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

August 19, 1980

IE Information Notice No. 80-30: POTENTIAL FOR UNACCEPTABLE INTERACTION BETWEEN THE CONTROL ROD DRIVE SCRAM FUNCTION AND NON-ESSENTIAL CONTROL AIR AT CERTAIN GE BWR FACILITIES

Continued NRC evaluation of possible failure modes of the control rod drive system related to the Browns Ferry event (IE Bulletin 80-17), has identified a potentially significant single failure mechanism which could degrade the scram function. The slow loss of non-essential control air pressure could degrade the scram function at certain facilities which have relatively poor communication between the scram discharge volume (SDV) and the scram discharge instrumented volume (SDIV) such that the SDIV drains more rapidly than the SDV drain rate into the SDIV.

The significance of such a single failure warrants transmission of an interim assessment by the NRC Office for Analysis and Evaluation of Operational Data as an early notification of a possibly significant matter that is still under review by the NRC staff. It is expected that recipients will review the information for possible applicability to their facility. No specific action or response is requested at this time. If you have any questions regarding this matter, please contact the Director of the appropriate NRC Regional Office.

Enclosure:
Memo from C. Michelson to
H. Denton, dated August 18,
1980

C O P Y

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

AUG 18 1980

MEMORANDUM FOR: Harold R. Denton, Director
Office of Nuclear Reactor Regulation

FROM: Carlyle Michelson, Director
Office for Analysis and Evaluation of
Operational Data

SUBJECT: POTENTIAL FOR UNACCEPTABLE INTERACTION BETWEEN THE CONTROL ROD DRIVE SYSTEM AND NON-ESSENTIAL CONTROL AIR SYSTEM AT THE BROWNS FERRY NUCLEAR PLANT

Since completing its analysis of the Browns Ferry 3 partial failure to scram event, AEOD has been taking a closer look at the added (temporary) scram discharge volume instrument arrangement in terms of its acceptability for continued operation pending completion of the recommended system modifications. Our evaluation is still ongoing, but one established conclusion is that an immediate, in-depth evaluation is needed of the potential for unacceptable interaction between the control rod drive system and the non-essential (non-safety) control air system.

At the recent meeting with General Electric relating to the Browns Ferry event, we questioned GE concerning the scram inlet and outlet valves and how they might respond to a slow loss of control air pressure. Their answer indicated that these valves would drift open slowly, but without early indication, as the air pressure decreased. In other words, the loss of air pressure would lead to a significant scram discharge volume inleakage, but the control rods might not move until the air pressure decreased substantially (with even greater inleakage).

The immediate concern is associated with this degraded air pressure situation and is focused on the scram discharge volume fill rate, the time for operator action, and the alarms and indications to guide his actions. We are already aware that the scram discharge volume drain rate is less than the scram instrument volume drain rate so any substantial inleakage may go undetected by the existing (permanent) alarm or scram instruments. Further, there is no position indication for the scram valves, other than full-open, nor is there direct scram protection on partial loss of control air. In fact, the alarm signaling low air pressure would undoubtedly cause the operator's attention to be distracted from the control rod drive system.

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Thus, failures in the non-essential control air system which result in a degraded air pressure could result in a significant and undetected increase in the scram discharge volume inleakage. In fact, an inleakage rate of 3 gpm per drive may exist before control rod movement is experienced. With this flow rate, the operator may have only a few minutes before the scram volume has filled to such an extent that the scram function could be adversely affected, and eventually even prevented. We believe the one alarm which might actuate (control rod drive high temperature alarm) would not be a sufficiently timely or good indication of what is happening to assure proper operator action.

An event related to this concern occurred at Browns Ferry on August 18, 1978 when a massive loss of control air pressure to the entire plant was experienced (PNO-78-147). Units 1 and 2 were operating at full power. Their control rods drifted inward as a result of low air pressure. Both units were manually (and successfully) scrammed in accordance with emergency procedures. This might have been a close call since the scram discharge volume was certainly filling as the rods drifted in before the manual scram. The actual rate of control air depressurization and the timely manual scram might have been the saving factors.

It appears essential that we obtain an adequate understanding of the control rod drive unit response to a loss of control air pressure. It is an immediate safety concern if the degradation of the nonsafety-related control air system can lead to a loss of scram capability before the situation is diagnosed by the operator and manual scram achieved. It should be apparent that the situation would be precarious if a loss of control air pressure lead to an inability to scram from full power and, at the same time, any significant portion of the full power heat removal capability (turbogenerator, main steam or feedwater systems) was lost for any reason such as the pressure reduction or its consequences. Recirculation pump trip, where available, could be timely and helpful, but not adequate. Boron injection would probably be too slow. In any case, this is an unacceptable interaction between a safety and nonsafety system.

The licensed design basis for Unit 3 was redundant level sensing capability, and appropriate provision for scram initiation, to protect against excessive water in the scram discharge volume. The AEOD recommended modifications contained in our report on the BF-3 partial failure to scram would restore this design basis and would protect against degraded air system pressures (provided the control rod drives are not adversely affected by any heatup prior to scram actuation).

However, Unit 3 is being allowed to operate on a temporary basis with a single ultrasonic detector to indicate accumulated inleakage to the scram discharge volume. This single detector does not indicate or alarm in the control room and provides no scram initiation. It is read locally by a roving operator every

30 minutes. We believe that these temporary scram discharge volume level monitoring measures do not adequately protect against a loss of scram function within a few minutes due to degraded air pressure.

In summary, we recommend that the margin of safety inherent in the licensed design basis should be promptly restored, although improved temporary measures and arrangements may be acceptable until permanent modifications can be completed. For example, improved temporary measures might be redundant level sensors on the scram discharge volume with control room alarms and readout, or a dedicated operator might be used locally with adequate control room communication and plant procedures covering the manual scram function. The adequacy of any modifications, temporary or permanent, should be confirmed by appropriate analysis, testing, and onsite evaluation.

Although our interim assessment and recommendation applies only to Browns Ferry 3, it is likely that it also applies to the other units at Browns Ferry and to many other BWRs. We will submit a full report for your consideration when our evaluation work is completed.

/signed/

Carlyle Michelson, Director
Office for Analysis and Evaluation
of Operational Data

RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date Issued	Issued To
80-29	Broken Studs on Terry Turbine Steam Inlet Flange	8/7/80	All light water reactor facilities holding power reactor OLs or CPs
Supplement to 80-06	Notification of Significant Events at Operating Power Reactor Facilities	7/29/80	All holders of reactor OLs and near-term operating license applicants
80-28	Prompt Reporting Of Required Information To NRC	6/13/80	All applicants for and holders of nuclear power reactor construction
80-27	Degradation of Reactor Coolant Pump Studs	6/11/80	All pressurized water reactor facilities holding power reactor OLs or CPs
80-26	Evaluation of Contractor QA Programs	6/10/80	All Part 50 licensees
80-25	Transportation of Pyrophoric Uranium	5/30/80	Material licensee in priority/categories II-A, II-D, III-I and IV-DI; agreement state licensees in equivalent categories
80-24	Low Level Radioactive Waste Burial Criteria	5/30/80	All NRC and agreement state licensees
80-23	Loss of Suction to Emergency Feedwater Pumps	5/29/80	All power reactor facilities with an OL or CP
80-22	Breakdown In Contamination Control Programs	5/28/80	All power reactor OLs and near-term CPs
80-21	Anchorage and Support of Safety-Related Electrical Equipment	5/16/80	All power reactor facilities with an OL or CP
80-20	Loss of Decay Heat Removal Capability at Davis-Besse Unit 1 While in a Refueling Mode	5/8/80	All light water reactor facilities holding power reactor OLs or CPs