TU ELECTRIC

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U. S. Nuclear Regulatory Commission
Document Control Desk
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SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)
DOCKET NOS. 50-445 AND 50-446
NRC BULLETIN NO. 96-01: CONTROL ROD INSERTION PROBLEMS

Gentlemen:

TU Electric has evaluated the concerns of the subject bulletin. The reporting requirements of the bulletin state that:

"All licensees of Westinghouse-designed plants must submit the following information:

1. Within 30 days of the date of this bulletin, a report certifying that control rods are determined to be operable; actions taken for Requested Actions (1) and (2); and the plans for implementing Requested Actions (3) and (4).

2. Within 30 days of the date of this bulletin, a core map of rodded fuel assemblies indicating fuel type (materials, grids, spacers, guide tube inner diameter) and current and projected end of cycle burnup of each rodded assembly for the current cycle; when available, provide the same information for the next cycle.

3. Within 30 days after completing Requested Action (3) for each outage, a report that summarizes the data and that documents the results obtained; this is also applicable to Requested Action (4) when any abnormal rod behavior is observed."

Requested Actions (1) through (4) from the bulletin were as follows:

(1) "Promptly inform operators of recent events (reactor trips and testing) in which control rods did not fully insert and subsequently provide necessary training, including simulator drills, utilizing the required procedures for responding to an event in which the control rods do not fully insert upon reactor trip (e.g., boration of a pre-specified amount)."

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(2) "Promptly determine the continued operability of control rods based on current information. As new information becomes available from plant rod drop tests and trips, licensees should consider this new information together with data already available from Wolf Creek, South Texas, North Anna, and other industry experience, and make a prompt determination of control rod operability."

(3) "Measure and evaluate at each outage of sufficient duration during calendar year 1996 (end of cycle, maintenance, etc.), the control rod drop times and rod recoil data for all control rods. If appropriate plant conditions exist where the vessel head is removed, measure and evaluate drag forces for all rodded fuel assemblies.

a. Rods failing to meet the rod drop time in the technical specifications shall be deemed inoperable.

b. Rods failing to bottom or exhibiting high drag forces shall require prompt corrective action in accordance with 10 CFR Part 50."

(4) "For each reactor trip during calendar year 1996, verify that all control rods have promptly fully inserted (bottomed) and obtain other available information to assess the operability and any performance trend of the rods. In the event that all rods do not fully insert promptly, conduct tests to measure and evaluate rod drop times and rod recoil."

In accordance with the bulletin requirements the following response is submitted.

Action Item 1

Within 30 days of the date of this bulletin, a report certifying that control rods are determined to be operable; actions taken for Requested Actions (1) and (2); and the plans for implementing Requested Actions (3) and (4).

TU Electric Response

CONTROL ROD OPERABILITY

An operability assessment of the control rods was performed as required by the bulletin. The assessment was required as a result of control rods not fully inserting upon a reactor trip at other plants. This assessment composes two primary facets for CPSES: 1) All previous surveillance testing performed at CPSES Unit's 1 and 2 on control rods has shown no abnormal performance and 2) CPSES has not observed any abnormal performance during additional testing beyond that of normal surveillance of the control rods.

Further, should CPSES experience control rod performance similar to that observed at Wolf Creek and the South Texas Project, the design basis safety analysis will remain valid.

CPSES has performed rod drop testing per the requirements of Technical Specification surveillance 4.1.3.4 on seven occasions prior to each cycle; five times for Unit 1 and twice for Unit 2. CPSES operates with an acceptance limit of 2.4 seconds for rod drop times in accordance with Technical Specifications. The actual rod drop times for CPSES Unit 1 have all been less than 1.6 seconds with a measured average drop time of 1.440 seconds and standard deviation of 0.031 seconds. Likewise, the rod drop times for CPSES Unit 2 have all been less than 1.5 seconds with a measured average drop time of 1.436 seconds and standard deviation of 0.017 seconds. As can be seen from the above data, the control rod performance for CPSES is well within the Technical Specification requirements with respect to rod drop times. Further, the small standard deviations demonstrate that the rods are performing uniformly with very little variance among individual locations.

Beyond the rod drop measurements performed prior to each cycle, CPSES performs rod movement surveillance monthly and rod alignment is verified every shift. Although not directly supporting the operability determination for rod insertion ability, these frequently performed surveillance activities have not identified any rod operability concerns associated with control rod freedom of movement. It should be noted that similar routine surveillance activities did not identify any problems at those facilities with rod insertion difficulties.

Beyond those tests that CPSES uses to demonstrate operability of the control rods, CPSES has routinely recorded control rod drag measurements during the latching and unlatching of the control rods. No abnormal control rod drag has been observed. Control rod shuffles conducted between operating cycles provide further basis for the acceptability of the control rods with the fuel utilized at CPSES as no problems have been documented regarding the inability to insert control rods into or remove control rods from fuel assemblies.

In response to recent industry events, CPSES measured rod drop times for Unit 2 at the end of Cycle 2 operation on February 23, 1996. The rod drop measurements exhibited satisfactory drop times that correlated well with those drop times measured prior to the cycle. Additionally, all rods were observed to have traces demonstrating the anticipated recoil when the rod entered the dashpot region. Also noteworthy is that the end of cycle data was compared to the beginning of cycle data with no statistically significant difference in drop times. During control rod unlatching at the end of Cycle 2, the control rod drag was measured and found to meet the drag force limits specified in Westinghouse Fuel Handling Specification F-5.1. The maximum burnup in the tested fuel assemblies was approximately 35,000 MWD/MTU.

In addition to the testing described above, a conservative assessment of the potential impact on CPSES of an incomplete rod insertion has been performed. This information is being provided for completeness in assessing CPSES Unit 1 Cycle 5 and CPSES Unit 2 Cycle 3 for continued operation.

The consequences of a potential incomplete rod insertion for Comanche Peak Units 1 and 2 have been evaluated by postulating a conservative reactor trip scenario and assessing the impact on the design basis safety analyses. In the scenario evaluated, it is assumed that no control rods, regardless of assembly design, fabrication, or burnup, insert beyond a position of 20 steps withdrawn following a reactor trip. In addition, the design basis worst stuck rod assumption is maintained, and one additional rod is assumed to stick at a position of 30 steps withdrawn. This scenario clearly bounds the incomplete rod insertion scenarios actually experienced at Wolf Creek and South Texas.

The safety analyses that support the operation of the current CPSES cycles (Unit 1 Cycle 5 and Unit 2 Cycle 3) were reviewed to identify the affected safety analysis parameters and evaluate the impact for the postulated incomplete rod insertion scenario. The affected parameters included shutdown margin, trip reactivity vs time, post-trip subcriticality for rod ejection, and time to criticality for boron dilution. It was determined that the conclusions of the CPSES design basis safety analyses remain valid, even considering the postulated incomplete rod insertion scenario.

Control rod operability has been adequately demonstrated and maintained at all times during the operation of CPSES Units 1 and 2. Further, no evidence exists that would render the control rods at CPSES inoperable at this time. TU Electric has demonstrated that there would be no adverse consequences to reactor safety if an incomplete rod insertion event significantly more severe than those observed at Wolf Creek and South Texas Project were to occur. Therefore, the control rods currently in place in CPSES Unit 1 Cycle 5 and in Unit 2 Cycle 3 are considered operable.

REQUESTED ACTIONS 1 AND 2

TU Electric has completed Requested Action (1) by informing operators of recent events (reactor trips and testing) in which control rods did not fully insert and Operations crews have received training, including simulator drills, utilizing the required procedures for responding to an event in which the control rods do not fully insert upon reactor trip. Implementation of Requested Action (2) is discussed above.

REQUESTED ACTIONS 3 AND 4

Regarding Requested Action (3), CPSES currently plans to perform rod drop time measurements (including analysis of rod recoil data) during outages of sufficient duration in calendar year 1996.

The TU Electric criteria for these outages includes:

- The Unit is in Mode 3 at normal operating pressure, normal operating temperature, and RCS full flow condition.
- The outage is projected to be of sufficient duration such that rod drop testing can be performed without restraining reactor restart.
- Rod drop data on the shutdown unit has not been obtained in the previous 62 Effective Full Power Days.

Rod drop time data obtained during these outages will be analyzed against previous measurements for observable trends. In addition, rod drop times will be obtained at the completion of Unit 1, Cycle 5 at the beginning of the fifth refueling outage (scheduled for fall 1996). This data (which should include rodded assemblies with burnups up to 45,000 MWD/MTU) will be compared to previous results to determine if any observable trends are evident.

When the reactor head is removed during 1996, RCCA drag force measurements will be obtained during the unlatching/latching of control rod drive shafts. CPSES Operations procedures currently require that the drag force observed during the unlatching/latching of control rod drive shafts be recorded. Operations procedures will be revised to provide maximum drag force limits per Westinghouse Fuel Handling Specification F-5.1 and require that if the drag forces exceed the values specified in F-5.1, then prompt corrective actions will be performed.

Regarding Requested Action (4), TU Electric will verify, for each reactor trip during 1996, that all control rods have promptly fully inserted (bottomed) and obtain other available information to assess the operability and any performance trend of the rods. CPSES Operations procedures require, immediately following a reactor trip, that the Reactor Operator determine if the Digital Rod Position Indication System indicates all rods at bottom. In the event that all rods do not fully insert promptly, tests will be conducted to measure and evaluate rod drop times and rod recoil and a report that summarizes the data and documents the results obtained will be submitted within 30 days of completing the evaluation of the rod drop time and rod recoil data.

The planned actions will be reviewed as additional data becomes available from ongoing industry investigations and revised action plans will be submitted as required.

Action Item 2

Within 30 days of the date of this bulletin, a core map of rodded fuel assemblies indicating fuel type (materials, grids, spacers, guide tube inner diameter) and current and projected end of cycle burnup of each rodded assembly for the current cycle; when available, provide the same information for the next cycle.

TU Electric Response

The requested core map data for Units 1 and 2 has been included as Attachment 1.

Action Item 3

Within 30 days after completing Requested Action (3) for each outage, a report that summarizes the data and that documents the results obtained; this is also applicable to Requested Action (4) when any abnormal od behavior is observed.

TU Electric Response

TU Electric will submit a report that summarizes the data and documents the results obtained for Requested Action (3) (and Requested Action (4), if necessary) within 30 days of completion of Requested Action (3) for each outage.

Sincerely,

C. L. Terry

GLM/glm
Attachment
Enclosure

cc: Mr. L. J. Callan, Region IV
Ms. L. J. Smith, Region IV
Resident Inspectors, CPSES

CPSES Unit 1, Cycle 5 Assemblywise Burnup in Control Bank Locations

	H	G	F	E	D	C	B	A
8	3 28.919 37.162 D		6 36.670 45.715 A		6 36.560 45.509 SE		6 33.538 41.524 C	
9						6 33.958 42.845 SB		
10	6 36.670 45.715 A		6 34.914 44.244 C				6 29.762 37.960 B	
11						6 27.688 36.863 SC		
12	6 36.560 45.509 SE				6 33.037 41.912 D		6 30.815 36.056 SA	
13		6 33.977 42.865 SB		6 27.698 36.871 SD				
14	6 33.538 41.524 C		6 29.763 37.962 B		6 30.821 36.062 SA			
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FUEL REGION
CURRENT (3/96) BURNUP (GWD/MTU)
PROJECTED EOC BURNUP (GWD/MTU)
RCCA BANK

Comanche Peak Steam Electric Station
Unit 1, Cycle 5 - Mechanical Characteristics of Fuel in Rodded Locations

Unit 1 Control Rod Clusters

Supplier:	Westinghouse
Total No. of Clusters:	(53) clusters
Control Rods:	(24) per cluster w/each rod 0.381" in diameter
Cladding:	High purity 304SS w/chrome plating
Absorber:	Ag-In-Cd (w/12" of reduced diameter absorber at tip of each rod)

Unit 1 Fuel Region No. 3

Supplier:	Westinghouse
Year Manufactured:	1983
No. in Rodded Locations:	(1) Region 3
Fuel Type:	17 X 17 "Standard" w/(24) Guide Tubes and (1) Instrument Tube
Fuel Rod O.D.:	0.374"
Fuel Rod Clad Material:	"Standard" Zircaloy-4
Guide Tube O.D./I.D.:	Above dashpot - 0.482"/0.450" Within dashpot - 0.429"/0.397"
Guide Tube Material:	"Standard" Zircaloy-4
Number of Spacer Grids:	(8) Spacer grids total
Spacer Grid Type:	(8) Inconel - 718
Inter. Flow Mixing Grids:	None

Unit 1 Fuel Region No. 6

Supplier:	Siemens Power Corporation (SPC)
Year Manufactured:	1993
No. in Rodded Locations:	(52) Region 6
Fuel Type:	17 X 17 "Small Rod" w/(24) Guide Tubes and (1) Instrument Tube
Fuel Rod O.D.:	0.360"
Fuel Rod Clad Material:	"PCA-2" Zircaloy-4
Guide Tube O.D./I.D.:	Above dashpot - 0.480"/0.448" Within dashpot - 0.430"/0.397"
Guide Tube Material:	"PCA-2" Zircaloy-4*
Number of Spacer Grids:	(8) Spacer grids total
Spacer Grid Type:	(8) "Bi-Metallic" w/Zircaloy grids and Inconel springs
Inter. Flow Mixing Grids:	None
Other Features:	6" natural U axial blanket at each end of each fuel rod

*Note: Tin content of SPC PCA-2 Zircaloy-4 tubing is similar to the allowed range of tin content in Westinghouse "Improved" Zircaloy-4 tubing.

CPSES Unit 1, Cycle 6 Projected Assemblywise Burnup in Control Bank Locations

	H	G	F	E	D	C	B	A
8	3 16.486 37.680 D		7 25.918 49.724 A		7 23.417 47.583 SE		7 23.418 44.429 C	
9						7 21.420 45.245 SB		
10	7 25.918 49.724 A		7 25.315 49.450 C				7 17.760 38.329 B	
11						7 18.653 42.059 SC		
12	7 23.417 47.583 SE				7 25.476 48.446 D		7 26.795 39.926 SA	
13		7 21.421 45.218 SB		7 18.643 42.052 SD				
14	7 23.418 44.429 C		7 17.766 38.335 B		7 26.332 39.470 SA			
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FUEL REGION
PROJECTED BOC BURNUP (GWD/MTU)
PROJECTED EOC BURNUP (GWD/MTU)
RCCA BANK

Comanche Peak Steam Electric Station
Unit 1, Cycle 6 - Mechanical Characteristics of Fuel in Rodded Locations

Unit 1 Control Rod Clusters

Supplier:	Westinghouse
Total No. of Clusters:	53 clusters
Control Rods:	(24) per cluster w/each rod 0.381" in diameter
Cladding:	High purity 304SS w/chrome plating
Absorber:	Ag-In-Cd (w/12" of reduced diameter absorber at tip of each rod)

Unit 1 Fuel Region No. 3

Supplier:	Westinghouse
Year Manufactured:	1983
No. in Rodded Locations:	(1) Region 3
Fuel Type:	17 X 17 "Standard" w/(24) Guide Tubes and (1) Instrument Tube
Fuel Rod O.D.:	0.374"
Fuel Rod Clad Material:	"Standard" Zircaloy-4
Guide Tube O.D./I.D.:	Above dashpot - 0.482"/0.450" Within dashpot - 0.429"/0.397"
Guide Tube Material:	"Standard" Zircaloy-4
Number of Spacer Grids:	(8) Spacer grids total
Spacer Grid Type:	(8) Inconel - 718
Inter. Flow Mixing Grids:	None

Unit 1 Fuel Region No. 7

Supplier:	Siemens Power Corporation (SPC)
Year Manufactured:	1995
No. in Rodded Locations:	(52) Region 7
Fuel Type:	17 X 17 "Small Rod" w/(24) Guide Tubes and (1) Instrument Tube
Fuel Rod O.D.:	0.360"
Fuel Rod Clad Material:	"PCA-2" Zircaloy-4
Guide Tube O.D./I.D.:	Above dashpot - 0.480"/0.448" Within dashpot - 0.430"/0.397"
Guide Tube Material:	"PCA-2" Zircaloy-4*
Number of Spacer Grids:	(8) Spacer grids total
Spacer Grid Type:	(8) "Bi-Metallic" - w/Zircaloy grids and Inconel springs
Inter. Flow Mixing Grids:	None
Other Features:	6" natural U axial blanket at each end of each fuel rod

*Note: Tin content of SPC PCA-2 Zircaloy-4 tubing is similar to the allowed range of tin content in Westinghouse "Improved" Zircaloy-4 tubing.

CPSES Unit 2, Cycle 2 Assemblywise Burnup in Control Bank Locations

	H	G	F	E	D	C	B	A
8	2 33.563 D		3 31.684 A		3 32.183 SE		3 29.100 C	
9						3 33.785 SB		
10	3 31.684 A		2 32.338 C				3 28.232 B	
11						3 31.672 SC		
12	3 32.183 SE				3 29.776 D		3 20.807 SA	
13		3 33.788 SB		3 31.696 SD				
14	3 29.100 C		3 28.247 B		3 20.810 SA			
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FUEL REGION

ACTUAL EOC BURNUP (GWD/MTU)

RCCA BANK

Comanche Peak Steam Electric Station
Unit 2, Cycle 2 - Mechanical Characteristics of Fuel in Rodded Locations

Unit 2 Control Rod Clusters

Supplier:	Westinghouse
Total No. of Clusters:	(53) clusters
Control Rods:	(24) per cluster w/each rod 0.381" in diameter
Cladding:	High purity 304SS w/chrome plating
Absorber:	Ag-In-Cd (w/12" of reduced diameter absorber at tip of each rod)

Unit 2 Fuel Region Nos. 2 and 3

Supplier:	Westinghouse
Year Manufactured:	1985
No. in Rodded Locations:	(5) Region 2, (48) Region 3
Fuel Type:	17 X 17 "OFA" w/(24) Guide Tubes and (1) Instrument Tube
Fuel Rod O.D.:	0.360"
Fuel Rod Clad Material:	"Standard" Zircaloy-4
Guide Tube O.D./I.D.:	Above dashpot - 0.474"/0.442" Within dashpot - 0.429"/0.397"
Guide Tube Material:	"Standard" Zircaloy-4
Number of Spacer Grids:	(8) Spacer grids total
Spacer Grid Type:	(2) Inconel - 718 end grids (6) "Standard" Zircaloy-4 mid-grids
Inter. Flow Mixing Grids:	None

CPSES Unit 2, Cycle 3 Assemblywise Burnup in Control Bank Locations

	H	G	F	E	D	C	B	A
8	3 21.722 42.752 D		4B 23.162 46.445 A		4A 22.250 44.126 SE		4B 20.746 41.508 C	
9						4A 17.831 40.088 SB		
10	4B 23.162 46.445 A		4B 20.777 44.750 C				4A 22.252 41.363 B	
11						4B 14.595 38.174 SC		
12	4A 22.250 44.126 SE				4A 23.095 44.209 D		4B 22.761 36.071 SA	
13		4A 17.844 40.108 SB		4B 14.683 38.228 SD				
14	4B 20.746 41.508 C		4A 22.240 41.358 B		4B 22.757 36.062 SA			
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FUEL REGION
CURRENT (BOC) BURNUP (GWD/MTU)
PROJECTED EOC BURNUP (GWD/MTU)
RCCA BANK

Comanche Peak Steam Electric Station
Unit 2, Cycle 3 - Mechanical Characteristics of Fuel in Rodded Locations

Unit 2 Control Rod Clusters

Supplier:	Westinghouse
Total No. of Clusters:	(53) clusters
Control Rods:	(24) per cluster w/each rod 0.381" in diameter
Cladding:	High purity 304SS w/chrome plating
Absorber:	Ag-In-Cd (w/12" of reduced diameter absorber at tip of each rod)

Unit 2 Fuel Region No. 3

Supplier:	Westinghouse
Year Manufactured:	1985
No. in Rodded Locations:	(1) Region 3
Fuel Type:	17 X 17 "OFA" w/(24) Guide Tubes and (1) Instrument Tube
Fuel Rod O.D.:	0.360"
Fuel Rod Clad Material:	"Standard" Zircaloy-4
Guide Tube O.D./I.D.:	Above dashpot - 0.474"/0.442" Within dashpot - 0.429"/0.397"
Guide Tube Material:	"Standard" Zircaloy-4
Number of Spacer Grids:	(8) Spacer grids total
Spacer Grid Type:	(2) Inconel - 718 end grids (6) "Standard" Zircaloy-4 mid-grids
Inter. Flow Mixing Grids:	None

Unit 2 Fuel Region Nos. 4A and 4B

Supplier:	Westinghouse
Year Manufactured:	1994
No. in Rodded Locations:	(24) Region 4A, (28) Region 4B
Fuel Type:	17 X 17 "OFA" w/(24) Guide Tubes and (1) Instrument Tube
Fuel Rod O.D.:	0.360"
Fuel Rod Clad Material:	"Improved" Zircaloy-4
Guide Tube O.D./I.D.:	Above dashpot - 0.474"/0.442" Within dashpot - 0.429"/0.397"
Guide Tube Material:	"Improved" Zircaloy-4
Number of Spacer Grids:	(8) Spacer grids total
Spacer Grid Type:	(2) Inconel - 718 end grids (6) "Improved" Zircaloy-4 mid-grids
Inter. Flow Mixing Grids:	None
Other Features:	6" natural U axial blanket at each end of each fuel rod