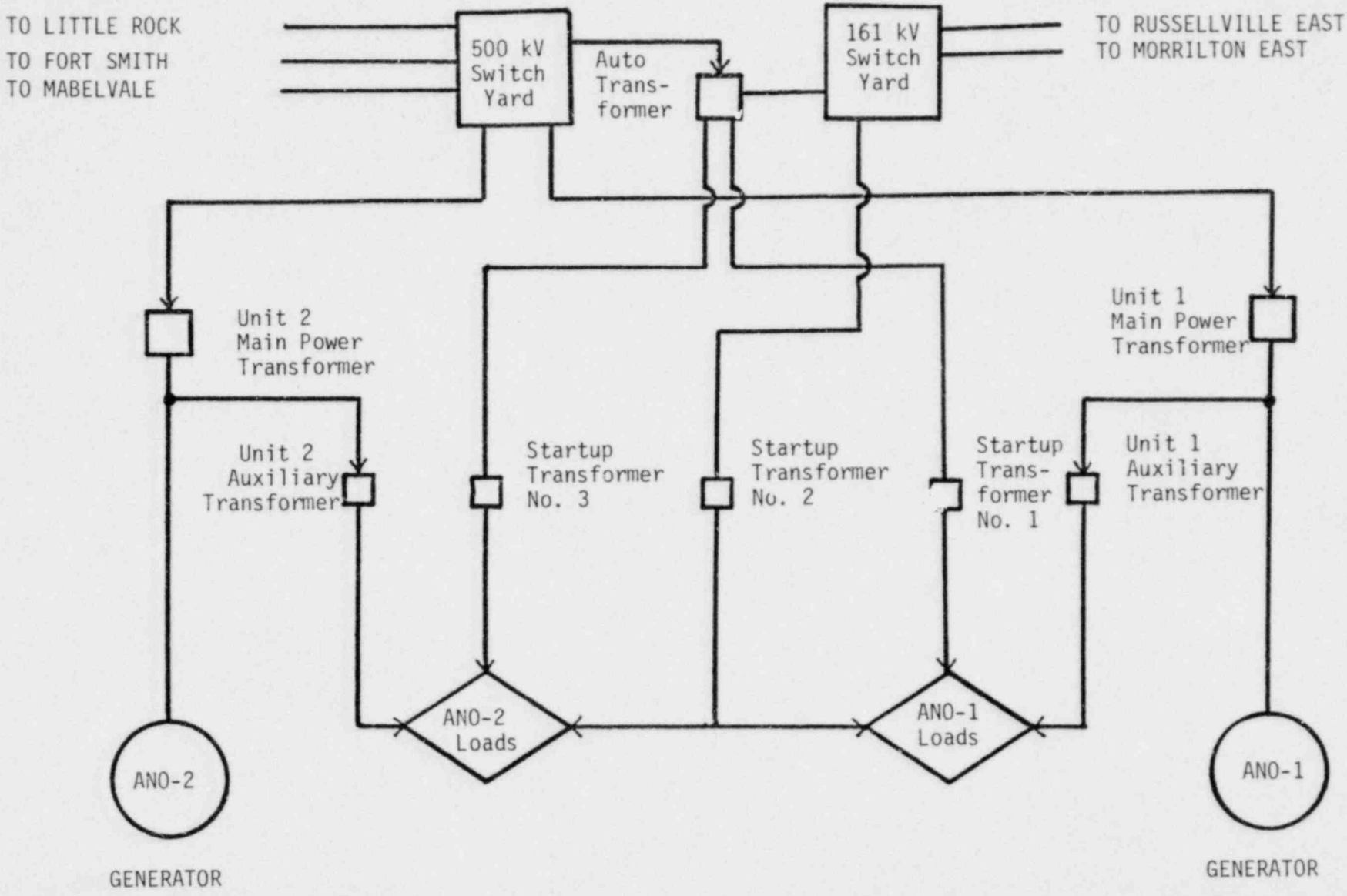

FIGURE 2. ARKANSAS NUCLEAR ONE SWITCHYARD

STATE OF ARKANSAS)
) SS
COUNTY OF PULASKI)

I, DAVID C. TRIMBLE, being duly sworn, subscribe to and say that I am the Manager of the Licensing Section, for Arkansas Power & Light Company; that I have full authority to execute this oath; that I have read the foregoing Letter No. ØCANØ78lØ7 and know the contents thereof; and that to the best of my knowledge, information and belief the statements made in it are true.

David C. Trimble
DAVID C. TRIMBLE

SUBSCRIBED AND SWORN TO before me, a Notary Public in and for the County and State above named, this 21 day of July, 1981.

Glenroy A Charles
NOTARY PUBLIC

MY COMMISSION EXPIRES:

12-20-82