



Commonwealth Edison
Quad-Cities Generating Station
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October 29, 1973



J.F. O'Leary, Director
Directorate of Licensing
U.S. Atomic Energy Commission
Washington, D.C. 20545

SUBJECT: Quad-Cities Nuclear Power Station Unit 2
Docket Number 50-265
DPR-30, Appendix 30, Section 6.6.B.2.b.

Dear Mr. O'Leary:

The purpose of this letter is to provide you with information concerning a Unit 2 Main Steam Isolation Valve pilot failure which occurred on September 29, 1973. This failure caused the outboard MSIV 2-203-2D to drift closed which led to an isolation and scram.

Although this failure did not jeopardize the isolation capability at any time, a report of this type was considered necessary in view of industry experience with these valves.

PROBLEM AND INVESTIGATION:

On September 29, 1973, Unit 2 was operating at a steady-state power level of 770 MWe. At 0310 twice weekly surveillance testing was performed on the MSIV's in accordance with Technical Specification 4.7.D.1.d. All eight valves performed satisfactorily during these 10 percent closure tests. A very short time after completion of these tests, MSIV 2-203-2D was observed to be drifting to the closed position for no apparent reason. Before any immediate corrective action could be taken, the valve had closed to the point where a Main Steam High Flow condition was present, and the reactor scrambled from a Group I isolation.

Immediately following the scram, an entry was made into the Unit 2 steam tunnel to determine the cause of the MSIV closure. A thorough inspection of MSIV 2D revealed no ruptured instrument air lines at the pilot valve assembly solenoids or at the valve air cylinder.

Instrument air pressure as indicated in the control room had been normal all through the events leading to the reactor scram. All MSIV's were tested again satisfactorily. Operation of MSIV 2D resulted in closure within the required time of five seconds, however, when the valve was exercised with the test switch it went to 90%, reopened and then drifted closed after a few minutes.

With the reactor in the hot-standby condition, the pilot valve assembly on MSIV 2D was replaced. Following completion of all repair work, the valve was cycled open and closed three times and the closure times were within Technical Specifications limits. The unit was then returned to power operation. 10 percent closure tests were performed on the valve on 5 occasions during the power increase and the tests were successful.

The defective pilot was completely disassembled. No excessive binding was noticed between the pilot piston and the sleeve as expected since the valve did close properly. The piston and sleeve were thoroughly cleaned and all gaskets and "O" rings were replaced. The pilot was re-assembled and placed in storage for future use.

EVALUATION AND CORRECTIVE ACTION

Safety Implications

Safe operation of the station was not jeopardized by this event since the Primary Containment Isolation system was operable at all times. If the pilot valve had failed in a manner which prevented fast closure of the 2D valve, isolation of the D steam line would still have been effected by closure of the 1D valve in the drywell. The present surveillance requirement for exercising these valves twice weekly is more than adequate to detect abnormalities before a simultaneous failure of both valves in the same line could be expected.

DETERMINATION OF CAUSE

Upon removal and inspection of the MSIV 2D pilot, particles of rust were observed on the piston sleeve and to a smaller extent on the pilot piston itself. Excessive moisture was also noticed in the vicinity of the parts in the sleeve. No defects were seen on the gaskets or "O" rings. It is postulated that the introduction of rust caused a slight restriction to the movement of the pilot piston during the conditions of the surveillance test and the piston did not fully return to the normal position after the test. This would then cause air to bleed from the MSIV cylinder itself and subsequently cause the valve spring to close the valve. The design clearance between the pilot piston and sleeve is 0.0007 inch and any introduction of minute particles will create a restriction to the movement of the pilot piston.

In performing the 10 percent MSIV closure test, the test control switch is momentarily placed in the placed in the TEST position and the returned to the NORMAL position. This action will energize the test relay which will in turn pick up the MSIV test solenoid. This will also de-energize the AC and DC pilot solenoids. This results in the upward movement of the pilot piston and the exhaust of air from the bottom of the MSIV air cylinder. Air also is forced to flow around the pilot solenoids and into the top of the MSIV cylinder. This drives the MSIV toward the closed position with the aid of the valve springs. Upon reaching the 10 percent closed position, the test relay de-energizes. This will drop out the test solenoid and energize the AC and DC pilot solenoids. The resulting action is the downward movement of the pilot piston and the exhaust of air from the top of the MSIV cylinder. Air is then forced through the test solenoid into the bottom of the MSIV cylinder. The valve is thus forced open and held in that position against the force of the valve springs.

Any pilot piston restriction which would cause the piston not to return to the full downward position, will result in a normally closed air port being open and afford a passage of air to the air exhaust. This will allow the force of the valve spring to overcome the force of the air which is keeping the MSIV open, and the valve gradually drifts closed.

CORRECTIVE ACTION

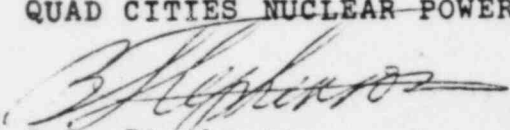
During a Unit 2 maintenance outage from October 17-22, all MSIV pilot valves were removed and overhauled. This preventive maintenance is done at lease every re-fueling outage and at 6 month intervals when possible. The inboard pilot valves did not have any signs of moisture or rust whereas the outboard pilot valve sleeves contained small rust particles. A previous pilot valve failure had occurred in November, 1972 on Unit 1. In that case, considerable binding between the pilot piston and sleeve was observed and a light colored residue was present on the piston. This residue has not been observed during the recent Unit 2 pilot investigations and excessive piston binding has not been noticed.

Commonwealth Edison is currently reviewing a modification which would replace the presently installed Numatics Inc. pilot valves with an improved type or different design. The objective being to obtain a valve which will be less sensitive to the existing environment and traces of contaminants in the air supply. Until this modification is

completed we believe that our preventive maintenance program in combination with frequent testing provides adequate confidence that these valves will perform their intended safety function.

Very truly yours,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION



B.B. Stephenson
Station Superintendent

BBS/111

cc: Regional Director
Directorate of Regulatory Operations - Region III