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ACCESSION NBR: 8801060357 DOC. DATE: 87/12/31 NOTARIZED: NO DOCKET #
FACIL: 50-361 San Onofre Nuclear Station, Unit 2, Southern Californ 05000361
AUTH. NAME AUTHOR AFFILIATION
MORGAN, H. E. Southern California Edison Co.
RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 86-029-02: on 861210, turbine tripped during power interruption to turbine governor control sys. Caused by failure to follow procedure for transfer of power supplies. Special Order issued & incorporated. W/871231 ltr.

DISTRIBUTION CODE: IE22D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 5
TITLE: 50.73 Licensee Event Report (LER), Incident Rpt, etc.

NOTES:

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	PD5 LA	1	1	PD5 PD	1	1
	ROOD, H	1	1			
INTERNAL:	ACRS MICHELSON	1	1	ACRS MOELLER	2	2
	AEOD/DOA	1	1	AEOD/DSP/NAS	1	1
	AEOD/DSP/ROAB	2	2	AEOD/DSP/TPAB	1	1
	ARM/DCTS/DAB	1	1	DEDRO	1	1
	NRR/DEST/ADS	1	0	NRR/DEST/CEB	1	1
	NRR/DEST/ELB	1	1	NRR/DEST/ICSB	1	1
	NRR/DEST/MEB	1	1	NRR/DEST/MTB	1	1
	NRR/DEST/PSB	1	1	NRR/DEST/RSB	1	1
	NRR/DEST/SGB	1	1	NRR/DLPQ/HFB	1	1
	NRR/DLPQ/QAB	1	1	NRR/DOEA/EAB	1	1
	NRR/DREP/RAB	1	1	NRR/DREP/RPB	2	2
	NRR/DRIS/SIB	1	1	NRR/PMAS/ILRB	1	1
	REG FILE 02	1	1	RES DEPY GI	1	1
	RES TELFORD, J	1	1	RES/DE/EIB	1	1
	RGN5 FILE 01	1	1			
EXTERNAL:	EG&G GROH, M	5	5	FORD BLDG HOY, A	1	1
	H ST LOBBY WARD	1	1	LPDR	1	1
	NRC PDR	1	1	NSIC HARRIS, J	1	1
	NSIC MAYS, G	1	1			

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NRC Form 366 (9/83)

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED OMB NO. 3150-0104
EXPIRES: 8/31/85

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 2	0 5 0 0 0 3 6 1	1 OF 0 4

TITLE (4)
UNIT 2 TRIP DURING TRANSFER OF NON-1E POWER SUPPLY

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQ. NUMBER	REV. NUMBER	MONTH	DAY	YEAR	FACILITY NAMES	DOCKET NUMBER(S)
										0 5 0 0 0
1 2	1 0	8 6	8 6	0 2 9	0 2	1 2	3 1	8 7		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)			
POWER LEVEL (10)	0 9 3	20.402(b)	20.405(c)	X 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)	50.73(a)(2)(ii)	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
H. E. MORGAN, STATION MANAGER	7 1 4 — 3 6 8 - 6 2 4 1

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	
X	J I	T M R	R 1 2 0	Y		X	I G	R J X	X 9 9 9	N	
X	T A	V	X 9 9 9	N							

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 12/10/86 at 1037, with Unit 2 at 93% power, the turbine tripped during a power interruption to the Turbine Governor Control System (TGCS), causing a reactor trip. The Steam Bypass Control System (SBCS) did not initially actuate and a Main Steam Safety Valve briefly actuated. The trip recovery proceeded normally, although start-up channel 'B' failed, and Plant Protection System (PPS) channel 'A' did not trip. All other required safety related equipment functioned as designed, and there were no safety consequences.

The Non-1E 120 VAC load was being transferred from the Non-1E Uninterruptible Power Supply (UPS) inverter to the alternate source. A procedural step to defeat the automatic retransfer circuit was not performed, causing the load to transfer back to the primary source. When the UPS inverter was disconnected under load, the automatic transfer to the alternate source did not occur in time to prevent the trip.

The UPS is equipped with an automatic transfer switch which automatically transfers the load to the alternate source on loss of inverter output voltage. The transfer switch was found to operate correctly; however, the ensuing transient is believed to have caused the trip.

The event resulted from the failure to follow the procedure; additionally, the job did not receive the correct level of attention by operations personnel. The administrative procedure governing equipment status control has been amended to require a tailboard prior to performing work on any of the listed critical circuits which have the potential to impact plant operations and safety. Additionally, the procedure for the operation of the UPS has been revised to incorporate signature steps and revised caution statements.

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On 12/10/86 at 1037, with Unit 2 at 93% power, the Main Turbine (EIIS System Code TA) (EIIS Component Code TRB) tripped due to a momentary interruption in the power supply to the Turbine Governor Control System (TGCS) (EIIS System Code JJ) (EIIS Component Code GRL). As designed, a reactor trip occurred on the resulting Loss of Load signal generated by the Turbine Supervisory System (TSS). The Steam Bypass Control System (SBCS) (EIIS System Code JI) did not automatically actuate after the power interruption and the secondary steam pressure reached 1100 psia, briefly actuating a Main Steam Safety Valve. Operations personnel utilized the Atmospheric Dump Valves (ADV) to reduce steam pressure, then proceeded to reset the SBCS, after which the trip recovery proceeded normally. However, it was also observed that start-up channel 'B' (EIIS System Code IG) did not indicate correctly, and the loss of load trip did not occur on Plant Protection System (PPS) channel 'A' (EIIS System Code JC). All other required safety related equipment functioned as designed, and there were no safety consequences associated with this event.

The interruption in power occurred during the removal from service of the Non-1E Uninterruptible Power Supply (UPS) (EIIS System Code EE) Inverter 2Y012 (EIIS Component Code INVT) which supplies power to the TGCS and SBCS, in addition to other loads. An alternate power source is available and is automatically aligned to the load by a static transfer switch (EIIS Component Code ASU) in the event that the inverter output voltage decreases below a preset value. Electrical Test technicians were investigating a high temperature reading in the inverter cabinet and requested Operations to have the load transferred from the inverter to the alternate source.

The static transfer switch is equipped with an automatic retransfer circuit which will retransfer the power supply from the alternate source back to the inverter 30 seconds after the initial transfer if the inverter output voltage level is restored or maintained. This circuit was provided in the design to assure the inverter output would be selected as the preferred power source.

The procedure for performing the transfer requires that the automatic retransfer circuit be turned off to prevent the static transfer switch from transferring back to the inverter. However, the procedure did not require that each step be signed off as it is performed, nor did it caution the operator that the transfer has the potential to trip the unit. The operator assigned to perform the task had studied the procedure in the Control Room, but did not take the procedure to the job site. As a result, the power supply transfer to the alternate source was completed without performing the procedural step to de-energize the automatic retransfer circuit.

The static transfer switch, actuated by the automatic retransfer circuit, apparently transferred the load back to the output of the inverter. The operation of the switch was not observed because the personnel involved were discussing the removal of the inverter from service and because the power transfer occurs silently. Shortly afterwards, the inverter output circuit breaker was opened (EIIS Component Code 52) to remove the inverter from service, and a momentary interruption in power to the TGCS resulted as the static transfer automatically operated to transfer the load to the alternate source.

The static transfer switch is designed to place the alternate power supply in service in sufficient time to prevent the brief loss of power from causing a trip. Normally the switch functions under conditions which cause the inverter output voltage to decrease. The opening of the inverter output circuit breaker under load instantly removes power and is a more severe condition than is normally experienced. Under such instantaneous power loss conditions, it is not consistently possible to preclude a loss of power supply that will cause a trip, since the timing of the switching operations with respect to the voltage cycle affects the recovery time. The failure to defeat the automatic retransfer circuit, in this instance, resulted in a trip.

Testing of the inverter and static transfer switch was conducted under conditions similar to those existing during the event. The test results did not reveal any equipment failures. During one of the tests, the TGCS load reference alarm, indicative of an impending loss of the TGCS channel, was observed. It is most likely that the event was caused by a similar voltage transient, however of a longer duration. The power interruption resulted in the trip and subsequent undervoltage lockout of the Turbine Governor Control System 5VDC power supplies, which initiated the turbine trip.

The SBCS, powered from the same inverter, was found to have a failed integrated circuit (IC) (RCA 553), which was replaced on the automatic restart timer card (EIIS Component Code TMR) in channel 2. The IC chip was inspected, and no evidence was found that heat, moisture, or improper assembly was the cause of the IC chip failure. The failure history for the SBCS was researched, and no similar failures have previously occurred. The performance of the SBCS, which is not safety related and for which no credit is taken in the Final Safety Analysis Report (FSAR), will continue to be monitored through the normal performance of scheduled surveillance testing. The IC chip will be included and monitored in the Reliability Engineering quarterly maintenance order trend reports for future reference. Should a similar failure be detected in the future, an investigation will be initiated to determine appropriate corrective action.

The PPS channel 'A' loss of load (LOL) trip function, for which no credit is taken in the FSAR, failed to actuate in this event. The circuitry was tested and found to perform satisfactorily. The turbine High Pressure Stop Valve (HPSV) (EIIS Component Code V) closure time was also tested and found to be satisfactory. The initial cause of the failure of the loss of load circuitry, as reported in LER 86-029-01, was attributed to a particle in the hydraulic oil causing the failure of the associated servo valve to actuate, preventing transmittal of the low oil pressure. This cause is discounted since the HPSV tripped closed properly upon receipt of the trip signal, which necessarily causes a low pressure condition in the HPSV hydraulic system. It is believed that a failure occurred in the pressure switch to PPS channel 'A' from the HPSV hydraulic system. The pressure switch was replaced and tested, but the failure could not be duplicated. The pressure switch failure has not been previously identified as a recurring malfunction, and no other corrective actions are planned at this time.

Start-up channel 'B' was found to have a failed power supply board (EIIS Component Code RJX) (Gamma-Metrics No. 87), which was replaced. Following this event, another power supply output was found to be below specifications. This second failure has resulted in SCE initiating an evaluation to determine the adequacy of the power supply. A suitable replacement circuit design is also under evaluation by the vendor.

In summary, the event resulted from failure to follow the procedure for transfer of the power supplies. A contributing factor was improper communication of the task to operations supervision and the consequent authorization of work without the level of advance planning and review expected for performing a procedure which has the potential to affect plant operation.

Prior to the event, a Special Order addressing critical circuits (including the Non-1E UPS) was being prepared as a part of a trip reduction program. The Special Order was issued and has now been incorporated into the administrative procedure governing equipment status control. This procedure lists the critical circuits requiring caution in performing activities which have the potential to impact plant operations and safety, and requiring that a tailboard meeting be held prior to performing any work on critical circuits. The personnel directly involved in the event were counseled in the proper application of procedures. Additionally, the procedure for the operation of the UPS has been revised to incorporate signature steps and revised caution statements.

Southern California Edison Company

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December 31, 1987

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

Subject: Docket No. 50-361
Revised Report
Licensee Event Report No. 86-029, Revision 2
San Onofre Nuclear Generating Station, Unit 2

References: 1) Letter, H. E. Morgan (SCE) to USNRC Document Control Desk, dated January 9, 1987
2) Letter, H. E. Morgan (SCE) to USNRC Document Control Desk, dated April 24, 1987
3) Letter, H. B. Ray (SCE) to J. B. Martin (NRC), dated November 5, 1987

Reference 1 provided the required 30-day Licensee Event Report (LER), and Reference 2 provided a revised report pursuant to 10 CFR 50.73(a)(2)(iv) for an occurrence involving the automatic actuation of the Reactor Protection System. This submittal provides additional information regarding the component failures in this event as indicated in Reference 3.

If you require any additional information, please so advise.

Sincerely,

HEMorg

Enclosure: LER No. 86-029, Rev. 2

cc: F. R. Huey (USNRC Senior Resident Inspector, Units 1, 2 and 3)
J. B. Martin (Regional Administrator, USNRC Region V)
Institute of Nuclear Power Operations (INPO)

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