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Vice President
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January 29, 2002

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

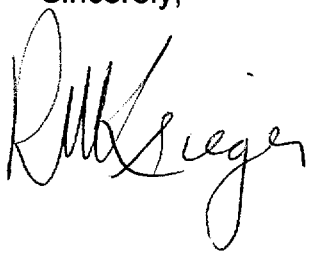
Subject: **Docket Nos. 50-361 and 50-362**
Voluntary Report
Licensee Event Report No. 2002-001
San Onofre Nuclear Generating Station, Units 2 and 3

Gentlemen:

This submittal provides a voluntary Licensee Event Report (LER) describing an aging phenomenon that affects certain Potter and Brumfield relays. SCE discovered this phenomenon while investigating a Potter and Brumfield relay that failed during its normal six month surveillance testing. This event did not meet the reporting criteria provided in 10CFR50.72, 50.73 or 10CFR21. Nevertheless, SCE considered that this information could assist other licensees that use similar relays and is providing this voluntary report.

Any actions listed are intended to ensure continued compliance with existing commitments as discussed in applicable licensing documents; this LER contains no new commitments. If you require any additional information, please so advise.

Sincerely,



LER No. 2002-001

cc: E. W. Merschoff, Regional Administrator, NRC Region IV
C. C. Osterholtz, NRC Senior Resident Inspector, San Onofre Units 2 & 3

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LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

APPROVED BY OMB NO. 3150-0104 EXPIRES MM-YYYY

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Information and Records Management Branch (T-6 F33), 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. If a document used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
San Onofre Nuclear Generation Station (SONGS) Unit 2	05000-361	1 of 7

TITLE (4)

Aging Phenomenon Affects Certain Potter and Brumfield Relays

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
									SONGS Unit 3	05000-362
09	11	2001	2002	001	00	01	29	2002	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9)	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)

20.2201(b)	20.2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(vii)
20.2201(d)	20.2203(a)(3)(ii)	50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(A)
20.2203(a)(1)	20.2203(a)(4)	50.73(a)(2)(ii)(B)	50.73(a)(2)(viii)(B)
20.2203(a)(2)(i)	50.36(c)(1)(i)(A)	50.73(a)(2)(iii)	50.73(a)(2)(ix)(A)
20.2203(a)(2)(ii)	50.36(c)(1)(ii)(A)	50.73(a)(2)(iv)(A)	50.73(a)(2)(x)
20.2203(a)(2)(iii)	50.36(c)(2)	50.73(a)(2)(v)(A)	73.71(a)(4)
20.2203(a)(2)(iv)	50.46(a)(3)(ii)	50.73(a)(2)(v)(B)	73.71(a)(5)
20.2203(a)(2)(v)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(C)	X OTHER
20.2203(a)(2)(vi)	50.73(a)(2)(i)(B)	50.73(a)(2)(v)(D)	Voluntary

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
R. W. Krieger, Vice President, Nuclear Operations	949-368-6255

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	BA	RLY	P297	Y						

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 15 single-spaced typewritten lines) (16)

On 9/11/01, while performing a subgroup relay test on Emergency Feedwater Actuation Signal (EFAS) 1 Train B, Steam Generator (SG) E-089 Auxiliary Feedwater (AFW) Isolation Valve 2HV4715 failed to close. AFW pump 2P140 started and AFW control valve 2HV4706 to SG E-089 closed as expected. 2HV4715 did not close as expected and was verified locally to be open. Plant operators manually closed 2HV4715 from the control room. Upon investigation, SCE discovered that the P&B relay (2L035K402) used for 2HV4715 had failed.

SCE determined the return springs of 2L035K402 would not fully rotate the relay shaft to its zero-degrees stop position when de-energized. A self-lubricating nylon hub in deck 1 of the form "Y" contacts (i.e., closest to the relay coils and the heat they generate) had deteriorated such that reinforcing glass fibers in the nylon were creating an abrasive interface.

SCE replaced the relay and returned the EFAS train to operable status within the time allowed by the Tech Specs. SCE also determined that there is no need to utilize the form "Y", high current contacts. A proactive approach will be implemented to replace the P&B MDR-7032 relays with P&B MDR-7033 or P&B MDR-7034 relays, which do not contain form "Y" contact blocks.

Because the failed relay is not in the EFAS or MSIS actuation logic for 2HV4715, there was no safety significance to this event.

Plant:	San Onofre Nuclear Generating Station, Units 2 and 3	
Event Date:	September 11, 2001	
Discovery Date:	January 11, 2002	
	Unit 2	Unit 3
Reactor Vendor	Combustion Engineering	Combustion Engineering
Mode	1 - power operation	1 - power operation
Power (percent)*	98.5	100

* on 9/11/2001

Background:

At San Onofre Nuclear Generating Station (SONGS) Units 2 and 3, the Engineered Safety Features Actuation System (ESFAS) use Potter and Brumfield (P&B) series 7032 Motor Driven Relays (MDR) to actuate Engineered Safety Features equipment. The ESFAS subgroup relays are the last relays in the control circuit before the ESF actuated equipment. As required by Technical Specification 3.3.6., "Engineered Safety Features Actuation System (ESFAS) Logic and Manual Actuation," Southern California Edison (SCE) surveils these relays once every six months.

Series 7032 relays are non-latching MDR relays (Figure 1). These relays have two positions: "energized" and "de-energized." When energized, two coils, connected in series and located inside the relay, rotate the relay rotor shaft and operate the relay contacts by a shaft extension. When de-energized, the rotor shaft is returned to its normal position by two connected springs (Figure 2). Relay shaft rotation is limited to a 30-degree arc by the stator faces and a stop ring. At SONGS, the Series 7032 relays are normally energized so that only spring force is used to rotate the relay on a loss of power.

The Series 7032 relays have three decks of main form "Y" contacts (high current applications) and three decks of four (4) auxiliary form "C" contacts (low current applications) mounted in isolated rings.

Units 2 and 3 each have 20 Series 7032 relays (total of 40) installed as follows:

1. 10 are spare relays and not currently being utilized
2. 18 form Y contacts are not being used
3. 12 form Y contacts are being used

Description of the Event:

On September 11, 2001, while performing a subgroup relay test on Emergency Feedwater Actuation Signal (EFAS) 1 Train B, Steam Generator (SG) E-089 Auxiliary Feedwater (AFW) {BA} Isolation Valve 2HV4715 {FCV} failed to close. AFW pump 2P140 started and AFW control valve 2HV4706 to SG E-089 closed as expected. 2HV4715 did not close as expected and was verified locally to be open. Plant operators manually closed 2HV4715 from the control room. Upon investigation, SCE discovered that the P&B relay (2L035K402) {RLY} used for 2HV4715 had failed. The relay was replaced and the EFAS train returned to operable status within the time allowed by Tech Spec 3.7.5, "Auxiliary Feedwater (AFW) System."

On September 14, 2001, SCE determined the shaft of relay 2L035K402 would not fully counter-rotate to its zero-degrees stop position when de-energized. SCE continued to perform a detailed cause evaluation, which included the use of a Scanning Electron Microscope to examine various components within the relay. During this time, SCE had ongoing discussions with P&B. During November 2001, SCE met with P&B at their facility in Greensboro, North Carolina and analyzed a second sample of the same type and vintage relay. In November 2001, SCE conducted additional laboratory analyses to quantify the degradation of the relay components. P&B confirmed that the springs were within their design specifications on December 28, 2001 and were not a factor in the relay failure. On January 11, 2002 (discovery date), SCE completed the cause evaluation, concluding that the self-lubricating nylon hub in deck 1 of the form "Y" contacts (i.e., closest to the relay coils and the heat they generate) had deteriorated such that reinforcing glass fibers in the nylon were creating an abrasive interface. The increased friction prevented the shaft from rotating to its zero position (Figure 2). Consequently, relay 2L035K402 failed to close contacts 4L-4M, which prevented 2HV4715 from closing.

Cause of the Event:

The primary factor, which increased the frictional force (drag) associated with the main form "Y" contact blocks, was the slow, age-related degradation of the movable nylon hub (Figure 3). Scratching on the "Y" contacts was a secondary factor that increased friction. This cumulative friction eventually overcame the spring return force and prevented the relay from fully counter-rotating to its fail safe "zero degree stop" position.

The 40 relays at SONGS (30 installed and 10 spare) were manufactured from 1989 through 1990 time frame and as such are subject to the same degradation mechanism.

Corrective Actions:

SCE has determined that there is no need to utilize the form "Y", high current contacts at SONGS Units 2 and 3. As such, a proactive approach will be implemented to replace all the SONGS P&B MDR-7032 relays with P&B MDR-7033 or P&B MDR-7034 relays, which do not contain form "Y" contact blocks.

SCE also examined a spare P&B MDR-7032 relay that had been subject to the same conditions (age, number of cycles and normally energized). This spare relay also showed signs of this age related degradation, but its contacts operated correctly.

The testing of 30 installed (i.e., non-spare) MDR-7032 relays are being staggered each month so that at least three relays are tested each month. Thirteen of these relays have already been tested following the initial relay test failure and there have been no additional failures.

The performance of these relays will be trended during the performance of the subgroup relay testing until the new MDR relay is installed.

Safety Significance:

Valve 2HV4715 is located on AFW pump P-141 discharge piping to steam generator (SG) E-089. This valve is closed during plant operation (Mode 1) and fails as-is upon loss of power. Upon an EFAS actuation, the valve opens and closes to provide automatic SG level control. It is also the AFW isolation valve for SG E-089.

There are two actuation signals for this valve generated by the ESFAS: (1) an EFAS, and (2) a Main Steam Isolation Signal (MSIS). These signals come from relays located in the ESFAS auxiliary relay cabinets. The EFAS initiates a signal for the valve to open to supply AFW to the SG for plant cool down in the event of a postulated Chapter 15 accident. MSIS initiates a close signal to isolate SG E-089. ESFAS actuates separate relays for these actions.

The failed relay is not in the EFAS or MSIS actuation logic for 2HV4715. The P&B relay which opens 2HV4715 on EFAS (2L035K724) and the relay which close 2HV4715 on MSIS (2LO35K723) did not experience the failure found in relay 2L035K402. Therefore, 2HV4715 would have been capable of closing on an MSIS. The failure of relay 2L035K402 to close valve 2HV4715 would only prevent the automatic control of SG E-089 water level, but would not (and did not) prevent control room operators from manually operating this valve. The close signal on the failed relay secures excess AFW flow by shutting valve 2HV4715 when the SG water level returns to above the low level setpoint and is not in the actuation logic for MSIS.

Although the EFAS 1 Train B was not able to automatically close 2HV4715 to secure excess AFW flow, it did not impact the ability of plant operators from detecting increasing water level in the SG E-089 and manually closing 2HV4715. Therefore, neither the health nor the safety of plant personnel or the public was affected by this condition.

Additional Information:

On May 5, 1999, SCE reported a defect found in a different type of P&B relays resulting from insufficiently welded contact pads. This condition does not involve the same underlying concern or reason as this event. Therefore, the corrective actions taken would not have prevented this condition.

Figure 1

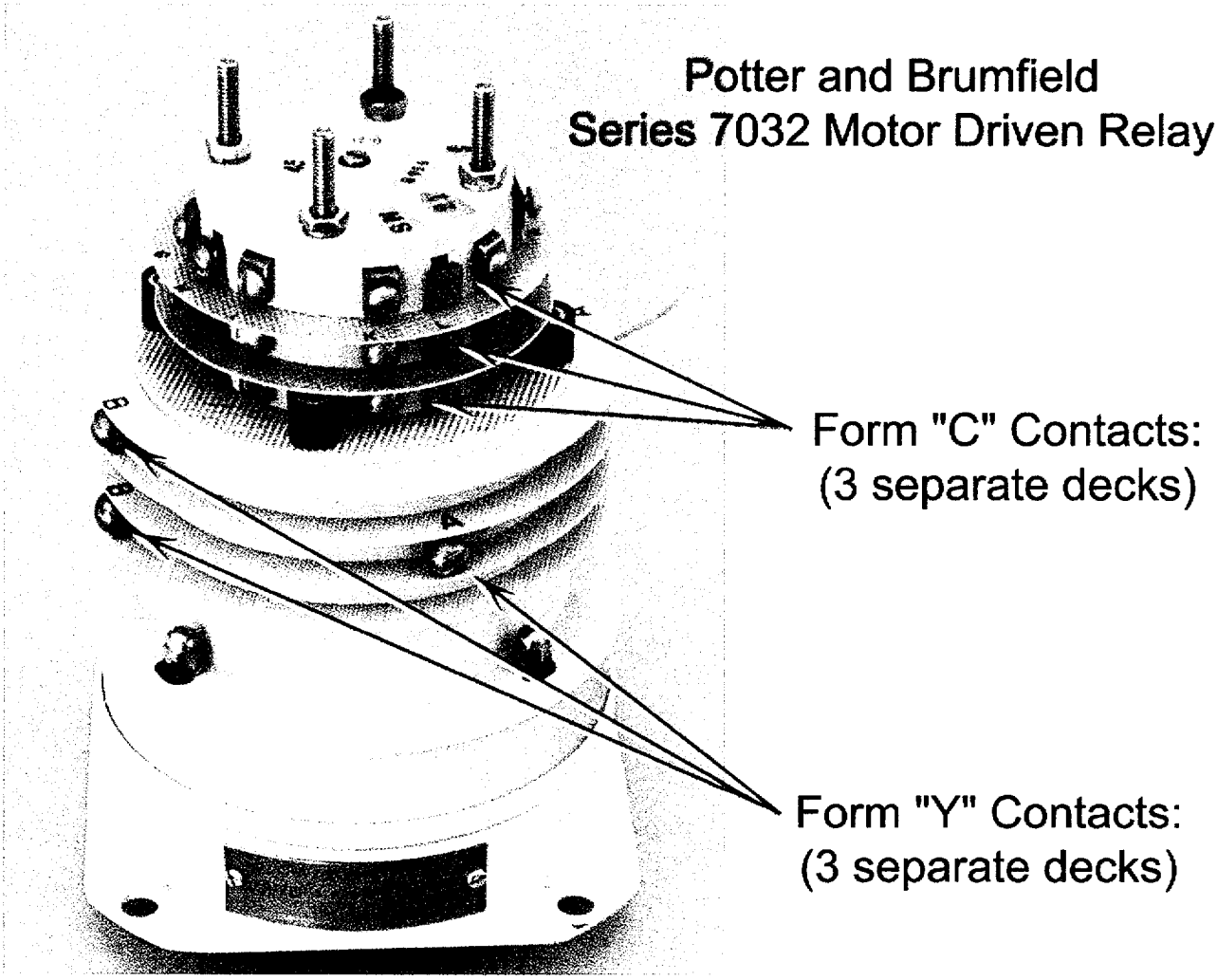
Potter and Brumfield
Series 7032 Motor Driven Relay
Form "C" Contacts:
(3 separate decks)
Form "Y" Contacts:
(3 separate decks)

Figure 2

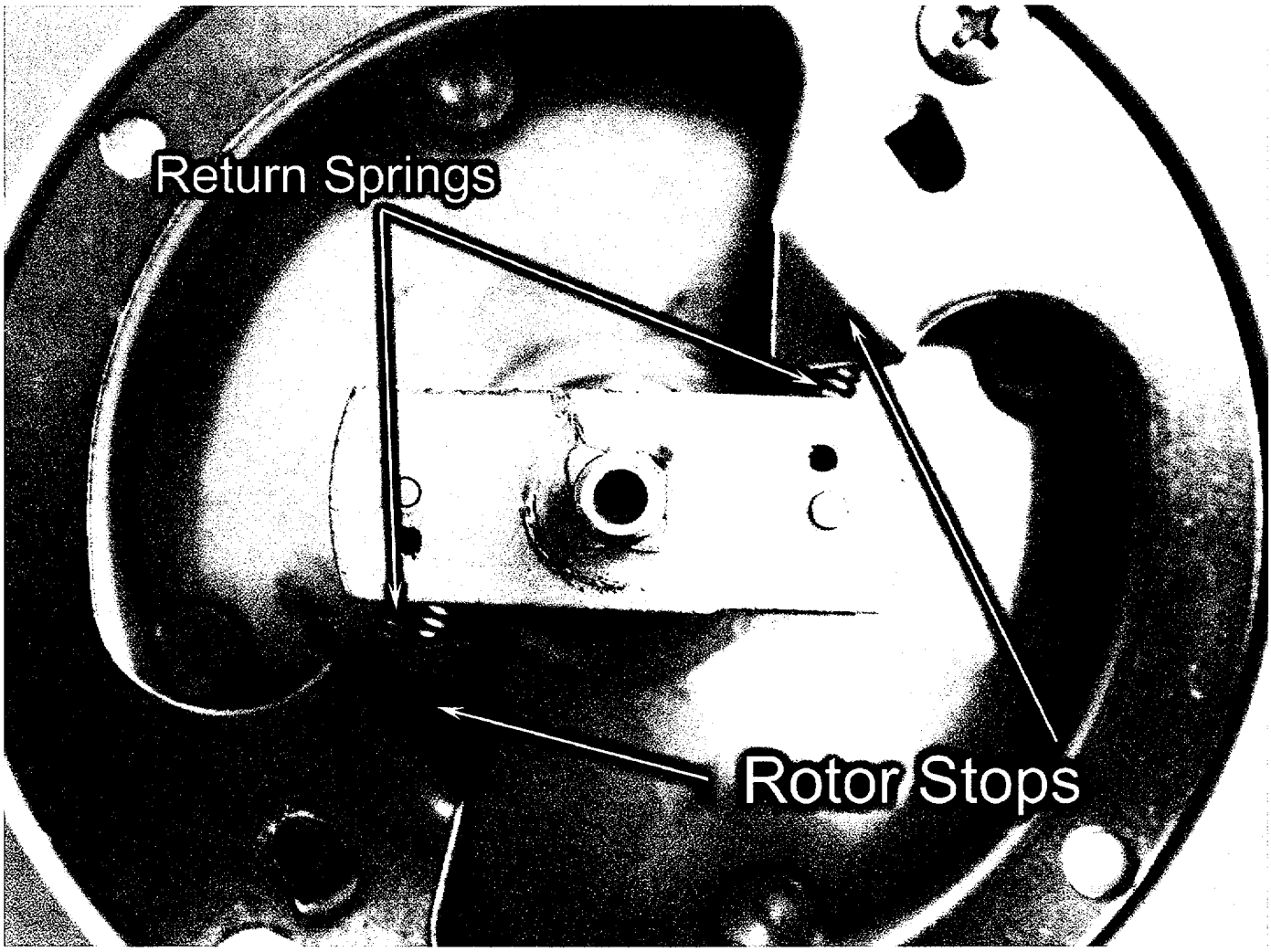

Figure 3

Photo of the movable contacts showing the age/heat damage to the Nylon