UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555-0001

February 15, 1996

NRC INFORMATION NOTICE 96-12: CONTROL ROD INSERTION PROBLEMS

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to recent events during which rod control cluster assemblies failed to insert fully. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

South Texas Project

On December 18, 1995, with South Texas Unit 1 at 100 percent power, a pilot wire monitoring relay actuation caused a main transformer lock out which resulted in a turbine trip and reactor trip. While verifying that control rods had inserted fully after the trip, operators noted that the rod bottom lights of three control rod assemblies were not lit; the digital rod position indication for each rod indicated six steps withdrawn. Boration of the reactor coolant system was occurring with the charging pump suction having been transferred to the refueling water storage tank. One rod did drift into the fully inserted rod bottom position within one hour, and the other two rods were manually inserted later. During subsequent testing of all control rods in the affected banks, the rod position indication for the same three locations as well as a new location indicated six steps withdrawn. As compared to prior rod drop testing, no significant differences in rod drop times were noted before reaching the upper dashpot area for any of the control rods. Within an hour after the rod drop tests, two of the rods drifted to rod bottom position and the other two were manually inserted. All four control rods were located in fuel assemblies that were in their third cycle with burnup greater then 42,880 megawatt days(MWD)/metric ton uranium(MTU).

Wolf Creek

On January 30, 1996, after a manual scram from 80-percent power, five control rod assemblies at Wolf Creek failed to insert fully. Two rods remained at six steps withdrawn, two at 12 steps, and one at 18 steps. Three of the affected rods drifted to fully inserted within 20 minutes, one within 60 minutes, and the last one within 78 minutes. After the scram, the licensee initiated emergency boration, as required, because all rods did not insert fully. The five rods were all in 17x17 VANTAGE 5H fuel with burnup greater than 47,000 MWD/MTU.

Discussion

At both South Texas units, a 14-foot active fuel length core design is used. Several differences between the standard 12-foot active fuel design and the 14-foot one are as follows: the 14-foot fuel design is approximately 76.2 cm [30 inches] longer than the standard fuel assembly design, it has 10 mid grids compared to 8 and the dashpot region is 25.4 cm [10 inches] longer and comprises a double dashpot. The control rod radial clearances above and in the dashpot region of the 14-foot fuel assembly are similar to those of the standard design. The South Texas core contains three different 17x17 fuel types--Standard XL, Standard XLR, and VANTAGE 5H--all of which are designed and fabricated by Westinghouse. This was the first operating cycle with VANTAGE 5H fuel. The core also contains 57 silver-indium-cadmium rods. The four affected rods were found in twice-burned Standard XLR fuel assemblies.

During subsequent testing, the rod drop traces revealed no significant change in dashpot entry time; however, the affected rods did not show recoil on the rod drop trace. Recoil is a dampening affect that is normally seen in the traces due to control rod assembly spider hub spring contact against the fuel assembly. When similar rods in Unit 2 were tested, the results revealed no adverse indications. One rod did show the "no recoil" effect but inserted fully into the core.

At Wolf Creek, subsequent cold, full flow testing of all of the control rod assemblies indicated that eight control rods, including the five control rods that did not fully insert following the January 30, 1996, reactor trip, did not fully insert when tripped. One control rod, H2, paused at 96 steps, stopped at 90 steps, and slowly inserted to 30 steps over the next 2 hours. The control rod was then manually inserted. The 7 other affected rods stopped at various heights in the dashpot region, 5 of which fully inserted within 22 minutes. One of the other two drifted to the bottom within one and a half hours while the remaining rod needed to be manually inserted. The remaining 45 rods fully inserted when dropped, although a number of the rods did not exhibit the expected number of recoils. Of the total 53 control rod assemblies, H2 (the only rod slowing outside the dashpot region) is a hafnium control rod, while the remaining are silver-indium-cadmium control rod assemblies. The licensee retested all rods that stuck, as well as those rods that failed to recoil more than twice, and the results were similar to the previous testing.

Westinghouse, Westinghouse Owners Group, and the respective licensees are pursuing the root cause identification of these events. Possible root causes are as follows: debris (foreign matter), control rod or drive line degradation, corrosion products, thimble tube bow, fuel assembly bow and/or twist, reduction in thimble tube diameter, adverse alignment of guide tube cards, and/or design tolerances.

Some foreign reactors have also experienced slow and/or stuck control rod assemblies.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Dennis M. Crutchfield, Director
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

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Attachment: List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
96-11	Ingress of Demineralizer Resins Increases Potential Stress Corrosion Cracking of Control Rod Drive Mechanism Penetrations	02/14/96	All holders of OLs or CPs for pressurized water nuclear power reactors
96-10	Potential Blockage by Debris of Safety System Piping Which is Not Used During Normal Operation or Tested During Surveillances	02/13/96	All holders of OLs or CPs for nuclear power reactors
96-09	Damage in Foreign Steam Generator Internals	02/12/96	All holders of OLs or CPs for pressurized water reactors
96-08	Thermally Induced Pressure Locking of a High Pressure Coolant Injection Gate Valve	02/05/96	All holders of OLs or CPs for nuclear power reactors
96-07	Slow Five Percent Scram Insertion Times Caused By Viton Diaphragms in Scram Solenoid Pilot Valves	01/26/96	All holders of OLs or CPs for boiling water reactors
96-06	Design and Testing Deficiencies of Tornado Dampers at Nuclear Power Plants	01/25/96	All holders of OLs or CPs for nuclear power reactors
96-05	Partial Bypass of Shutdown Cooling Flow from the Reactor Vessel	01/18/96	All holders of OLs or CPs for boiling water reactors
96-04	Incident Reporting Requirements for Radiography Licensees	01/10/96	All radiography licensees and manufacturers of radiography equipment

OL = Operating License
CP = Construction Permit

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original signed by

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Reviewed and concurred on by tech editor 02/01/96 *SEE PREVIOUS CONCURRENCES

DOCUMENT NAME: 96-12.IN

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OFFICE	TECH CONTS		C:SPLB		C:PECB		D:DRPM			
NAME	MChatterton* SKoenick*		RJones*		AChaffee*		DCrutchfield			
DATE	02/07/96 02/06/96		02/08/96		02/08/96		02/12/96			

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DOCUMENT NAME: G:\IN\IN ST CR.SSK

OFFICE	PECB/DRPM	SPLB/DSSA	ADM:PUB	SC:SPLB/DSSA	RIV/DRS
NAME	SKoenick*	MChatterton*	TECH ED*	EWeiss*	JPellet*
DATE	2/06/96	2/07/96	2/01/96	2/07/96	2/08/96

OFFICE	BC:SPLB/DSSA	SC:PECB/DOPS	C/PECB:DOPS	D/DRPM
NAME	RJones*	EGoodwin*	AChaffee	DCrutchfield
DATE	2/08/96	2/07/96	2/8/96	2/ /96

* See previous concurrence

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NAME	SKoenick SSK	MChatterton for	TECH ED	EWeiss	
DATE	2/6/96	2/7/96	2/ /96	2/7/96	2/ /96

OFFICE	BC:SPLB/DSSA	SC:PECB/DOPS	C/PECB:DOPS	D/DRPM
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OFFICE	SPLB/DSSA		SC:SPLB/DSSA		ADM:PUB		BC:SPLB/DSSA		RIV/DRS	
NAME	MChatterton		EWeiss		TECH ED	RS	RJones			
DATE	2/ /96		2/ /96		2/ /96		2/ /96		2/ /96	

OFFICE	PECB/DRPM		SC:PECB/DOPS		C/PECB:DOPS		D/DRPM	
NAME	SKoenick		EGoodwin		AChaffee		DCrutchfield	
DATE	2/ /96		2/ /96		2/ /96		2/ /96	

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