AD12
S023
NRC

November 2, 1989

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Subject: Docket Nos. 50-361 and 50-362
ATWS Rule - TAC Nos. 59139/40
San Onofre Nuclear Generating Station
Units 2 and 3

Reference: November 22, 1988 letter from M. O. Medford (SCE) to Document Control Desk, Subject: Docket Nos. 50-361 and 50-362, San Onofre Nuclear Generating Station, Units 2 and 3

This letter provides additional information to the NRC regarding SCE's diverse turbine trip (DTT).

During a meeting on May 1, 1989 between the NRC staff and several members of the Combustion Engineering Owners Group (CEOG), including Southern California Edison (SCE) representatives, the design of the Diverse Scram System (DSS) and the Diverse Turbine Trip (DTT) for San Onofre Units 2 and 3 was discussed. This discussion was based on the design information previously submitted to the NRC by the above reference. During this meeting, the NRC requested additional information concerning design details of the DTT. This information will be used to complete the evaluation of compliance with the DTT requirements in Section (c)(1) of the ATWS Rule (10 CFR 50.62). The enclosure to this letter provides SCE's response to all of the NRC's questions regarding DTT design.

SCE regrets the extended time taken in providing this response.

If you have any questions or would like additional information, please contact me.

Very truly yours,

F. R. Nandy
Manager of Nuclear Licensing

CEW:1/nrc11

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NRC Files
SOCR Files

CEW for C. Diamond per approval of previous draft.

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NRC CORRESPONDENCE

Date:

	Organization	Init.	Date
X	Mgr.-Nuc. Reg. Affairs		
	Mgr.-Nuc. Licensing		
X	Supv.-Nuc. Licensing	[illegible]	8/5/89
X	Law	[illegible]	[illegible]
X	Mgr.-Nuc. Eng.& Const.	[illegible]	10/25
	Project Mgr.	[illegible]	10/24
X	Mgr.-Nuc. Eng. Design	MTM	8/2/89
X	Project Eng.	RL	8/24
	Supv.-Civil		
X	Supv.-Controls	CEW for R Rize per 7/25/89 telecon	
	Supv.-Electrical		
X	Supv.-Mechanical	MDW	7/31/89
	Supv.-Nuclear NE	[illegible]	7/31/89
X	Author TDM	CEW	6/6/89
*	Station approval documented on form 26-185 per telecon with		

SCE RESPONSE TO NRC QUESTIONS
ON DIVERSE TURBINE TRIP

NRC Question 1:

In the enclosure to SCE's November 22, 1988 letter to the NRC in the response to Request 2b mention is made of "passive measures of isolation" between the two motor generator sets tie breaker status lights and the 1E circuits. Please clarify these "passive measures."

SCE Response:

The motor generator set tie breaker status indication on the Diverse Scram System (DSS) is derived from spare contacts on the tie breaker auxiliary relay. The tie breaker power is Class 1E 125 Vdc control power. Isolation of the 1E power and the DSS is achieved through the use of two one ampere fuses, one on either end of the circuit supplying the tie breaker status in the DSS[1].

IEEE Standard 384-1981, Section 7.2.2.3 provides for the use of fuses as an isolation device.

NRC Question 2:

Please identify the type of power on the Diverse Turbine Trip (DTT) and provide a block diagram of the DTT.

SCE Response:

The power to the Turbine Trip Circuit is a combination of 240 Vac, three phase, 60 hertz and Non 1E Uninterruptible Power Supply (UPS) 120 Vac Control Power. The 240 Vac is derived from the motor generator sets and monitored by undervoltage relays in the Control Element Drive Mechanism Cabinets (CEDMC).

At present, on loss of 240 Vac, the undervoltage relays de-energize and cause the auxiliary relays in a selective two out of four logic to de-energize and energize two turbine trip relays which initiate a turbine trip.

During the Cycle V refueling outages, the turbine trip function described above will be modified. The intent is to improve plant reliability while retaining the same functional logic. The existing trip logic will remain the same as

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[1]Note the information given in the response to Request 2b in the November 22, 1988 letter to the NRC is incorrect on page 8. The response states: "This status indication is powered from the DSS cabinet and uses wiring and tie breaker auxiliary contacts isolated from 1E circuits in accordance with IEEE-384."

Isolation is achieved per IEEE-384-1981 (fuses), but the power is not derived from the DSS.

before except the auxiliary relays will be energized to trip instead of de-energize to trip.

Subsequent to Cycle V, on loss of 240 Vac, the undervoltage relays de-energize after a time delay energizing the auxiliary relays in a selective two out of four logic which in turn energizes the turbine trip relays (one out of two logic) to trip the turbine. The time delay on the undervoltage relays provides a means of discriminating between actual voltage loss and momentary transients. The auxiliary relays are powered from separate 120 Vac instruments buses derived from the Non-1E UPS.

Two simplified functional diagrams titled "Present Configuration" and "Proposed Configuration" are attached.

NRC Question 3:

In SCE's November 22, 1988 letter to the NRC, SCE stated that the description of the DSS does not apply to the DTT (last sentence in the response to 1a). Please respond to requests 1b through 6 for the DTT where applicable.

SCE Response:

(The following responses have been numbered to correspond with SCE's November 22, 1988 response to the NRC for DSS.)

1b: The Diverse Turbine Trip (DTT) is actuated by the Diverse Scram System (DSS). It is a variation of the existing turbine trip logic presently actuated by the Plant Protection System (PPS). Referring to Figure 1, one can see the PPS interrupts power to the CEDM Power Supplies, i.e., the reactor trip breakers open. The undervoltage relay logic in CEDMC initiates a turbine trip based on the loss of voltage to the CEDMC.

The DSS performs the same function by opening the motor generator sets output contactors. The interruption of power from the motor generator sets by the DSS is diverse from the PPS, but the turbine trip logic after actuation is the same for both. A simplified functional diagram titled "Present Configuration" is attached, Figure 1.

The DTT meets the diversity requirements of the ATWS rule as can be seen from the attached Table 1. Table 1 compares the logic and actuation components in PPS, DSS and DTT. As shown on Table 1, the PPS and DSS logic and actuation components are completely different (diverse) in operation. However, as stated above, the turbine trip logic is the same after actuation occurs (the PPS interrupts power to the CEDMC power supplies by opening the reactor trip breakers; the DSS interrupts power by opening the motor generator sets output contactors).

The following components in CEDMC are common to both the existing and diverse reactor initiated turbine trip: UV Logic relays (UV-1, UV-2, UV-3 and UV-4), Auxiliary Relays (AUX-1, AUX-2, AUX-3 and AUX-4), Reactor Initiated Turbine Trip Relays (TTR1 and TTR2) and the turbine solenoid valves.

1c: Same as previous response in November 22, 1988 letter. As long as the DSS is operable, the DTT is operable. However, as previously stated, on complete loss of offsite power the motor generator sets will stop operating and the CEA's will drop without any specific action. Please see diagram referred to in item 2 above.

1d: The DTT does not have any specific alarms, indication or bypasses associated with it. The turbine trip is an inherent consequence of power interruption to the CEDM Cabinets. No additional circuits or equipment have been added specifically as a Diverse Turbine Trip. The DSS is a diverse means of interrupting the 240 Vac power to the CEDM's. Therefore, the existing undervoltage relays in the CEDM Cabinets will actuate the turbine trip as before. All alarms, indications and bypasses are incorporated into the DSS.

1e: The response for the DTT is the same as stated in the November 22, 1988 response for the DSS.

2: The response for the DTT is the same as stated in the November 22, 1988 response for the DSS.

2a: The response for the DTT is the same as stated in the November 22, 1988 response for the DSS.

2b: Please see response to question 1 for a discussion of the tie breaker status indication isolation.

3: The response for the DTT is the same as stated in the November 22, 1988 response for the DSS.

3a: The DTT is an inherent consequence of the DSS opening the motor generator output contactors. The DTT is not specifically tested, but the DSS is tested as stated in the November 22, 1988 letter. The turbine trip function is the result of the undervoltage relays de-energizing. The undervoltage relays are functionally tested at each refueling outage.

3b: The undervoltage relays can be tested at each refueling outage via test switches. A functional representation is shown in the attached figures.

4: The DTT does not utilize components that are used in the Reactor Protection System (Plant Protection System) or the DSS. However, the DTT is a consequence of the DSS interrupting power to the CEDM cabinets.

5: The DTT does not have or add any annunciation or displays to the control room. The Diverse Turbine Trip is a consequence of the DSS interrupting power into the CEDM Cabinets.

6: The DTT does not have any 1E isolation devices associated with it. The DSS has isolation between the bus tie breaker status indication and the 1E control power as discussed in the response to question 1.

NRC Question 4:

Relative to the requirements of Generic Letter 85-06, please provide the following:

a. Will the DTT conform to the QA requirements of Generic Letter 85-06?
b. How will the DTT be tested and at what frequency?
c. Will the CEDM undervoltage relays be surveilled at power?
d. Please discuss inadvertent actuation of the DTT.

SCE Response:

4.a. The DSS conforms to the QA requirements of Generic Letter 85-06. The DTT is a consequence of the installation of the DSS. The turbine trip circuits function as before; however, the DSS provides another means of actuating these same turbine trip circuits. Therefore, the QA requirements of Generic Letter 85-06 apply only to the DSS and are not specifically applicable to the DTT. However, both the turbine trip scheme and the CEDMCS scheme are Quality Class III (non-safety related) and were purchased, installed and tested in accordance with SCE's QA program as applicable to QC III components and systems.

4.b. The overall Diverse Turbine Trip is tested in two distinct segments. First, the DSS is tested to insure that the Motor Generator Set MG contactors open properly. These contactors are tested only when the reactor is shutdown. (Testing at power would cause a reactor trip.) The CEDMC undervoltage relays, also tested when the reactor is shutdown, are tested separately. Please refer to the Response to Request 3a in the November 22, 1988 letter.

4.c. The undervoltage relays in the CEDM Cabinets are not tested at power. The undervoltage relays are tested at refueling intervals.

4.d. If the DSS were to actuate inadvertently, the reactor would trip. Since the DTT is a consequence of the DSS, there are two cases:

1. An inadvertent DSS actuation would cause a turbine trip and a reactor trip if above 55% reactor power.

2. Existing turbine trip circuitry associated with the CEDM undervoltage relays remains unchanged. The inadvertent actuation of one UV relay will not cause a turbine trip. The actuation of two relays may or may not cause a turbine trip as the UV relay logic is setup as a selective two of four to trip. Actuation of any three relays will cause a turbine trip and a subsequent reactor trip if the reactor is above 55% power.

TABLE I
Unit 2 and 3
DIVERSE TURBINE TRIP COMPONENT COMPARISON

Component	Design Principal	ID	Location	Mode of Operation	Power Source	Manufacturer/ Model No.	Coil Voltage Rating
PPS - Logic	Electro-Mechanical Reed Relay	Numerous	Plant Protection System 2(3)L032	Deenergize to Trip	1E Vital Buses Y001, 002 003 & 004	Douglas Randall Model 377043 Double coil, (Reed Relay)	12 Vdc
PPS - Actuation	Electro-Mechanical Rotary Relay	K1 K2 K3 K4	Plant Protection System 2(3)L032	Deenergize to Trip	1E Vital Buses Y001, 002 003 & 004	Potter & Brum-field Model MDR-170-1-SCE-0 (Rotary Relay)	115 V
DSS - Logic	Integrated Circuits Programable Logic	2PC-0114A 2PC-0114B 2PC-0114C 2PC-0114D	Diverse Scram System 2(3)L675 Note 1	Energize to Trip	Non 1E UPS 120 Vac 2(3)Y012	Foxboro Spec 200 Micro N-2CCA-DC	NA
DSS - Actuation	Electro-Mechanical	2PY-0114AA 2PY-0114BA 2PY-0114CA 2PY-0114DA	Diverse Scram System 2(3)L675 Note 1	Energize to Trip	Non 1E UPS 120 Vac 2(3)Y012	Foxboro Spec 200 Custom N-2AO-L2C-R	15 Vdc
CEDMC - UV Logic Turbine Trip	Electro-Mechanical Induction Disk	K3001 K3002 K3003 K3004 (UV1, UV2, UV3 & UV4)	Control Element Drive Mechanism Cabinets 2(3)L36 & 37	Deenergize to Trip	CEDMC Motor Generators 240 Vac 3 Phase	General Electric Model 12ICR54B2A Phase Sequence and Undervoltage Relay	240 Vac

DTT

Notes: 1. Diverse Scram System presently being installed in Unit 2, will be installed in Unit 3 Spring of 1990

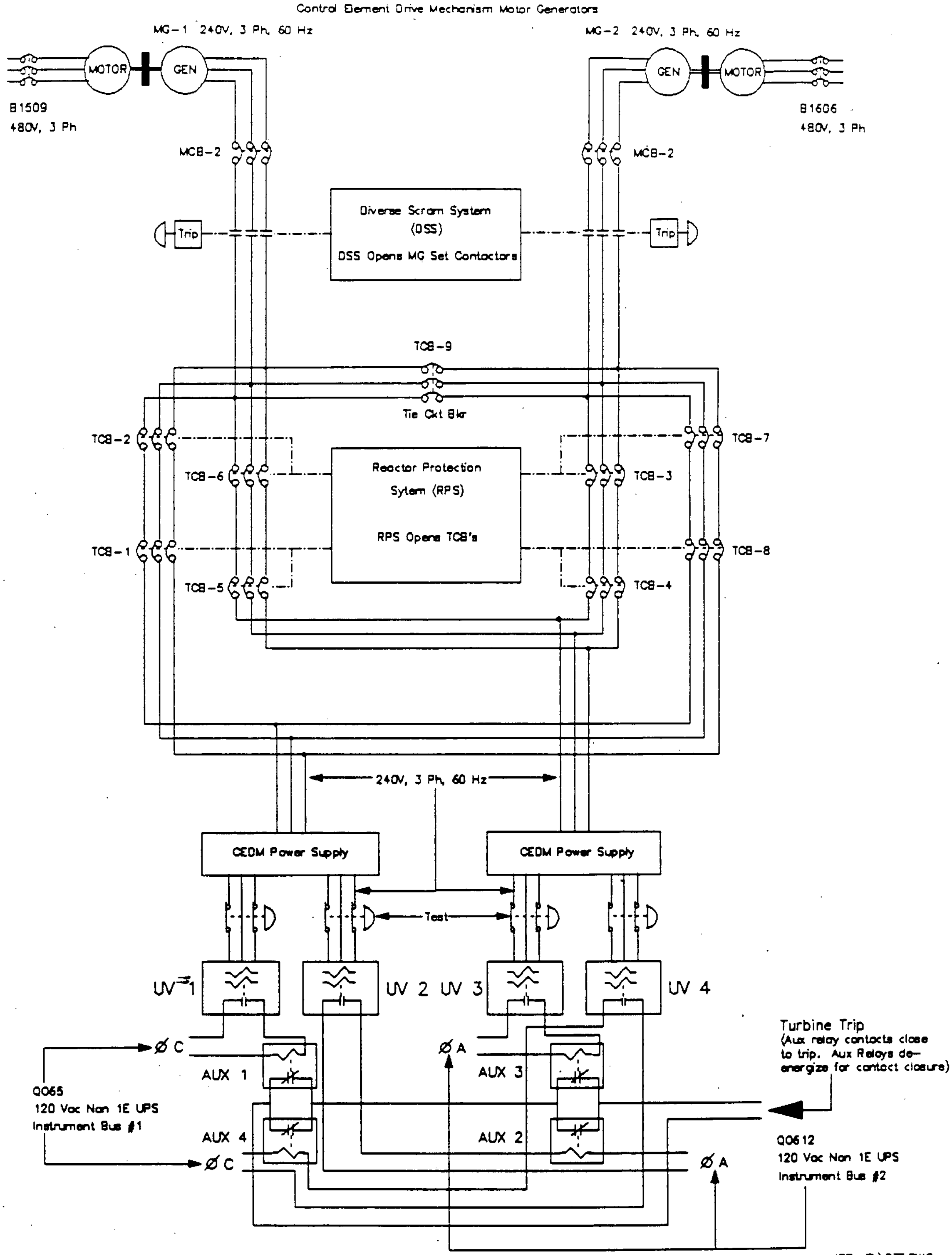
TABLE I
Unit 2 and 3
DIVERSE TURBINE TRIP COMPONENT COMPARISON

Component	Design Principal	ID	Location	Mode of Operation	Power Source	Manufacturer/ Model No.	Coil Voltage Rating
CEMCS - UV Logic Turbine Trip Auxiliary Relays	Electro-Mechanical	K3005 K3006 K3007 K3008 (Aux 1, 2 Aux 3 & 4)	Control Element Drive Mechanism Cabinets 2(3)L36 & 37	Deenergize to Trip Note 1	Non 1E UPS 120 Vac 2(3)Y012	General Electric Model No. 12HFA51A49F Instantaneous, hinged armature, multi-contact, auxiliary relay	120 Vac
Reactor Inititated Turbine Trip Relays	Electro-Mechanical	TTR1 TTR2	Turbine Protection Cubicle 2(3)L002	Energize to Trip	Non 1E DC 125 Vdc 2D5	General Electric (England GEC) Model No. VATX125F2255EA EB2	110 Vdc
Turbine Solenoid Valves	Electro-Mechanical	Numerous (same as associated valve)	Turbine Deck - integral to valve	Deenergize to Trip	Non 1E DC 125 Vdc	Sperry Vickers Model No. DG4M4-32-21-A1-S-110DC	110 Vdc

Notes: 1. Will be modified to energize to trip

DIVERSE TURBINE TRIP

Present Configuration
June, 1989



JRR FL\DTT.DWG
6/22/89

Figure 1

DIVERSE TURBINE TRIP

Proposed Configuration
Expected Implementation - Winter 1989

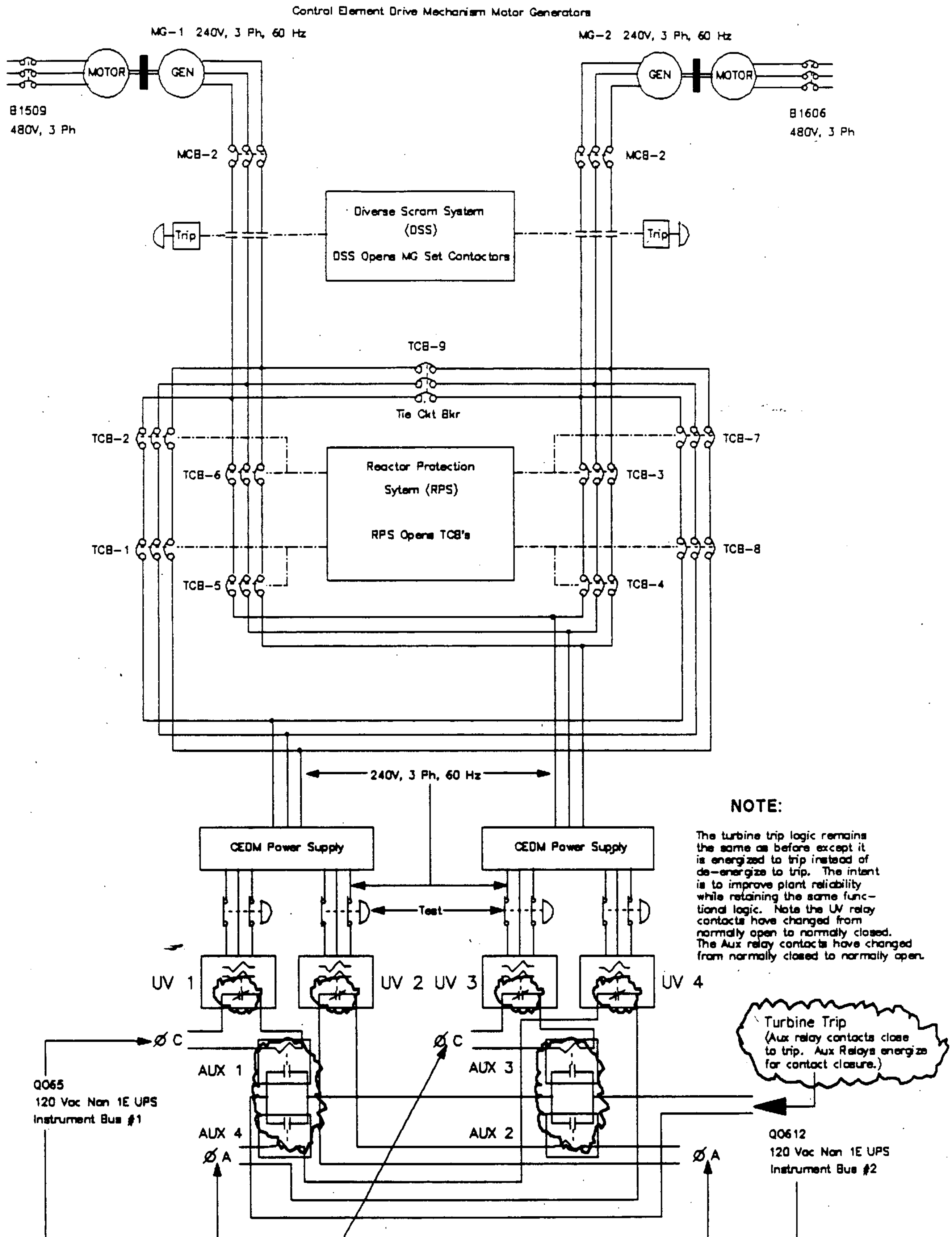


Figure 2

JRR FL\DTT-1.DWG
10/10/89