

Log # TXX-94084 File # 10200 Ref. # 50.73(a)(2)(iv)

March 31, 1994

William J. Cabill, Jr. Group Vice President

U. S. Nuclear Regulatory Commission Attn: Document Control Dcsk Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES) - UNIT 2 DOCKET NO. 50-446 ENGINEERED SAFETY FEATURE ACTUATION LICENSEE EVENT REPORT 446/94-003-00

Gentlemen:

Enclosed is the Licensee Event Report (LER) 94-003-00 for Comanche Peak Steam Electric Station Unit 2 "Initiation of Manual Reactor Trip Due to Main Turbine Load Swings."

Sincerely,

William J. Cahill, Jr.

By:

J. J. Kelley, Jr. Vice President of Nuclear Engineering and Support

OB:tg

ENCLOSURE

cc: Mr. L. J. Callan, Region IV Mr. L. A. Yandell, Region IV Resident Inspectors, CPSES

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Enclosure to TXX-94084							
NRC FORM 366 U.S. NUCLEAR REGULATORY COMMIS	SION APPROVED OME NO.3150-0104 EXPIRES: 4/30/92						
LICENSEE EVENT REPORT (LER)	ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THI INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWAR COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AN REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEA REGULATORY COMMISSION, WASHINGTON, DC. 20555, AND T THE PAPERWORK REDUCTION PROJECT (3150-0104). OFFICE O MANAGEMENT AND BUDGET, WASHINGTON, DC. 20503.						
Facility Name (1)	Docket Number (2) Pege (3)						
COMANCHE BEAK UNIT 2	015101010141416 1 05 11						
INITIATION OF MANUAL REACTOR TRIP DUE TO MAIN TU	RBINE LOAD SWINGS						
Event Date (5) LER Number (6) Report Date (7)	Other Facilities Involved (B)						
Month Day Year Year Sequential Meriaion Month Day Year Number							
0 3 0 5 9 4 9 4 - 0 0 3 - 0 0 0 3 3 1 9 4	N/A 05000						
Power Level (10) 20.405 (a)(1)(i) 20.405 (a)(1)(i) 50.36 (c)(1) 60.73 (a)   20.405 (a)(1)(ii) 20.405 (a)(1)(ii) 50.36 (c)(2) 50.73 (a)   20.405 (a)(1)(ii) 20.405 (a)(1)(ii) 50.73 (a)(2)(i) 50.73 (a)   20.405 (a)(1)(iii) 20.405 (a)(1)(ii) 50.73 (a)(2)(i) 50.73 (a)   20.405 (a)(1)(iv) 50.73 (a)(2)(ii) 50.73 (a)   20.405 (a)(1)(v) 50.73 (a)(2)(ii) 50.73 (a)   20.405 (a)(1)(v) 50.73 (a)(2)(ii) 50.73 (a)   20.405 (a)(1)(v) 50.73 (a)(2)(iii) 50.73 (a)	2)(v) 2)(v) (2)(vii) (2)(viii) (2)(viii)(A) (2)(viii)(B) (2)(viii)(B) (2)(viii) (b) (c)(c) (c)(c) (c)(c) (c)(c) (c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c) (c)(c)(c)(c) (c)(c)(c)(c) (c)(c)(c)(c) (c)(c)(c)(c)(c) (c)(c)(c)(c)(c)(c) (c)(c)(c)(c)(c)(c)(c)(c)(c)(c)(c)(c)(c)(						
Name	Ares Code Telephone Number						
W.G. Guldemond, Manager, System Engineering	8 1 7 - 8 9 7 - 8 7 3 9						
Complete One Line For Each Component Failu	re Described in This Report (13)						
Cause System Component Manufacturer Reportable Cau	se System Component Munufacturer Reportable To NPRDS						
Supplemental Report Expected (14)	Month Day Year						
Yes (if yes, complete Expected Submission Date)	Expected Submission Date (16)						
On March 5, 1994, Comanche Peak Steam Electri 1, with reactor power at 75 percent. The Bal Turbine/Generator (TG) load swings. Abnormal stabilize the plant while the problem was bei problems with the Electro-Hydraulic Control ( control was switched to the Mechanical-Hydrau temporarily subsided. The load swings return was shifted to EHC Converter #2. This action Without the ability to control the load swing reactor trip.After extensive troubleshooting, at 3:45 p.m., CDT on March 13, 1994. During approximately 120 MWe, all four control valve	c Station (CPSES) Unit 2 was in Mode ance of Plant Operator noticed Operating Procedure was entered to ng diagnosed. Because possible EHC) Converter #1 were indicated, load lic Controller. The load swings ed and were increasing and the load did not stabilize the load swings. s the Unit Supervisor directed a manual and correcting Unit 2 was restarted the restart with the load at s abruptly closed. The BOP Operator						

It was determined that a feedback (Collins) coil in the EHC system had shorted/failed. Corrective actions involved troubleshooting of the EHC system and replacement of the feedback coil.

RC FORM 36	6A		U.S. NUCLEAR RESULATORY COMM	ISSION	APPROVED	OMB NO.31 PIRES: 4/30/9	50-0104 2				
	LIC	ENSEE EVENT TEXT CONT	REPORT (LER)	ESTIMATED INFORMAT COMMENT REPORTS REGULATO THE PAPEF MANAGEM	ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH INFORMATION COLLECTION REQUEST: 50.0 HRS. FORW COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCI REGULATORY COMMISSION, WASHINGTON, DC. 20555, ANI THE PAPERWORK REDUCTION PROJECT (3150-0104). OFFICE MANAGEMENT AND BUDGET, WASHINGTON, DC. 20503.						
cility Name	(1)			LER Number (6)	1	Page (3)					
OMANCI	HE PE	AK-UNIT 2	0 5 0 0 0 4 4	6 9 4	- 0 0 3	- 0 0	2	OF	11		
ixt (if more e I •	DESC	required, use additional NRC For CRIPTION OF THE	REPORTABLE EVENT								
	Α.	. REPORTABLE EVENT CLASSIFICATION									
		Any event or o any Engineered System (RPS)(B	condition that result d Safety Feature (ESF EIIS:(JC)).	ed in manua ), includin	al or auto ng the Read	matic ac ctor Pro	tuati tecti	ion of ion	F		
	в.	PLANT OPERATING CONDITIONS PRIOR TO THE EVENT									
		On March 5, 19 in Mode 1, Pow (approximately	994, Comanche Peak Sto wer Operation, with ro y 800 Megawatts (MWe)	eam Electr eactor powe	ic Station er at 75 p	(CPSES) ercent	Unit	: 2 wa	15		
		On March 13, 1 percent (appro	n March 13, 1994, CPSES Unit 2 was in Mode 1, with reactor power at 18 ercent (approximately 120 MWe).								
	c.	STATUS OF STRUCTURES, SYSTEMS, OR COMPONENTS THAT WERE INOPERABLE AT THE START OF THE EVENT AND THAT CONTRIBUTED TO THE EVENT									
		There were no inoperable structures, systems, or components that contributed to the event.									
	D.	NARRATIVE SUMMARY OF THE EVENT, INCLUDING DATES AND APPROXIMATE TIMES									
		At 6:58 a.m., Operator (uti (EIIS:TRB/GEN these load sw ABN-401, "Main while the prol pressure was o with Electro-	CDT on March 5, 1994 lity, licensed) notic ) load swings of appr ings TG load had been n Turbine Malfunction blem was being diagno observed to cycle sli Hydraulic Control (EH	, the Unit ed Turbine oximately stable. ", was ent sed. Duri ghtly, ind C) Convert	2 Balance /Generator 16 Megawat Abnormal O ered to st ng this ti icating a er #1 (EII	of Plar (TG) ts (MWe) perating abilize me hydra possible S:(CNV)(	nt (BC ). Pr g Proc the p aulic e prot (JJ)).	DP) cedure blant blem	to B		
		At 8:09 a.m., CDT on March 5, 1994, the BOP Operator observed large load swings of approximately 76 MWe. On the advice of the System Engineer (utility, non-licensed) the Unit Supervisor (utility, licensed) shifted to Mechanical-Hydraulic Controller (MHC) (EIIS:(HCV)(JJ)) and secured power to EHC Converter #1. At 8:36 a.m., CDT, TG control was shifted to EHC Converter #2. Load was stabilized and was being controlled in Load Control Mode.									

NRC FORM 366A	J.S. NUCLEAR REGULATORY COMMISSION	APPROVED OMB NO.3150-0104 EXPIRES: 4/30/92
LICENSEE EVENT RI TEXT CONTINU	ESTIMATED SURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC. 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104). OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC. 20503.	
Facility Name (1)	Docket Number (2)	LER Number (6) Page (3)
		Tear Sequencial Number
COMANCHE PEAK-UNIT 2		94 - 003 - 003 OF 11
At 2:00 p.m., CDT of approximately the load swings b temporarily subsi increasing to app licensed) based o failed and shifte lowered the load swings were in pr from MHC to EHC. because of the mi swings, the Unit p.m., CDT on Marco 1994, both motor however, the turb started due to 2 percent. All sys Source Range Nucl required. CPSES An event or condi any ESF, includin 10CFR50.72(b)(2)( Regulatory Commis Emergency Notific	on March 5, 1994, th 50 MWe. The BOP Oper by transferring contro ded, at 2:10 p.m., CD proximately 100 MWe. In his observations, to d control to EHC Conv on EHC Converter #2. Togress that were mask As a result the TG smatch between MHC ar Supervisor directed a th 5, 1994. At approxid driven auxiliary feed one driven auxiliary of 4 steam generator tems responded as explear Instrument Channe Unit 2 was stabilized tion that results in og the RPS, is reporta ii). At 5:00 p.m., Co sion Operations Center ation System.	he BOP Operator observed load swings bator again attempted to mitigate of to MHC. Although the load swings of the load swings returned, The Unit Supervisor, (utility, believed that the MHC Controller had verter #2. The BOP Operator then As he began this evolution load sing the actual transfer of control load decreased to about 400 MWe and EHC. Unable to control the load a Manual Unit 2 Reactor Trip at 2:29 simately 5:00 p.m., CDT on March 5, dwater pumps were manually started; feedwater pump automatically levels being less than 35.4 bected, with the exception of the el N31 which did not energize as d in Mode 3, Hot Standby. an automatic or manual actuation of uble within 4 hours under CDT on March 5, 1994, the Nuclear er was notified of the event via the
During the eight that identified s (see section IV f The root cause of it was postulated load swings. Wit restart Unit 2.	days following the tr several factors which for a detailed discuss the TG load swings of that a combination of these factors corre	rip, troubleshooting was conducted could have contributed to the event sion of troubleshooting performed). could not be determined. However, of contributing factors caused the ected the decision was made to
At approximately percent reactor p four control valv opened due to rev turbine. Neither required). The e event, the root o feedback (Collins (see section IV f	3:40 p.m., CDT on Man power (approximately 1 ves abruptly closed an verse power. The BOP r a reactor trip or an event was terminated a cause of the load swin s) coil in the EHC sys for a detailed discus	rch 13, 1994, Unit 2 was at 18 120 MWe). At 3:47 p.m., CDT, all nd the generator output breakers Operator immediately tripped the n ESF actuation occurred (nor were and the plan' stabilized. From this ng event was determined; that the stem (EIIS:(JJ)) had shorted/failed sion).

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Facility Name (1)		Docket Number (2)	LER Number (6) Page (3)
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COMANCHE P	EAK-UNIT 2	015101010141416	94-003-004 OF 1.
Ε.	THE METHOD OF PERSONNEL ERRO	DISCOVERY OF EACH COMPO	NENT FAILURE, OR PROCEDURAL OR
	At 6:58 a.m., Turbine/Genera the BOP Operat Actions were t	CDT on March 5, 1994, t tor load swings of appr or observed large load aken to stabilize the l	he Unit 2 BOP Operator noticed oximately 16 MWe. At 8:09 a.m., CDT swings of approximately 76 MWe. oad.
	At 2:00 p.m., of approximate 2:10 p.m., CDT MWe. Unable t manual trip.	CDT on March 5, 1994, t by 50 MWe. The load sw the load swings return to control the load swin	he BOP Operator observed load swings ings temporarily subsided. At ed, increasing to approximately 100 gs the Unit Supervisor directed a
	At 3:47 p.m., closed and the The BOP Operat	CDT on March 13, 1994, e generator output break for immediately tripped	all four control valves abruptly ers opened due to reverse power. the turbine.
II. COM	PONENT OR SYSTEM	FAILURES	
Α.	FAILURE MODE,	MECHANISM, AND EFFECT O	F EACH FAILED COMPONENT
	The cause of t However, durin troubleshootin to the event. IV of the LER. control valves shorted/failed determined. T is considered sent to the ve	the TG load swings could ng the eight days follow ng identified several fa The details of the tro On March 13, 1994, du abruptly closed. The d. The failure cause of This appears to be an un to be an isolated occur endor for a failure anal	not be initially determined. ing the event (trip), ctors which could have contributed ubleshooting is described in section ring the restart of Unit 2 all four feedback coil in the EHC system had the feedback coil has not been usual failure for this component and rence. The feedback coil has been ysis.
в.	CAUSE OF EACH	COMPONENT OR SYSTEM FAI	LURE
	The cause of f conducted by t	feedback coil failure is	unknown, failure analysis is being

# C. SYSTEMS OR SECONDARY FUNCTIONS THAT WERE AFFECTED BY FAILURE OF COMPONENTS WITH MULTIPLE FUNCTIONS

Not applicable - there were no failed components with multiple functions that affected this event.

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Page (3)		
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Manufacturer: G. L. Collins Corporation Model: Linear Motion Transducer Serial Number: 180295 Tag Number: 2-SE1LC005F01

## III. ANALYSIS OF THE EVENT

#### A. SAFETY SYSTEM RESPONSES THAT OCCURRED

The following safety system actuations occurred as expected as a result of this event.

Reactor Protection System Auxiliary Feedwater System (AFW)(EIIS:BA).

# B. DURATION OF SAFETY SYSTEM TRAIN INOPERABILITY

At 2:40 p.m., CDT on March 5, 1994. Source range instrument channel N31 did not energize as required. At 3:35 a.m., CDT on March 6, 1994, N31 was returned to service.

#### C. SAFETY CONSEQUENCES AND IMPLICATIONS OF THE EVENT

This event has been analyzed in Chapter 15.2.3 and 15.1.3 of the Final Safety Analysis Report (FSAR) for Turbine Trip. The FSAR provides analysis of a turbine trip without taking credit for a reactor trip or the initiation of AFW. In this event a turbine trip occurred coincident with a reactor trip and the initiation of AFW. The reactor trip and the response to the plant trip were normal and within design limits. Based on this discussion it is concluded that this event did not adversely affect the safe operation of CPSES Unit 2 or the health and safety of the public.

## IV. CAUSE OF THE EVENT

The root cause of the Turbine/Generator load swings could not initially be determined. During the eight days (after the trip) troubleshooting was conducted that identified several potential causes. The troubles ofting

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Facility Name (1)		Docket Number (2)	LER No	umber (6)	Revision	Page (3)	
COMANCI'E PEAK-UNI	T 2	0 5 0 0 0 4 4 6	9 4 - 0	0 3 -	0 0 6	OF	11
performed	and the corre	ective actions taken	are discusse	ed below			
		TROUBLESHOOTI	NG				
Troublesho contribute Failures; causes/con	oting focused d to the ever and (C) Grid tributing fac	d on three general ar ht: (A) Electronic Co Fluctuations. The f ctors of the event we	reas which co ontrol Failur ollowing pot ere evaluated	ould hav res; (B) tential d.	e caused Hydraul	or ic	
A) ELECT	RONIC CONTROL	S FAILURE					
1.	EHC controlle calibration:	er, MHC controller, E	HC valve lit	ft contr	oller ou	t of	
	Loop calibrat within specif considered to	tions were performed, fication, requiring m b be a contributing f	and the loo minor adjustr actor to the	ops were ments. e event.	found t This was	o be not	
2.	Speed Sensor fluctuations	or Controller affect	ing the EHC	contro1	ler caus	ing loa	d
	The Speed Tan Acquisition S normal during inspected wit along with so sensors were factor to the	rget Unit (STU) data System. The STU data g the time frame of t th damage found on th ome sensor damage. T replaced. This was e event.	was collecte was reviewe the event. The outer ring the magnet d not consider	ed from ed and f The STU g of the isk and red to b	the Data ound to sensors magnet the spee e a cont	be were disk d ributin	g
B) HYDRA	ULIC FAILURE						숨
1.	Erratic EHC I	Pump Operation:					0.1
	EHC pumps A, dimensions we damage was for pumps reveal installed to inspected for was found. all three Un	B and C were dissemb ere taken per vendor ound. During CPSES L ed signs of rotation eliminate the proble r signs of rotation. As a precautionary me it 2 EHC pumps were	oled and ins recommendat Unit 1 refue and anti-ro om. The Uni No evidence easure anti- installed.	pected. ions. N ling out tational t 2 pump e of the rotation	Critica o intern age, Uni devices diffuse pump ro al devic	1 al pump t 1 were rs were tation es on	

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LICENSEE EV TEXT C	/ENT REPORT (LER) ONTINUATION	ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC. 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104). OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC. 20503.
COMANCHE PEAK-UNIT 2	0 5 0 0 0 4 4 6	LER Number (6) Page (3)   Year Sequential Number Revision Number   9   4 - 0   0   3 - 0   0 7 0F 11
Text (if more space is required, use additions Trou	bleshooting of each pump is a	as follows:
a) b)	EHC Pump A; the gasket betwee diffuser pushed away from the effected the performance of control fluid pressure. The stage impeller was measured as the second stage, instead larger, as specified. The us considered to be a contribut the interim, the turbine ver operation will continue with EHC Pump B; approximately 50 pump discharge flange gasket significantly affected the p of the control fluid pressur operating during this event, be a contributing factor.	een the second and third stage the sealing surface. This could have the pump and the stability of the e outer diameter (OD) of the third and found to be the same dimension d of being around 6 millimeters (mm) undersized impeller was not ting factor to the load swings. In hdor has concluded that stable in this condition. D percent of the high pressure (HP) t was missing. This could have pump's performance and the stability re. However, EHC Pump B was not , and as such was not considered to The gasket was replaced.
c)	EHC Pump C; the gasket betwee diffuser was found separated significant loss of sealing, impeller was measured and for second stage, instead of be- (similar to EHC Pump A). The considered to be a contribut In the interim, the turbine operation will continue with	een the second and third stage d in two places but with no . The OD of the third stage bund to be the same dimension as the ing 6mm larger, as specified he undersized impeller was not ting factor to the load swing event. vendor has concluded that stable h this condition.
d)	It was postulated that the of determined to be contaminate contributed to the gasket for removed from the pumps did of deterioration and the EHC f should not affect the gasket A sample of fluid was sent to	degraded EHC fluid (previously ed with ethylene glycol) could have ailures. The gasket material not exhibit any sign of luid manufacturer stated the fluid t material used in the EHC system. to the vendor for confirmation.
The EHC performan	oumps were reassembled under the second s	the vendor's direction. The pump ed prior to restart of the TG.

NRC FORM 366A	Napanitan salah merupakan keralakan di dalam sebuah dai ka	U.S. NUCLEAR REGULATORY COMMI	SSION	APPROVED ON EXPIRES	B NO.3150-010 5: 4/30/92	04			
LICENS TE	ESTIMATED BURI INFORMATION CO COMMENTS REGA REPORTS MANA REGULATORY CO THE PAPERWORK MANAGEMENT AN	ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH TH INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWAY COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS A REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLE REGULATORY COMMISSION, WASHINGTON, DC. 20555. AND THE PAPERWORK REDUCTION PROJECT (3150-0104). OFFICE MANAGEMENT AND BUDGET, WASHINGTON, DC. 20503.							
Facility Name [1]		Docket Number (2)	LEA	Number (6)	Bayleino	Page (3)			
COMANCHE DEAK H	NIT 2		6 014 0		Number	05	11		
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2.	EHC Pump Di	scharge Check Valve	Malfunction:						
	All six EHC checked for inspection feet head o sticky. Th problem. T event.	Pump d'scharge che freedom of movemer and demonstrated th f EHC fluid. One c e check valve's pac his was not conside	eck valves were nt. The check ne ability to o check valve's cking was adjust ered to be a co	e visuall valves p contain a (2EH-OOO2 sted, cor ontributi	ly inspec bassed th pproxima ?) moveme recting ing facto	ted and e visua tely 30 nt was the r to th	1 ie		
3.	EHC Pump Mi	nimum Flow Line Che	eck Valve Malf	unction:					
	All three c valves were repacked. factor to t	heck valves were ch found to have stic This condition was he event.	necked for free ky operation. not considered	edom of n The two d to be a	novement. ) valves L centrib	Two were uting			
4.	System Leak	s:							
	The EHC sys external le contributin	tem was walked down akage was observed. g factor to the eve	n and inspected . This was not ent.	d for lea t conside	iks. No ered to b	major e a			
5.	EHC Fluid D Contaminati	egradation and Air on:	Entrainment C	aused By	Ethylene	Glycol			
	There were into the EH load swings swings by i replaced to	no evolutions which C systems. The con , but may have cont nhibiting the overa conform with vendo	n would have in ndition of the tributed to the all control sy or specification	ntroduced fluid d e severit stem. Th ons.	d additio id not ca ty of the ne EHC fl	nal air use the load uid was			
6.	EHC System	Cleanliness:							
	During the debris was paper found small piece pilot valve slightly sl believed to cleanliness	removal of the EHC found in the sump. d in the cuno filter e of plastic found e. While this did lowed movement of the be a contributing s issue was resolver	fluid, a smal There was a r upstream of in the #4 HP C not prevent mo he valve. Sys cause of the d during EHC f	l amount small pie the Conve ontrol Va vement, tem clear load swir luid rep	of const ece of cl erters, a alve pre- it may ha nliness i ngs. EHC lacement.	ructior eaning nd a control ve s not system	n n		
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LICENSEE EVENT REPORT (LER) TEXT CONTINUATION					EXTINCT AVAILABLE ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH T INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWA COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS A REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCL REGULATORY COMMISSION, WASHINGTON, DC. 20555, AND THE PAPERV/ORK REDUCTION PROJECT (3150-0104). OFFICE MAWAGEMENT AND BUDGET, WASHINGTON, DC. 20503.						
ecility Name (1)			Docket Number (2)		Ver Balance	LER Number (6		Avision	Page (	3)	
COMANCHE P	EAK-UNI	IT 2	0151010	0141416	9 4 -	0 0 3	-	009	OF	11	
ext (if more space is	required, use	edditional NRC Form 366	ve Erratic	Behavior:							
	8.	These curves It was noted and then sli Valves pre-co were no sign This was not swings. A s valve perfor An inspection Valve was co pin. When the appropriate for position Control Valve Valve were not have been a Erratic Sole	s showed the d that the ightly lag control pil as of failu t believed set of Mech mance veri on of the f onducted. the brass b ly to the con- replaced ar contribution	at the con #1 Control the other lot valve as ine but it is to be a con annical and ified prior feedback lin The pivot bushing is control sign spection re- pred. All ing factor	trol valv Valve ap three val ssemblies did exhib ntributin Electric to resta nkage piv pins have worn the nal, thus vealed th three bus e reteste to the lo	es were peared to ves. A were in it signs g factor al curve rt of th ot pins a brass valve ma causing at the i hings in d succes ad swing	open to in 11 foi s of to es we for to for to s busi ay no g the bushi h the ssful gs.	ating itiall ur HP ted. normal the lo re tak the #1 hing a t resp valve ngs in #1 Co ly. T	normal y lead Contro There wear. ad en and contro round t ond to hur the #J ntrol his cou	ly. 1 che 1 uld	
		The ground of Turbine Trip power supply restart of T the Turbine be a contrib	detector re o System Ca y grounds a IG. No gro Trip Syste outing fact	evealed a g abinet. Te are not cau bunds were em Cabinets tor of the	round on sting was sing the identifie . This a load swin	the powe perform load swi d in the rea was gs.	er su med t ings e pow not	pply b o ensu prior er sup consid	us to f re thes to ply to ered to	the se	
C)	GRID	FLUCTUATION									
	The	grid was not	the source	e of the lo	ad swings	based (	on th	e lack	of		

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#### ROOT CAUSE

At 3:47 p.m. on March 13, 1994, during the restart of Unit 2 TG, all four Control Valves abruptly closed. The generator output breakers opened due to reverse power. The BOP Operator immediately tripped the turbine. Neither reactor trip nor ESF actuation occurred (nor were required). From this event, the root cause of the load swings was determined. The feedback (Collins) coil in the EHC System had shorted/failed. The feedback coil is a linear motion transducer that provides feedback to the valve lift controller to maintain Control Valve position while controlling on EHC. Failure of this coil produces clearly identifiable symptoms. In this case the coil was apparently experiencing intermittent failures which did not clearly identify it as being the cause until it completely failed. Electrical Valve Curve tests had been previously performed to determine if a problem in this circuit existed. While the tests would disclose a feedback coil failure, they did not do so in this case because of the intermittent nature of the failure.

#### V. CORRECTIVE ACTIONS

The Unit 2 linear motion transducer (Collins Coil) was replaced, and the EHC Unit was returned to service. The failed Collins Coil was sent to the turbine vendor for a failure analysis. Failure of this coil has previously occurred at other utilities; however, these failures resulted in an open circuit instead of a short. The intermittent failure and subsequent shorting of this coil was considered unusual and an isolated case. Nevertheless, TU Electric will review the failure analysis and determine appropriate actions for both Units. To further ensure reliability the Collins Coil in the other Unit 2 EHC converter will be tested during a future outage.

With respect to corrective actions taken during the troubleshooting process, TU Electric has or will perform the following actions to prevent recurrence:

- a) The damaged gaskets in Unit 2 EHC pumps were replaced. The performance of Unit 1 EHC pumps was also reviewed. Current Unit 1 EHC pump performance did not reveal gasket problems, no action was taken for Unit 1 EHC pumps.
- b) The entire volume of EHC fluid was replaced with new fluid meeting the vendor's specification. A sample of the degraded fluid was sent to the vendor to ensure that the degraded fluid did not have an affect on the gaskets in the EHC system. TU Electric will evaluate the need for additional corrective actions, if warranted, upon receipt of the fluid analysis from the vendor.

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- c) All three brass bushings which were found scored in the #1 Control Valve were replaced and the valve retested successfully. The brass bushings in the other control valves will not be replaced at this time (for both units) based on satisfactory performance of these valves.
- d) The failure of source range channel N31 was traced to a fault card in Train A Solid State Protection System (EIIS:(JG)). The fault card which freds the Train A P-10 source range auto-block was replaced.

# VI. PREVIOUS SIMILAR EVENTS

There have been no other previous LERs which dealt with Turbine/Generator load swings causing a reactor trip.