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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

CONTROL ROD DRIVE SYSTEM MALFUNCTIONS

Description of Circumstances:

Continued NRC evaluation of BWR control rod drive (CRD) systems operating experience has identified several operating events which highlight the need for timely operator action if certain CRD system malfunctions occur during specific modes of reactor operation. In each event, operator action was taken when needed and scram capability was maintained at all times. However, if timely operator action were not taken (or if other circumstances existed) scram capability might have been degraded. This notice is provided to inform reactor operators of these events and re-emphasize the reliance on timely operator action (IEB 80-17 Supplement 4, Confirmatory Order dated October 2, 1980, and Safety Evaluation Report dated December 1, 1980.)

On February 24, 1981, at Brunswick Unit 2, the reactor was manually scrammed from 1.5% power after the group 4 control rods had received three scram signals. (Group 4 contains 33 control rods and is one of four control rod groups.) The first scram signal for group 4 occurred when surveillance testing caused a trip of RPS "B" channel. Reactor power decreased from 7% to 1.5% and the RPS "B" trip was reset by the operator. Another group 4 scram signal, received when an intermediate range monitor (IRM) drifted upscale, was reset by the operator. A third scram signal, received when the IRM drifted upscale again, caused the operator to initiate a manual scram. Subsequent investigation revealed that a relay contact (K14c) in group 4 RPS "A" had failed open. Thus, group 4 rods received a scram signal each time RPS "B" was tripped.

We note that rod group scrams of this type have been previously addressed by the NRC (December 1, 1980 Safety Evaluation Report, pages 22-24). For plants like Brunswick with good communication between the SDV and instrument volume (IV), operator action is not needed to maintain scram capability. However, for those BWRs with poor communication between the SDV and IV, CRD seal leakage from the scrammed control rods (with open scram outlet valves) could potentially result in filling the SDV before level switches in the IV initiate an automatic scram. In this case, timely operator action is needed to prevent a temporary loss of scram capability. Indications are available to alert the operator to scrammed CRDs and accumulation of water in the SDV. These indications include control rod position indication, rod drift indication (with annunciator), high

level in SDV (with annunciator), high level in IV (with rod block and annunciator), and change in reactor power with attendant indications. With current equipment and requirements (IEB 80-17 and Confirmatory Orders) we expect the operator would initiate a manual scram while sufficient capacity remains in the SDV.

Two other operating events involved operator action following CRD system malfunctions not related to SDV performance. At Brunswick 1 on August 27, 1980, both CRD pumps became inoperable due to low suction pressure caused by high pressure drop across the suction filter coincident with low level in the condensate storage tank. In accordance with procedures the operator manually scrammed the reactor which was in startup, subcritical with some control rods not fully inserted, and at approximately 5 psig pressure. At Oyster Creek on November 30, 1980, operability of both CRD pumps was challenged by seal water piping leaks on each pump. This condition was detected and corrected by operators during routine power operation. There was no direct threat to loss of scram capability in this event since the reactor was pressurized; however, this event is of interest since similar failures affected both pumps. Scram capability was maintained at all times during both events.

Evaluation of these two events and possible CRD system failure modes show the need for operator action to maintain scram capability. Under conditions of reactor low pressure, such as those encountered during startup, control rod scram capability could be lost in an event in which complete failure of CRD hydraulic flow occurred simultaneously with gross leakage from the scram accumulators. The CRD pumps maintain the pressure on the accumulators and provide motive force for single rod drive operations. Failure of CRD hydraulic flow can be caused by (1) inoperability of both CRD pumps caused by power failure; (2) plugging of CRD pump suction strainers; (3) lack of an adequate condensate storage tank supply; or (4) other failures in the CRD hydraulic system. Scram capability under these conditions is designed to be provided by the scram accumulators. Extensive deterioration of the accumulator charging line check valves could cause a sufficient number of accumulators to discharge and result in a loss of scram capability if the operator does not take appropriate action. In the event of such multiple failures, reactor shutdown would have to be accomplished by use of the liquid control system.

This information is provided as a notification of a possibly significant matter that is still under review by the NRC staff. In case the continuing NRC review finds that specific licensee actions would be appropriate, a bulletin or circular may be issued. In the interim, we expect that licensees will review this information for applicability to their facilities paying particular attention to their operating procedures. The operating procedures should include specific actions (i.e., initiation of full scram) to be taken by the operator in response to a scram of a portion of the control rods. Procedures should also include the required response (i.e., again to initiate a scram) on recognition of loss of operability of both CRD pumps, especially

during the initial stages of plant startup when reactor pressure is insufficient to accomplish a scram. It is noted that current licensing requirements, as reflected in BWR Standard Technical Specifications, include surveillance testing at least once every eighteen months to check the leak tightness of the scram accumulators to hold pressure for at least 20 minutes.

No written response to this IE Information Notice is required. If you need additional information regarding this matter, please contact the Director of the appropriate NRC Regional Office.

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LISTING OF RECENTLY ISSUED IE INFORMATION NOTICES

Information Notice No.	Subject	Date Issued	Issued To
81-07	Potential Problem with Water-Soluble Purge Dam Materials Used During Inert Gas Welding	3/16/81	All power reactor facilities with an Operating License (OL) or Construction Permit (CP)
81-08	Repetitive Failures of Limitorque Operator SMB-4 Motor-to-Shaft Key	3/20/81	All power reactor facilities with an Operating License (OL) or Construction Permit (CP)
81-10	Inadvertent Containment Spray Due to Personnel Error	3/25/81	All power reactor facilities with an Operating License (OL) or Construction Permit (CP)
81-09	Degradation of Residual Heat Removal (RHR) System	3/26/81	All power reactor facilities with an Operating License (OL) or Construction Permit (CP)
81-11	Alternate Rod Insertion for BWR Scram Represents a Potential Path for Loss of Primary Coolant	3/30/81	All BWR facilities with an Operating License (OL) or Construction Permit (CP)
81-12	Guidance on Order Issued January 9, 1981 Regarding Automatic Control Rod Insertion on Low Control Air Pressure	3/31/81	All BWR facilities with an Operating License (OL) or Construction Permit (CP)
81-13	Jammed Source Rack in a Gamma Irradiator	4/14/81	Specified Irradiator licensees
81-14	Potential Overstress of Shafts on Fisher Series 9200 Butterfly Valves with Expandable T Rings	4/17/81	All power reactor facilities with an Operating License (OL)
81-15	Degradation of Automatic ECCS Actuation Capability by Isolation of Instrument Lines	4/22/81	All power reactor facilities with an Operating License (OL) or Construction Permit (CP)