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 RECIPIENT AFFILIATION  
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 MARTIN, J.B.      Region 5 (Post 820201)

SUBJECT: Requests temporary waiver of compliance from LCO 3.8.2.1, "DC Sources - Operating" to allow one dc train to be inoperable for up to 8 h to permit replacement of existing two-cell battery jars in one dc train (Channel B).

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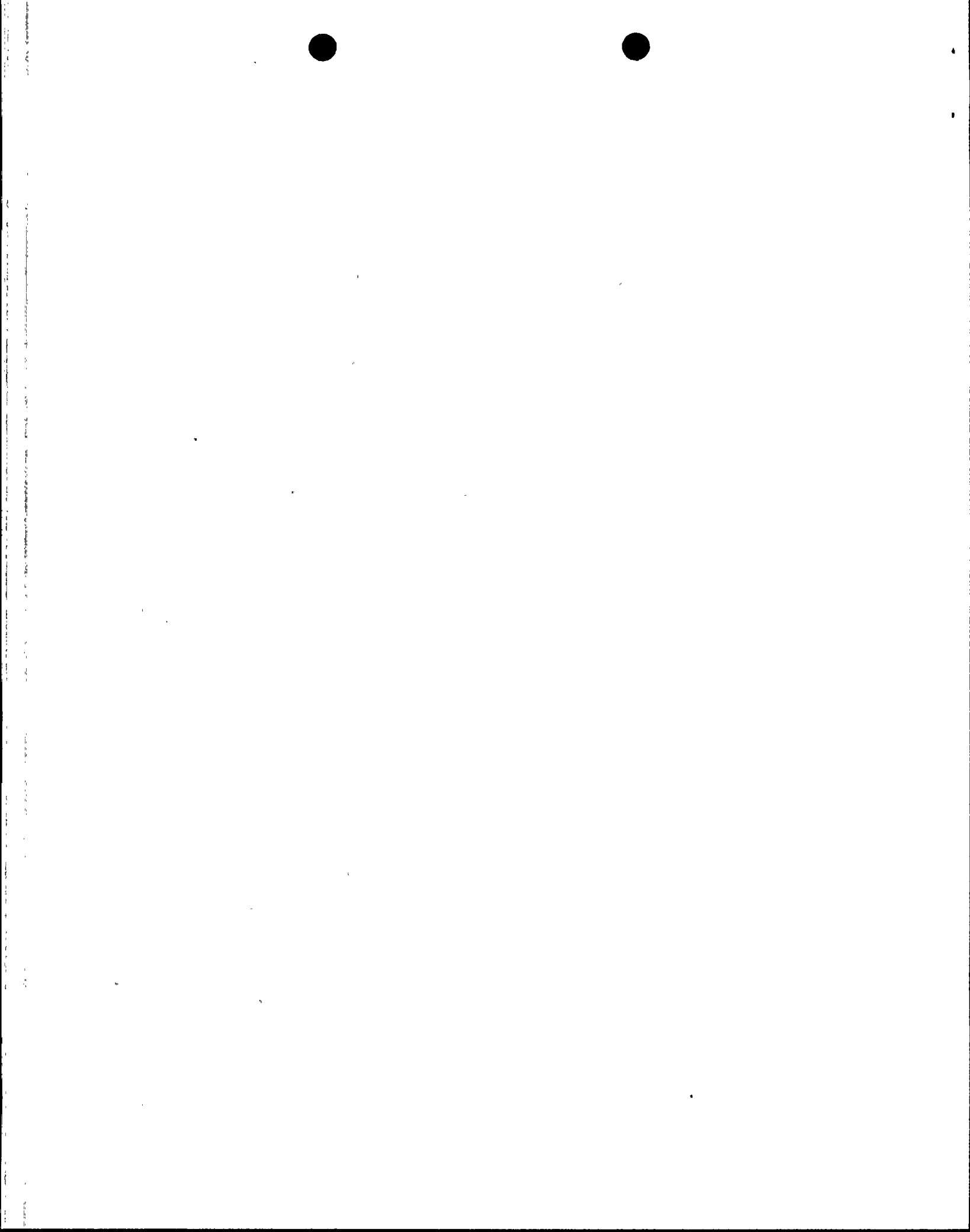
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WILLIAM F. CONWAY  
EXECUTIVE VICE PRESIDENT  
NUCLEAR

161-04308-WFC/JRP

November 25, 1991

Docket No. STN 50-528

Mr. John B. Martin  
Regional Administrator, Region V  
U. S. Nuclear Regulatory Commission  
1450 Maria Lane, Suite 210  
Walnut Creek, California 94596-5368

Dear Mr. Martin:

Subject: Palo Verde Nuclear Generating Station (PVNGS)  
Unit 1  
Request for Temporary Waiver of Compliance from Limiting  
Condition for Operation 3.8.2.1; D. C. Sources-Operating  
File: 91-056-026

Arizona Public Service Company herewith requests a Temporary Waiver of Compliance from Limiting Condition for Operation (LCO) 3.8.2.1; D. C. Sources - Operating. The Temporary Waiver of Compliance would allow one DC Train to be inoperable for up to eight hours. The existing LCO allows one DC Train to be inoperable for up to two hours. The additional six hours is necessary to allow Unit 1 to replace two existing two-cell battery jars in one DC Train (Channel B) with two new two-cell battery jars.

The existing LCO Action statement requires that, with one of the required DC trains inoperable, restore the inoperable DC Trains to OPERABLE status within two hours or be in at least HOT STANDBY within the next six hours.

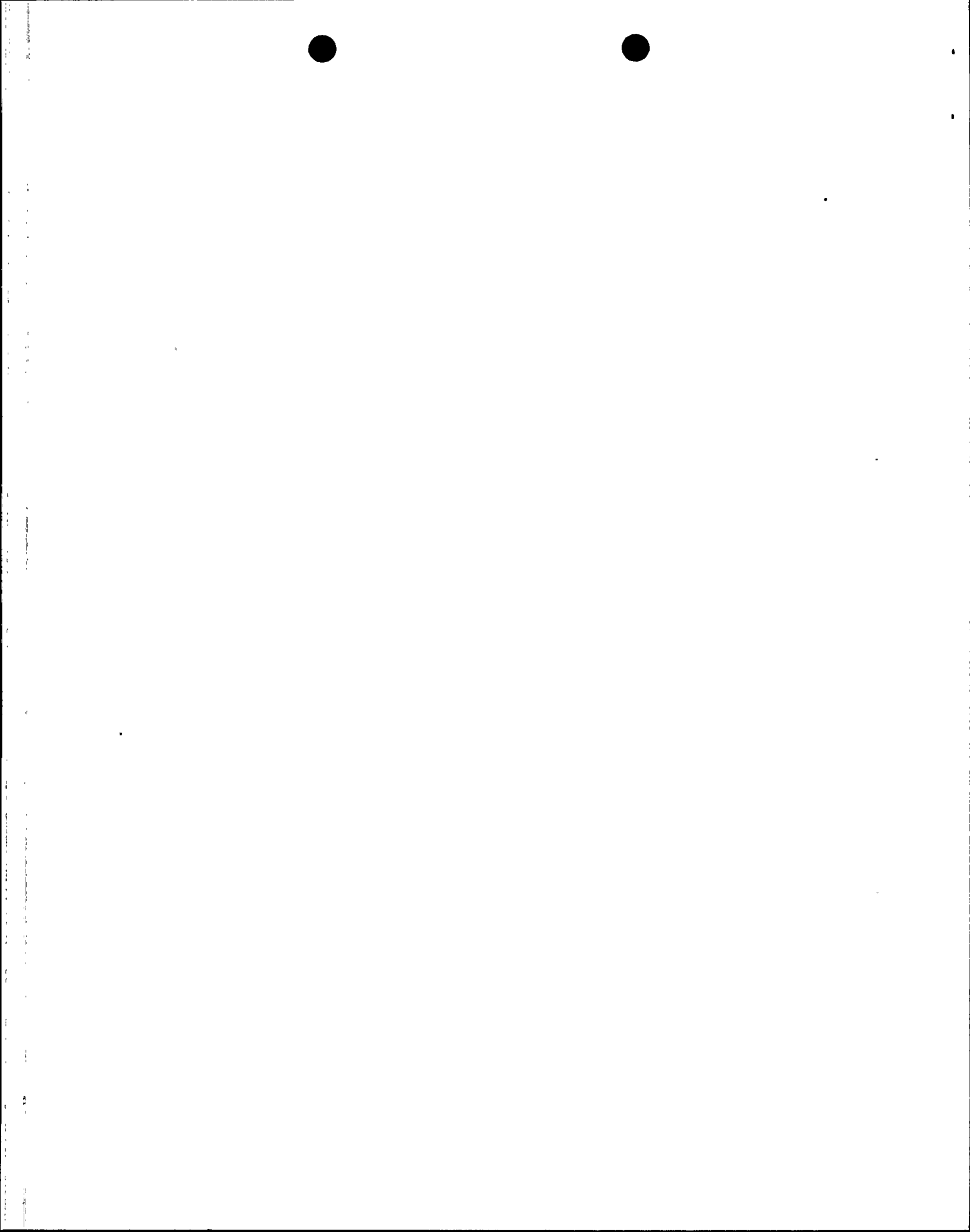
The Temporary Waiver of Compliance is necessary in order to prevent an unnecessary plant shutdown to Mode 5 to replace the batteries.

It is requested that the NRC review and approve this Temporary Waiver of Compliance prior to December 4, 1991, in order to allow battery replacement to begin on that date. Enclosed with this letter, please find the bases for the Temporary Waiver of Compliance.

Pursuant to 10 CFR 50.91(b)(1), and by copy of this letter, Arizona Radiation Regulatory Agency is being notified of this request for a Temporary Waiver of Compliance.

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Mr. John B. Martin  
U. S. Nuclear Regulatory Commission  
Temporary Waiver of Compliance  
Page 2

If you should have any questions, please contact Michael E. Powell of my staff  
at (602) 340-4981.

Sincerely,

*James M. Levine*  
for WFC

WFC/JRP/rw  
Attachment

cc: Document Control Desk  
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C. H. Coe  
A. C. Gehr  
A. H. Gutterman  
P. J. Weeden

ATTACHMENT

REQUIREMENTS FOR WHICH THE WAIVER IS REQUESTED

The Class 1E DC system (Figures 1 and 2, and also discussed in UFSAR Section 8.3.2) provides DC electric power to the Class 1E DC loads, including the inverters which power the Class 1E 120V AC buses, and for control and switching of the Class 1E systems. Physical separation, electrical isolation, and redundancy are provided to prevent common failure modes. Design of the Class 1E DC system includes the following:

- o The DC system is separated into two trains of two channels each.
- o The safety actions by each group of loads are independent of the safety actions provided by its redundant counterpart.
- o Each DC Channel includes power supplies that consist of one battery and one battery charger.
- o Each DC Train has a swing charger capable of supplying either of the two DC Channels in the train.
- o The batteries are not interconnected.
- o The redundant batteries cannot be made inoperable by a single design basis event.

Each Class 1E distribution circuit is capable of starting and operating all required loads in that circuit. Distribution circuits to redundant equipment are independent of each other. The distribution system is monitored to ensure that the system is energized and operable (i.e., available to accept emergency loads). The DC auxiliary devices required to operate equipment of a specific AC Train are supplied from the corresponding DC Train.

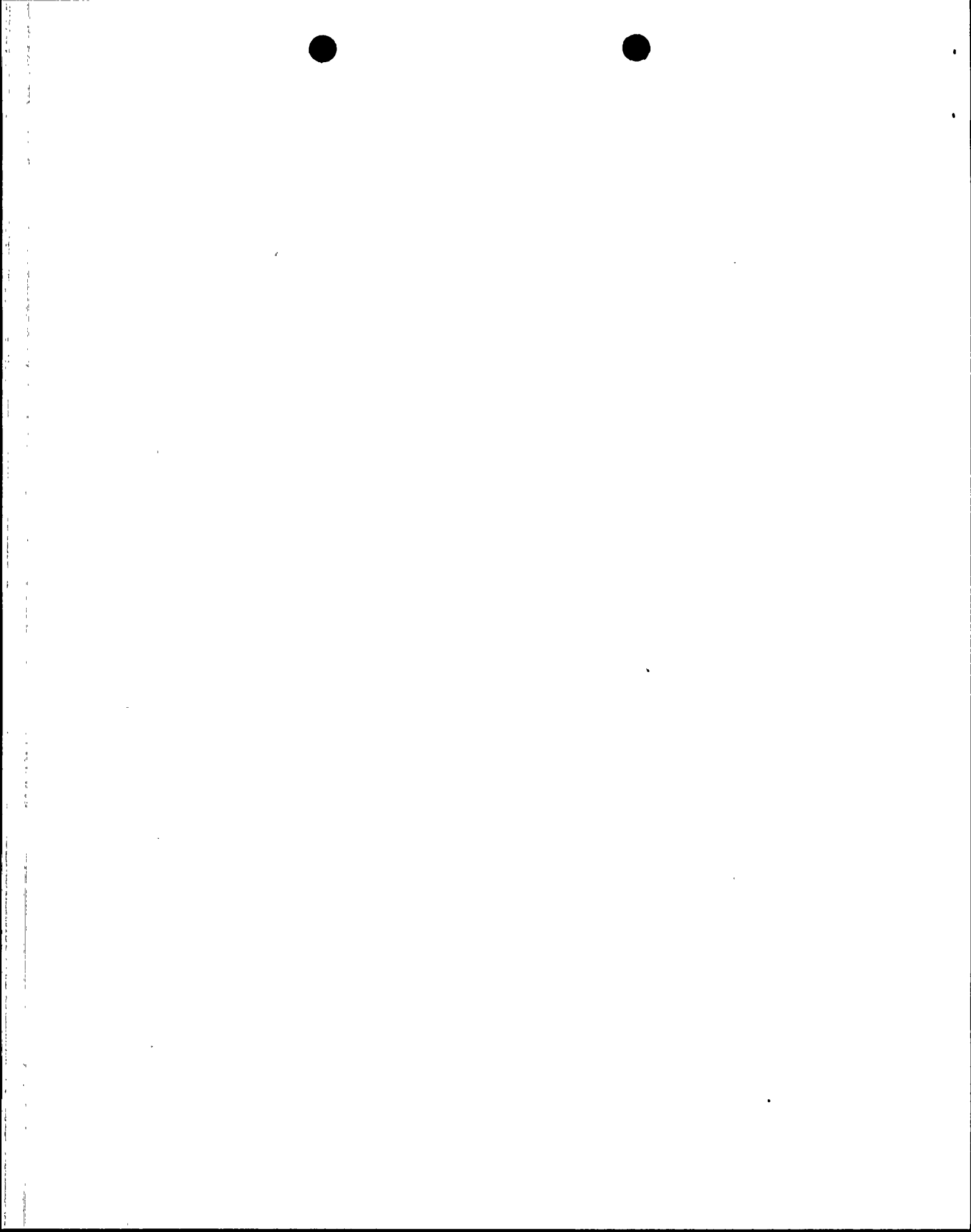
Some nonsafety-related circuits may be supplied from the safety-related DC buses. In such cases, those circuits are treated as safety-related up to the equipment terminations or isolation devices.

Each battery is continuously available to start and operate required loads.

Control room instrumentation is provided to monitor the status of the battery supply as follows:

- o DC bus undervoltage alarm (a)
- o Battery current indication
- o DC voltage indication
- o DC ground alarm
- o Battery breaker open alarm (a)

a. via alarm typewriter, alarm CRTs and plant annunciator.



The Plant Monitoring System provides a common DC system trouble annunciator.

The batteries are maintained in a fully-charged condition and have sufficient stored energy to operate all necessary circuit breakers. They can provide an adequate amount of energy for all required emergency loads for two hours after loss of AC power. The periodic testing and surveillance requirements for the Class 1E batteries are detailed in Section 4.8.2.1 of the Technical Specifications.

Each Class 1E battery charger has sufficient capacity to restore the battery from the design minimum charge to its fully-charged state while supplying the maximum demand of the steady-state loads. Each of the batteries in the four channels has a dedicated battery charger. Additionally, each train has a swing charger which can supply either of the two battery channels in the train. The swing charger is mechanically interlocked to prevent both battery channels from being connected to the charger simultaneously. Instrumentation is provided to monitor the status of the battery charger as follows:

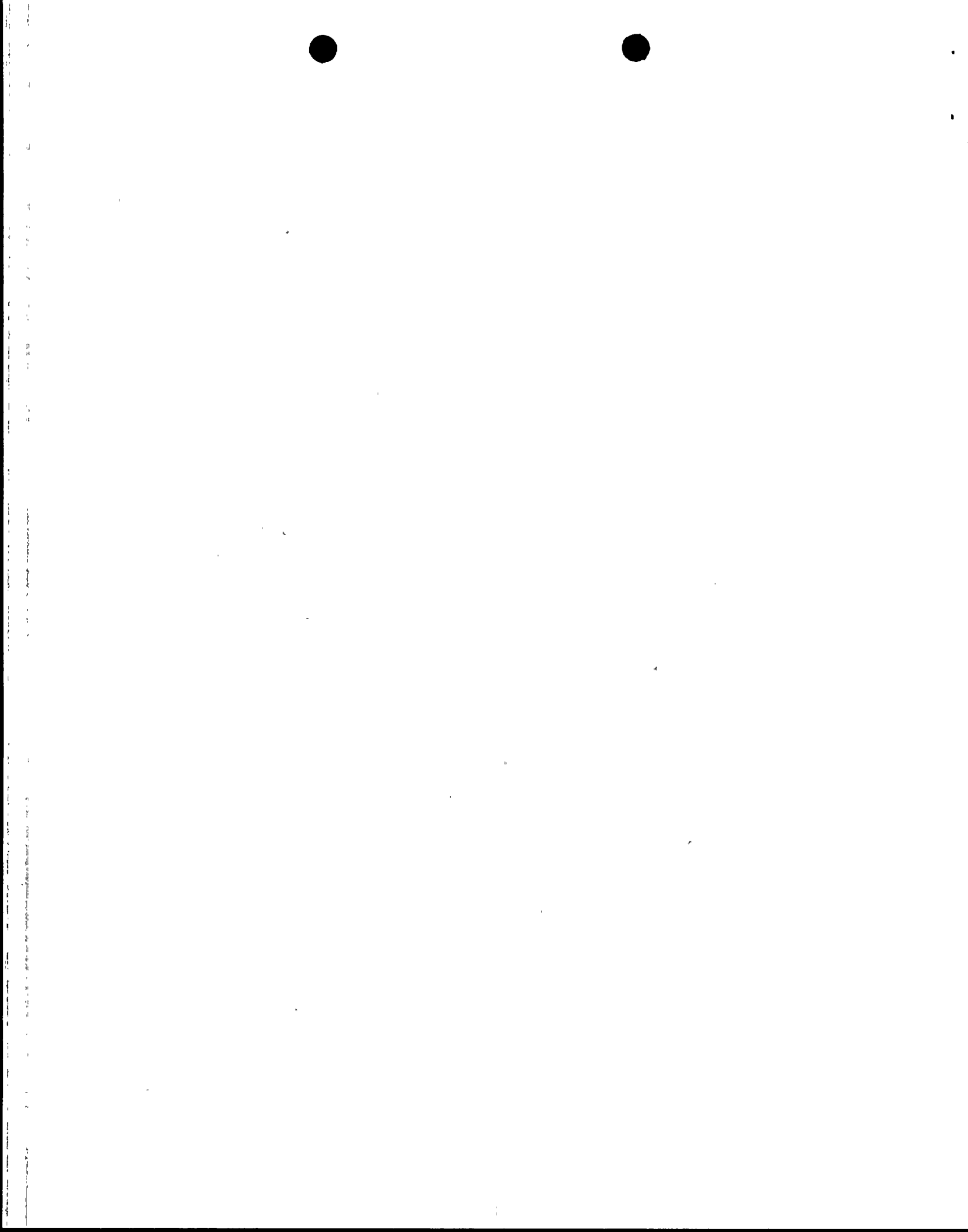
- o Output voltage at the charger and in the control room
- o Output current at the charger and in the control room
- o AC and DC breaker position indications at the charger
- o Charger malfunction alarm in control room, including input AC undervoltage, DC undervoltage, DC overvoltage, and output breaker open

Each battery charger has an input AC and output DC circuit breaker for isolation of the charger. Each battery charger power supply is designed to prevent the AC supply from becoming a load on the battery due to a power feedback as the result of the loss of AC power to the chargers. Battery chargers are provided with built-in overvoltage shutdown protection capable of tripping the AC input breaker in the event of DC overvoltage.

Equipment of the Class 1E DC system is protected and isolated by fuses or circuit breakers in case of short circuit or overload conditions. Indication is provided to identify equipment that is made unavailable.

The Class 1E 125V DC subsystem is designed to meet Seismic Category I requirements. The batteries, battery chargers, inverters, and other components of each DC subsystem are housed in the control building, which is a Seismic Category I structure. The 125V DC batteries and battery racks are designed to 0.20g Safe Shutdown Earthquake (SSE) conditions.





CIRCUMSTANCES SURROUNDING THE SITUATION AND WHY IT COULD NOT BE AVOIDED

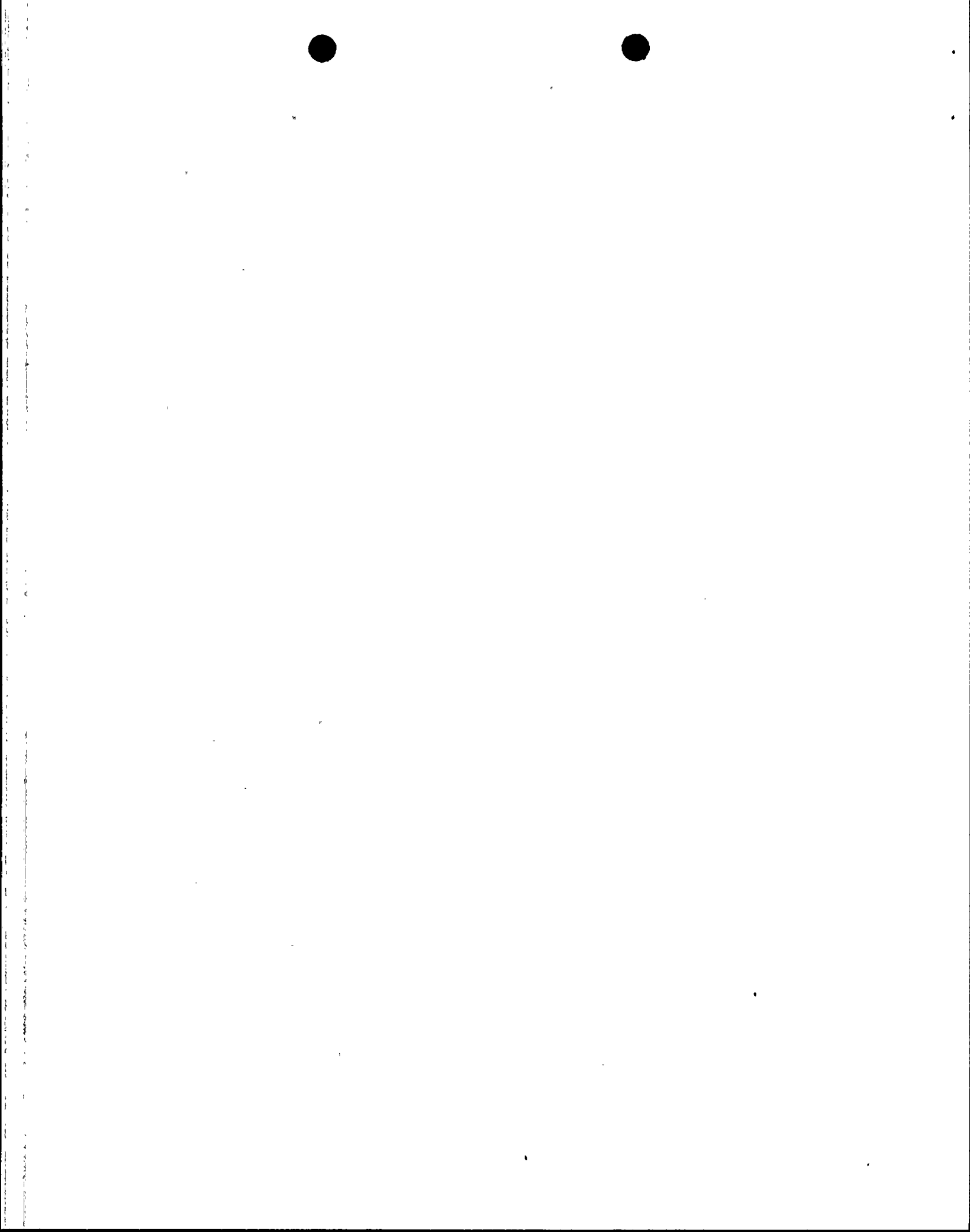
The 125V DC batteries which are part of the Class 1E DC system at Palo Verde Nuclear Generating Station (PVNGS) were manufactured by Exide Corporation. There are two sizes of the same model; 2GN13 (1140 amp-hour) and 2GN23 (1800 amp-hour). Channels A and B batteries are model 2GN23 and Channels C and D batteries are model 2GN13. Two predominant problems developed with the Exide Corporation cells after installation. First, the seal between the cover and the terminal posts was not entirely effective. When the electrolyte enters the positive post seal area and becomes trapped, corrosion of the post takes place. The corrosion builds up over time, and when the growth results in enough stress on the seal area, the plastic nut around the seal or the cell cover, or both, crack to relieve the stresses. The second problem is copper contamination. The battery posts are constructed of copper cast in lead. When there is a defect in the lead post casting that allows the electrolyte to penetrate the lead and contact the copper, electroplating occurs removing copper from the copper insert in the positive post and depositing it on the negative plates.

Exide has maintained that the problems were minor and did not require immediate replacement. Also, Exide had a procedure to pour a layer of epoxy over the top of the cells that exhibited the cracking problem. This "fix" was not used on the Class 1E DC System cells but was used on the non-class DC System. Arizona Public Service Company (APS) currently has cells in Unit 2 non-class 1E batteries with the epoxy application.

The current status and history of Class 1E cells with cracked seal nuts and covers and copper contamination is as follows:

UNIT	BATTERY CHANNEL	CURRENT CELLS WITH CRACKS	CELLS REPLACED		
			CURRENT CELLS WITH COPPER CONTAMINATION	WITH COPPER CONTAMINATION	WITH CRACKS
1	A	2			
	B	12			8
	C	1			3
	D	1			2
2	A		1		1
	D		2		
3	A			4	
	B			3	
	C	1		11	1
	D		1	4	2
<b>TOTALS</b>		<b>17</b>	<b>4</b>	<b>22</b>	<b>17</b>

Exide has changed the design of the post seals. The new style is used for replacement cells. APS has not experienced any problems with the new design.



The Exide cell problems are not unique to PVNGS. Other utilities have performed corrective actions with no known major problems until one station declared two batteries inoperable when a cell cracked on September 11, 1991, and spilled one-third of its electrolyte. Both batteries had the epoxy cover pour.

It is APS' position that the epoxy pour on the cover allowed greater stress to build around the post before a crack relieved that stress, causing the major crack. Since PVNGS does not have the epoxy pour on its cells (except on Unit 2 non-class 1E batteries), APS expects to have an earlier warning of cracking problems.

Site Nuclear Engineering Department and System Engineering are investigating the feasibility of replacing the Exide batteries with cells manufactured by AT&T.

#### NEED FOR PROMPT ACTION

Due to additional crack growth in the Channel B battery, PVNGS jumpered out an individual cell and has decided to replace the two most severely cracked battery jars rather than waiting until the unit's next refueling outage currently scheduled to begin February 1, 1992. PVNGS has new Exide replacement batteries on site which are fully charged. Should an additional cell be declared inoperable, Unit 1 would immediately enter the two-hour ACTION statement. Although APS doesn't expect additional crack growth to be imminent, prompt corrective action is advisable to prevent an unnecessary plant shutdown.

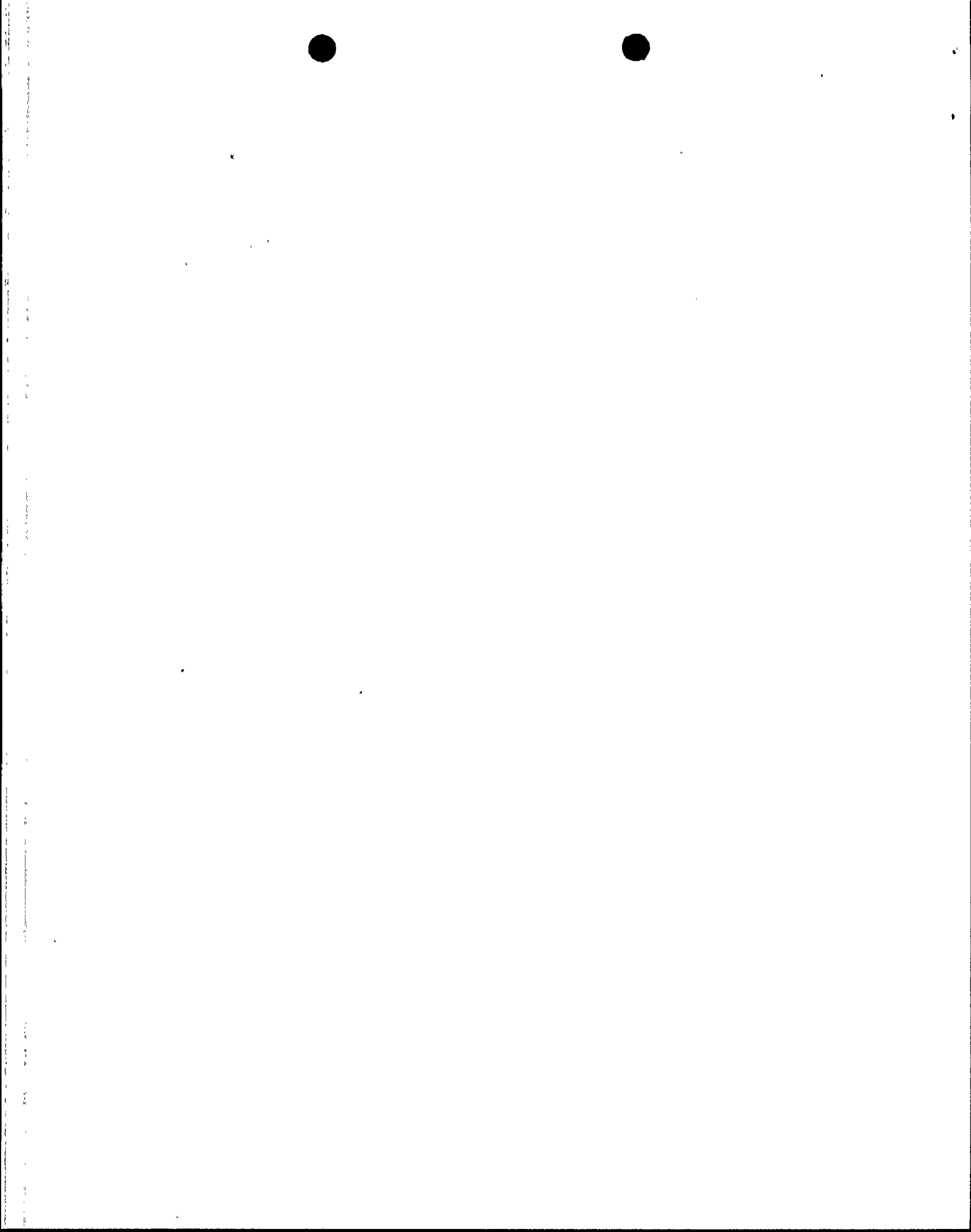
#### COMPENSATORY MEASURES

APS is presently reviewing the need to replace the existing 125V DC batteries with new batteries during future refueling outages. If a determination is made that a Technical Specification amendment is necessary, one will be submitted.

As a compensatory measure the opposite Class 1E 125V DC system will be verified as available during the duration of the Temporary Waiver of Compliance.

#### JUSTIFICATION AND DURATION OF THE REQUEST

The request for a Temporary Waiver of Compliance from Limiting Condition for Operation (LCO) 3.8.2.1 allowing one DC Train to be inoperable for up to eight hours has been evaluated and it has been determined that this request will not impact public health and safety. The additional six hours allowed by the Temporary Waiver of Compliance will result in an increase in core damage probability of less than 6E-6. The affected channel (Train B, Channel B) will have its breaker opened prior to the start of work and will remain open until completion of the battery replacement. This is done for personnel safety as well as the safety of the remaining train and channels.



A No Significant Hazards Consideration and Environmental Impact Consideration Determination have been performed, and it has been concluded that the additional time for one channel to be inoperable will not impact public health and safety. The Plant Review Board has reviewed and approved this request for a Temporary Waiver of Compliance from LCO 3.8.2.1. It is requested that the Temporary Waiver of Compliance be effective on Wednesday, December 4, 1991, from 0730 MST to 1530 MST.

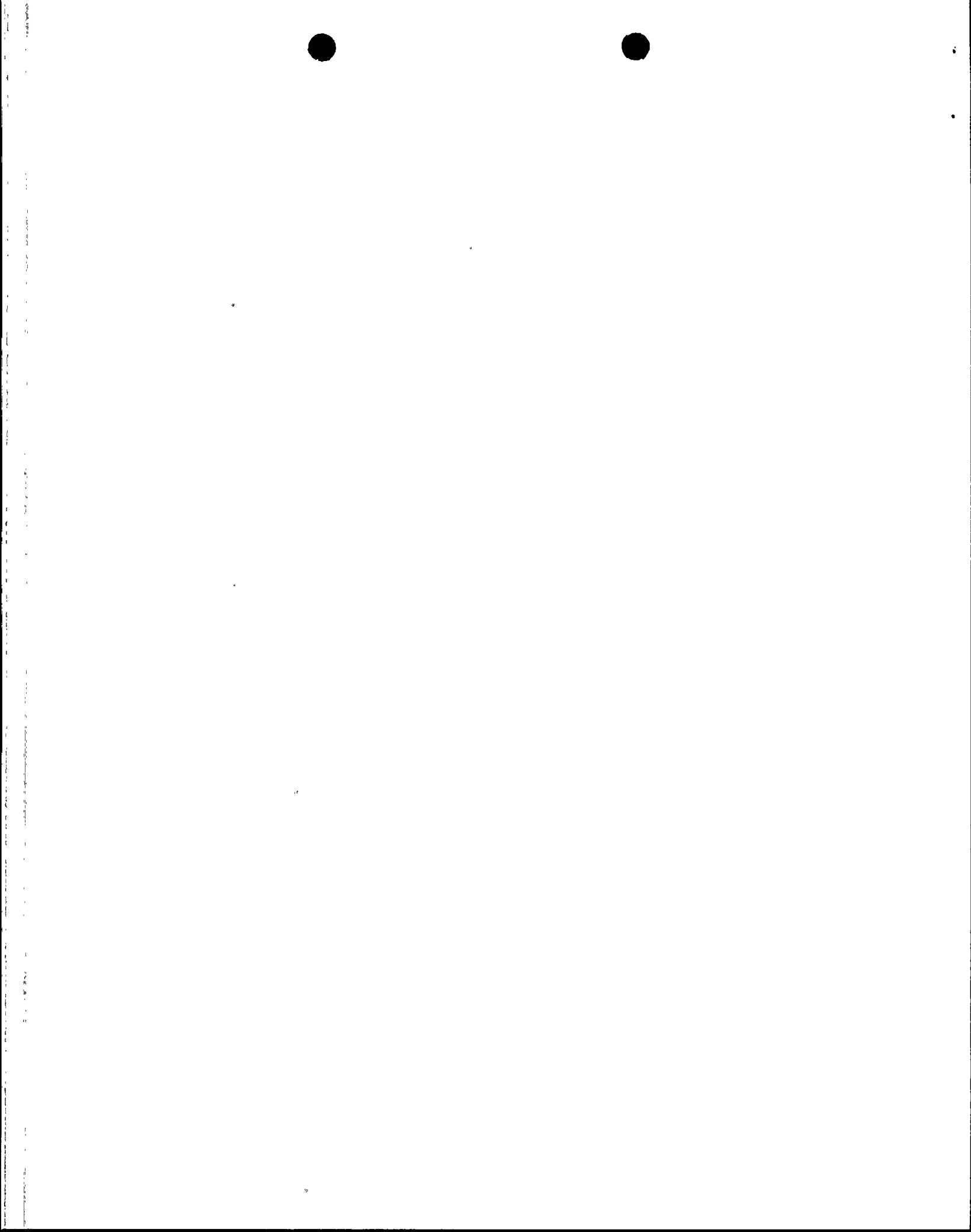
EVALUATION OF THE SAFETY SIGNIFICANCE AND BASIS FOR NO SIGNIFICANT HAZARDS CONSIDERATION

The extension of the LCO from two hours to eight hours for one inoperable DC Channel will provide the opportunity to perform corrective action on Train B, Channel B station batteries. This corrective action will provide assurance of continued operability. Failure to grant relief from the two-hour LCO would result in an unnecessary plant shutdown and a consequent transient on the plant.

The required corrective action can be performed successfully at power on the Channel B batteries. As stated previously, the corrective action being performed consists of the installation of two new 2-cell battery jars. During the time period that the affected cells are being replaced (approximately eight hours), a loss of off-site power will fail the Channel B DC equipment. The frequency of a loss of off-site power at PVNGS is approximately  $8E-2$  per year. For the additional six hours allowed by the Temporary Waiver of Compliance, the probability of a loss of off-site power is  $6E-5$ . A loss of off-site power will result in a Main Steam Isolation Valve and Feedwater Isolation Valve closure and the loss of DC control power to Train B equipment. This leads to a loss of the Train B Emergency Diesel Generator (EDG), Auxiliary Feedwater Pump B and other Train B safety-related pumps and loads. The ultimate heat sink will be maintained with the Train A EDG starting and successfully loading, and with either Auxiliary Feedwater Pump A or N available. The conditional probability of core damage is about 0.1 with the dominating contributor being the failure of the EDG to start or run. The probability of core damage resulting from a loss of off-site power during this six-hour period is therefore  $6E-6$ .

In order to complete the cell replacement, the Train B, Channel B battery will not meet its seismic qualification requirements for the eight-hour duration of the Temporary Waiver of Compliance. Should a Safe Shutdown Earthquake (SSE) occur during this time, the effects would be almost identical to those discussed above for a loss of off-site power with the battery disconnected. The frequency of a SSE at PVNGS is approximately  $2E-5$  per year based on the 1982 hazard study performed by Ertec, Inc. For the proposed six-hour increase in the duration of the LCO, the probability of an SSE is  $2E-8$ . The probability of core damage during this six-hour period is therefore  $2E-9$ .

The Temporary Waiver of Compliance only impacts the allowed time for the battery to be inoperable and does not change which equipment is allowed to be inoperable, and therefore, the consequences of a previously evaluated accident remain unchanged.



Increasing the allowed out of service time of LCO 3.8.2.1 from two hours to eight hours on a one time only basis for the purpose of installing two new 2-cell battery jars is the safest course of action other than placing the unit in cold shutdown. The safety function of the batteries can be performed by the redundant battery train and one emergency diesel generator should a loss of off-site power or seismic event occur. The possibility of a new or different kind of accident from any previously evaluated will not be created by the increase.

Extension of the two-hour limit would not involve a significant reduction in a margin of safety because there are no new or common failure modes being created by the extension. The performance of the associated safety systems will not be degraded by the extended out of service time.

The safety-related equipment required to maintain the integrity of fission product barriers can depend upon Train A for their performance. Two of the four separate Class 1E 125V DC subsystems, one per each load group, supply control power for their respective Class 1E AC load groups. Complete loss of either one of these subsystems does not prevent the minimum safety functions from being performed. Therefore, the extension does not involve a significant reduction in a margin of safety.

The safety function of the DC power sources (i.e., batteries) is to ensure that sufficient power will be available to supply the safety-related equipment required for: 1) The safe shutdown of the facility, and 2) The mitigation and control of accident conditions within the plant. Train B, Channel B of station batteries will have two new 2-cell battery jars installed in order to maintain the design capacity of the DC power source. Extension of the two-hour limit would not compromise any safety function performed by the subject batteries and would not cause an unnecessary transient on the plant by forcing shutdown of the unit to perform this corrective action. Completion of this corrective action will remove any question concerning the continued operability of the subject batteries.

#### ENVIRONMENTAL IMPACT CONSIDERATION DETERMINATION

The proposed Temporary Waiver of Compliance request does not involve an unreviewed environmental question because operation of PVNGS Unit 1 with the LCO extension would not:

- A. Result in a significant increase in any adverse environmental impact previously evaluated in the Final Environmental Statement as modified by the Staff's testimony to the Atomic Safety and Licensing Board; or
- B. Result in a significant change in effluents or power levels; or
- C. Result in matters not previously reviewed in the licensing basis for PVNGS which may have a significant environmental impact.





As discussed above, no significant reduction in the margin of safety and no new accidents are introduced by this Temporary Waiver of Compliance. This Temporary Waiver of Compliance does not significantly affect effluents or power levels, and has no environmental impact.

