NRC FORM 366 (4-95) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMD NO. 3150-0104
EXPIRES: 04/30/98
ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Oconee Nuclear Station, Unit One	05000 269	1 OF 13

TITLE (4) Inadequate Safety Evaluation Results In Operating Outside The Design Basis Of The Plant

EVENT DATE (5)			LER NUMBER (6)					REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR		SEQUENTIAL NUMBER		REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER(S)
											Oconee, Unit Two	05000 270
03	11	98	98	-	006	-	00	04	08	98		05000

OPERATING MODE (9)	N	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR (Check one or more of the following) (11)				
POWER LEVEL (10)	85%	20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)	
		20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)	
		20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	OTHER (Specify in Abstract below and in Text, NRC Form 366A)	
		20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)		
		20.405(a)(1)(iv)	X 50.73(a)(2)(ii)(B)	50.73(a)(2)(viii)(B)		
		20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER	
	AREA CODE	
J.E. Burchfield, Regulatory Compliance Manager	(864)	885-3292

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO				

ABSTRACT (Limit to 1400 spaces, i.e. approximately fifteen single-space typewritten lines) (16)

On March 10, 1998, the NRC was performing a Safety System Engineering Inspection of the Control Room Ventilation System (CRVS). As a result of the NRC review of some related CRVS issues, Oconee Engineering questioned the single active failure capability of the Oconee Cable and Equipment Room Cooling System (C&ERCS). An evaluation by Oconee Engineering revealed that a single active failure of a Unit 1 or 2 cable room air handling unit could impact the affected unit's associated safety related equipment. On March 11, 1998, Unit 1 was at 85% full power and Unit 2 was at 100% full power. At 2105 hours, Technical Specification (TS) 3.0 was entered on Units 1 and 2 due to a conservative evaluation of the impact of the C&ERCS on the operability of systems required by TS. At 2137 hours, the NRC was informed via the Emergency Notification System. On March 12, 1998, at 0355 hours, TS 3.0 was exited when compensatory actions had been approved and implemented to prevent a single active failure from adversely affecting the cooling capability of the C&ERCS. The root cause of the event is Design Deficiency; Inadequate Safety Review. Corrective actions include appropriately modifying the C&ERCS and reviewing the Updated Final Safety Analysis Report for consistency with plant design.

EVALUATION:

Background

An air handling unit is utilized to perform normal heating, ventilation and air conditioning functions for various areas which require temperature control at Oconee. The air handling unit consists of a fan, cooling or heating coils, standard ventilation dust filters, and associated dampers and ducts.

The Control Room Ventilation System (CRVS) is designed to maintain a suitable environment in the Control Room for equipment and operating personnel. Air handling units supply the control room with cooling under all operating conditions. In the event of an accident, which could jeopardize habitability of the control room, filtered booster fans are started to filter and pressurize the control room.

The Cable and Equipment Room Cooling System (C&ERCS) is a subsystem of the CRVS. The purpose of the C&ERCS is to maintain temperatures within acceptable ranges in the cable rooms and electrical equipment rooms.

The original Final Safety Analysis Report, Section 7.1.1.7 and the Updated Final Safety Analysis Report, Section 3.11.4, in part, state that no single active failure of an active component within the control area air conditioning and ventilation systems will prevent proper control area environmental control. The "control area" is defined as the control room, cable room, and equipment room.

The Design Basis Document defines a single active failure as the failure of a component that is externally powered, such as a piece of mechanical equipment, a component of the electrical supply system, or an instrumentation and control component, to operate on demand to perform its design function.

Technical Specification 3.0 Limiting Condition For Operation states that "in the event a LCO and/or associated action requirements cannot be satisfied because of circumstances in excess of those addressed in the specification, the affected unit shall be placed in at least Hot Shutdown within the next 12 hours, and in at least Cold Shutdown within the

following 24 hours unless corrective measures are completed that permit operation under the permissible action statements for the specified time interval as measured from initial discovery or until the reactor is placed in a mode in which the specification is not applicable."

Description of Event

The original design of Oconee Nuclear Station included a Control Room Ventilation System (CRVS) for Units 1 and 2 which share a common control room. The CRVS air handling units discharged air into the control room. This air flow then progressed to the cable room, equipment room, and back to the suction of the air handling units (See Attachment 1). Therefore, the original licensing and design basis included air communication between the control room, cable room, and equipment room for each unit. Control room, cable room, and equipment room cooling and control room filtration were addressed in the original licensing basis of Oconee. Control room pressurization was not addressed in the original licensing basis.

After the Three Mile Island Unit 2 (TMI-2) event in 1979, the NRC issued NUREG-0737. NUREG-0737 provided the nuclear industry a series of long term corrective actions based on lessons learned from the TMI-2 event. As a result of interactions with the NRC on the CRVS design, Duke recognized the need to enhance the capability of the CRVS to pressurize the control room. Therefore, efforts were undertaken to increase the air tightness of the control rooms.

In the early 1980s, a change to 10CFR50.71 required that licensees establish and maintain a Updated Final Safety Analysis Report (UFSAR) which reflected the current design and licensing basis of the plant. As a result, the Original FSAR was rewritten. As part of the rewrite, to establish better consistency with NUREG-0800, Standard Review Plan, certain sections of the Original FSAR were relocated. Section 7.1.1.7 of the Original FSAR, which describes the single active failure requirements for the control area cooling and ventilation system, was relocated to Section 3.11.4 in the UFSAR.

In the mid 1980s, several modifications were performed to separate the control room atmosphere from the cable and equipment rooms on each unit.

These modifications were intended to enhance control room pressurization and cooling capabilities.

These modifications separated the control room atmosphere from the cable room and equipment room atmosphere for each unit. As a result, a subsystem was created independent of the Control Room Ventilation System (CRVS). This subsystem is the Cable and Equipment Room Cooling System (C&ERCS). The C&ERCS serves to cool the cable and equipment rooms for each unit.

For the Units 1 and 2 C&ERCS, one new larger air handling unit was provided for each unit's cable room to compensate for the air flow which previously was supplied from the control room. In addition, one existing air handling unit was relocated to supply each unit's equipment room.

In this modified design for Units 1 and 2, the C&ERCS air flow was from the cable room air handling unit, to the cable room, and then down to the equipment room via a cable shaft. From the equipment room, this air flow then returned to the cable room air handling unit return duct in the equipment room. In addition to the cable room air handling units, each unit's equipment room also had an additional smaller capacity air handling unit. The smaller capacity air handling unit recirculated cool air to and from the equipment room for each unit (See Attachment 2).

In October 1991, the Design Basis Document (DBD) was issued on the CRVS (OSS-0254.00-00-1021). The CRVS DBD also addresses the C&ERCS as a subsystem. Section 31.1, System Description and Function, states in part that the C&ERCS is not redundant. This is inconsistent with UFSAR Section 3.11.4, which requires that the C&ERCS be capable of maintaining adequate cooling in the event of a single active failure.

In 1994, the Loss of Offsite Power Abnormal Procedure was revised to include actions for verifying air handling units are in service.

In 1995, work began on the Oconee Safety Related Designation Clarification Project (OSRDC). The OSRDC Project was originated to review the scope of Oconee's 10CFR50 Appendix B program and its relationship to design basis accident mitigation. As part of this long term initiative, in June 1997, the OSRDC Project identified the need to review aspects of the CRVS, such

as single failure requirements, as they relate to design basis accident mitigation.

In February 1998, Engineering completed an assessment of the CRVS that identified aspects of the CRVS design and operation where additional engineering analysis was necessary.

On March 1, 1998, the NRC began a Safety System Engineering Inspection on the CRVS and the Penetration Room Ventilation System at Oconee. During a review of related issues previously identified by Oconee and the SSEI team, engineering questioned the cooling capability for the cable and equipment room from a single active failure design criterion perspective.

On March 10, 1998 Regulatory Compliance was consulted relative to the UFSAR Section 3.11.4 single active failure criterion. After reviewing UFSAR Section 3.11.4, Regulatory Compliance determined that the C&ERCS should be capable of performing its cooling function in the event of a single active failure. As a result, Engineering reviewed the current design by applying the single active failure criteria for cooling of the Unit 1, 2, and 3 cable rooms and equipment rooms. The preliminary conclusions were that, without compensatory actions, vital equipment breakers in the Unit 1 or 2 cable rooms could eventually trip due to the affected room exceeding high temperature design limits. The current design of the cooling system is sufficient to maintain temperatures in the Unit 1 and 2 control rooms and equipment rooms below design limits assuming a single active failure. Unit 3 has met and continues to meet the single active failure design criterion for control area cooling.

On March 11, 1998, at 2105 hours, Technical Specification (TS) 3.0 was entered on Units 1 and 2. TS 3.0 was conservatively entered due to the potential adverse impact of a cable room cooling single active failure on the operability of systems required by TS. These systems are powered and/or controlled from vital equipment located in the cable room. Potentially impacted systems include 125 VDC Vital I&C Power, 120 VAC Vital I&C Power, and Emergency Steam Generator Level Control. This was reported via Emergency Notification System to the NRC at 2137 hours, as a condition outside the design basis of the plant.

Compensatory actions were completed on March 12, 1998, at 0355 hours, and TS 3.0 was exited. The compensatory actions consisted of the appropriate procedural revisions to assure that sufficient cable room cooling could be established in the event of a single active failure. The compensatory actions require manual action to 1) connect the affected cable room with the unaffected cable room by opening doors, and 2) close a fire damper in the unaffected cable room (See Attachment 3).

Conclusion

The original design of the Control Room Ventilation System (CRVS) and the original Final Safety Analysis Report (FSAR) specified a single active failure criterion for control area cooling. This design requirement was originally located in FSAR section 7.1.1.7, Environment. FSAR Section 9.8 originally described Station Ventilation Systems.

In the early 1980s, the control area cooling single active failure criterion was relocated to Section 3.11.4 of the Updated Final Safety Analysis Report (UFSAR). UFSAR Section 3.11.4 addressed the Environmental Design of Mechanical and Electrical Equipment. UFSAR Section 9.4 contained the information on Station Ventilation Systems. This section was re-titled Air Conditioning, Heating, Cooling And Ventilation Systems.

Modifications in the mid 1980s separated the Unit 1 and 2 control rooms from the cable rooms and equipment rooms. There is no documentation that a control area cooling single active failure was considered during this modification process. A reference to UFSAR Section 9.8 was documented in the 1984 10CFR50.59 Safety Evaluation performed for the modification to separate the systems. However, there is no documentation in the Safety Evaluation that UFSAR Section 3.11.4 was reviewed. Therefore, the root cause of this event is Design Configuration and Analysis; Design Analysis; Inadequate safety review. The UFSAR non-conformance was created by an inadequate 10CFR50.59 safety evaluation. The reason for the inadequate safety evaluation was that all relevant statements in the UFSAR were not identified and evaluated.

The Design Basis Document (DBD) for the CRVS was completed in October 1991 and has had four revisions. The last DBD revision was in January 1995. The C&ERCS was included in the scope of the CRVS DBD. The DBD process

includes extensive research and documentation of all the design criteria for a system, including requirements related to single active failure. However, the CRVS DBD did not document the control area cooling single active failure requirement specified in Section 3.11.4 of the UFSAR. The DBD specifies that the CRVS does not have to withstand single active failure. It further states the C&ERCS is isolated from the Control Room and is not redundant. Properly interpreting the control area cooling single active failure criterion during DBD development as it relates to the protection of safety related equipment in the cable room and equipment room would not have prevented the current problem but would have detected and resolved it sooner.

Current requirements for 10CFR50.59 safety evaluations are more rigorous than they were in the 1980s. Industry and regulatory guidance such as NSAC-125, Generic Letter 91-18, and operating experience, were incorporated into a Duke implementing directive in 1992. This directive provides detailed guidance and Duke policy on how to properly perform 10CFR50.59 evaluations. In addition, specific qualification and continuing training are conducted for personnel who perform evaluations under the Duke directive. Based on interviews with engineers who perform 10CFR50.59 safety evaluations, the current processes are capable of providing a method for determining single active failure requirements for systems. An electronic version of the UFSAR is maintained and provides search capabilities that are capable of identifying statements that may be overlooked by more traditional UFSAR review techniques.

A UFSAR accuracy review began at Oconee in July, 1997. This accuracy review consists of a comparison of the UFSAR content with design basis documents such as the DBD and design drawings. The UFSAR review is being conducted one chapter at a time. The intent of the accuracy review is to identify and resolve discrepancies between the UFSAR and the design basis. The review of UFSAR Chapter 3 had not been initiated at the time of this event. UFSAR discrepancies similar to the one identified by this event should be identified and resolved by the UFSAR accuracy review.

A review of LERs within the last two years indicated that root causes of design deficiency have been identified at Oconee (LER 269/97-02 Deficient Design Analysis, Unanticipated Interaction of Systems for RBCU piping; 269/97-03 Deficient Design Analysis, Unanticipated Interaction of Systems

for post-LOCA boron dilution flow paths; 269/98-04 Deficient Design Analysis associated with procedural setpoint). However, there has not been an event associated with the CRVS, C&ERCS, or an inadequate 10CFR50.59 safety evaluation. Therefore, this event is considered to be non-recurring.

This event did not involve equipment failures, personnel injuries, or radioactive releases/exposures.

CORRECTIVE ACTION

Immediate:

1. An operability assessment was performed for cable room vital equipment assuming a single active failure of a Cable and Equipment Room Cooling System (C&ERCS) component.

2. Technical Specification 3.0 was conservatively entered on Units 1 and 2.

Subsequent:

1. Compensatory actions were implemented to assure adequate cooling to the Unit 1 and 2 cable rooms in the event of a cable room air handling unit single active failure.

Planned:

1. Perform the appropriate modifications to the Cable and Equipment Room Cooling System (C&ERCS) to resolve the non-conformance with the Updated Final Safety Analysis Report (UFSAR) Section 3.11.4.

2. Complete the UFSAR Accuracy Review Project to verify that the UFSAR is consistent with existing plant design, configuration, and operation.

3. Revise the UFSAR to include the control area cooling single active failure criterion in Section 9.4.

4. Revise the Design Basis Document to adequately address the control area cooling single active failure criterion.

5. Complete a single active failure analysis of the control area cooling.

Planned corrective actions 1 through 5 are considered to be NRC Commitment Items. These are the only NRC Commitment items contained in this LER.

SAFETY ANALYSIS

The Unit 1 and 2 cable rooms are currently not designed to accommodate a single active failure of the Cable and Equipment Room Cooling System (C&ERCS) without taking credit for appropriate manual compensatory actions. If a single active failure prevented either of the two cable room air handling units from performing its design function, safety related equipment in the cable room could be impacted. The equipment in the cable room consists of various vital power supplies and control cabinets which are relied upon for mitigation of certain design basis accidents. Some examples are; 125 VDC Vital I&C Power [EIIS:EJ], 120 VAC Vital I&C Power, and Emergency Steam Generator Level Control.

In the event of a C&ERCS single active failure which adversely affects cable room cooling, it is possible to take credit for manual actions to recognize and correct the situation. Manual recognition and correction can be reasonably credited because the cable room would heat up over a extended period of time following the single active failure. Operator doses received in the performance of these manual operator actions were evaluated and determined to be well within acceptable limits.

As a result of the operability review, it was concluded that the only single active failure in which compensatory actions would be required involves a failure of one of the two Air Handling Units serving the Unit 1 or 2 cable room(s).

Oconee Operations procedures require that at least one operator round would be made through the affected cable room within a 12 hour shift. Although one operator round is required per shift, management expects that two rounds typically be made per 12 hour shift. Therefore, an operator round would have been sufficient to identify a cable room cooling problem within 12 hours. In addition, since 1995, failure of either one of these units

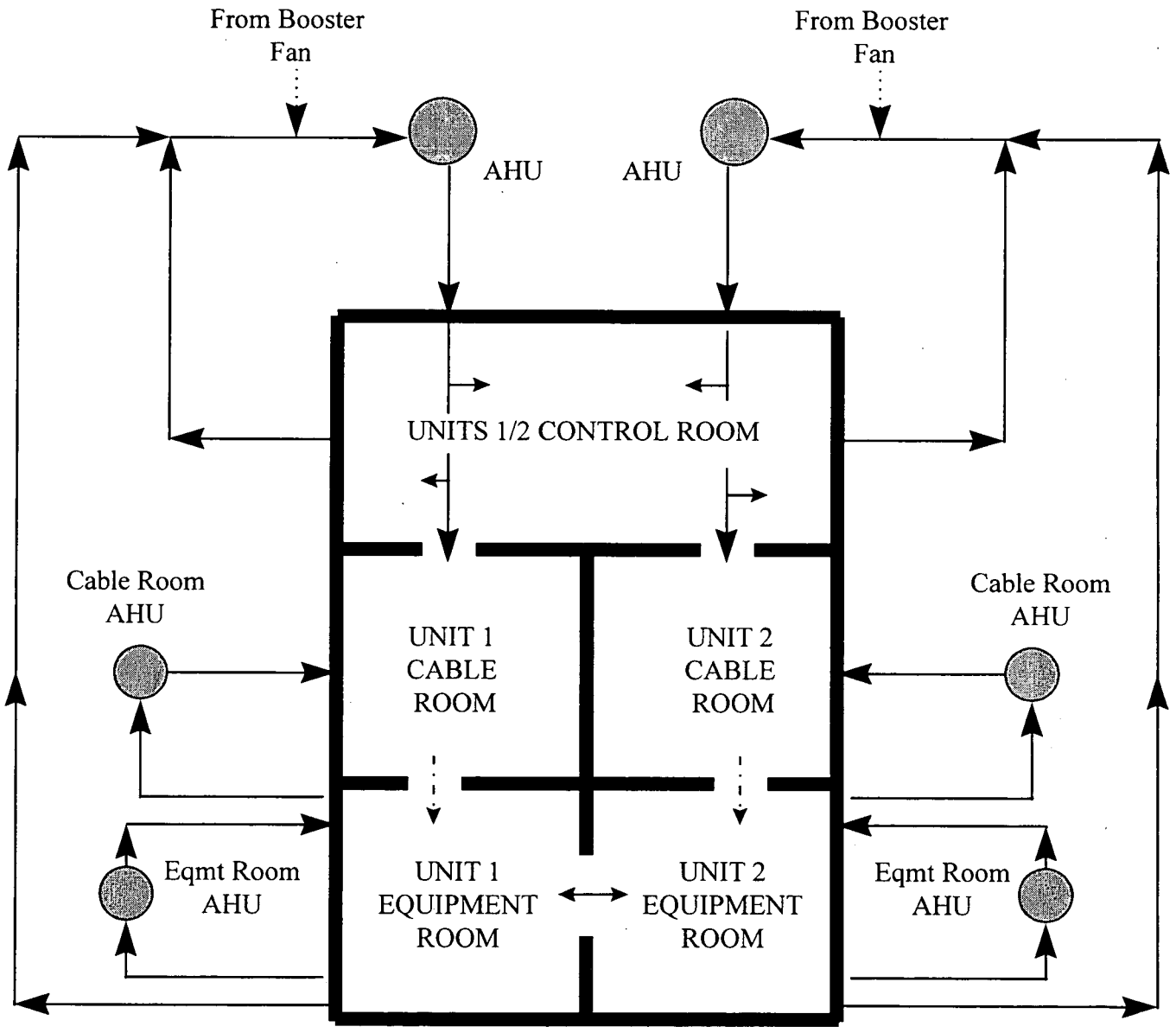
would also have been identified within 12 hours following the Loss Of Offsite Power (LOOP) through the use of the LOOP Abnormal Procedure.

Sufficient compensatory actions would have been reasonably identified and put into place within 24 hours of the LOOP event, prior to the cable room exceeding acceptable temperatures. The compensatory actions are simple in that air circulation can be established by opening doors and positioning dampers. The actions do not require complicated engineering analyses or detailed logistics to complete. Calculations conclude that temperatures within the cable room are acceptable for more than 48 hours assuming no compensatory actions are taken.

Therefore, Duke's evaluation concluded that ample time exists for Operations to identify a cable room air handling unit single active failure. In addition, ample time exists for the Technical Support Center to establish adequate compensatory actions to preclude equipment overheating in the cable rooms in the event of a cable room air handling unit single active failure. As a result, the health and safety of the public was not affected by this event.

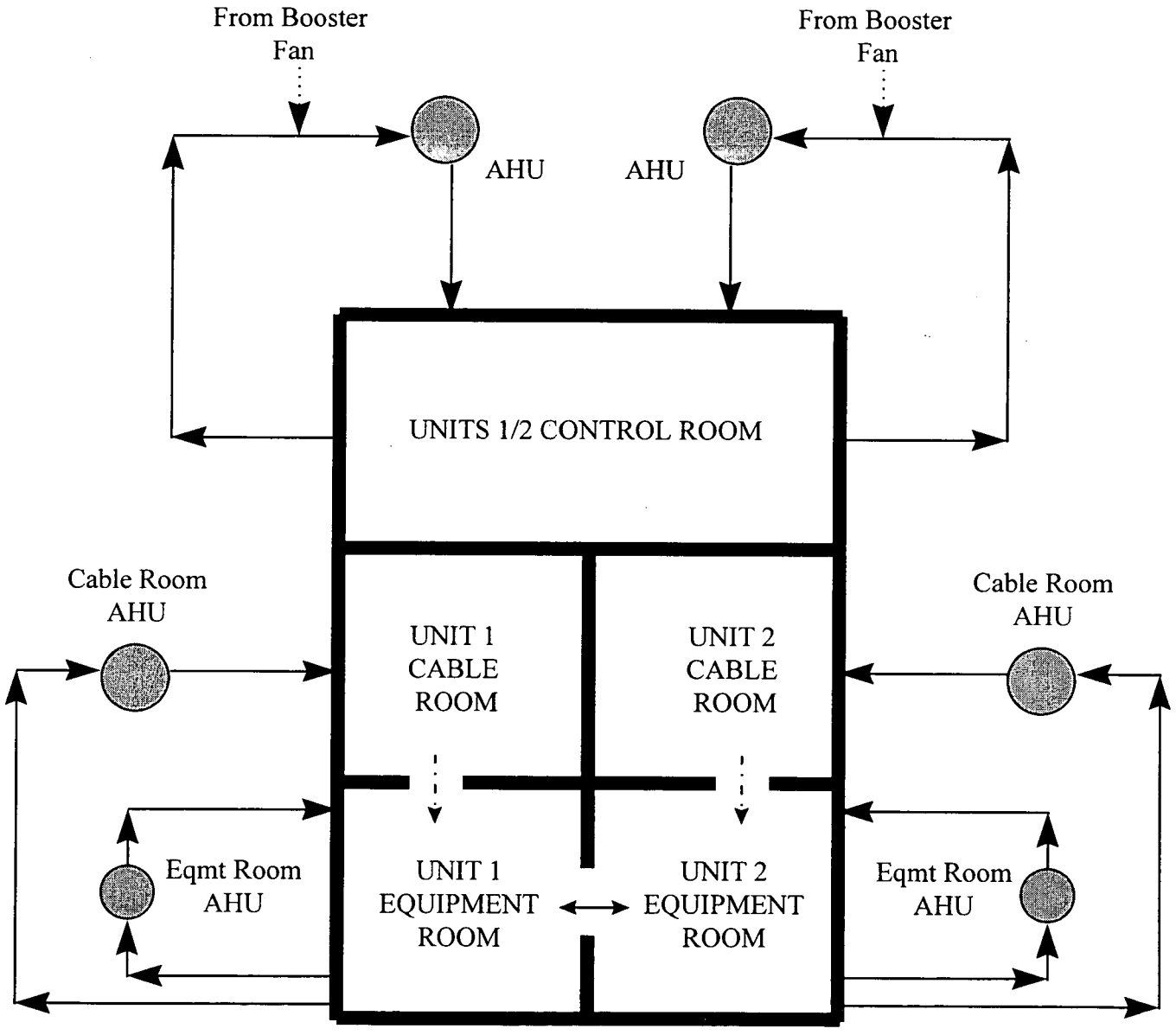
ATTACHMENT 1

Control Area Cooling -Original Design



ATTACHMENT 2

Control Area Cooling - Current Design



ATTACHMENT 3

Control Area Cooling -Compensatory Actions