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

June 10, 1993

NRC INFORMATION NOTICE 93-46: POTENTIAL PROBLEM WITH WESTINGHOUSE ROD CONTROL SYSTEM AND INADVERTENT WITHDRAWAL OF A SINGLE ROD CONTROL CLUSTER ASSEMBLY

Addressees

All holders of operating licenses or construction permits for Westinghouse (W)-designed nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to a potential problem with the Westinghouse rod control system that can cause an inadvertent withdrawal of one or more control rod cluster assemblies in a selected bank. 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

On May 27, 1993, operators at the Salem Nuclear Generating Station, Unit 2, experienced problems with the rod control system. During an attempt to withdraw Shutdown Bank A, the operator observed that the Analog Rod Position Indicator (ARPI) did not indicate that the control rods were being withdrawn. The operator stopped attempting to withdraw rods at 20 steps as indicated on the Group Demand Indicator. The Group Demand Indicator tells the operator the position the rods should have moved to based on the demand from the rod control system. The ARPI provides the actual position of each rod. The operator then attempted to insert Shutdown Bank A. However, one control rod (1SA3) withdrew to 8 steps while the Group Demand Indicator counted down from 20 steps to 6 steps. The operator continued to try to insert the Shutdown Bank A control rods until the Group Demand Indicator showed a rod position of zero. The operator observed that the indicated position on the ARPI for control rod 1SA3 was 15 steps. Public Service Electric & Gas (the licensee) removed the power from the rod by pulling fuses and rod 1SA3 dropped to the 0 step position as indicated by ARPI.

The licensee initiated troubleshooting activities on the Salem, Unit 2, rod control system. An NRC Augmented Inspection Team (AIT) has been sent to Salem, Unit 2, to evaluate this issue and observe the investigation of this event by the licensee. Westinghouse Electric Corporation personnel are providing technical assistance to the licensee.

Discussion

During a refueling outage this spring, the licensee and Westinghouse performed extensive maintenance work on the solid state electronic rod control system for Salem, Unit 2. On May 26, 1993, the licensee initiated the startup of Salem, Unit 2, from the refueling outage. From May 26, 1993 to June 3, 1993, the licensee experienced a series of failures in the rod control system. Following each failure, the licensee located the failed components in the system, performed repairs and retests, and returned the rod control system to operation. On June 4, 1993, the licensee shut down Salem, Unit 2, pending the results of an investigation into the rod control system failures. None of the failures in the rod control system interfered with the operation of the reactor scram function.

The licensee, in response to NRC questions in consultation with Westinghouse, has postulated that, for the event that occurred on May 27, 1993, a single failure in the rod control system caused a single rod to withdraw from the core 15 steps while the operator was applying a rod insertion signal. The failure, an integrated circuit on a slave cycler decoder card, disrupted the normal sequence of pulses that the rod control system sends to the rods in the selected bank. Normally on insert demand, the pulses are staggered in a sequence that leads to rod insertion. With the failure, the rod control system periodically sent simultaneous pulses to the movable gripper coil, lift coil, and stationary coil for each of the rods in the selected bank. Under these conditions, based on the preliminary investigation, each rod in the bank may either remain where it is or withdraw from the core when a rod movement demand occurs. When the rod control system is in the automatic mode of operation, a rod movement demand is generated automatically in response to changes in turbine load and changes in the average reactor coolant temperature. Rod movement then occurs without any operator action until the demand is satisfied. When the rod control system is in the manual mode of operation, a rod movement demand is generated only in response to operator manipulation of the IN-HOLD-OUT switch, given no failures in the demand circuit.

The Updated Final Safety Analysis Report (UFSAR) for Salem, Unit 2, states that multiple failures would have to be present in order for an inadvertent single rod withdrawal event to occur. The event on May 27, 1993, indicates that the present design for Salem, Unit 2, appears to violate this statement.

The licensee issued a standing order for the operators at Salem, Unit 1, which was operating at 100 percent power at the time. The standing order required (1) placing the rod control system in the manual mode of operation, (2) maintaining the control rods at or near the top of the core, and (3) manually tripping the reactor if the control operator and supervisor judge that safety system setpoints are being challenged. With the rod control system in the manual mode of operation, two failures would be required to cause an inadvertent rod withdrawal; a failure in the rod control system in combination with an inadvertent rod movement demand. After the standing order was issued, Salem, Unit 1, experienced a scram due to a clogged intake structure. The operators were unable to prevent the scram by manual turbine

or reactor runback. The licensee had provided operator training and prepared an engineering evaluation of the event on May 27, 1993. The licensee had also identified a periodic Technical Specification Surveillance Requirement that would detect the presence of the postulated failure.

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C T Grimes for
Brian K. Grimes, Director
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(301) 504-2911

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List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
93-45	Degradation of Shutdown Cooling System Performance	06/16/93	All holders of OLs or CPs for nuclear power reactors.
93-44	Operational Challenges During A Dual-Unit Transient	06/15/93	All holders of OLs or CPs for nuclear power reactors.
93-43	Use of Inappropriate Lubrication Oils in Safety-Related Applications	06/10/93	All holders of OLs or CPs for nuclear power reactors.
93-42	Failure of Anti-Rotation Keys in Motor-Operated Valves Manufactured by Velan	06/09/93	All holders of OLs or CPs for nuclear power reactors.
93-41	One Hour Fire Endurance Test Results for Thermal Ceramics Kaowool, 3M Company FS-195 and 3M Company Interam E-50 Barrier Systems	05/28/93	All holders of OLs or CPs for nuclear power reactors.
93-40	Fire Endurance Test Results for Thermal Ceramics FP-60 Fire Barrier Material	05/26/93	All holders of OLs or CPs for nuclear power reactors.
93-39	Radiation Beams from Power Reactor Biological Shields	05/25/93	All holders of OLs or CPs for nuclear power reactors.
93-38	Inadequate Testing of Engineered Safety Features Actuation System	05/24/93	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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orig /s/'d by CIGrimes

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MSChatterton	TECollins	RCJones	ACThadani	
06/09/93	06/09/93	06/09/93	06/09/93	
*OEAB:DORS:NRR	*OEAB:DORS:NRR	*HICB:DRCH:NRR	*HICB:DRCH:NRR	*D/DRCH:NRR
EFGoodwin	AEChaffee	ECMarinos	JSWermiel	BABoger
06/09/93	06/09/93	06/09/93	06/09/93	06/09/93
*PD12	*PD12	*REGION 1	*OGCB:DORS:NRR	
JStone	CMiller	WRuland	NCampbell	
06/09/93	06/09/93	06/10/93	06/09/93	

*C/OGCB:DORS:NRR	D/DORS:NRR
GHMarcus	BKGrimes CIG for
06/09/93	06/10/93

DOCUMENT NAME: 93-46.IN

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FOR COMMENTS WHERE UNIT 1 INFORMATION

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