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 SUBJECT: Responds to programmed enhancement items of Generic Ltr  
 88-17.  
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161-01674-DBK/BJA

February 6, 1989

Docket Nos. STN 50-528/529/530

Document Control Desk  
U.S. Nuclear Regulatory Commission  
Mail Station P1-137  
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- References:
1. Letter from Dennis M. Crutchfield, NRC, to All Holders of Operating Licenses or Construction Permits for PWRs dated October 17, 1988. Subject: Loss of Decay Heat Removal (Generic Letter No. 88-17).
  2. Letter from J. G. Haynes, ANPP, to USNRC Document Control Desk, dated September 21, 1987 (161-00517). Subject: Response to Generic Letter 87-12.
  3. Letter from D. B. Karner, ANPP, to USNRC Document Control Desk, dated January 6, 1989 (161-01597). Subject: Response to Generic Letter 88-17 Concerning Loss of Decay Heat Removal.

Dear Sirs:

Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Units 1, 2, and 3  
Response to Programmed Enhancement Items of Generic Letter 88-17  
File: 89-A-056-026

Pursuant to the requirements of 10CFR50.54(f), the NRC has requested a response to six programmed enhancement recommendations. The responses were requested within 90 days of receipt of Generic Letter 88-17. By Reference 3, ANPP provided responses to all of the expeditious actions and two of the programmed enhancement items. The attachment to this letter provides the ANPP responses to the remainder of the programmed enhancement items.

If you have any additional questions on this matter, please contact Mr. A. C. Rogers at (602) 371-4041.

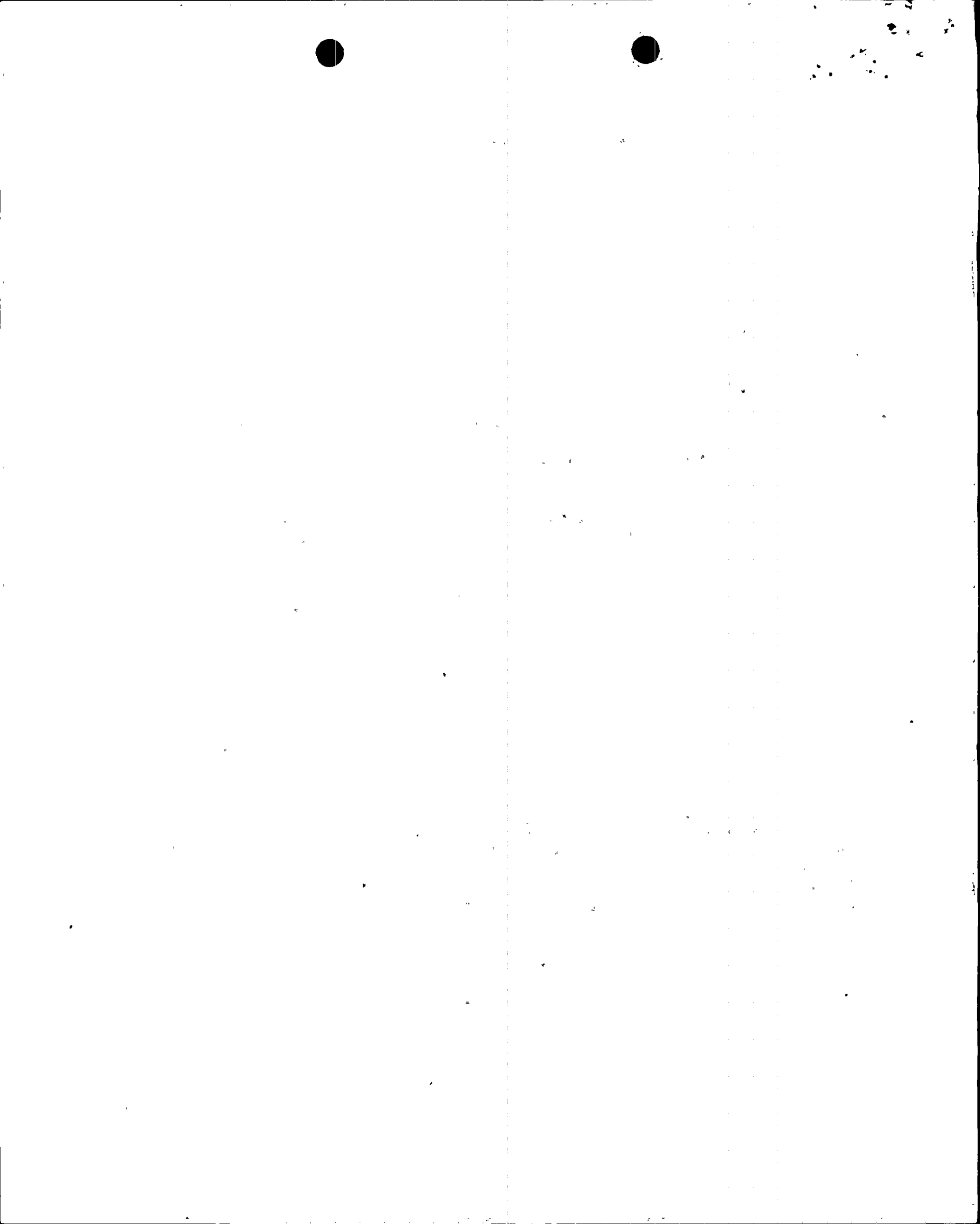
Very truly yours,

D. B. Karner  
Executive Vice President

DBK/BJA/pvk  
Attachment

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Page 2

161-01674-DBK/BJA  
February 6, 1989

cc: G. W. Knighton (all w/a)  
T. L. Chan  
M. J. Davis  
J. B. Martin  
T. J. Polich  
A. C. Gehr



STATE OF ARIZONA    )  
                          ) ss.  
COUNTY OF MARICOPA)

I, Donald B. Karner, represent that I am Executive Vice President of Arizona Nuclear Power Project, that the foregoing document has been signed by me on behalf of Arizona Public Service Company with full authority to do so, that I have read such document and know its contents, and that to the best of my knowledge and belief, the statements made therein are true.

Donald B. Karner  
Donald B. Karner

Sworn to before me this 6 day of February, 1989.

Nora E. Meador  
Notary Public

My Commission Expires:

My Commission Expires April 6, 1991





**ATTACHMENT**

**ANPP RESPONSES TO GENERIC LETTER 88-17  
PROGRAMMED ENHANCEMENTS**



### **(1) NRC PROGRAMMED ENHANCEMENT**

Provide reliable indication of parameters that describe the state of the RCS and the performance of systems normally used to cool the RCS for both normal and accident conditions. At a minimum, provide the following in the CR:

- (a) two independent RCS level indications
- (b) at least two independent temperature measurements representative of the core exit whenever the RV head is located on top of the RV. (We suggest that temperature indications be provided at all times.)
- (c) the capability of continuously monitoring DHR system performance whenever a DHR system is being used for cooling the RCS
- (d) visible and audible indications of abnormal conditions in temperature, level, and DHR system performance

### **ANPP RESPONSE**

- (a) Level: ANPP will install a permanent Refueling Water Level Indication System (RWLIS) in accordance with the schedule provided in Generic Letter 88-17. Specifically, the RWLIS will be installed in each Palo Verde unit prior to the end of the second refueling outage following receipt of Generic Letter 88-17 (this corresponds to the third refueling outage for Unit 1, the third refueling outage for Unit 2, and the second refueling outage for Unit 3).

The process tubing design of the permanent RWLIS is shown in Figure 1. The RWLIS provides for independent level indication from

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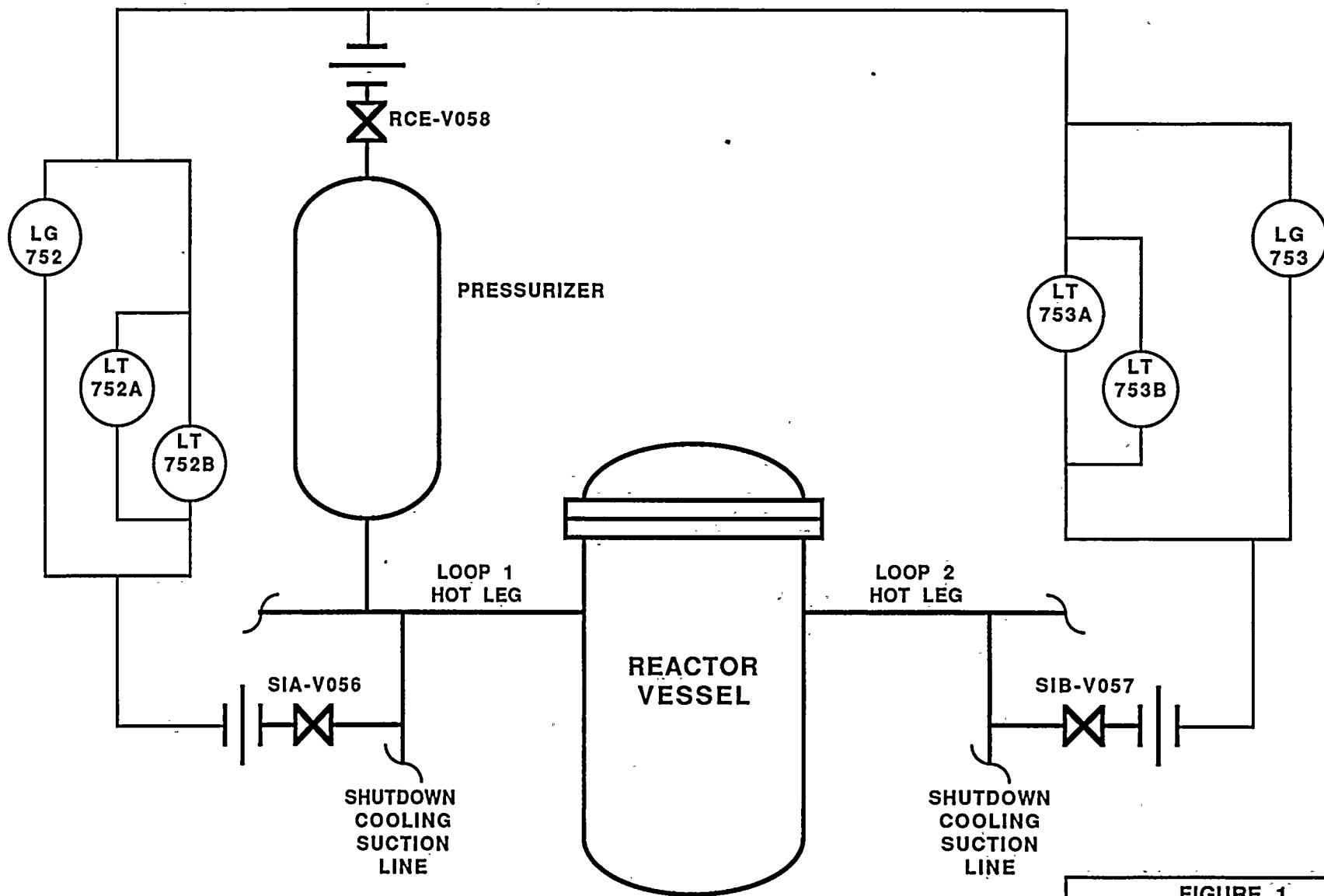
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each RCS hot leg. The system provides for two control room level indicators and one level recorder. The control room indicators receive input from two level transmitters (one wide range and one narrow range) on each RCS hot leg. The level signals are also input to the plant computer for trending and to the plant annunciator system for main control room alarm output. The main control room will have visible and audible alarms for low level and low-low level.

Due to the location of the sensing lines on the Shutdown Cooling System (SDCS) suction lines, the SDCS flow can have a significant effect on RCS level indications. As the SDCS flow increases, the pressure at the instrument tap decreases which results in the indicated level being lower than the actual level. To address this concern, the permanent RWLIS will include flow compensation. SDCS flowrate signals will be obtained from flow transmitters SIA-FT-306 and SIB-FT-307 and the level signals modified to compensate for the SDCS flow.

- (b) Temperature: In Reference 3, ANPP committed to maintain at least two Core Exit Thermocouples (CETs) available whenever the RCS was in a mid-loop condition and the reactor vessel head was located on top of the reactor vessel. This commitment addressed expeditious action #3 of Generic Letter 88-17. For the longer term, the NRC Staff is recommending that core exit temperature be available to the operators during all SDCS operations (i.e., with the reactor vessel head installed or removed and with the RCS filled or





**FIGURE 1**  
**REFUELING WATER LEVEL**  
**INDICATION SYSTEM**





in a reduced inventory condition). Currently, the Palo Verde units are not equipped with temperature instrumentation capable of satisfying this NRC recommendation under all conditions. Therefore, ANPP will conduct an engineering study to consider various ways to implement this NRC recommendation. This engineering study will consider existing instrumentation and potential design changes to provide core exit temperature for all phases of SDCS operations. The study will investigate the alternative solutions to determine if any of the alternatives are feasible. The study will be completed by April 30, 1990 and the results will be provided to the NRC.

- (c) DHR Monitoring: The operation of the SDCS at Palo Verde can be monitored through the use of the instrumentation described in Table 1. This instrumentation provides the capability to determine heat removal, cooldown rate, SDCS flow rate, and the capability to detect degradation in flow or heat removal capacity. No additional instrumentation [except for the permanent RWLIS discussed in 1(a) and any additional temperature instrumentation resulting from the study discussed in 1(b)] is required as a result of this NRC programmed enhancement. Note that the instrumentation listed in Table 1 does not include the additional instrumentation that is available to monitor systems that support SDCS operation.

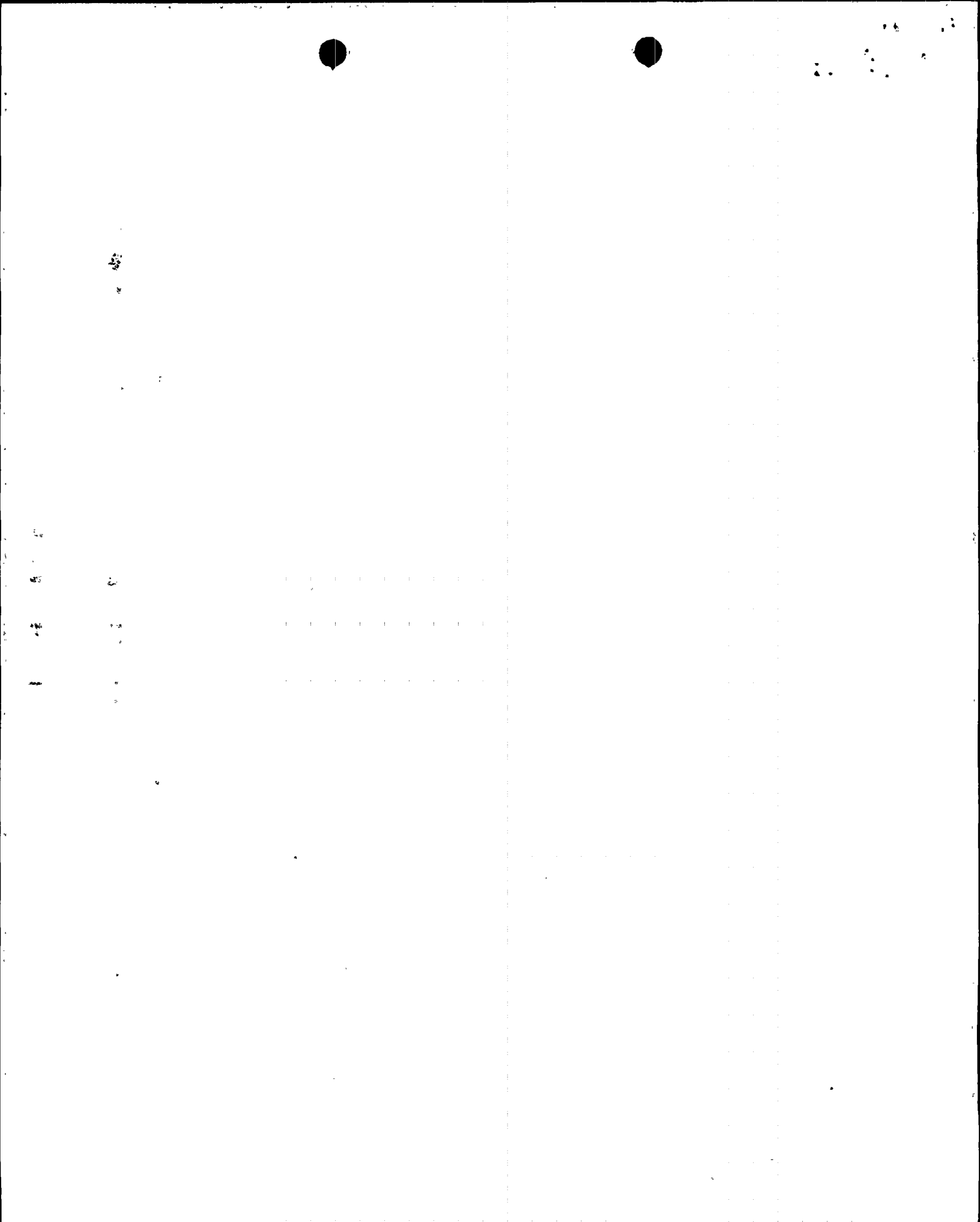


Table 1 - Instrumentation for Monitoring SDCS Operations

Monitored Parameter	Instrument Numbers	Instrument Location	Comments
Temperature	SIA-TT-303X SIB-TT-303Y	SDCS Heat Exchanger Outlet	SDCS heat exchanger outlet temperature is displayed on the main control board for both SDCS loops.
	SIA-TT-351X SIB-TT-352X	SDCS Heat Exchanger Inlet	SDCS heat exchanger inlet temperature is displayed by a recorder on the main control board for each SDCS loop.
	SIA-TT-351Y SIB-TT-352Y	LPSI Header	LPSI header temperature is displayed by a recorder on the main control board.
	CETs	Top of Fuel Assemblies	CETs are provided at the top of the fuel assemblies and are displayed in the main control room via the QSPDS CRTs.
	HJTC Probes	Reactor Vessel	The two Heated Junction Thermocouple (HJTC) probes can be used for core exit temperature monitoring when the system is available. Display is via the QSPDS CRTs.
	RCA-TT-112H1 RCB-TT-122H1	RCS Hot Leg RTDs	RCS hot leg temp. for loops 1 and 2 is displayed on recorders in the main control room.

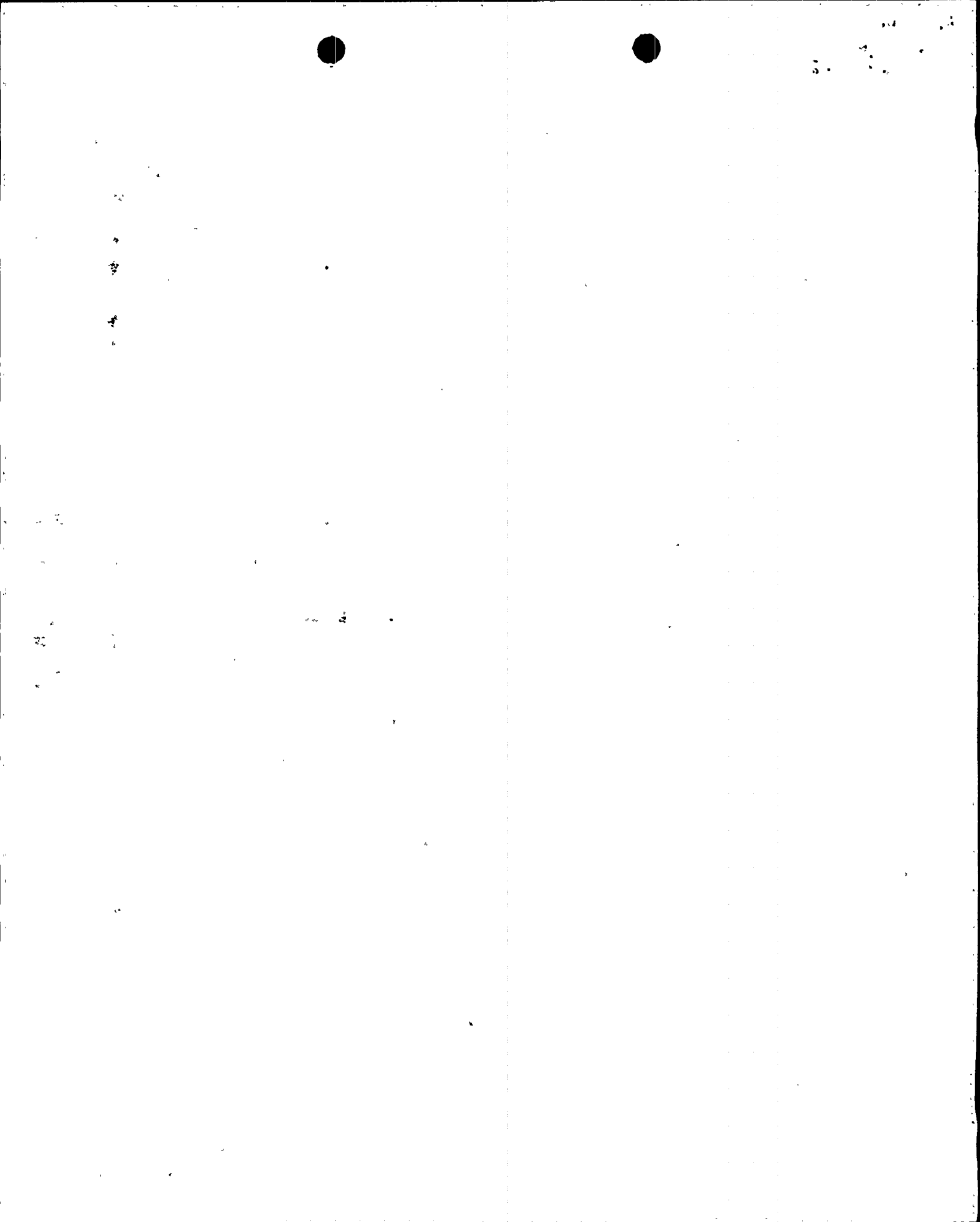
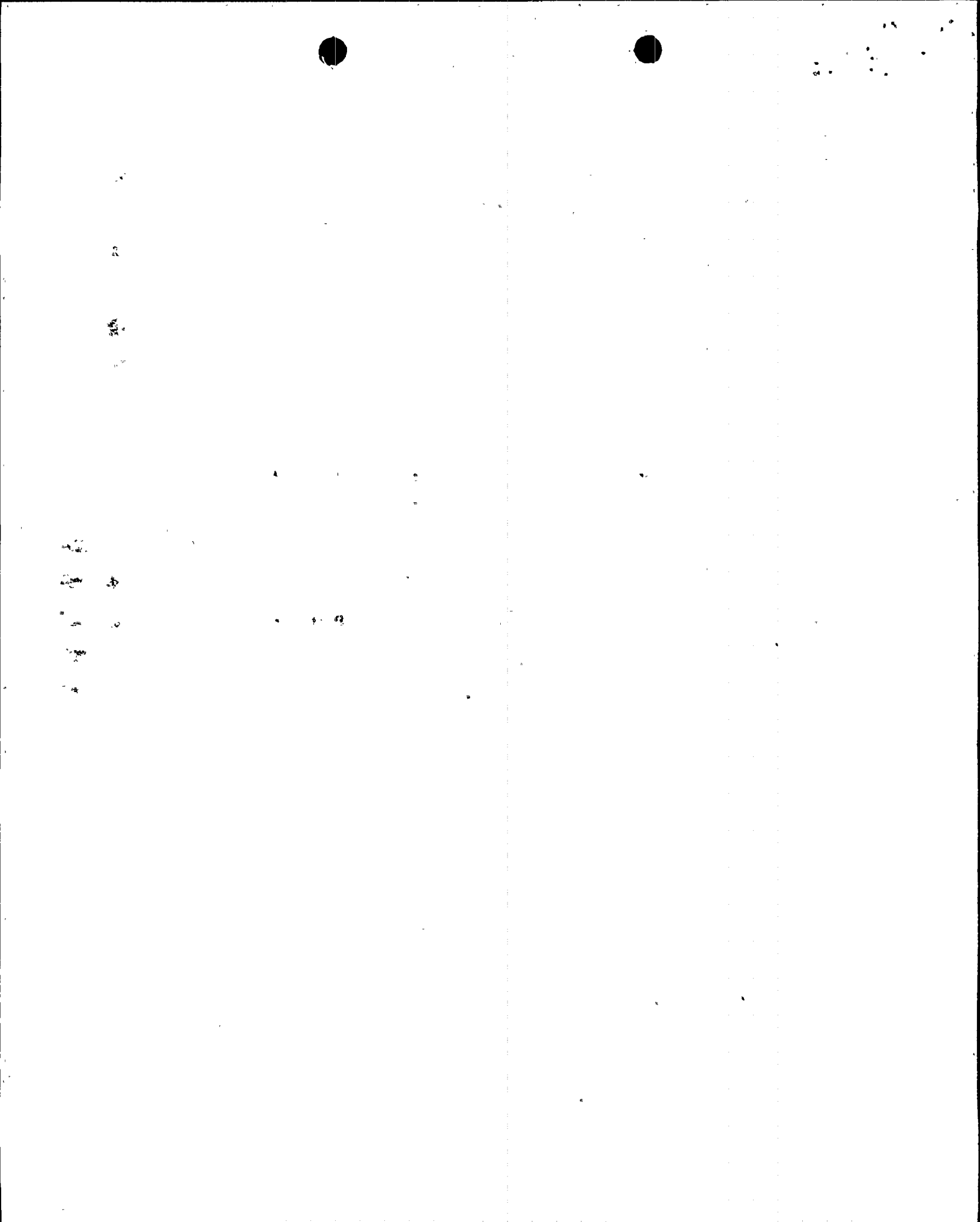


Table 1 - Instrumentation for Monitoring SDCS Operations (continued)

Monitored Parameter	Instrument Numbers	Instrument Location	Comments
Pressure	SIA-PT-303X SIB-PT-303Y	SDCS Heat Exchanger	Pressure transmitters are located on the inlet side of the SDCS heat exchangers and displayed in the main control room.
	SIA-PT-306 SIB-PT-307	LPSI to SDCS Heat Exchanger Cross-tie Lines	Pressure transmitters located on the cross-tie lines between the LPSI headers and the SDCS heat exchangers. This parameter is displayed in the main control room.
Flow	SIA-FT-306 SIB-FT-307	LPSI Headers	Flow instruments are located on the SDCS return lines to the RCS and are displayed in the main control room.
	SIA-FT-338 SIB-FT-348	CS Pump Discharge	If a CS pump is being used for shutdown cooling, then pump flow rate is displayed in the main control room.
Pump Status (Motor Current)	SIA-HS-5 SIA-HS-3 SIB-HS-6 SIB-HS-4	Motor Amps for LPSI and CS Pumps	Each pump that can be used for SDCS is provided with motor current indication in the main control room.



(d) Visible and Audible Indications: The responses to items 1(a) through 1(c) provided a description of the instrumentation that would provide the control room operators with visible indication of RCS temperature, RCS level, and SDCS performance. Table 2 provides a listing of the alarms (existing and planned) that provide a visible and audible indication of problems with the SDCS or supporting systems and problems with RCS level. In addition to the alarms listed in Table 2, ANPP is currently designing a low flow alarm for the pumps used for shutdown cooling (i.e., LPSI and CS pumps). When installed, these low flow alarms will provide for visible and audible indication in the control room if the LPSI or CS pump flow decreases below a low flow setpoint during shutdown cooling operations. Following completion of the design effort, ANPP will install these additional alarms in each of the Palo Verde units on a schedule consistent with the requirements of Generic Letter 88-17. This corresponds to the third refueling outages for Units 1 and 2 and the second refueling outage for Unit 3.

Table 2 - Visible and Audible Indications

Window	Display	Comments
2A09A	ESS CLG WTR SYS TRBL	This alarm indicates a problem in the essential cooling water system. This system supports SDCS operations by transferring heat from the SDCS heat exchangers to the spray pond system.

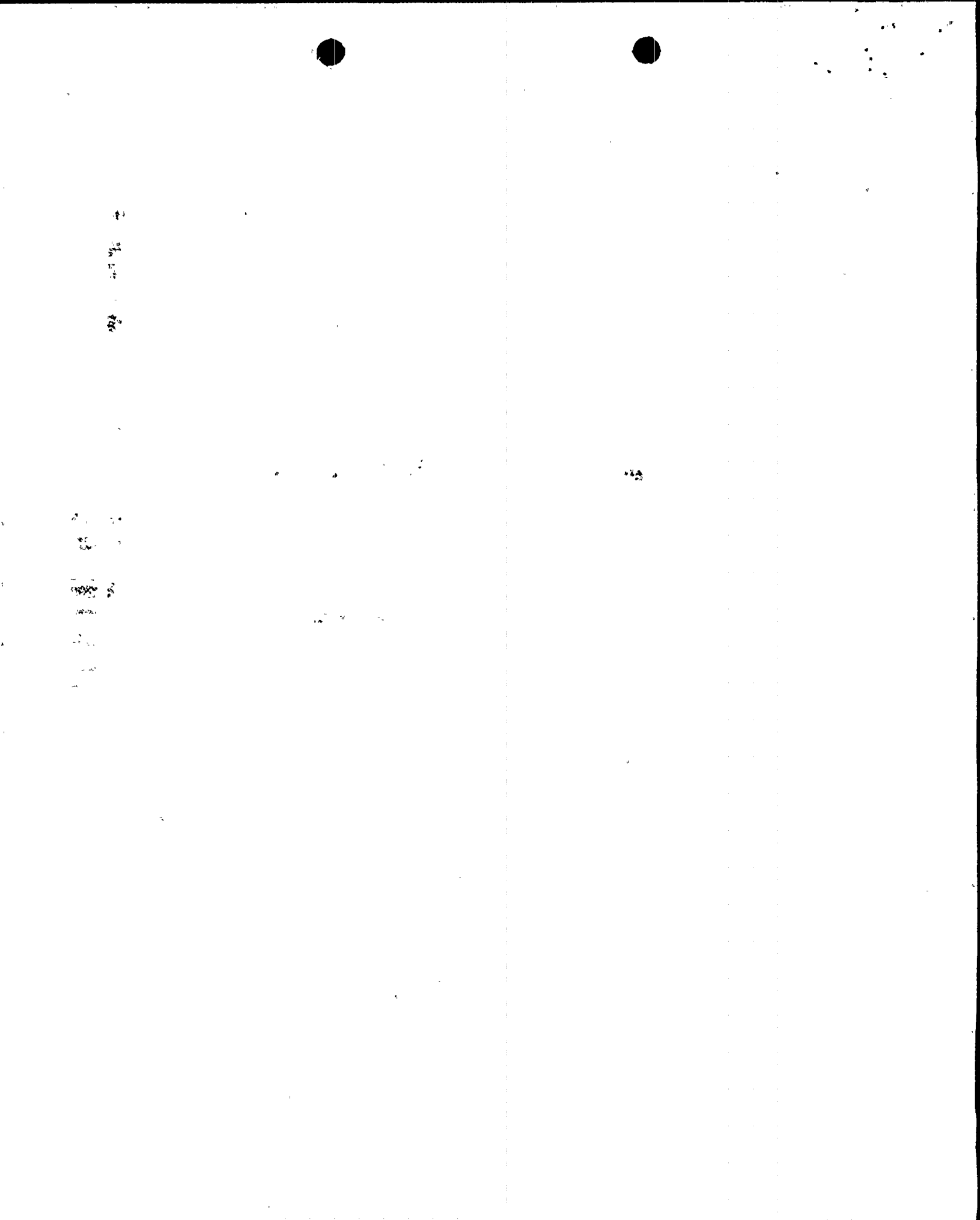
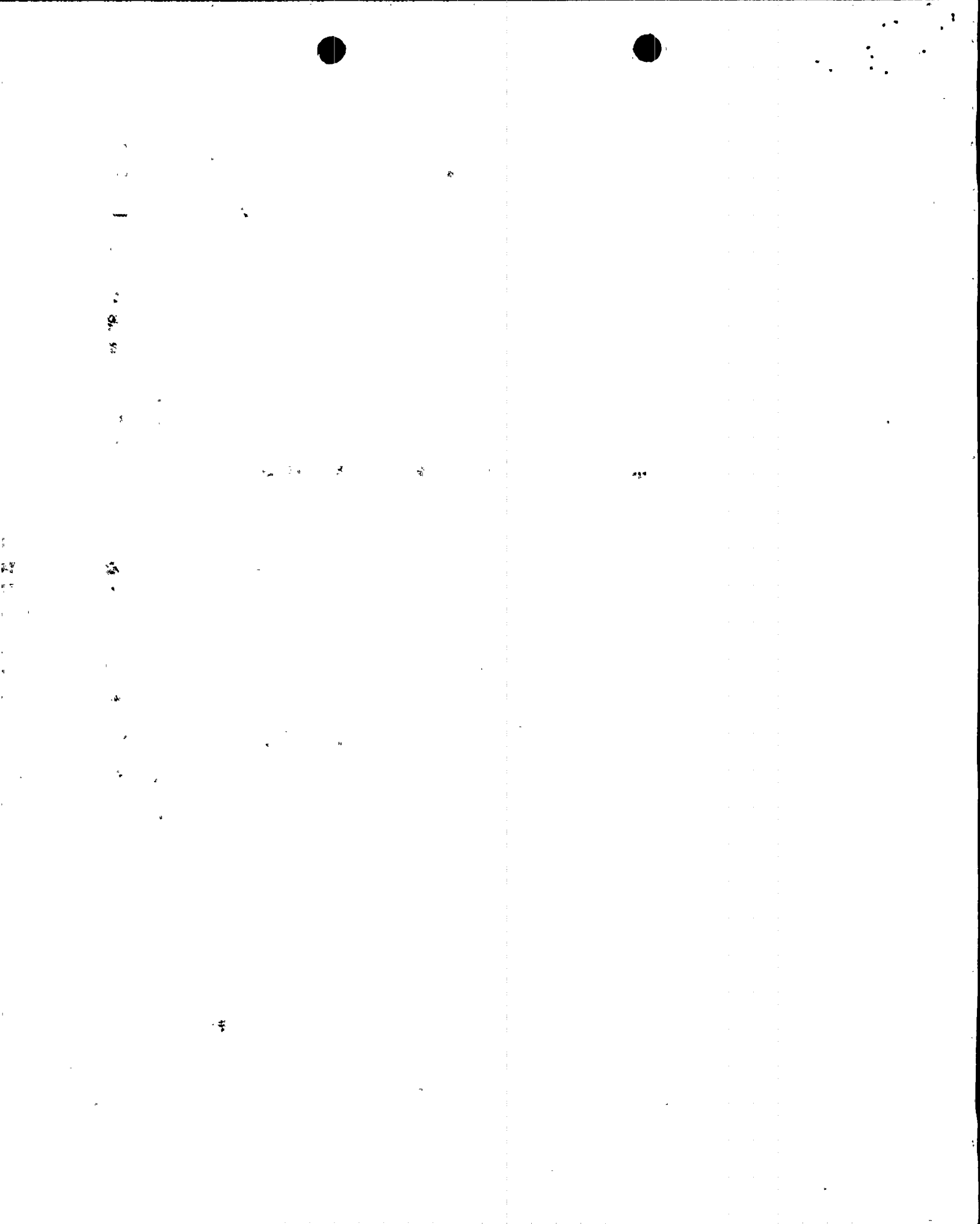




Table 2 - Visible and Audible Indications (continued)

Window	Display	Comments
2A09B 2A10B	ESS CLG WTR PMP A (B) DSCH PRESS HI-LO	These alarms indicate either a high or low discharge pressure condition from the two essential cooling water pumps.
2A11A	ESP SYS TRBL	This alarm indicates a problem in either of the two essential spray pond trains.
2A11B 2A12B	ESP PMP A(B) DSCH PRESS HI-LO	These alarms indicate either a high or low discharge pressure condition from the two essential spray pond pumps.
2B10A	REFUELING WATER LEVEL LO	This alarm will be installed with the new RWLIS in accordance with the schedule described in the response to item 1(a). It is anticipated that the alarm setpoint will be slightly above the centerline of the RCS hot legs.
2B10B	REFUELING WATER LEVEL LO-LO	This alarm is also part of the new RWLIS and will be installed in accordance with the RWLIS installation schedule. It is expected that the alarm setpoint will be set at the centerline of the RCS hot legs.



## **(2) NRC PROGRAMMED ENHANCEMENT**

Develop and implement procedures that cover reduced inventory operation and that provide an adequate basis for entry into a reduced inventory condition. These include:

- (a) procedures that cover normal operation of the NSSS, the containment, and supporting systems under conditions for which cooling would normally be provided by DHR systems.
- (b) procedures that cover emergency, abnormal, off-normal, or the equivalent operation of the NSSS, the containment, and supporting systems if an off-normal condition occurs while operating under conditions for which cooling would normally be provided by DHR systems.
- (c) administrative controls that support and supplement the procedures in items (a), (b), and all other actions identified in this communication, as appropriate.

## **ANPP RESPONSE**

- (a) The following list of procedures provides the operating instructions applicable to reduced inventory operations, assures that the necessary equipment is operable/available, and provides instructions for operating supporting systems. All of the listed procedures are currently available for use with the exception of procedure 4XOP-XZZ16. (Note that the unit specific designator has been replaced by an "X" in the procedure numbers shown below.)

4XOP-XZZ16 "RCS Drain Operations" = This procedure is currently being developed and will be the normal operating procedure for reduced inventory operations. This new procedure is expected to be available prior to the next reduced inventory operation at Palo Verde. This procedure will provide the operating



instructions for entry into and operation in a reduced inventory condition.

4XOP-XSI01 "Shutdown Cooling Initiation" = This procedure provides the instructions for placing the shutdown cooling system into service.

4XOP-XRC04 "Reactor Coolant System Gas Vent System" = This procedure is used during the draining process of the RCS.

4XOP-XRC02 "Reactor Coolant System Fill and Vent" = The instructions in this procedure are used to exit from a reduced inventory condition.

4XOP-XSI02 "Recovery from Shutdown Cooling to Normal Operating Lineup" = This procedure provides instructions for terminating SDCS operations.

4XOP-XEW01(2) "Essential Cooling Water System (EW) Train A (B)" = These two procedures provide operating instructions for the two trains of the essential cooling water system. This system is needed to support SDCS operations.

4XOP-XSP01(2) "Essential Spray Pond (SP) Train A (B)" = These two procedures provide operating instructions for the two trains of the essential spray pond system. This system is needed to support SDCS operations.

(b) The procedure listed below is currently available for use and covers abnormal operations while the RCS is in a reduced inventory condition:

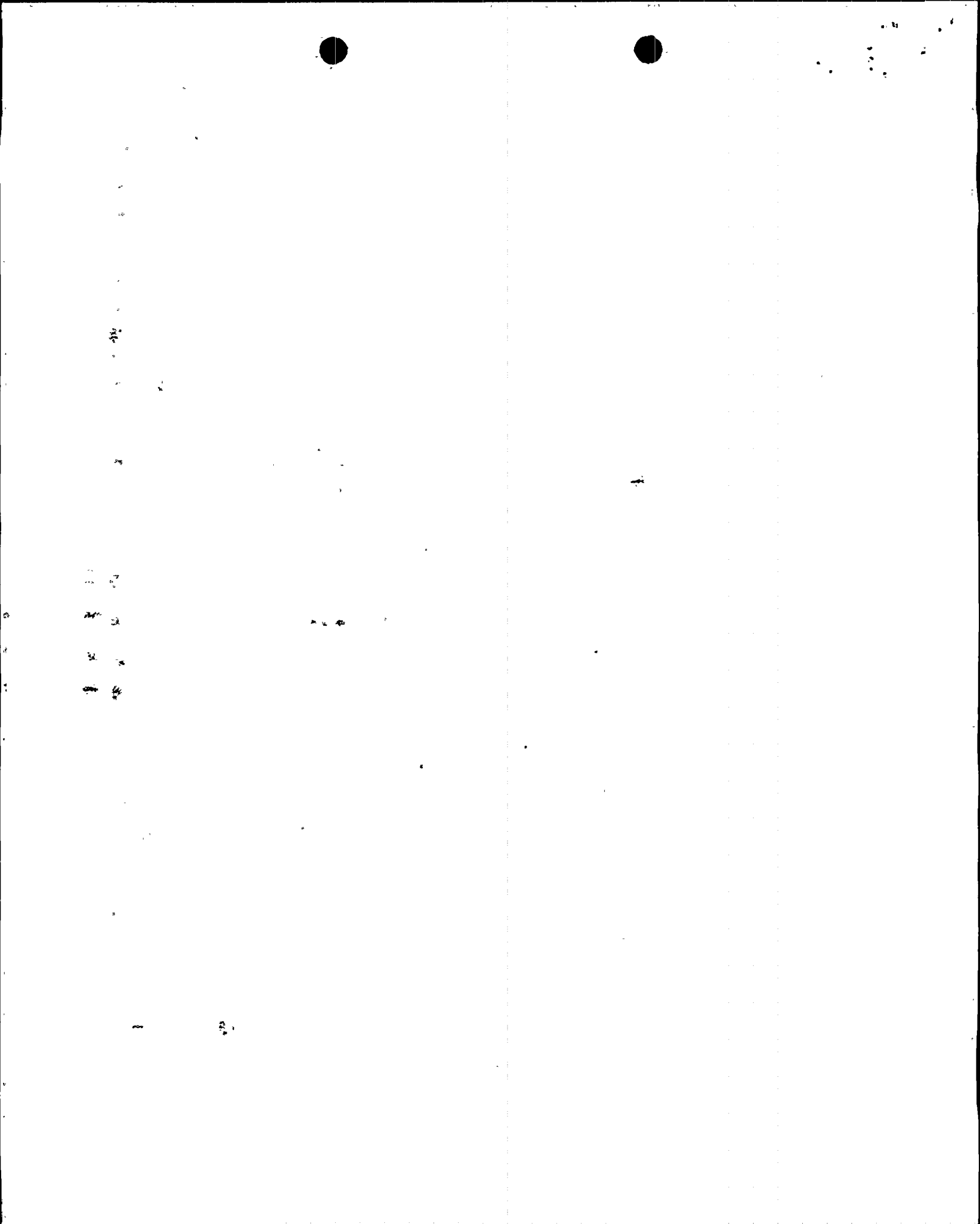
4XAO-XZZ22 "Loss of Shutdown Cooling" = This procedure covers the actions necessary to restore core cooling in the event of a loss of SDCS. The procedure addresses actions related to providing makeup to the RCS,

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closing the containment, and restoring support systems that may have caused the loss of SDCS.

- (c) An administrative control procedure is being developed to formalize the Mid-Loop Coordinator position (refer to item #5 of Reference 3). This procedure will incorporate several of the administrative controls related to reduced inventory operations. Other procedures that are presently in existence and are related to actions required by Generic Letter 88-17 include:

- 36MT-9RI06 "Withdrawal of the Incore Instruments for Reactor Refueling Operations" = This procedure provides the instructions for maintaining two core exit thermocouples available for mid-loop operations as described in item #3 of Reference 3.
- 31MT-9RC27 "Installation and Removal of Reactor Vessel Temporary Level Indicator" = This procedure provides the instructions for installing the tygon tube level monitoring system on RCS loop #1.
- 31MT-9RC28 "Installation and Removal of Reactor Vessel Temporary Level Indicator RC Loop #2" = This procedure provides the instructions for installing the tygon tube level monitoring system on RCS loop #2.





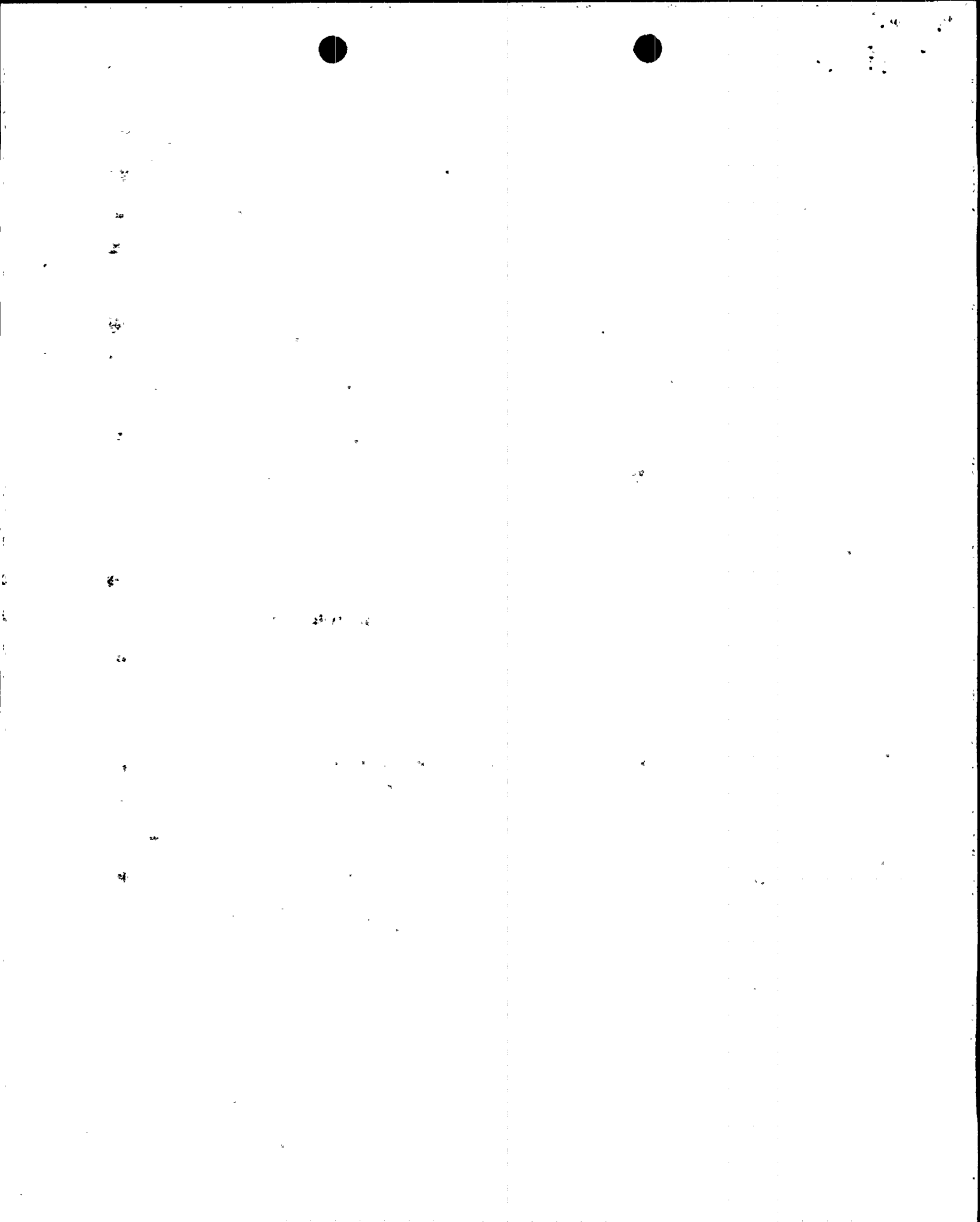
### **(3) NRC PROGRAMMED ENHANCEMENT**

- (a) Assure that adequate operating, operable, and/or available equipment of high reliability is provided for cooling the RCS and for avoiding a loss of RCS cooling.
- (b) Maintain sufficient existing equipment in an operable or available status so as to mitigate loss of DHR or loss of RCS inventory should they occur. This should include at least one high pressure injection pump and one other system. The water addition rate capable of being provided by each equipment item should be at least sufficient to keep the core covered.
- (c) Provide adequate equipment for personnel communications that involve activities related to the RCS or systems necessary to maintain the RCS in a stable and controlled condition.

### **ANPP RESPONSE**

- (a) The Palo Verde units are provided with reliable equipment for performing the decay heat removal function. Each Palo Verde unit is equipped with two safety grade Shutdown Cooling Systems (SDCS). Either the Low Pressure Safety Injection (LPSI) or the Containment Spray (CS) pumps can be used for the SDCS function. The LPSI and CS pumps are safety grade pumps. Additionally, the support systems necessary for fulfilling the SDCS function are safety grade. The direct support systems include the essential cooling water system and the essential spray pond system.

For the various shutdown modes, the Palo Verde Technical Specifications assure that adequate equipment is maintained in an operable condition for performing the RCS heat removal function. However, ANPP believes that revisions can be made to the



Technical Specifications to improve SDCS reliability. These revisions were described in Reference 3 and include: i) removal of the SDCS suction valve autoclosure interlocks, and ii) a reduction in the SDCS flow rate requirements.

(b) ANPP's response to item #6 of the expeditious actions (see Reference 3) stated that at least two available means of adding inventory to the RCS will be provided whenever the RCS is in a reduced inventory condition. The required makeup flowrates were based upon analysis of loss of SDCS events. ANPP will also examine credible loss of RCS inventory events to determine the makeup flowrates required to keep the core covered during these events. Any necessary revisions to the required makeup flowrates will then be incorporated into the appropriate administrative controls for reduced inventory operations by April 30, 1990.

(c) ANPP's Engineering Department and Operations Standards Department will examine the existing personnel communications equipment to determine if the existing equipment is adequate for maintaining the RCS in a stable and controlled condition. The study will consider design changes where deficiencies are found. The study will be completed by April 30, 1990.

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#### **(4) NRC PROGRAMMED ENHANCEMENT**

Conduct analyses to supplement existing information and develop a basis for procedures, instrumentation installation and response, and equipment/NSSS interactions and response. The analyses should encompass thermodynamic and physical (configuration) states to which the hardware can be subjected and should provide sufficient depth that the basis is developed. Emphasis should be placed upon obtaining a complete understanding of NSSS behavior under nonpower operation.

#### **ANPP RESPONSE**

The response to this item was provided in Reference 3.

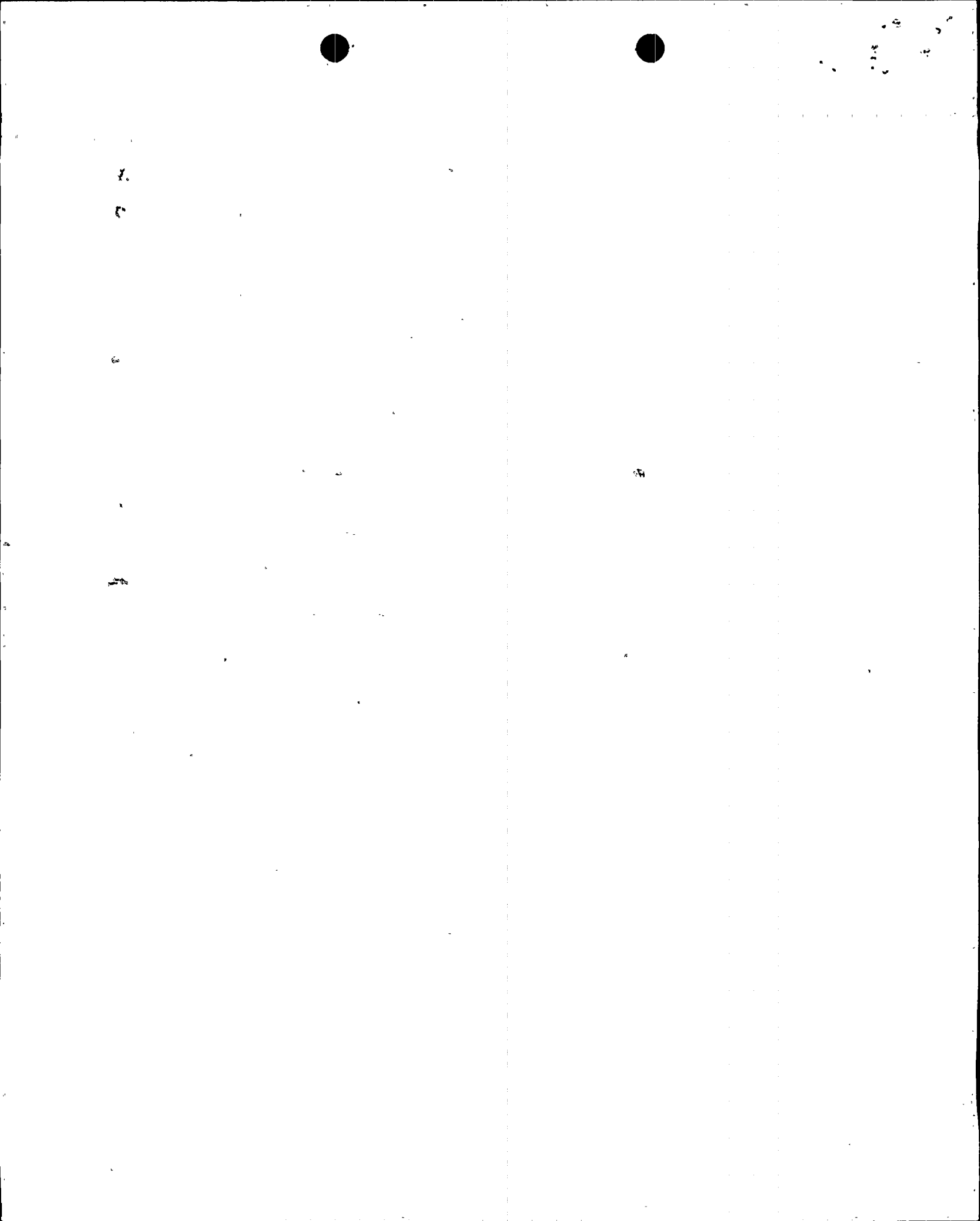
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**(5) NRC PROGRAMMED ENHANCEMENT**

Technical Specifications (TSs) that restrict or limit the safety benefit of the actions identified in this letter should be identified and appropriate changes should be submitted.

**ANPP RESPONSE**

The response to this item was provided in Reference 3.





**(6) NRC PROGRAMMED ENHANCEMENT**

Item (5) of the expeditious actions should be reexamined and operations refined as necessary to reasonably minimize the likelihood of loss of DHR.

**ANPP RESPONSE**

ANPP will review the issue of RCS perturbations after experience has been gained with the new procedural controls. The review will be conducted by the on-site Independent Safety Engineering Group and will examine the accumulated experience and determine the adequacy of the procedural controls. The review may also identify certain activities that should not be performed during mid-loop operations or additional measures that should be taken during the performance of certain activities. ANPP will complete this review by April 30, 1990. A schedule will then be developed for addressing any deficiencies.

