GULF STATES UTILITIES COMPANY
POST OFFICE BOX 2951 · BEAUMONT, TEXAS 77704
AREA CODE 713 838-6631

October 1, 1984
RBG- 19072
File Nos. G9.5, G9.33.4

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

Dear Mr. Eisenhut:

River Bend Station - Unit 1
Docket No. 50-458
Generic Letter 83-28

In a letter dated August 3, 1984, Gulf States Utilities Company (GSU) committed to respond to Section 1.2 of Generic Letter 83-28 "Required Actions Based on Generic Implications of Salem ATWS Events".

Attached please find forty (40) copies of GSU's interim response to Section 1.2 of Generic Letter 83-28. A final response to Section 1.2 regarding River Bend's Post Data Recall program variables will be provided by February 4, 1985.

The response to Sections 3.1 and 3.2 of Generic Letter 83-28 will be provided prior to fuel load as previously indicated in the August 3, 1984 letter.

Should you have any questions feel free to contact us.

Sincerely,

J. E. Booker

J. E. Booker
Manager-Engineering,
Nuclear Fuels & Licensing
River Bend Nuclear Group

JEB/LAE/MWH/lp

A055
1/40

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

STATE OF TEXAS	§	
COUNTY OF JEFFERSON	§	
In the Matter of	§	Docket Nos. 50-458
GULF STATES UTILITIES COMPANY	§	
(River Bend Station, Unit 1)		

AFFIDAVIT

J. E. Booker, being duly sworn, states that he is Manager-Engineering Nuclear Fuels, and Licensing; that this position requires him to submit documents to the Nuclear Regulatory Commission in behalf of Gulf States Utilities; that the documents attached hereto are true and correct to the best of his knowledge, information and belief.

J E Booker
J. E. Booker

Subscribed and sworn to before me, a Notary Public in and for the State and County above named, this 1 day of October, 1984.

Notary Public in and for
Jefferson County, Texas

My Commission Expires:

1-11-86

GULF STATES UTILITIES
RIVER BEND STATION

RESPONSE TO SECTION 1.2 OF GENERIC LETTER 83-28 "REQUIRED ACTIONS BASED ON GENERIC IMPLICATIONS OF SALEM ATWS EVENTS"

OCTOBER 1, 1984

SECTION 1.2

POST TRIP REVIEW
(Data and Information Capability)

Items 1.2.1.1 - 1.2.1.6

At River Bend, two systems, the Performance Monitoring System (PMS) and the Emergency Response Information System (ERIS) are used to record, collect and display data and information needed to correctly diagnose causes of unscheduled reactor shutdowns and to provide adequate information to monitor the function of safety-related equipment during these events. Both systems, the PMS and ERIS, are powered by non-Class 1E, uninterruptable power supplies.

I. The PMS performs the functions and calculations necessary for the effective evaluation of nuclear power plant operation. The functions performed include monitoring of process variables such as temperature, pressure, flow, level, status indicators, etc., performing calculations on those variables, and presenting the inputs and calculated results to plant personnel. The PMS can be functionally divided into three main subsystems. They are (a) Process Interface, (b) Man-Machine Interface, and (c) Central Processing System. (See Figure 1.2-1)

   (a) Process Interface. The process interface subsystem performs the function of interfacing plant instrumentation with the Central Processing System. Process interface hardware and software receives signals from plant instrumentation, signal conditions the measurements, converts analog signals to digital and makes the data available to the Central Processing System for scanning. Process interface hardware consists of field sensors and remote and local controllers.

   (b) Man-Machine Interface. The Man-Machine interface subsystem performs the function of interfacing the Central Processing System (CPS) with plant personnel. Interface is provided in the form of CPS to personnel (Output Interface) and personnel to CPS (Input Interface). Man Machine Interface hardware consists of one or more of the following:

      a. Display devices - CRTs, etc.

      b. Hard copy output devices - printers, copiers, typers.

      c. Input devices - keyboards, etc.

(c) Central Processing System

General. The functions performed by the Central Processing System can be divided into two categories (1) Operating System functions, and (2) Application System functions. Central Processing System hardware consists of one central processing unit, memory, data transfer controllers, and mass storage devices.

Operating System. The operating system is that portion of the Central Processing System which controls the operation of the PMS. Operating system functions include scanning of process variables, control of memory use, control of data transfer, and monitoring of peripheral devices for failure.

Application System. The Application System is that portion of the Central Processing System which processes inputs from the plant into meaningful indications of plant performance and provides a method of presenting the results to plant personnel.

The capability for assessing sequence of events (SOE) is provided through the Sequence Annunciator function of the application system. The PMS software used to implement the SOE functions is furnished as an SOE log program. During operating conditions, upon detection of a status change of any of the 256 BOP and NSSS preselected sequential event contacts, the sequence of event log is initiated. When 64 contact changes have been collected or 30 seconds have elapsed since the first detected change the log is automatically printed. Once initiated, the SOE log will continue as long as events remain to be printed. This SOE log takes precedence over any other alarms and messages occuring at the same time.

Primary input variables monitored by the Sequence Annunciator are:

1. Average Power Range Monitor (APRM) Neutron Flux Trip
2. Intermediate Range Monitor (IRM) Upscale Trip on Level
3. APRM Simulated Thermal Power Trip
4. Discharge Volume High Water Level
5. Reactor Neutron Monitor System Trip
6. Reactor Manual Scram
7. Reactor Auto Trip/Scram
8. Turbine Control Valve Fast Closure
9. Turbine Stop Valve Closure
10. Turbine Bypass Valve
11. Main Steamline High Radiation
12. Reactor Vessel Low Water Level
13. Reactor Vessel High Water Level
14. Main Steamline Isolation Valve Closure
15. Reactor Vessel High Pressure

16. Safety Relief Valve
17. Drywell High Pressure
18. RHR/ADS High Drywell Pressure
19. LPCS/RHR/ADS High Drywell Pressure
20. RHR/ADS 3 Low Reactor Water Level
21. LPCS/RHR/ADS 3 Low Reactor Water Level
22. RHR Pump Motor Breaker
23. RHR Loop Pressure
24. RHR Loop Flow
25. LPCS Pump Motor Breaker
26. LPCS Loop Pressure
27. LPCS Loop Flow
28. HPCS High Drywell Pressure
29. HPCS 2 Low Reactor Water Level
30. HPCS Pump Motor Breaker #2
31. HPCS Loop Pressure
32. HPCS Loop Flow
33. Recirc Pump Trip (Trip System A,B)
34. Recirc Pump Trip (Division I, II, III, IV)

These variables were chosen based on accident analysis outlined in River Bend FSAR Chapter 15.

The format of the SOE data, as printed on the SOE log, will consist of entries under the following column divisions:

a. TIME - hour, minute, second, millisecond
b. POINT ID - unique identification number
c. CODE DESCRIPTION - description of variable
d. STATUS - nature of variable

Chronological order shall be correctly resolved for all events that occur four milliseconds or more apart. A listing of events are retained in memory until the SOE log is terminated, at which time the listing is printed out.

II. The ERIS is also designed to provide the capability for assessing sequence of events. The ERIS is an integrated system that gathers required plant data, stores and processes that data, generates visual displays for the operator and other personnel who need plant status information, and provides printed records of transient events. The major functions of the ERIS are (a) data acquisition, (b) system data processing, and (c) system operator interface. System functional flow and configuration for the ERIS is illustrated in Figures 2.2-2 and 2.2-1 respectively.

(a) Data Acquisition System. (DAS). The DAS interfaces with existing plant sensors or devices, converts the acquired signals to digital data, and performs some pre-processing of the data before passing it on to the central processor

contained within the system data processing system and subsystems.

(b) System Data Processing. The System Data Processing System and subsystems receive from or transmit data to the data acquisition subsystem, perform necessary calculations and manipulations, store data and provide processed data to the system operator interface.

(c) System Operator Interface. The System Operator Interface subsystem consists of graphic display units, printers/plotters and input devices which provide an interface between the operator and the data acquisition and system data processing subsystems of the ERIS.

To accomplish these functions, two major subsystems are used, the Real Time Analysis for Display (RTAD) subsystem which provides for the function of automatic reporting and display of real time plant parameters for current user requests and the Transient Recording and Analysis (TRA) subsystem which performs the data analysis function and provides printed records of transient events. Both the RTAD and the TRA are used to assess SOE.

The RTAD is used to assess system real-time dynamics that relate to SOE. The RTAD determines the validation status of critical plant variables. These values are stored and used to generate displays for plant operations. The RTAD indicates each event is one of five status: inactive, safe, bad data, caution, and alarm. Among the status indications are the following:

Safety Relief Valve (SRV) open
Main Steam Isolation Valve (MSIV) shut
Group Isolated
Scram
Diesel Generator Operation

The TRA is used to assess system transients relative to SOE. The TRA characteristics relating to SOE may be divided into two functions. They are (1) the sentinel trigger processing function, and (2) the sequence of events function.

The sentinel trigger processing function provides signal surveillance and recording. The sentinel processing mode is intended to permit recording during planned or unplanned events/transients. The recording of preselected process signals is initiated by a change in the trigger variables. The operator shall have the capability of selecting sentinels (triggers), change values and define plan(s) for sentinel recording. The following is River Bend's current sentinel trigger list. Additional variables may be added in the future.

Variable

1. Reactor Scram
2. Reactor Isolation
3. All Feedpumps Tripped
4. All Condensate Booster Pumps
5. All Condensate Pumps Tripped
6. All Circ Water Pumps Tripped
7. Condenser Vacuum
8. Condensate Demineralizer
9. Reactor Level
10. Reactor Pressure
11. A Recirc Pump Trip
12. B Recirc Pump Trip
13. APRM A
14. APRM B
15. A Steamline Flow
16. B Steamline Flow
17. C Steamline Flow
18. D Steamline Flow
19. Off Gas Radiation
20. A Release Point Radiation
21. B Release Point Radiation
22. C Release Point Radidaion
23. Suppression Pool Temperature
24. Suppression Pool Level
25. Drywell Pressure
26. Drywell Temperature
27. Main Turbine Speed 1850 RPM
28. A Recirc Pump Speed
29. B Recirc Pump Speed
30. Feedwater Controller Output
31. HPCI/HPCS Initiation
32. RCIC Initiation
33. LPCI Initiation
34. LPCS Initiation
35. ADS Initiation
36. Main Generator Breaker(s) Open
37. Any Two Diesel Breakers Closed
38. Instrument Air Pressure
39. Manual Event Marker(s)

The sentinel logging function provides for an orderly and sequential retention of output data. Real-time set points are placed on up to one-hundred pre-specified process variables. When the variable moves to the setpoint, a sentinel generation is initiated and pre-sentinel and post-sentinel data is recorded.

The sequence of events function of the TRA monitors signal inputs for change-of-status and establishes and displays in a tabular list the time of occurence and the sequence of event. The SOE data is collected in rows chronologically and the attributes are categorized in columns as follows:

*time of occurrence - hour, minute, second millisecond
*point ID and description
*status (alarm, high, low, etc.)

The following is the criteria GSU is using for the ERIS SOE parameter selections:

The River Bend Unit 1 is safe,

* when the core is adequately cooled
* when the reactivity is controlled
* when heat sinks and heat transfer paths, from the core and containment are functioning properly.
* when the integrity of fuel, reactor coolant system and containment is maintained.
* when the containment of radioactive materials is held with-in acceptable (specified) limits.

The parameters under consideration which meet the above criteria are as follows:

* Reactor water level (core cooling)
* Reactor coolant sample analysis and off-gas pretreatment radiation (fuel integrity).
* Source Range Monitor (SRM) log count rate (reactivity).
* Reactor coolant system integrity:

    1. Reactor pressure
    2. Drywell pressure
    3. Drywell sump collection rate (flow)
    4. Relief Pressure Valve (PRV) (status - isolation)
    5. Safety Relief Valve (SRV) (status - position)

* Containment integrity

    1. Containment pressure
    2. Containment isolation valve positions (status)
    3. Containment hydrogen concentration
    4. Suppression pool/wetwell temperature

5. Suppression pool/wetwell pressure
6. Drywell Temperature

* Radioactivity effluent to environment

1. Radiation levels at plant release points

Each time the status of any signal included in SOE changes, the point ID and time are printed in the SOE log (chronological order shall be correctly resolved for all events that occur five milliseconds or more apart). If no further changes occur within the next 60 seconds, the SOE data base is updated with the current status of the monitored signals, and then the function is terminated.

The operator can either view the log on the maintenance console or initiate a hard copy request for a SOE printout. The SOE function is comprised of a Point Definition Data Base, Sequence of Event Data Base, and a collection of Historical data. The ERIS has data storage in the form of disk and tape drive units to support data retention requirements.

Items 1.2.2.1 - 1.2.2.6

The capability for assessing the time history of analog variables needed to determine the cause of unscheduled reactor shutdowns, and the functioning of safety-related equipment is also provided through the PMS and ERIS at River Bend. Both systems were described earlier.

I. In the PMS this capability is provided through the Post Data Recall program of the application system. The Post Data Recall program will continuously record and store the values of the selected analog variables as follows:

Variable	Sampling Rate*	Past History	Post Trip
16 assigned NSSS	5 sec.	5 min.	5 min.
40 assigned BOP	15 sec.	30 min.	30 min.
8 selected BOP	15 sec.	30 min.	30 min.

* The basis for selecting these sampling rates is due to hardware configuration.

The selection of variables to be monitored under this program at River Bend is under analysis at this time and will be provided by February 4, 1985.

When a reactor scram is detected, past history data shall be frozen in memory and collection for post-trip data shall be initiated. After all data is collected, the log shall automatically print and run to completion. The format of this log, as displayed on the PPC,

is organized in columns; where the first column will contain the time and the remaining columns will contain unique point identifications. The time will be displayed to the closest second.

II. The parameters monitored in the ERIS were described earlier as part of the TRA nad RTAD subsystems. These parameters are scanned at a rate of one second.

For the TRA subsystem, the Sentinel Trigger provides recording during planned or unplanned events/transients. The recording of pre-selected process signals are initiated by pre-selected variables chosen as trigger points. The recorded data shall consist of pre-sentinel and post-sentinel data. The data collection function can be assigned one hundred pre-specified variables. The pre-sentinel data shall occupy 1/10th and the post-sentinel data shall occupy 9/10th of a pre-determined disk space. This data can be displayed in plot or print form per operator request. The log shall include the time when log is printed or plotted, point identification, variable identification, status or value of the point and real time when either the reading was taken or calculation was made. Time on the printed log will be indicated in hours, minutes, seconds and milliseconds. All selected variables will be indicated in their corresponding engineering units.

The RTAD subsystem is capable of displaying the latest 30 minutes worth of data for all critical plant variables and their related secondary variables. There are four types of operator initiated real-time ERIS displays used to display this data. They are the Emergency Procedure Guidelines, the two-dimensional plots, the Plant Critical Variables, and the Trend Plots.

The Emergency Procedure Guidelines (EPG) display shows a graphic format for the reactor pressure vessel control and containment control displays. The EPG presents, in separate regions of the display, the control parameters and their limits, event indications, and system status. The figures found on pages 14 and 15 illustrate the reactor pressure vessel control display and the containment control display, respectively.

Examples of display formats currently used at River Bend Station for the two-dimensional plots, plant critical variable display and trend plots are illustrated in figures found on pages 16 through 18.

Both the TRA and RTAD are configured with necessary software and hardware to retrieve and display data. This data will provide the information required for a detailed examination and reconstruction of plant operation and transient conditions. The hardware system configuration drawing, Figure 2.2-1, is intended to show the capability of the ERIS to provide adequate data storage for the functions described.

Item 1.2.3

The PMS possesses the capability to monitor SOE and post-trip data. The ERIS is used to enhance this capability. Other data provided to the operator which can be used to assess the cause of unscheduled reactor scrams included data collected on control room recorders such as reactor water level, reactor pressure, neutron flux, drywell pressure, suppression pool temperature, etc.

Item 1.2.4

The ERIS shall be upgraded as changes occur in the industry. It is GSU's plans to keep this system current. At present there are no schedules to modify or change out the existing ERIS. The PMS system is not scheduled to be modified, upgraded, or changed.

REFERENCES

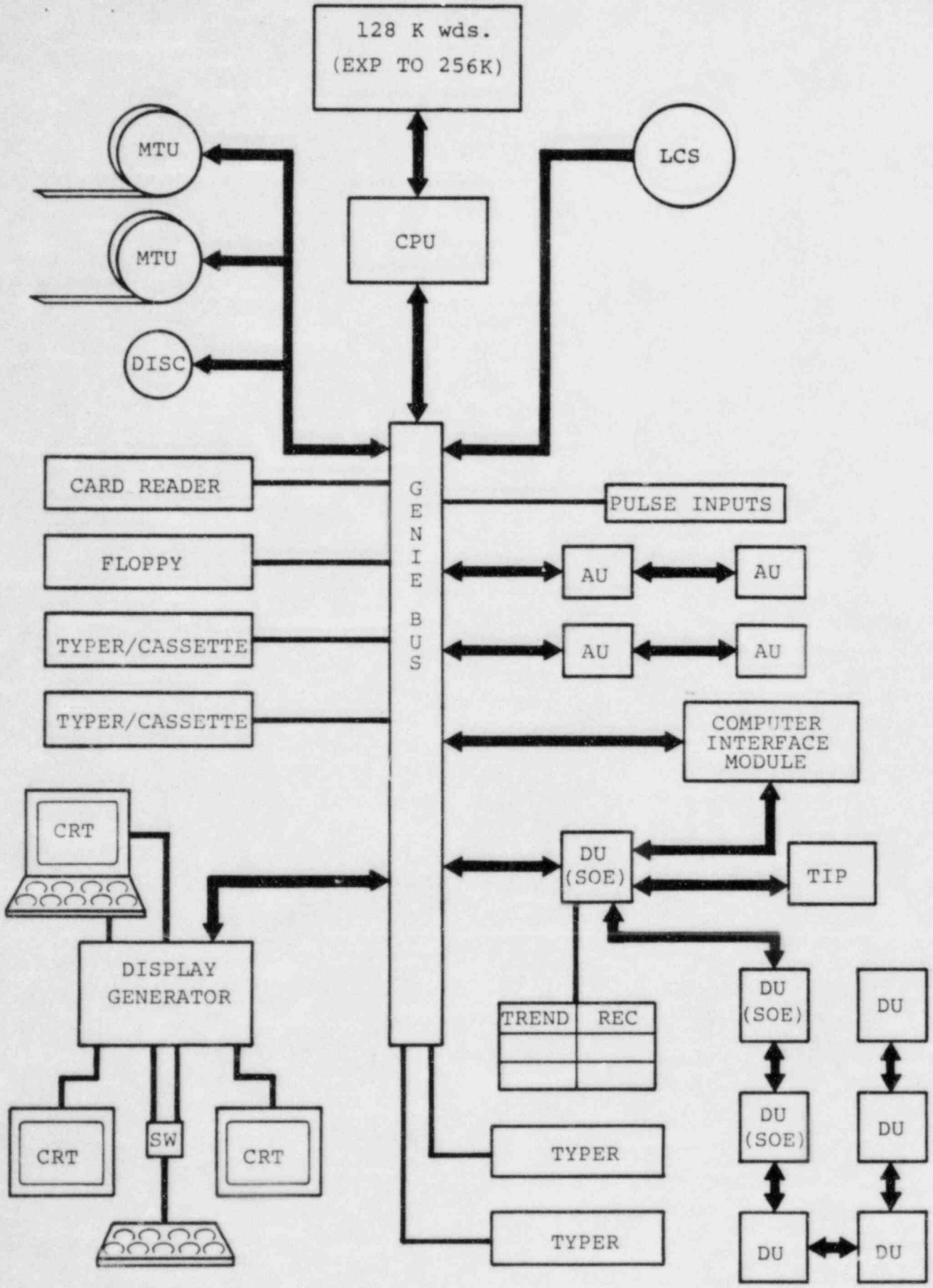
1. GE document 22A6058, Rev. 0 - Performance Monitoring System ((NSS)+(BOP) and NUCLENET)

2. River Bend Station Unit 1 Computes Points I/O List, RBS-T-12307 Rev. 20

3. GE document 23A1608, Rev. 0 - Emergency Response Information System

4. GE document 23A1598, Rev. 0 - Emergency Response Information System-Applications

5. GE document 23A1599, Rev. 0 - Emergency Response Information System - Application Data



MTU - MAGNETIC TAPE UNIT
CPU - CENTRAL PROCESSING UNIT
LCS - LARGE CORE STORE
AU - ANALOG UNIT
DU - DIGITAL UNIT

PERFORMANCE MONITORING SYSTEM
HONEYWELL 4500 COMPUTER SYSTEM
FIGURE 1.2-1

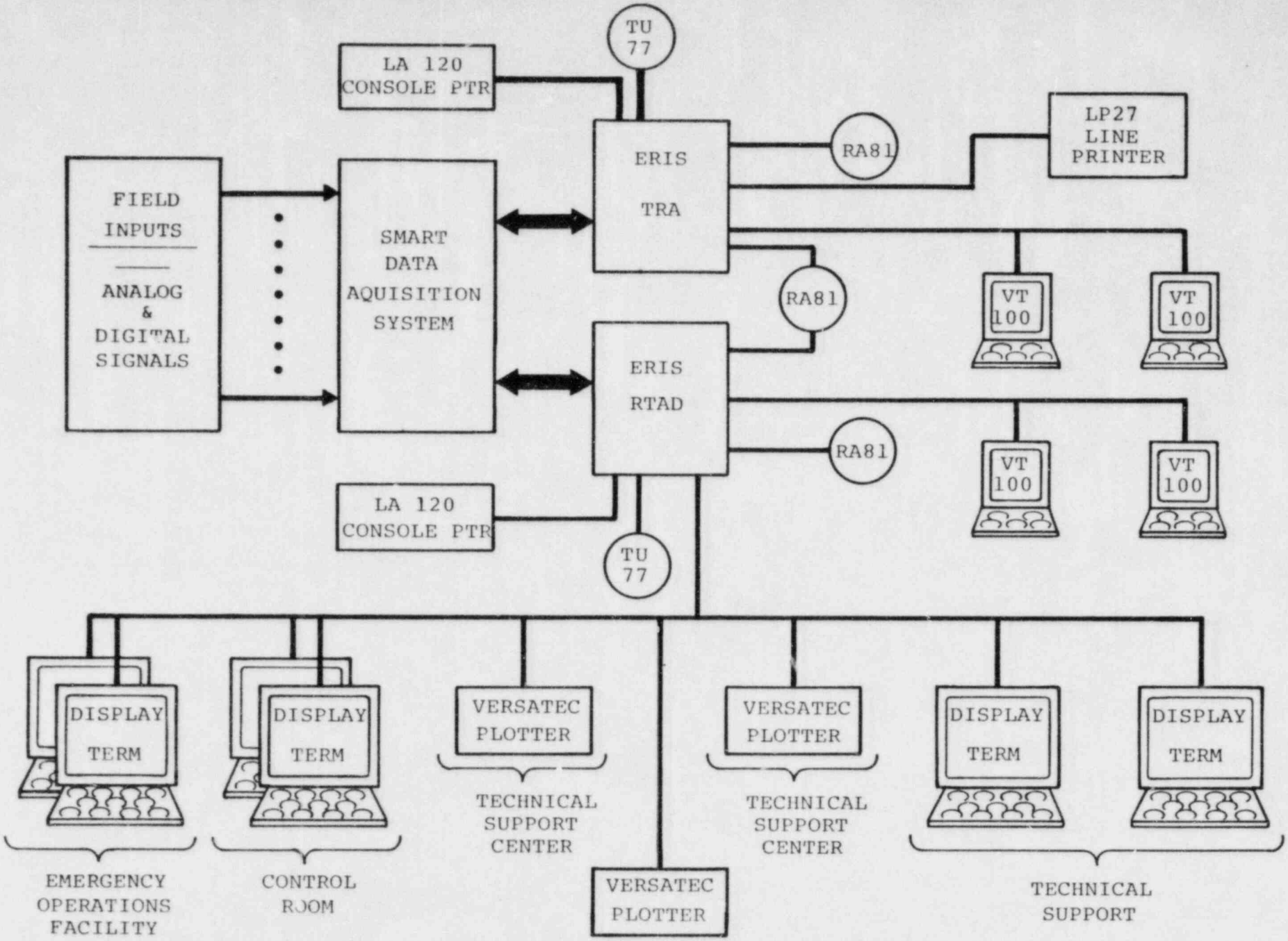
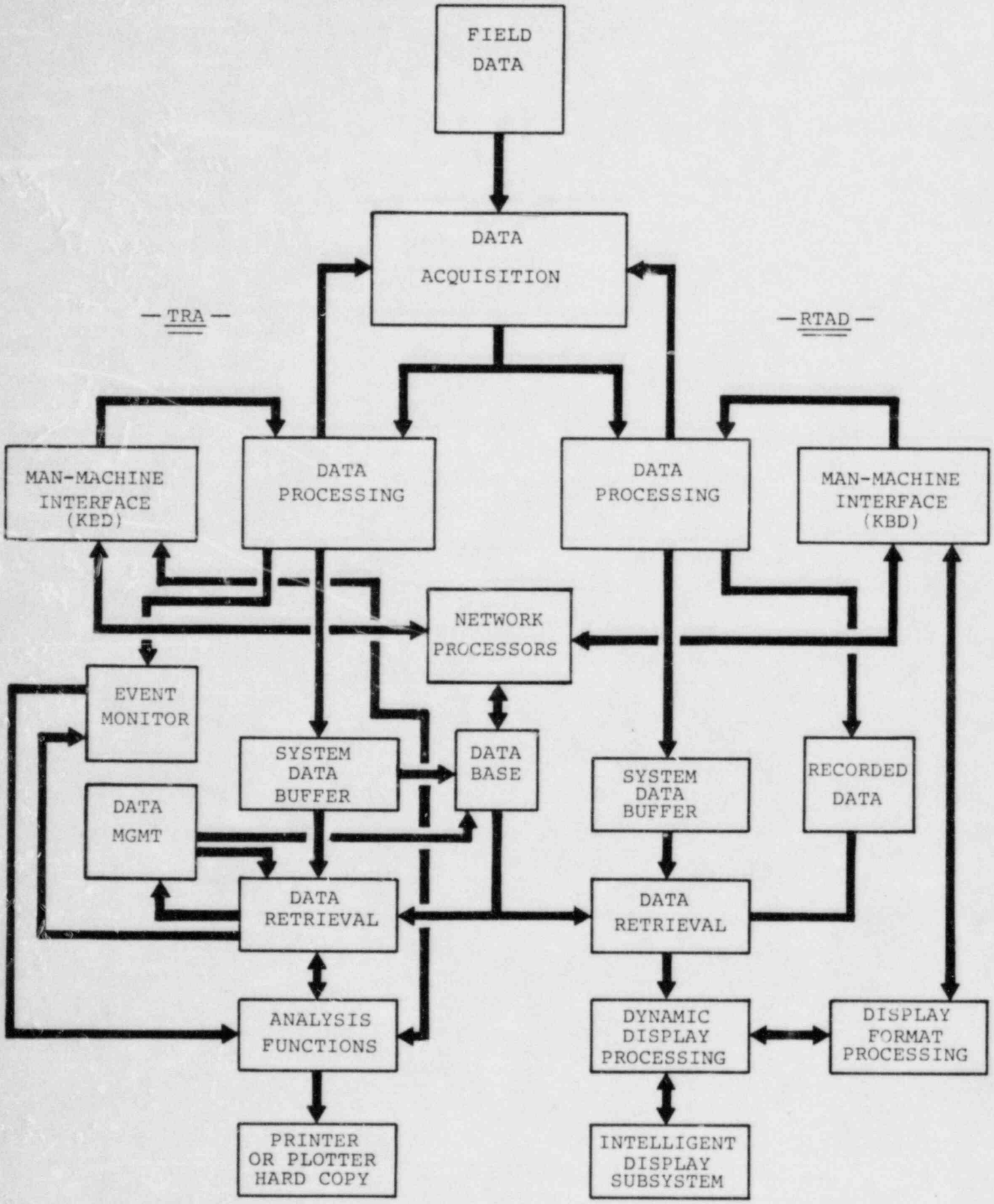


FIGURE 2.2-1
ERIS BLOCK
DIAGRAM



ERIS
FUNCTIONAL
DATA PATH
FIGURE 2.2-2

412

RPV CONTROL--WR/POWER

CNDS/FW	WATER AVAIL	RPV PRESS	POWER AVAIL	PUMP RUN
CRD	WATER AVAIL	RPV PRESS	POWER AVAIL	PUMP RUN
RCIC	WATER AVAIL	RPV PRESS	POWER NA	PUMP OFF
HPCS	WATER AVAIL	RPV PRESS	POWER AVAIL	PUMP RUN
LPCS	WATER AVAIL	RPV PR HI	POWER AVAIL	PUMP OFF
LPCI	WATER AVAIL	RPV PR HI	POWER AVAIL	PUMP OFF
SHTDN COOLING	CLG AVAIL	RPV PR HI	[illegible]	PUMP OFF
RWCU	COOLING AVAILABLE	[illegible]		PUMP RUN
TURBINE CONTROL	CLG AVAIL	VAC AVAIL	H.PWR AVAIL	VALVE OPEN
TURBINE BYPASS	CLG AVAIL	VAC AVAIL	H.PWR AVAIL	VALVE SHUT
MSL DRAINS	COOLING AVAILABLE		V.PWR AVAIL	VALVE SHUT
SLC	LIQUID AVAILABLE		POWER AVAIL	PUMP OFF

DG OPER

SRV SHUT

MSIV OPEN

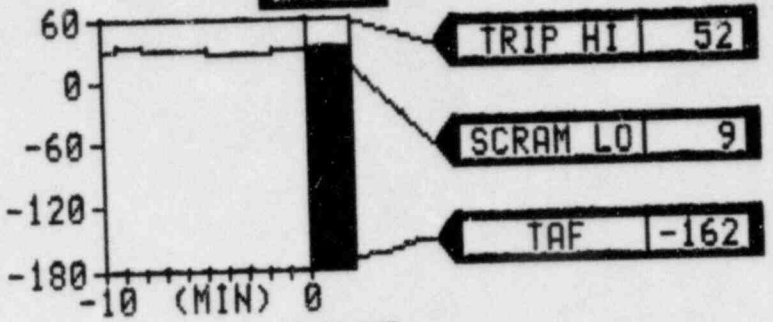
GROUP ISLN CMD

SCRAM RODS IN

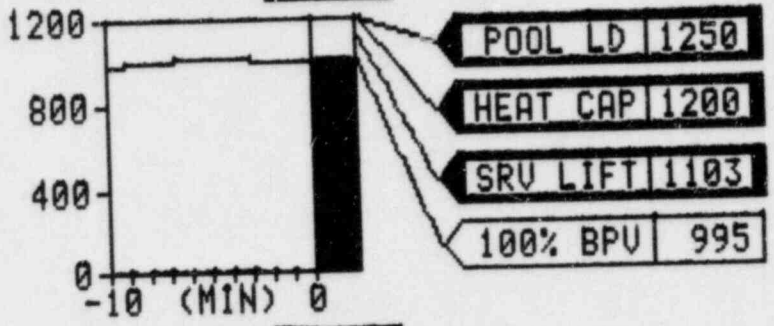
CNTMT ALARM

RPV LEVEL 192 IN >TAF

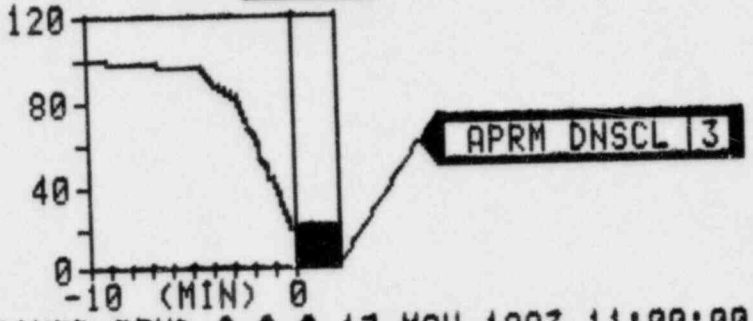
30 IN



RPV PRESS 1000 PSIG



RX POWER 19 % (RESCALE)



RIVER BEND 17-MAY-1983 11:00:00

FIGURE 20.1.1-1
GENERATION EXECUTING !

424 RPV NORMAL CONTAINMENT CONTROL--NR

POOL COOLING	COOLING AVAILABLE	POWER AVAIL	PUMP RUN
DRYWELL COOLING	COOLING AVAILABLE	POWER AVAIL	FAN RUN
CNTMT COOLING	COOLING AVAILABLE	POWER AVAIL	FAN RUN
PRESS CONTROL	VALVE LINE-UP	POWER AVAIL	FAN RUN
SBGT	VALVE LINE-UP	POWER NA	FAN OFF

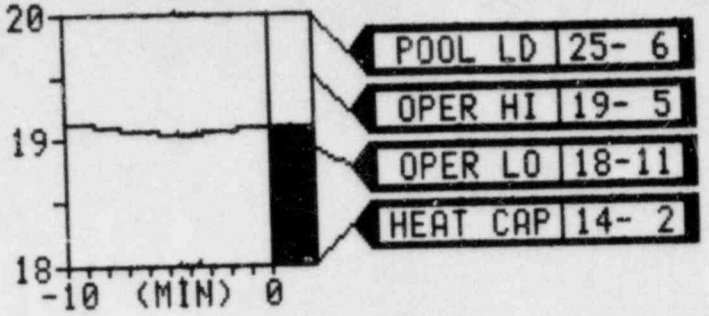
DG NOT OPER

SRV SHUT

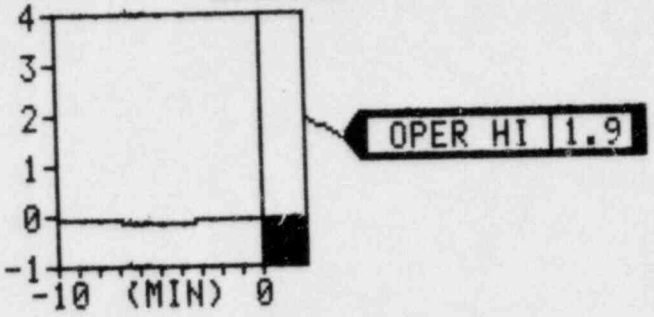
GROUP ISLN CMD

SCRAM NONE

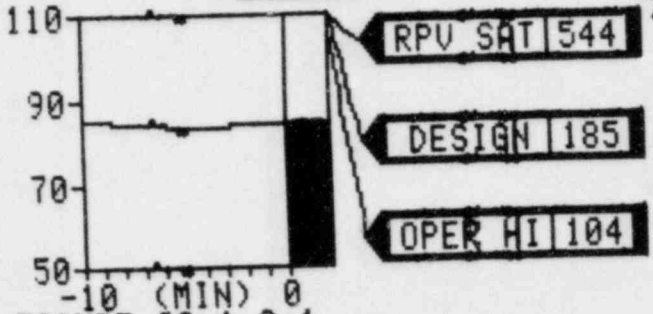
POOL LEVEL 19 FT 1 IN (RESCALE)



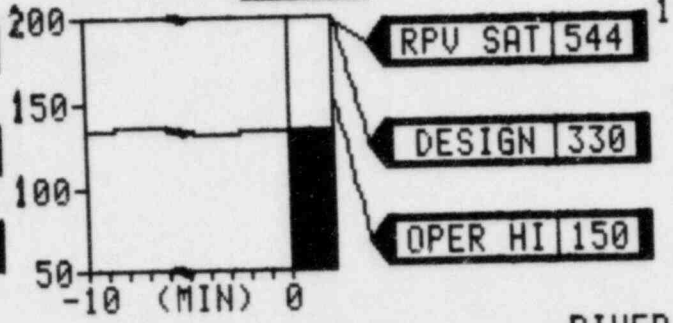
DW PRESS -0.1 PSIG



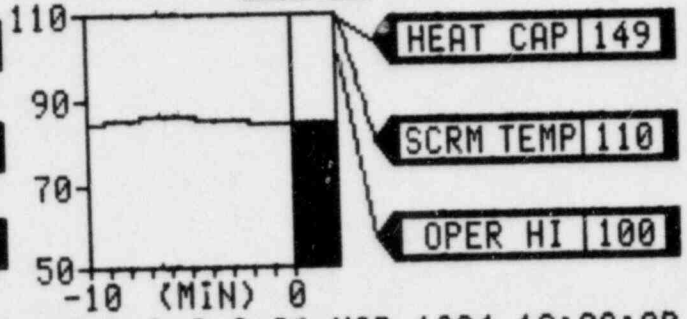
CNTMT TEMP 85 °F



DW TEMP 135 °F



POOL TEMP 85 °F



RIVER BEND 06-MAR-1984 10:00:00

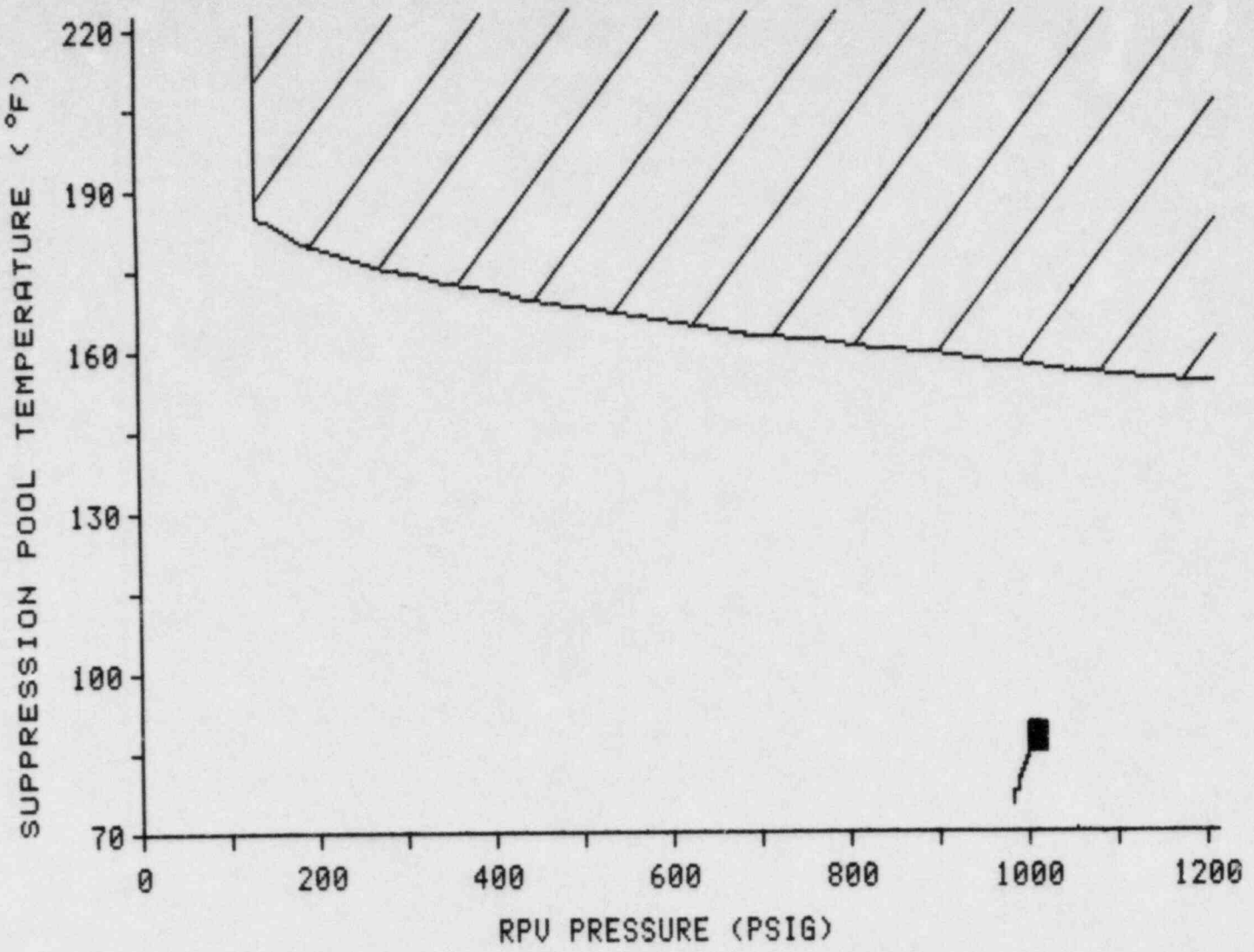
FIGURE 20.1.2-1

GENERATION EXECUTING !

436 RPV NORMAL

HEAT CAPACITY TEMP LIMIT

CNTMT CAUTION

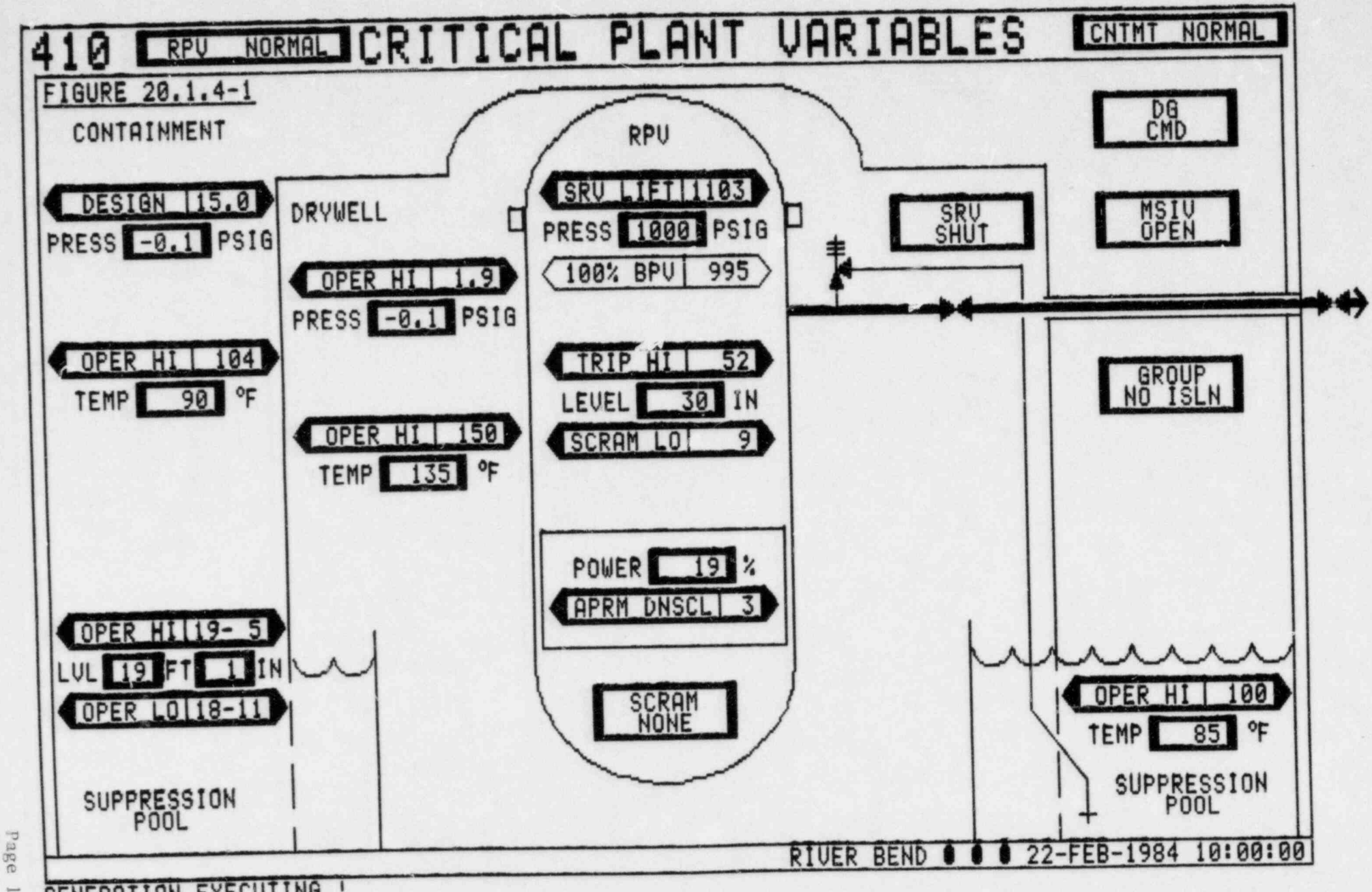


POOL TEMP
85 °F

RPV PRESS
1000 PSIG

FIGURE 20.1.3-3
GENERATION EXECUTING !

RIVER BEND ● ● ● 08-MAR-1984 10:00:00


410
RPV NORMAL
CRITICAL PLANT VARIABLES
CNTMT NORMAL
FIGURE 20.1.4-1
CONTAINMENT
DESIGN 15.0
PRESS -0.1 PSIG
DRYWELL
OPER HI 1.9
PRESS -0.1 PSIG
OPER HI 104
TEMP 90 °F
OPER HI 150
TEMP 135 °F
OPER HI 19- 5
LVL 19 FT 1 IN
OPER LO 18-11
SUPPRESSION POOL
RPV
SRV LIFT 1103
PRESS 1000 PSIG
100% BPV 995
TRIP HI 52
LEVEL 30 IN
SCRAM LO 9
POWER 19 %
APRM DNSCL 3
SCRAM NONE
DG CMD
SRV SHUT
MSIV OPEN
GROUP NO ISLN
OPER HI 100
TEMP 85 °F
SUPPRESSION POOL
RIVER BEND 22-FEB-1984 10:00:00
GENERATION EXECUTING !

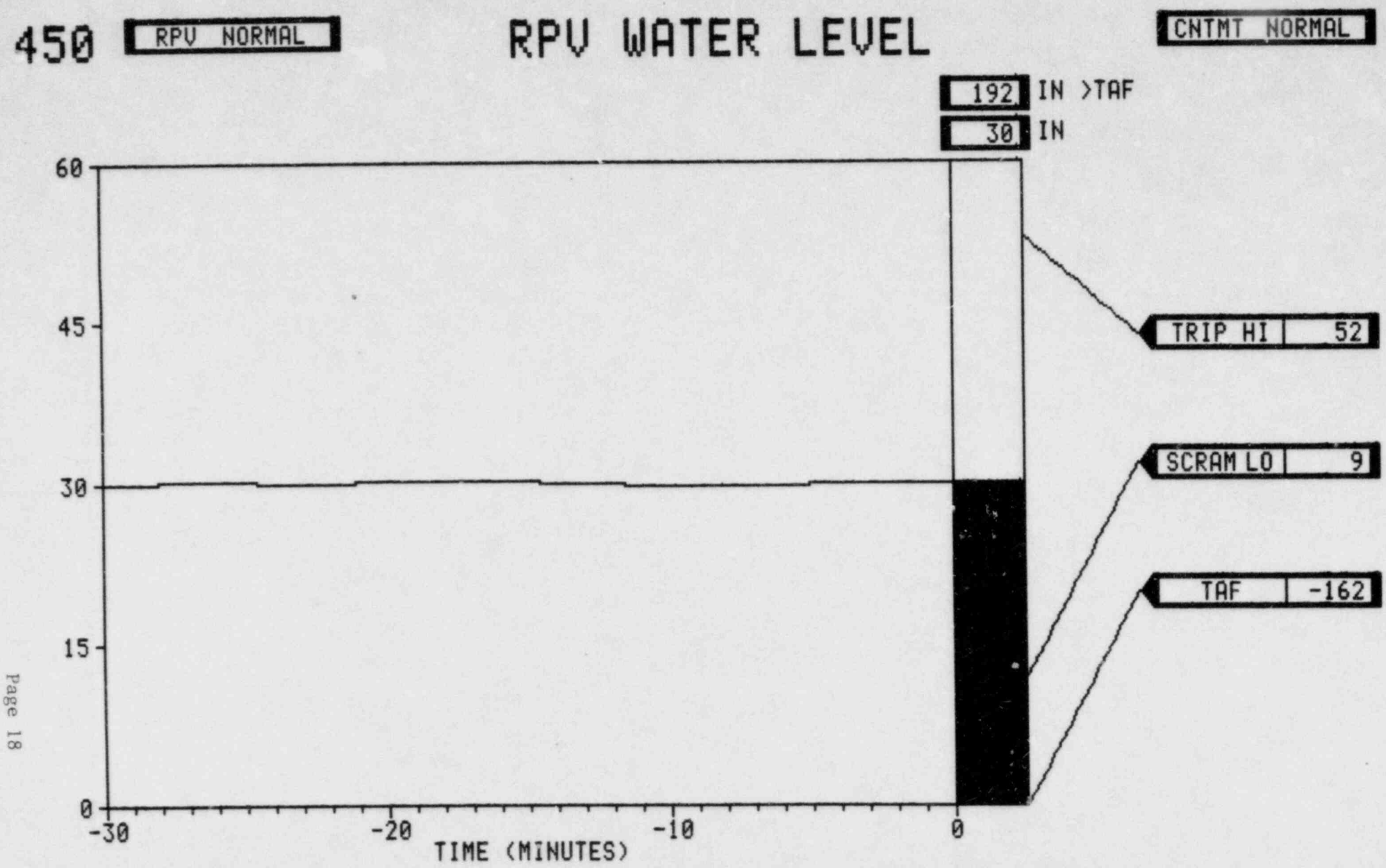


FIGURE 20.1.5-2
GENERATION EXECUTING !

RIVER BEND • • • 08-MAR-1984 10:00:00