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Alabama Power
the southern electric system

February 17, 1984

Docket Nos. 50-348
50-364

Director, Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attention: Mr. S. A. Varga

Joseph M. Farley Nuclear Plant - Units 1 and 2
Proposed Technical Specification Change

Gentlemen:

Pursuant to the commitments made by Alabama Power Company in the January 20, 1984 meeting with the NRC staff, this letter transmits a revised proposed technical specification change request for the Rod Control System at Farley Nuclear Plant - Units 1 and 2.

Attachment 1 contains a detailed description of the Rod Control System, the proposed technical specification change and justifications for the change. Attachment 2 is the proposed changed technical specification pages.

These proposed changes do not involve a Significant Hazards Consideration as defined in 10CFR50.92. These changes are similar to example (iv) of "Examples of Amendments that are Considered Not Likely to Involve Significant Hazards Considerations" listed in 48FR14870 dated April 6, 1983. These proposed changes are similar in that these changes request relief from an operational restriction which can now be lifted based upon previous NRC staff review.

The Plant Operations Review Committee has reviewed this proposed change. The Nuclear Operations Review Board will review this proposed change at a future meeting. Westinghouse Corporation has reviewed and concurred with the intent of this change.

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This proposed technical specification change is considered to be a Class III Amendment for Unit 1 and Class I Amendment for Unit 2 pursuant to 10CFR170.22. Since the previous request (March 4, 1983) was denied, a check for this revised change request in the amount of $4,400.00 is enclosed.

Pursuant to 10CFR50.90 three (3) signed originals and 40 conforming copies of this proposed change are enclosed. Pursuant to 10CFR50.91 (b) we have provided a copy of this letter and its attachments to Dr. I. L. Myers the designated representative of the State of Alabama.

If you have any questions, please advise.

Yours truly,

F. L. Clayton, Jr.

FLCJr/CJS:grs-D2
Attachments
cc: Mr. R. A. Thomas
Mr. G. F. Trowbridge
Mr. J. P. O'Reilly
Mr. E. A. Reeves
Mr. W. H. Bradford
Dr. I. L. Myers

SWORN TO AND SUBSCRIBED BEFORE ME

THIS 17th DAY OF February 1984

Linda Humber
Notary Public

My Commission Expires: 1-10-87

bc: Mr. W. O. Whitt
Mr. R. P. McDonald
Mr. H. O. Thrash
Mr. O. D. [illegible]ngsley, Jr.
Mr. W. G. Hairston, III
Mr. J. W. McGowan
Mr. C. D. Nesbitt
Mr. R. G. Berryhill
Mr. D. E. Mansfield
Mr. J. A. Ripple
Mr. W. G. Ware
Mr. L. B. Long
Mr. B. J. George
Mr. J. R. Crane
Mr. K. C. Gandhi
Reference Listing

Attachment 1

Description of the Proposed Change to the Rod Control System Technical Specification

I. Background Information

By letters dated March 4 and July 8, 1983 Alabama Power Company requested a change to Technical Specification 3/4.1.3. The purpose of this change was to permit adequate time for the diagnosis and repair of electrical problems in the Rod Control System (non-safety related) before a shutdown would be required. By letter dated September 21, 1983 the NRC denied Alabama Power Company's request.

On January 20, 1984 Alabama Power Company held a meeting with the NRC in Bethesda, Maryland to provide in-depth information on the Rod Control System and how symptoms and diagnostic procedures can provide the plant operators with the ability to discriminate between Rod Control System electrical malfunctions (which are not safety significant) and mechanical binding of the control rods. Pursuant to the NRC request in the meeting, Alabama Power Company is formally submitting the material provided to the NRC Staff at the meeting. In addition, Alabama Power Company has revised the proposed technical specification request of March 4, 1983 to be consistent with the meeting conclusions.

II. Proposed Technical Specification Change

It is proposed that Technical Specification 3.1.3.1 be revised to permit 36 hours for the performance of diagnostic procedures to determine the source of inoperability of the control rod(s) due to electrical problems and repair of the Rod Control System prior to orderly shutdown.

III. Justification for the Proposed Change

A. Rod Control System Description

1) Arrangement of Mechanisms

The Farley Nuclear Plant is a three loop plant with forty-eight (48) full length rod drive mechanisms arranged into banks and groups. A typical bank and group arrangement is shown in Figure 1. A group consists of four mechanisms that are electrically paralleled to step simultaneously. A bank of mechanisms consists of two (2) groups that are moved in staggered fashion such that the groups are always within one step of each other. The arrangement includes two (2) shutdown banks, A and B, and four (4) control Banks A, B, C and D. Control banks are moved in overlap in the following withdrawal sequence: When Control Bank A reaches a predetermined height in the top half of the core, Control Bank B starts to move out with A. Control Bank A stops at the top of the core and Bank B continues until it reaches a predetermined height in the top half of the core when Control Bank C starts to move out with B. This sequence continues until all rods are withdrawn. The insertion sequence is the opposite of the withdrawal sequence.

2) Main Control Room Controls

Controls for the Rod Control System located in the Main Control Room are listed in Figure 2. The In-Hold-Out lever is used for manual rod motion and is located on the Main Control Board. Also, on the Main Control Board is a Bank Selector Switch with eight (8) positions. In the manual position, control banks are moved from the In-Hold-Out lever in overlap. Control banks are moved in overlap by the automatic Tavg control system with the switch in the auto position. Six (6) additional positions are provided for individual bank movement.

Step counters, one for each group, are located on the Main Control Board to display demanded rod position. A Digital Rod Position Indication System, not connected to the Rod Control System, is used to display actual rod position and is used in conjunction with the step counters to determine deviation between demanded and actual position.

In-out lights show the request for rod motion from either the In-Hold-Out lever or the Automatic Tavg Control System. A startup pushbutton is provided to reset the step counters and all internal system counters such as the bank overlap counter on startup. An alarm reset pushbutton resets internal system failure detectors and alarms which include a seal-in feature. Lift coil disconnect switches, one for each mechanism, are provided to assist in retrieval of a dropped rod.

Two (2) annunciators are located on the control board: a Rod Control Urgent Failure and a Rod Control Non-Urgent Failure Alarm. The Rod Control Urgent Failure Alarm indicates that a control system failure has occurred that would affect the ability of the control system to move rods. A Rod Control Non-Urgent Failure Alarm indicates failure of one or more redundant power supplies that feed the system printed circuit cards.

3) Basic Thyristor Bridge Control Circuit

Three (3) thyristors forming a half wave phase controlled bridge supply current to four (4) mechanism coils (either lift, movable, or stationary gripper) as shown in Figure 3. Current feedback signals from shunts in series with each coil are used to regulate the current commanded by a slave cycler located in the system logic cabinet.

4) Power Cabinet Power Circuits

Five (5) thyristor bridges form one system power cabinet as shown in Figure 4. Four (4) power cabinets are used in the system. The power cabinet amplifies low level command signals from a slave cycler in the logic cabinet. One (1) power cabinet drives three (3) groups of four (4) mechanisms and is capable of moving one (1) group while holding the other two (2) in position. The selection as to which group is to move is made with multiplexing thyristors, one (1) for each group of movable coils and one (1) for each lift coil. The lift coil multiplexing thyristors also serve as lift disconnect switches for retrieving a dropped rod.

5) System Block Diagram

Four (4) power cabinets are supplied with power from two motor generator sets normally operating in parallel through two reactor trip breakers in series as shown in Figure 5. The logic cabinet includes a pulser, master cycler, bank overlap unit, and four (4) slave cyclers. The pulser determines the speed of rod motion (1) as directed by the reactor Tavg control system when automatic operation is selected or (2) by a preset speed when manual operation is selected. The master cycler directs pulses from the pulser alternately to the slave cyclers for the two (2) groups in a bank. Selection of which bank or banks are to move is done by the bank overlap unit. The slave cycler sequences the mechanism coils through one (1) step, either in or out for each "go" pulse from the master cycler. A DC hold cabinet is provided to allow replacement of printed circuit cards in the power cabinet while the plant is in operation.

B. Rod Control System Diagnostic Features

1) Failure Detection and Alarms

A Rod Control Urgent Failure Alarm is actuated by five (5) failure detectors in each power cabinet or by three (3) failure detectors in the logic cabinet as shown in Figure 6. A Rod Control Urgent Failure Alarm stops automatic rod motion and permits manual movement of a selected bank if the logic cabinet and the two (2) power cabinets associated with the selected bank are not in urgent alarm.

Detection of a failure by a failure detector results in the following indications:

a. A failure detector lamp, one for each type of failure, located on the edge of a printed circuit card in the failed cabinet is energized.

b. A red urgent failure lamp on the front of the failed cabinet is energized.

c. A "Rod Control Urgent Failure Alarm" annunciator in the Main Control Room is actuated.

A Rod Control Non-Urgent Failure Alarm indicates failure of one (1) of a number of redundant power supplies and does not effect the operation of the system.

2) Effect of Mechanism Mechanical Failure on Control System

The Rod Control System operates independently of the rod drive mechanisms. Nothing has been included in the system, either by design or inadvertantly, to allow it to see movement of the mechanism mechanical parts, the drive shaft or rod control clusters; therefore, mechanical binding would not be detected by or cause a Rod Control System alarm. This has been verified many times during factory checkout of completed systems where the test loads consist only of simulated mechanism coils with iron pipes in the center to approximate the magnetic properties of the coils. Checkout of the Rod Control System at the sites are generally done during Hot Functional Testing with only the mechanism coils connected and no reactor core, rods, or drive shafts in place.

3) How to Distinguish Between Control System and Mechanism Problems

Based on the previous discussion and Figure 7, a Rod Control Urgent Failure Alarm must be the result of a control system failure and cannot be related to a mechanically inoperable rod or rods. There are failures that do not result in a Rod Control Urgent Failure Alarm that could prevent one or more rods from moving. In this case, the problem can be traced to either the control system or mechanism by monitoring the mechanism coil currents. Built-in test points are located in the power cabinets for this purpose. If the control system will not vary the currents to the mechanism coils, the problem must be in the control system and not the mechanisms. If the control system varies currents to the coils, then the mechanism may be suspect. Grossly abnormal currents would indicate control system problems and mildly abnormal currents would indicate mechanism problems. Recordings of the currents would have to be studied in this event. Whatever the cause of the inability to move control rods, repair or shutdown consistent with existing technical specifications would be initiated.

C. Process for Identifying Root Cause of Rod Control System Malfunctions

1) Troubleshooting and repair of Rod Control System malfunctions require adequate time to systematically implement diagnostic procedures to identify the malfunction and its root cause as well as repair the system.

Replacement of many, but not all, components in the logic and power cabinets is possible while maintaining all rods in a fixed position; however, determination of which components can be replaced takes a thorough analysis of that component's functions in the system and should not be done hurriedly. The following typical sequence of events should occur for a major rod control problem in which no rods are dropped but a ROD CONTROL URGENT FAILURE ALARM is received:

a. Initiate planning which results in I&C personnel inspecting cabinets and determining which cabinet has the problem. Estimated time is 2 hours.

b. I&C supervisory personnel are notified (back shifts and week-ends), travel to site, and are briefed on initial findings - estimated time 2 hours.

c. Procedure for more detailed troubleshooting is implemented. Estimated time is 12 hours.

d. Westinghouse rod control experts are contacted by telephone for additional technical assistance based on results of step c above and anticipatory repair efforts are planned. Problem is located. Estimated time is 6 hours.

e. Repair parts, if not available on-site, are placed on emergency order and flown to site. Estimated time is 12 hours.

f. Repair is made and system is functionally tested by stepping affected rods. Estimated time is 2 hours.

D. Conclusion

The proposed change is considered to increase the margin of safety. Thirty-six hours to diagnose and repair electrical problems will prevent hurried, and therefore less safe, diagnosis of malfunctions other than rod misalignment or mechanical binding in the non-safety related Rod Control System. Insufficient time (i.e., 6 hours permitted by existing technical specifications) to find the root cause of a malfunction necessitates treating symptoms as opposed to implementing permanent solutions. This change would minimize the potential for dropped or misaligned rods or any further Rod Control System malfunctions as a result of inadequate time for proper diagnostic test procedure performance. The additional time will also permit the operating personnel more flexibility in voluntary investigations of suspected rod control system problems.

The proposed change does not increase the probability or consequences of accidents previously evaluated because control rods will remain trippable thereby maintaining shutdown margin. In addition, the power distribution will continue to be regulated by other existing technical specifications during the proposed 36 hours allowed for testing and repair of the Rod Control System.

The proposed change does not create the possibility of a new or different kind of accident previously evaluated, rather, it allows sufficient time for licensee personnel to perform orderly maintenance thereby minimizing the potential for human error in the diagnosis and repair of rod control malfunctions. Alabama Power Company and Westinghouse do not feel that the 36 hour period permitted for troubleshooting and repair constitutes a decrease in plant safety.

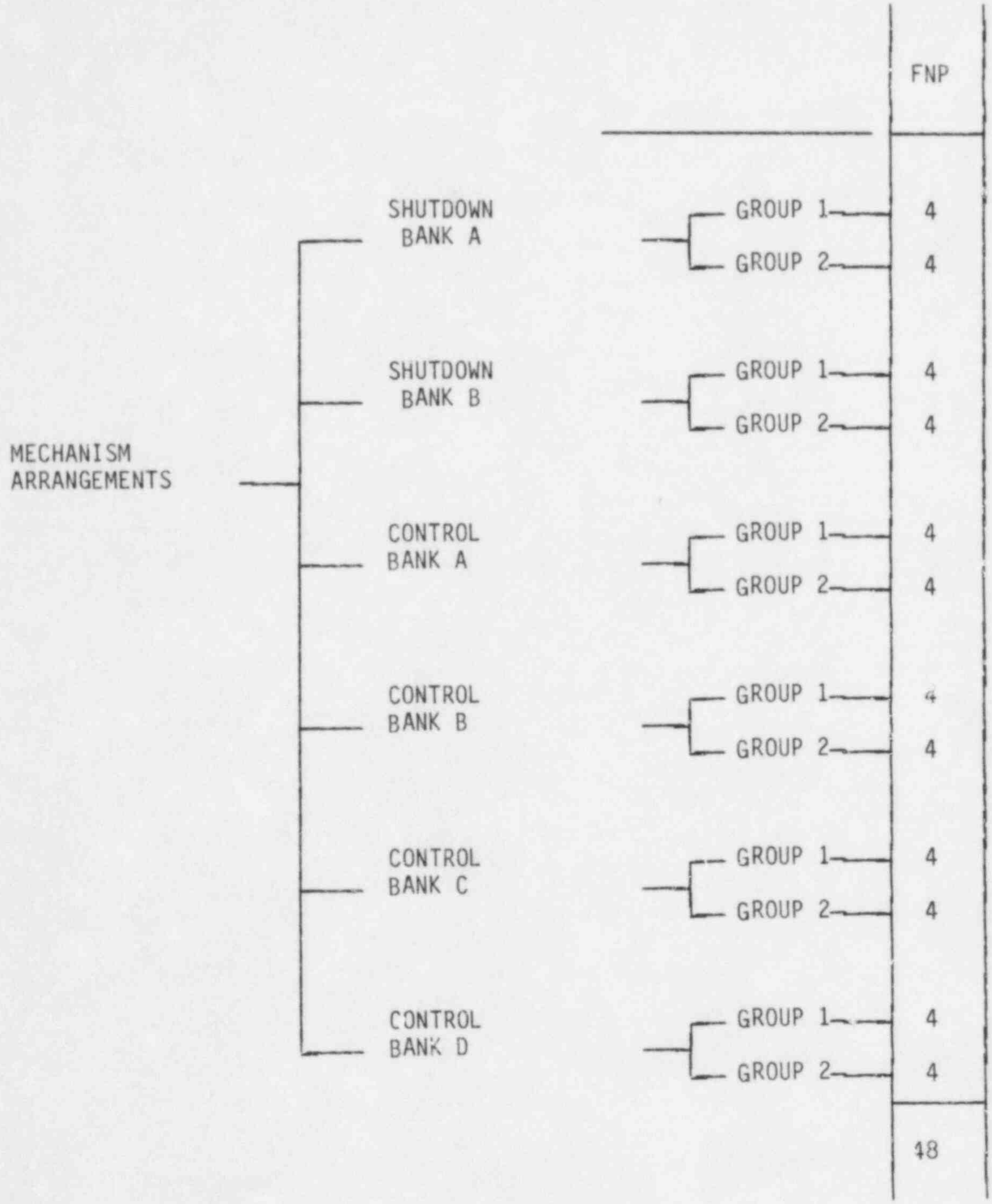

Figure 1. FNP Arrangements of Mechanism Banks and Groups

MAIN CONTROL ROOM CONTROLS

- o IN-HOLD-OUT LEVEL
- o BANK SELECTOR SWITCH
    - MANUAL
    - AUTO
    - SHUTDOWN BANK A, B
    - CONTROL BANK A, B, C, D
- o STEP COUNTERS
    - SHOW DEMANDED POSITION
- o IN-OUT LIGHTS
- o STARTUP PUSHBUTTON
- o ALARM RESET PUSHBUTTON
- o LIFT COIL DISCONNECT SWITCHES
- o ANNUNCIATORS
    - ROD CONTROL URGENT ALARM
    - ROD CONTROL NON-URGENT ALARM

FIGURE 2

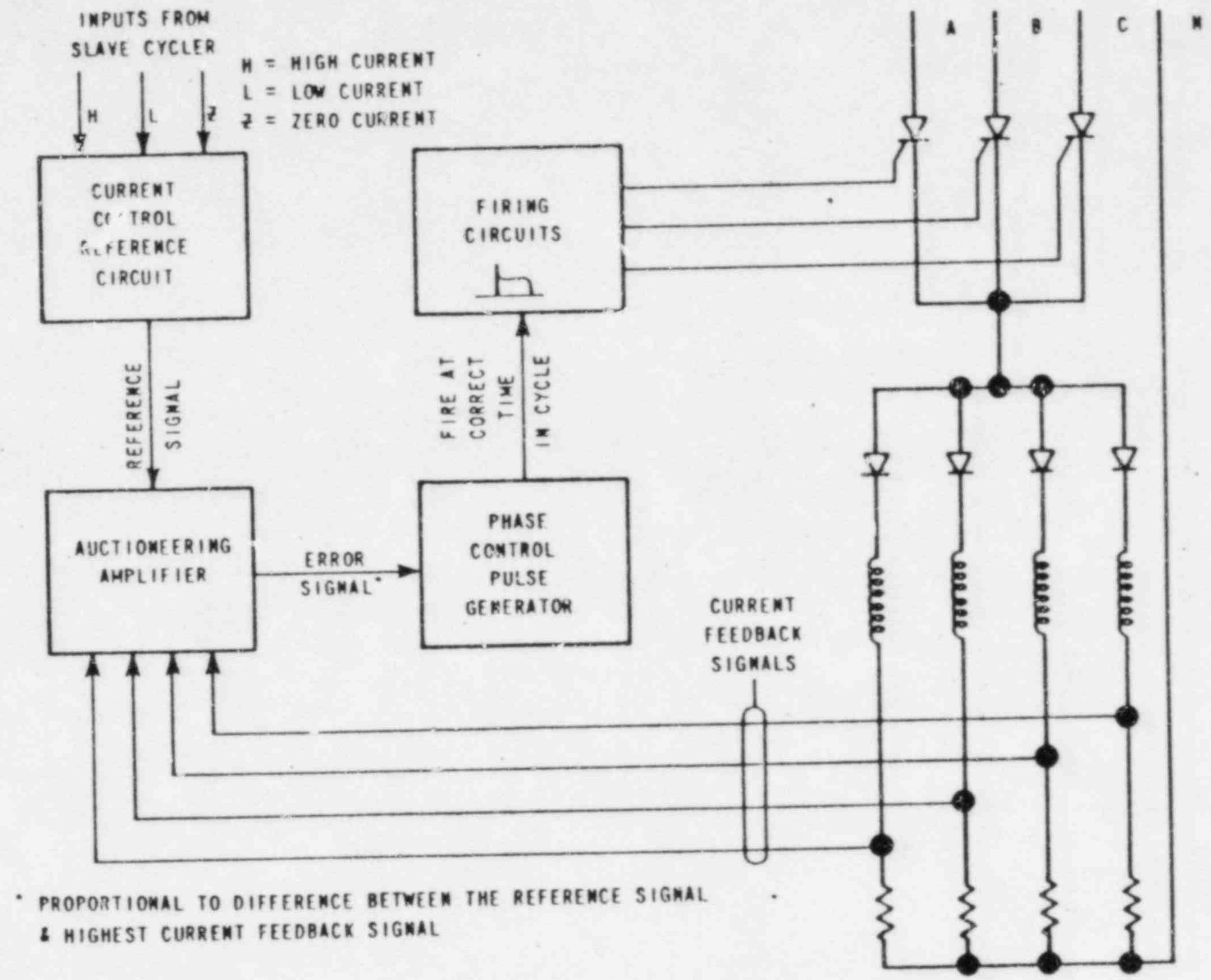

Figure 3. Thyristor Bridge Control Circuit

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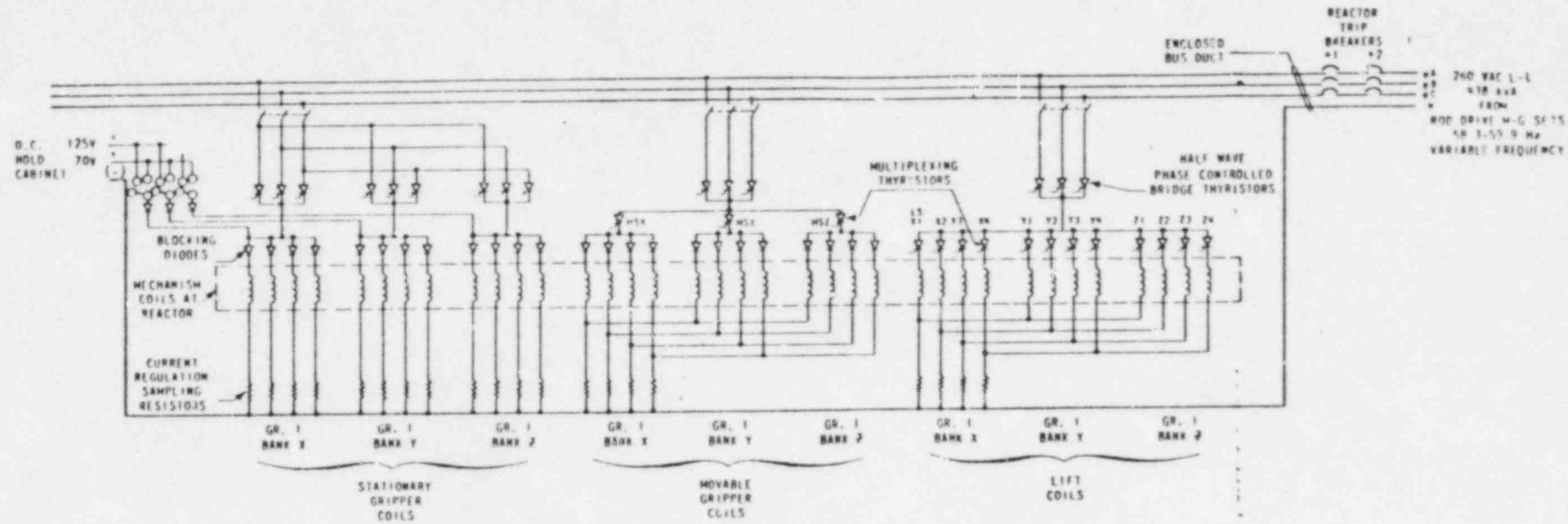

Figure 4 Solid State Power Cabinet
Simplified Power Circuit
(Control Circuits Not Shown)

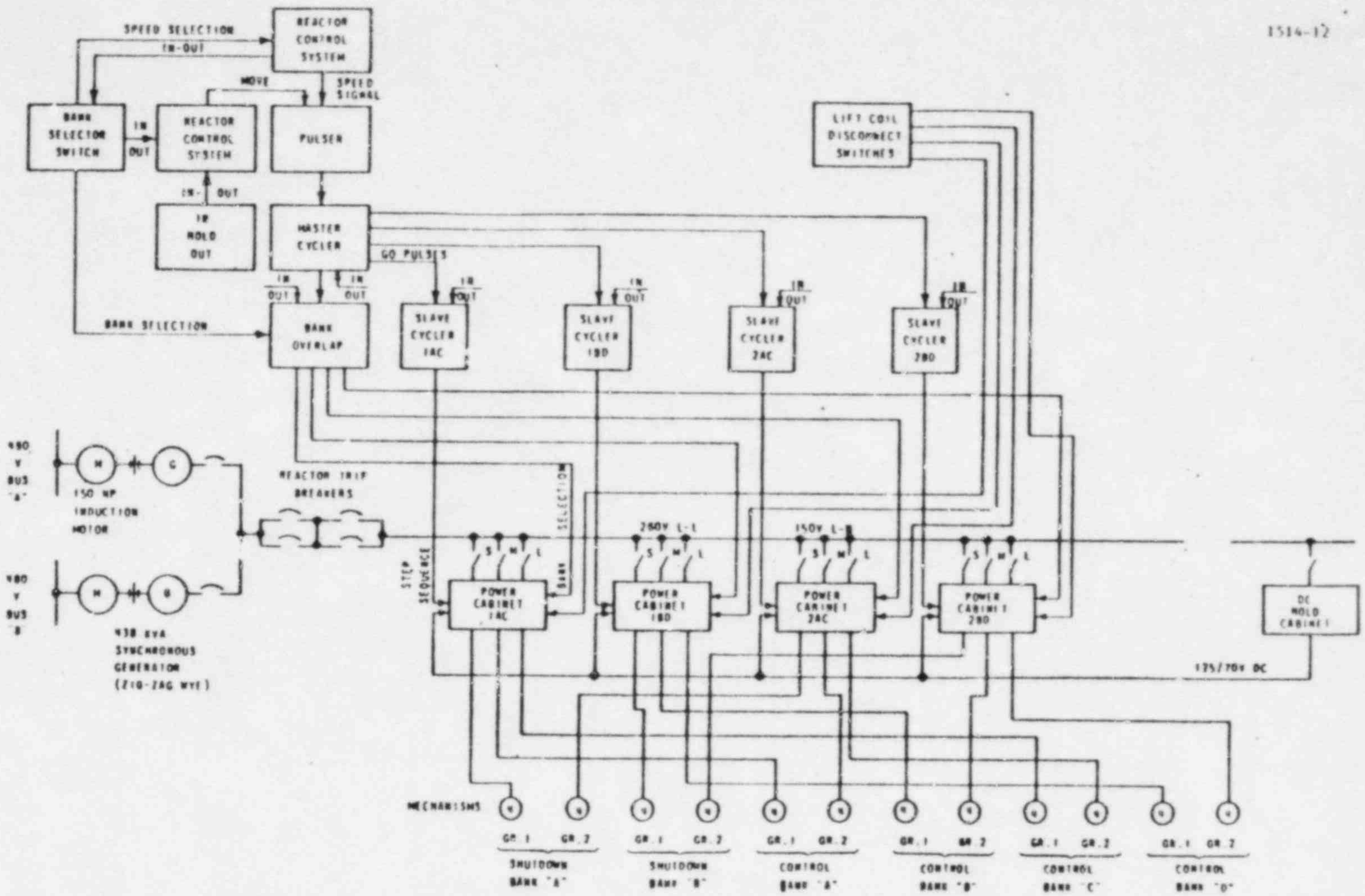

Figure 5. Block Diagram of 3-Loop Plant Rod Control System

URGENT ALARM - POWER CABINET

- o REGULATION FAILURE
- o PHASE FAILURE
- o LOGIC ERROR
- o MULTIPLEXING ERROR
- o CARD MISSING

URGENT ALARM - LOGIC CABINET

- o SLAVE CYCLER RECEIVES A GO PULSE DURING A STEP
- o OSCILLATOR FAILURE
- o CARD MISSING

URGENT ALARM EFFECT ON SYSTEM

- o AUTOMATIC ROD MOVEMENT IS STOPPED
- o MANUAL MOVEMENT OF SELECTED BANK IS PERMITTED IF LOGIC CABINET AND POWER CABINET ARE NOT IN URGENT ALARM

NON-URGENT ALARM - LOGIC OR POWER CABINET

- o REDUNDANT POWER SUPPLY FAILURE

FIGURE 6

HOW TO DISTINGUISH BETWEEN CONTROL SYSTEM AND MECHANISM PROBLEMS

- URGENT ALARM - MUST BE CONTROL SYSTEM FAILURE

- NO URGENT ALARM, ONE OR MORE RODS WON'T MOVE
  - MONITOR COIL CURRENTS
  - CONTROL SYSTEM WON'T VARY CURRENTS - PROBLEM MUST BE IN CONTROL SYSTEM
  - CONTROL SYSTEM VARIES CURRENT TO COILS NORMALLY - SUSPECT MECHANISM
  - CURRENTS ABNORMAL
    - GROSSLY ABNORMAL - SUSPECT CONTROL SYSTEM
    - MILDLY ABNORMAL - SUSPECT MECHANISM

FIGURE 7