DMB-016

July 15, 1983

Dockets Nos. 50-269, 50-270,
50-287 and 50-370

LICENSEE: Duke Power Company (DPC)

FACILITY: Oconee Nuclear Station, Units Nos. 1, 2 and 3
McGuire Nuclear Station, Unit No. 2

SUBJECT: SUMMARY OF APPEAL MEETING HELD ON JUNE 8, 1983 WITH REPRESENTATIVES OF DPC TO DISCUSS SSF MONITORS FOR SOURCE RANGE FLUX AND STEAM GENERATOR PRESSURE

The meeting was held to discuss an appeal by the licensee (DPC) of staff positions on requirements for the Standby Shutdown Facility (SSF) for each station. The requirements addressed for the Oconee Units Nos. 1, 2, and 3 pertain to process monitoring instruments for source range flux and steam generator pressure. The requirements addressed for the McGuire 2 unit pertain to source range flux monitors. The attendees list and a copy of the meeting agenda utilized are enclosed.

Discussion

Using the agenda enclosed as an outline, DPC presented the case that the results of their evaluation indicated that the intent of the NRC staff requirements are met for each station due to the existing SSF design and presently available instrumentation. Although the NRC staff requirement on SSF source range monitors and steam generator pressure monitors remains the same as before, DPC argued the case that relief from this requirement as specifically applied to the Oconee and McGuire stations was justified. DPC's justification was made on the basis of: the NRC staff postulated scenarios involving the use of the SSF as applied to the Oconee and McGuire stations; the design philosophy incorporated in the SSF's functional purpose and capabilities; and, the analyzed allowable time frames relative to loss of shutdown margin during plant operation. Based on the information exchange developed during the meeting, in conjunction with DPC's presentation and prior documentation to date, the NRC staff concluded that relief from the staff requirement to have a backup source range monitor (Oconee and McGuire) and a backup steam generator pressure monitor (Oconee only) in the SSF was warranted.

The NRC staff will prepare a Safety Evaluation Report (SER) documenting the results of the meeting. This SER is expected to be issued on each

SURNAME ▶	.....	.....	.....	.....	.....	.....
DATE ▶	.....	.....	.....	.....	.....	.....

station's docket file by the NRC staff in late July 1983.

Original signed by

John F. Suermann, Project Manager
Operating Reactors Branch #4, DL

Original signed by

Ralph A. Birkel, Project Manager
Licensing Branch #4, DL

Enclosures
As stated

cc w/enclosures:
See next page

OFFICE	ORB#4:DL	LB#4:DL					
SURNAME	JSuermann;ps	RBirkel					
DATE	7/14/83	7/15/83					

NRC FORM 318 (10-80) NRCM 0240 OFFICIAL RECORD COPY USGPO: 1981—335-960

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MEETING SUMMARY DISTRIBUTION

Licensee:

*Copies also sent to those people on service (cc) list for subject plant(s).

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NRC Meeting Participants:

NFioravante
TChan
ESylvester
LRubenstein
OParr
TNovak
RMattson
HOrnstein
BSheron
KJabbour

MEETING OF JUNE 8, 1983

OCONEE/McGUIRE SSF

NRC	DPC	Bechtel Corp.
JSuermann	KCanady	PGex (Licensing)
RBirkel	JMcPherson	
NFioravante	GSwindlehurst	Texas Utilities
TChan	RWardell	
ESylvester	DKluttz	DWoodlan
LRubenstein	RRevels	
OParr	TMcMeekin	
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RMattson		
HOrnstein		
BSheron		
KJabbour		

Duke Power Company
Oconee Nuclear Station
McGuire Nuclear Station

Appeal Meeting on
Standby Shutdown System
Instrumentation

June 8, 1983

AGENDA

STANDBY SHUTDOWN SYSTEM (SSS) INSTRUMENTATION

OCONEE NUCLEAR STATION / McGUIRE NUCLEAR STATION

DUKE POWER / NRC

JUNE 8, 1983

I. INTRODUCTION (K. S. CANADY)

II. SSS DESIGN - OVERVIEW (T. C. McMEEKIN)

III. RESPONSE TO NRC STAFF REQUIREMENTS (J. A. McPHERSON)
(D. E. KLUTTZ)

A. SOURCE-RANGE NEUTRON FLUX

B. STEAM GENERATOR PRESSURE

IV. CLOSING REMARKS (K. S. CANADY)

V. DISCUSSION

PURPOSE

RESOLVE NRC CONCERNS ABOUT STANDBY SHUTDOWN SYSTEM (SSS) MONITORING INSTRUMENTATION AT MCGUIRE AND OCONEE RELATIVE TO ALTERNATE SHUTDOWN CAPABILITY REQUIRED BY 10 CFR 50, APPENDIX R.

BACKGROUND

- SER's REQUIRED THE FOLLOWING ADDITIONAL INSTRUMENTATION:

  SOURCE-RANGE NEUTRON FLUX

  STEAM GENERATOR PRESSURE (OCONEE ONLY)

- MCGUIRE UNIT 2 LICENSE CONDITION REQUIRED SCHEDULE COMMITMENT

- DUKE REQUESTED A MEETING TO RECONSIDER REQUIREMENTS

- DUKE MET THE LICENSE CONDITION BY PROVIDING A PROVISIONAL SCHEDULE FOR INSTALLATION PENDING APPEAL

OCONEE NUCLEAR STATION
STANDBY SHUTDOWN FACILITY
SIGNIFICANT EVENT CHRONOLOGY

JAN 18	1978	•	Duke Presentation to NRC Staff
JAN 25	1978	•	Submittal Concerning Post-fire Shutdown Capability
FEB 1	1978	•	Formal Submittal of SSF Proposal
APR 14	1978	•	Fire Protection/Suppression Appeal
MAY 18	1978	•	NRC Request for Additional Information
JUN 2	1978	•	NRC Staff Presentation to ACRS
JUN 19	1978	•	Duke Submittal of Additional Information
DEC 29	1978	•	NRC Staff Approval of Conceptual Design
MAR 28	1980	•	Final Design Proposal Submitted by Duke
OCT 27	1980	•	NRC Request Concerning Conformance with Standard Review Plan
FEB 16	1981	•	Duke Submittal of Additional Information
FEB 19	1981	•	Appendix R to 10CFR50 Becomes Effective
MAR 18	1981	•	Duke Submittal of Additional Information
MAR 31	1981	•	Duke Submittal of Additional Information
APR 30	1981	•	Duke Submittal of Additional Information
SEP 8	1981	•	Duke Presentation to ACRS
JAN 25	1982	•	Duke Submittal of Additional Information
APR 13	1982	•	Duke Submittal of Additional Information
SEP 20	1982	•	Duke Submittal of Additional Information
DEC 23	1982	•	Duke Submittal of Additional Information
APR	1983	•	SSF Safety Evaluation Report

MCGUIRE NUCLEAR STATION
STANDBY SHUTDOWN FACILITY
SIGNIFICANT EVENT CHRONOLOGY

MAR 23	1978	• Duke Presentation to NRC Staff
APR 14	1978	• Fire Protection/Suppression Appeal
MAY 1	1978	• Formal Submittal of SSF Proposal
JUN 2	1978	• NRC Staff Presentation to ACRS
JAN 31	1979	• Duke Provides Revised Fire Protection Review
MAR	1979	• Supplement 2 to SER Approves SSF Concept
MAR 31	1980	• Final Design Proposal Submitted by Duke
FEB 19	1981	• Appendix R to 10CFR50 Becomes Effective
SEP 8	1981	• Duke Presentation to ACRS
OCT 21	1981	• Duke Submittal of Additional Information
OCT 12	1981	• Duke Submittal of Additional Information
DEC 14	1982	• Duke Submittal of Additional Information
JAN 5	1983	• Duke Submittal of Additional Information
FEB 22	1983	• Duke Submittal of Additional Information
FEB	1983	• Supplement 6 of McGuire SER Issued

SSF DESIGN BASIS

TO PROVIDE AN ALTERNATE MEANS TO ACHIEVE AND MAINTAIN A HOT SHUTDOWN CONDITION IN ALL UNITS AT EACH SITE IN THE EVENT THAT OTHER S/D SYSTEMS BECOME UNAVAILABLE DUE TO FIRE, SABOTAGE OR T. B. FLOODING (OCONEE ONLY).

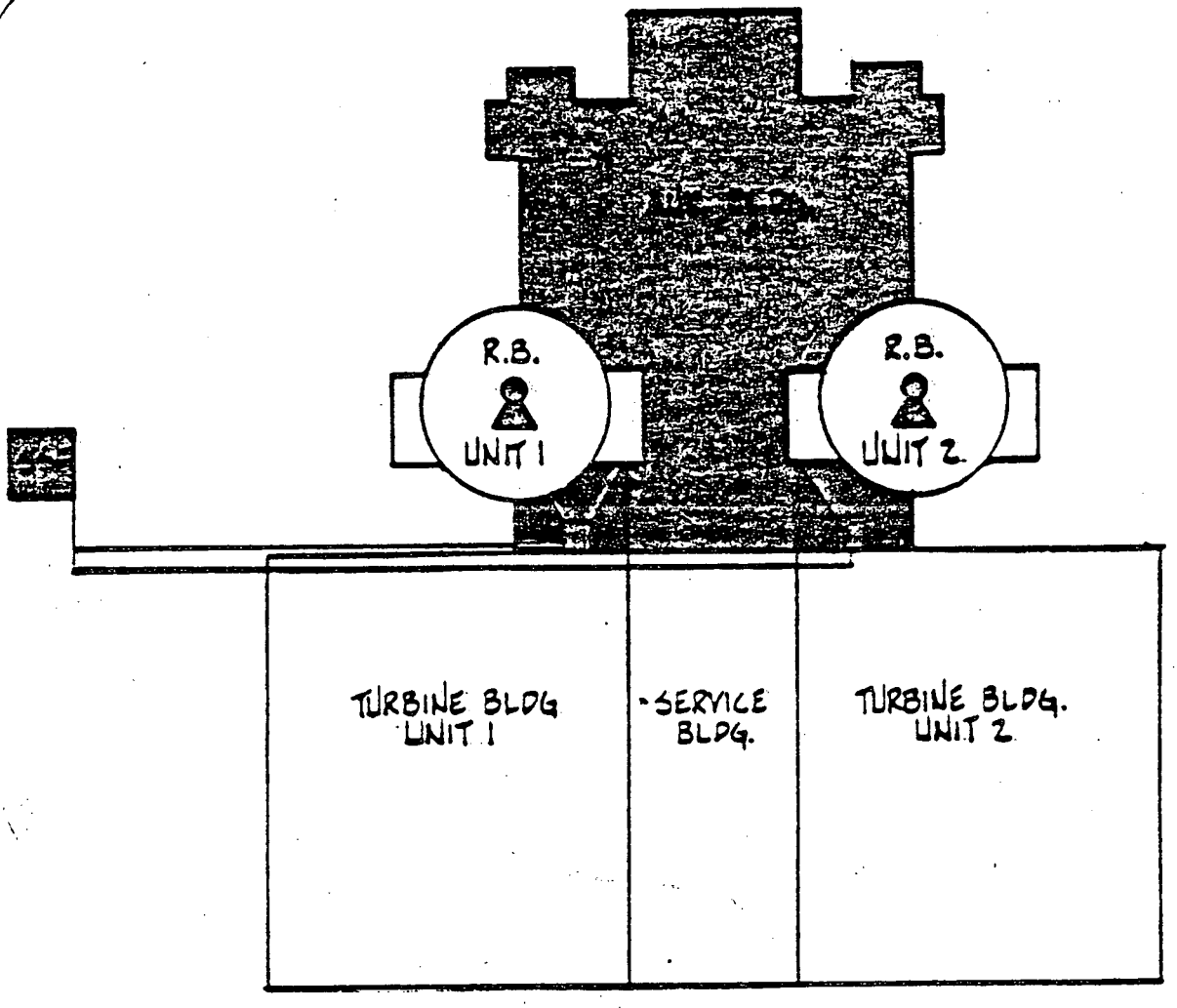
SSF DESIGN FUNCTIONS

1) MAINTAIN ADEQUATE PRIMARY SIDE COOLANT VOLUME
2) MAINTAIN ADEQUATE SECONDARY SIDE COOLANT VOLUME
3) UTILIZE PRIMARY SIDE NATURAL CIRCULATION
4) UTILIZE ATMOSPHERE AS HEAT SINK VIA SECONDARY SIDE STEAM RELIEF
5) PROVIDE SUPPORTING SERVICES, INSTRUMENTATION, POWER SUPPLY, ETC.

STANDBY SHUTDOWN SYSTEMS

TIME LIMITATIONS WITHOUT DAMAGE CONTROL MEASURES

	Oconee	McGuire
Secondary Side Water	~ 3.5 days	~ 3.5 days
Primary Side Water	~ 3 days	~ 3.5 days
Power Supply	~ 7 days	~ 7 days

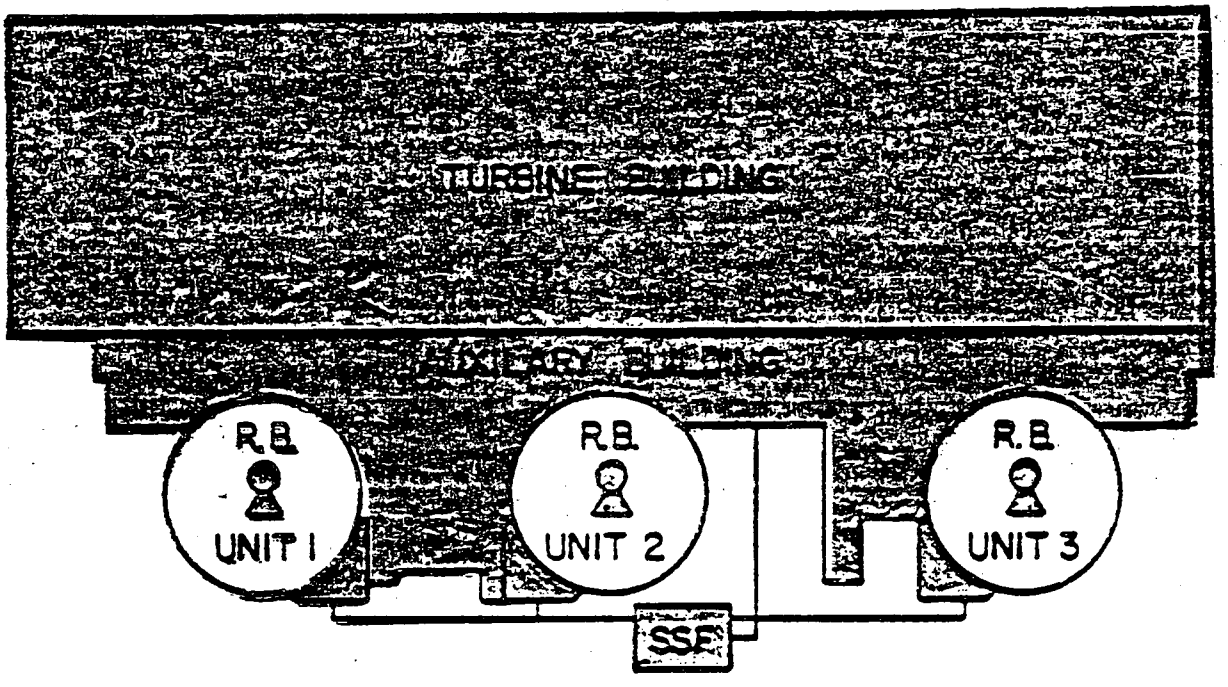


STANDBY SHUTDOWN

STEAM DRIVEN AUX FW PUMP (AUX BLDG)
STANDBY MAKEUP PUMP (REACT BLDG)
DIESEL GENERATOR (SSF)
LOAD CENTER (SSF)
MOTOR CONTROL CENTER (SSF)
INVERTER (SSF)
BATTERY & CHARGER (SSF)
TRANSFORMER/REGULATOR (SSF)
SHUTDOWN PANELS (SSF)
HVAC (SSF)

[redacted]

MOTOR DRIVEN AUX FW PUMP (AUX BLDG)
CHARGING PUMP (AUX BLDG)
DIESEL GENERATORS (AUX BLDG)
CONTROL COMPLEX (AUX BLDG)
SUPPORT EQUIPMENT (AUX BLDG)



Standby Shutdown

Diesel Generator
Switchgear
Load Center
Motor Control Center
Battery & Chargers
Inverters
Transformers/Regulators
High Head Aux Service Water Pump
Emergency Makeup Pump
Shutdown Panels
HVAC

Normal Shutdown

Keowee
Emergency Feedwater Pump
High Pressure Injection Pump
Low Pressure Service Water Pump
Control Complex
Support Equipment

MCGUIRE

REACTIVITY CONTROL

SOURCE RANGE NEUTRON FLUX MONITORING

- Purpose
- NRC Position
- Duke Position
- Evaluation of Postulated Fire Induced Boron Dilution Events
- Conclusion

PURPOSE

To address NRC Staff concerns regarding potential boron dilution events due to fire induced spurious operation of components.

NRC STAFF POSITION

MCGUIRE

For an in-containment fire, spurious valve operation may result in the need for continuous charging system operation. Coupled with operator error in aligning the charging system water source, and failure to quickly detect that error, boron dilution events could be expected. Therefore, source-range neutron flux instrumentation should be provided in the Standby Shutdown Facility (SSF) control room.

DUKE POSITION

MCGUIRE

After complete evaluation, we have concluded that fire-induced spurious operation and/or operator error resulting in unisolable RCS leakage coincident with unborated makeup is unlikely. Even if boron dilution did occur existing instrumentation is adequate to detect this event. Corrective actions would be taken before shutdown margin loss. Therefore, source-range neutron flux instrumentation in the Standby Shutdown Facility (SSF) is unnecessary.

FIRE INSIDE CONTAINMENT

- Plant control is not transferred to the Standby Shutdown Facility (SSF) for an in-containment fire. The Plant is controlled from the Control Room.
- McGuire 1 source-range neutron flux instrumentation cables are separated by Appendix R distances inside containment. Instrument readout is in the Control Room.
- McGuire 2 source-range neutron flux instrumentation cables are separated by Appendix R distances inside containment except for one section approximately sixty feet long. Instrument readout is in the Control Room.

BORON DILUTION EVENTS

- Boron dilution events are unlikely since a spuriously initiated unisolable flowpath would have to occur coincident with operator error in aligning the makeup flowpath. The operator will have reliable valve position indication in the Control Room for any in-containment fire.

- If a boron dilution event did occur, it would be detected by:
  1) Operator verification of RCS makeup alignment to borated source.
  2) Rapid pressurizer level increase if no RCS leakage path existed.
  3) Boron sampling and analysis if an RCS leakage path existed.

- Worst case boron dilution event analysis (at hot standby) indicates that unborated makeup at the maximum flow rate must continue for 106 minutes before re-criticality.

CONCLUSION

As indicated in this presentation

- Plant shutdown is controlled from the Control Room for any in-containment fire
- Source-range neutron flux indication will be available in the Control Room for any in-containment fire for McGuire Unit 1
- Source-range neutron flux indication will be available in the Control Room for most in-containment fires for McGuire Unit 2
- Boron dilution events are unlikely
- Boron dilution events that do occur are readily detectable
- The worst case boron dilution event requires 106 minutes of unmitigated maximum flow of unborated water to cause criticality

Therefore, Duke Power Company believes that source-range neutron flux indication in the Standby Shutdown Facility is not necessary.

OCONEE: NRC REQUEST FOR NEUTRON SOURCE RANGE FLUX INSTRUMENTATION

A. INTRODUCTION

1. NRC POSITION
2. DUKE POSITION

B. SCENARIO

1. INSIDE REACTOR BUILDING FIRE
   - (A) CONTROL ROOM CONTROL
   - (B) DILUTION NOT CREDIBLE
   - (C) INTERLOCKS TERMINATE DEBORATION
   - (D) SOURCE RANGE INSTRUMENTATION AVAILABLE
2. OUTSIDE REACTOR BUILDING FIRE
   - (A) CONTROL FROM EITHER SSF OR CONTROL ROOM
   - (B) BORON DILUTION DUE TO "SPURIOUS VALVE OPERATION" CREDIBLE BUT UNLIKELY
   - (C) ANALYSIS SHOWS 2 HOURS 35 MINUTES TO REACH CRITICALITY
   - (D) BORON DILUTION CAUSES PRESSURIZER LEVEL INCREASE
   - (E) OPERATOR MONITORS PRESSURIZER LEVEL PER PROCEDURE
   - (F) OPERATOR WILL VERIFY HPI STATUS/SOURCE PER PROCEDURE
   - (G) BORON DILUTION IS TERMINATED

C. CONCLUSION

1. BORON DILUTION UNLIKELY
2. BORON DILUTION READILY RECOGNIZED AND TERMINATED
3. SOURCE RANGE INSTRUMENTATION IN SSF IS NOT NECESSARY

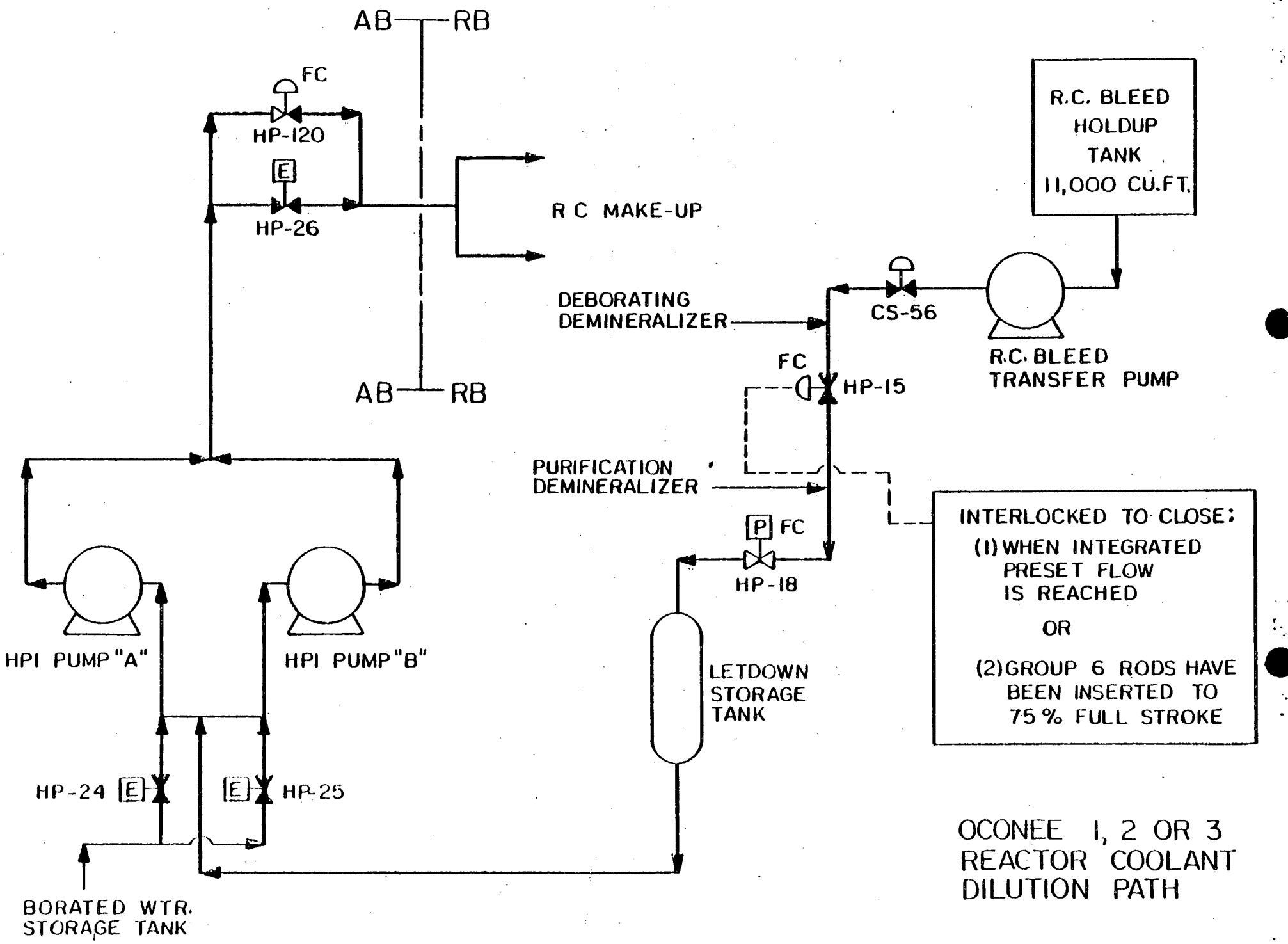
OCONEE: NRC POSITION ON SOURCE RANGE FLUX INSTRUMENTATION IN THE SSF

THE NRC POSITION ON SOURCE RANGE FLUX IN THE OCONEE SER SECTION 4.7.4.1 IS AS FOLLOWS:

"MONITORING OF CORE FLUX PROVIDES THE ONLY DIRECT INDICATION OF THE REACTOR SHUTDOWN CONDITION. THE MONITORING OF OTHER PROCESS VARIABLES WOULD PROVIDE AN INFERRED ANSWER ONLY. WITH REGARD TO THE FISSION PROCESS, CHANGES IN NEUTRON FLUX PROVIDE THE QUICKEST AND ONLY DIRECT MEANS OF ASSESSING REACTOR CRITICALITY. DILUTION EVENTS CAUSED BY THE POSTULATED SPURIOUS OPERATION OF VALVES COULD RESULT IN POWER EXCURSIONS WHICH WOULD NOT BE READILY DETECTED BY INTERPRETING THE CHANGES IN OTHER PROCESS VARIABLES ..."

OCONEE: DUKE POSITION ON SOURCE RANGE FLUX INSTRUMENTATION IN THE SSF

AFTER COMPLETE EVALUATION, DUKE HAS CONCLUDED THAT FIRE-INDUCED SPURIOUS VALVE OPERATION RESULTING IN UNBORATED MAKE-UP IS UNLIKELY. EVEN IF SUCH A BORON DILUTION EVENT DID OCCUR, IT WOULD BE DETECTED WITH OTHER EXISTING INSTRUMENTATION. CORRECTIVE ACTIONS WOULD BE TAKEN BEFORE SHUTDOWN MARGIN LOSS; THEREFORE, SOURCE-RANGE NEUTRON FLUX INSTRUMENTATION IN THE OCONEE STANDBY SHUTDOWN FACILITY (SSF) IS UNNECESSARY.



OCONEE 1, 2 OR 3
REACTOR COOLANT
DILUTION PATH

OCONEE: NRC REQUEST FOR STEAM GENERATOR PRESSURE INSTRUMENTATION IN THE SSF

A. INTRODUCTION

1. NRC POSITION
2. DUKE POSITION

B. SSF DESIGN/CONTROL PHILOSOPHY

1. SSF SHUTDOWN CONTROL PROCEDURES/TRAINING SPECIAL & SEPARATE FROM NORMAL PLANT
2. PROVIDE CONTROLLED HEAT SINK AND INVENTORY FOR RCS "HOT SHUTDOWN" COOLING FROM SSF:
   - FEED ONE STEAM GENERATOR
   - MONITOR/MAINTAIN STEAM GENERATOR LEVEL
   - STEAM GENERATOR PRESSURE REGULATED BY MAIN STEAM CODE SAFETY VALVES
   - MAKE UP TO RCS
   - MONITOR/MAINTAIN RCS PRESSURIZER LEVEL
   - MONITOR/MAINTAIN RCS T_{HOT} & T_{COLD}
   - PRESSURIZER HEATER CONTROL
3. WITH REGULATED STEAM GENERATOR PRESSURE, RCS HEAT REMOVAL RATE CAN BE DIRECTLY MONITORED BY RCS PARAMETERS AND CONTROLLED BY STEAM GENERATOR LEVEL WITHOUT STEAM GENERATOR PRESSURE

C. RCS OVERCOOLING

1. DIRECT DETECTION OF OVERCOOLING BY

   - T_{COLD} DECREASING
   - RCS PRESSURE DECREASING
   - RCS PRESSURIZER LEVEL DECREASING
   - STEAM GENERATOR LEVEL CHANGING

2. CORRECTIVE ACTION

   - REGAIN PROPER STEAM GENERATOR LEVEL TO REGAIN T_{COLD}

     OR

     ISOLATE AFFECTED STEAM GENERATOR AND FEED REMAINING STEAM GENERATOR

   - MONITOR/MAINTAIN T_{COLD}, RCS PRESSURE, RCS PRESSURIZER LEVEL, STEAM GENERATOR LEVEL
   - MAKE UP TO RCS, USE PRESSURIZER HEATERS AS NECESSARY

3. WITH REGULATED (OR LOSS OF) STEAM GENERATOR PRESSURE DURING OVERCOOLING, RCS HEAT REMOVAL RATE CHANGES ARE DIRECTLY MONITORED BY RCS PARAMETERS AND STEAM GENERATOR LEVEL AND STABILIZED WITHOUT STEAM GENERATOR PRESSURE

D. CONCLUSIONS

1. WITH REGULATED STEAM GENERATOR PRESSURE THE ONLY PARAMETERS NEEDED FOR "HOT SHUTDOWN" ARE

   - PRESSURIZER LEVEL
   - RCS PRESSURE, T_{COLD}, T_{HOT}
   - STEAM GENERATOR LEVEL

2. STEAM GENERATOR PRESSURE IS NOT NECESSARY FOR MAINTAINING "HOT SHUTDOWN"

3. TRANSLATION FROM "HOT SHUTDOWN" TO "COLD SHUTDOWN" MODE REQUIRES ADDITIONAL INSTRUMENTATION AND EQUIPMENT WHICH WILL BE AVAILABLE THROUGH DAMAGE CONTROL MEASURES. THUS, STEAM GENERATOR PRESSURE INSTRUMENTATION IS NOT REQUIRED IN THE SSF.

OCONEE: NRC POSITION ON SSF STEAM GENERATOR PRESSURE INSTRUMENTATION

THE NRC POSITION ON STEAM GENERATOR PRESSURE IN THE OCONEE SER SECTION 4.7.4.2 IS AS FOLLOWS:

> "MAINTENANCE OF LEVEL IN THE STEAM GENERATORS MAY NOT BE SUFFICIENT IN ITSELF TO CONTROL THE HEAT REMOVAL RATE AND THEREBY MAINTAIN A "HOT STANDBY" OR "HOT SHUTDOWN" MODE, OR TRANSLATE FROM A "HOT SHUTDOWN" MODE TO A "COLD SHUTDOWN" MODE . . ."

OCONEE: DUKE POSITION ON SSF STEAM GENERATOR PRESSURE INSTRUMENTATION

SSF STEAM GENERATOR PRESSURE IS NOT NECESSARY BECAUSE

- SSF SECONDARY SIDE CONTROL/DESIGN PHILOSOPHY IS BASED ON STEAM GENERATOR LEVEL
- STEAM GENERATOR LEVEL PROVIDES POSITIVE INDICATION OF AVAILABLE HEAT SINK FOR RCS
- STEAM GENERATOR LEVEL PROVIDES DIRECT INDICATION OF CHANGING CONDITIONS OF HEAT SINK (I.E., OVERCOOLING, UNDERCOOLING)
- RCS PARAMETERS PROVIDE DIRECT INDICATION OF RCS COOLING RATE:
  - T_{COLD}
  - T_{HOT}
  - PRESSURIZER LEVEL
  - RCS PRESSURE

CONCLUSION

- THE DUKE STANDBY SHUTDOWN SYSTEM DESIGN IS UNIQUE.
- THE STAFF REQUIREMENTS FOR ADDITIONAL SSS INSTRUMENTATION HAVE BEEN REVIEWED ON BOTH OCONEE AND McGUIRE.
- THE RESULTS OF THE EVALUATION INDICATE THAT THE EXISTING SSS DESIGN AND INSTRUMENTATION ARE ADEQUATE TO ADDRESS STAFF CONCERNS.
- SOURCE RANGE FLUX INSTRUMENTATION IN THE SSS IS NOT REQUIRED FOR McGUIRE OR OCONEE.
- STEAM GENERATOR PRESSURE INSTRUMENTATION IN THE SSS IS NOT REQUIRED FOR OCONEE.