REFERENCE 1

Jersey Central Power & Light Company

MADISON AVENUE AT PUNCH BOWL ROAD • MORRISTOWN, N.J. 07960 • 539-6111

October 14, 1969

Dr. Peter A. Morris, Director
Division of Reactor Licensing
United States Atomic Energy Commission
Washington, D. C. 20545

Re: Report of Abnormal Occurrence
Oyster Creek Nuclear Generating
Station, Unit No. 1
October 2, 1969

Gentlemen:

SUBJECT:

The inability to meet a limiting condition for operation at the Oyster Creek Nuclear Generating Station of the Jersey Central Power and Light Company on October 2, 1969. Reference AEC Operating License DPR-16, Technical Specifications, thereof, Section 3.2 "Reactivity Control," Specification B, Sub-Specification No. 3 - "The average of the scram insertion times of all operable control rods shall be no greater than: . . . ."

SITUATION:

In the course of proceeding with the start-up test program of the Oyster Creek reactor, the reactor had been operating with all control rods operable and a total of 113 control rods fully or partially withdrawn from the core. Also during this program, twenty-six (26) of the control rods that are fully withdrawn during power operation are continuously monitored for scram insertion time so that data can be obtained in the course of transient testing when scrams could occur. During such testing, a scram occurred at 9:08 a.m. on October 2, 1969, and it was observed that the insertion times for these twenty-six drives did not, in their entirety, meet the limiting conditions for operation as specified in the technical specifications. Each of the selected drives met the 10 percent insertion time requirement of 0.7 seconds with an average of approximately 0.436 seconds. The actual average for the 50 percent insertion time was approximately 2.509 seconds as compared to a LCO of 2.05 seconds; and for 90 percent insertion, the actual average was approximately 5.793 seconds as compared to the LCO of 5.0 seconds. Subsequent testing of additional control rods resulted in the conclusion that the problem was of a general nature. The Division of Compliance was notified of this abnormal occurrence as required by the Technical Specifications.

CAUSE AND RESULTS:

Examination of the drives disclosed the fact that the internal and external filters within the drive were partially plugged with a very fine red iron oxide. The internal filters, composed of a fine wire mesh of approximately three micron filtering capacity, were plugged to the extent that the flow of reactor water into the volume between the stop piston and the top of the index tube during a scram operation was excessively restricted. When this occurred, the pressure unbalance across the top of the index tube caused an increase in the scram insertion time for the drive. This fact was confirmed by retesting selected drives without the fine internal filter in place, at which time the drives tested in this manner more than met the scram insertion time specified. (See attached Exhibit A for a cross section of the drive showing the internal and external filters and the flow path of water when withdrawing and inserting the drives).

Inasmuch as reactor water flows through the internal filter on every insert and scram signal, the "rouge-like" oxide had to come from the vessel water rather than the control rod drive hydraulic system. Internal inspection of drives and various locations in the hydraulic system confirmed the reactor water to be the source. Along with the increases in power level during the start-up test program, auxiliary systems (condensate and feedwater) have been experiencing increased flows and steam systems have been brought into service for the first time (i.e. turbines, condenser, reheaters, and extraction steam feedwater heating). It is believed that the source of the oxide is from the carbon steel equipment associated with these auxiliary systems. Separation of this oxide and other foreign matter from reactor water occurs by settling in the condenser hotwells and by filtering in the condensate demineralizer beds. During this period of power testing, water quality remained within the specified limits. The precise mechanism for the accumulation of iron oxide and the exaggerated tendency to plug the drive filters is not clearly understood. It is our understanding that a similar phenomenon was encountered at KRB, but the plugging was of lesser magnitude and scram times reached equilibrium within specified limits after the initial startup period.

CORRECTIVE ACTION TAKEN:

Based upon the control rod drive manufacturer's recommendation, the fine wire mesh on the internal filter will be removed on all of the 137 drives. (Consideration is being given to reinstall a small number of fine filters in order to obtain additional data). In addition, the external filters will be exchanged for clean filters on all of the 137 drives.

With the removal of the fine wire mesh from the internal filter, the reactor water will now pass through the filter support basket which is a cylinder perforated with 5/32 inch holes. The fine oxide cannot plug

these openings, and therefore, the LCO for scram insertion time will continue to be met. The effect of the fine material upon the drive internals (inside of index tube and stop piston seals) may be increased wear of the stop piston seals, however, there is no reason to believe that it would increase the scram insertion time of the drive or the ability to fully insert the rods.

In addition to the above modifications, monitoring of the scram insertion times will continue, seal leakage will be measured for each fully withdrawn rod, condensate demineralizer operation will be reviewed with particular attention being given to oxide carryover, and each hot well will be cleaned of the accumulated foreign material.

NUCLEAR SAFETY SIGNIFICANCE:

The slow scram insertion times associated with this event did not result in any nuclear safety problems. All control rods were fully inserted into the core and all drives were faster than the time required for 10 percent insertion. There were no Limiting Safety System Settings violated. The neutron flux did not exceed its scram setting for longer than 2.5 seconds; in fact, it returned to its trip setting in approximately 0.3 seconds.

An additional off-site test was performed wherein the manufacturer completely sealed the external fine mesh filter. Even with the filter in this condition, the drive completed its full travel and would not have failed to scram. The insertion time was greater than that experienced with the partially plugged filters at Oyster Creek. It is not likely that the fine strainer would be completely plugged during the operation, but even with complete plugging the force balance ensures a net upward force to cause the scram.

Very truly yours,

George Kelcec
Manager Generating Stations

No! - only because the seals leak do the drives scram with a completely sealed external filter.

GK;ja

CC: R. W. Kirkman, Director
Division of Compliance

How about plugged External filter?

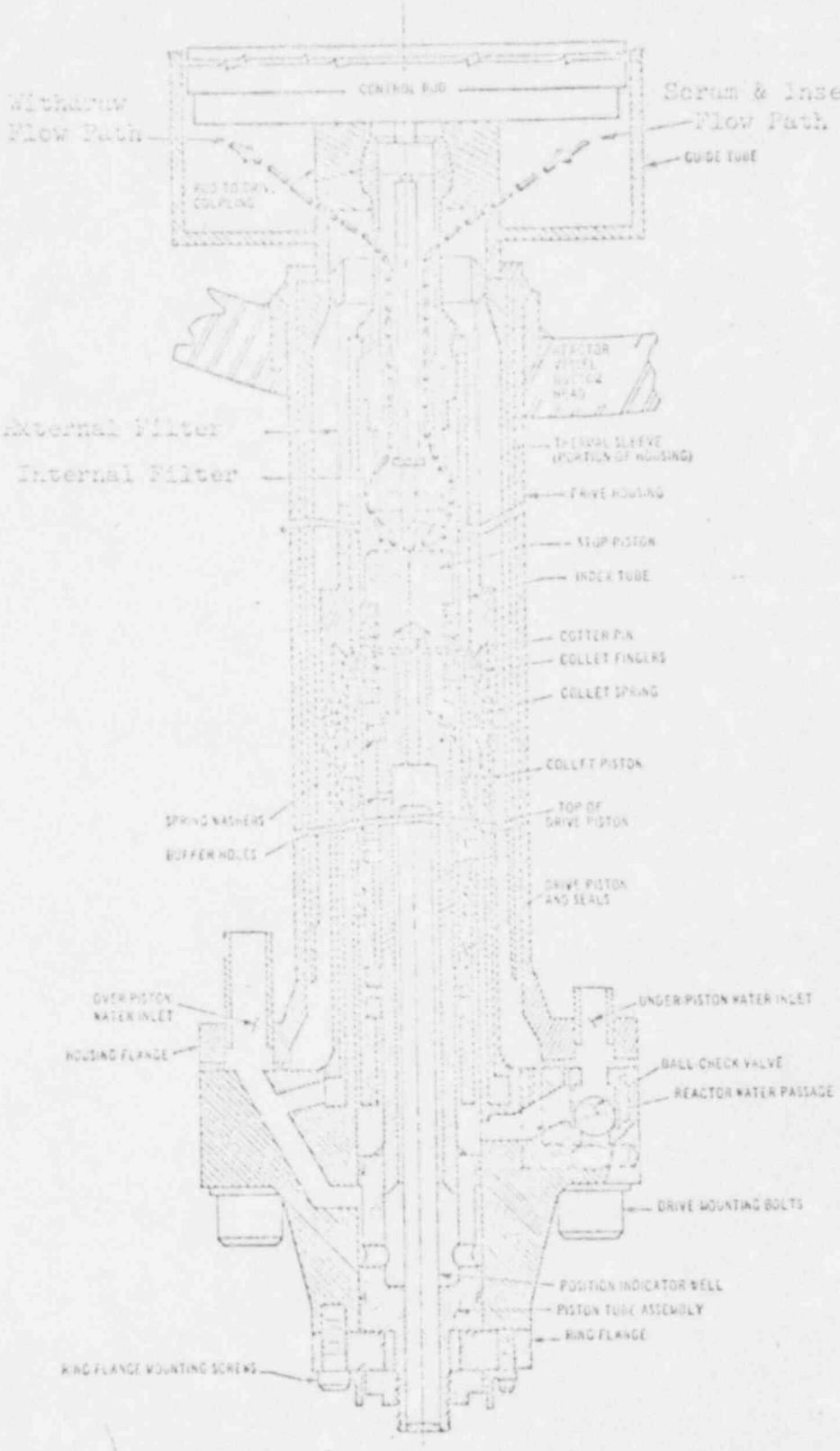

EXHIBIT A

Schematic Diagram – Model TR-DB-144-A1 Control Rod Drive Mechanism