**UNITED STATES DEPARTMENT OF COMMERCE**
**National Bureau of Standards**
Washington, D.C. 20234

March 29, 1984

Mr. Cecil Thomas
Chief, Standardization & Special
Projects Branch
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Thomas:

Subject: Shim Arm No. 1, Docket No. 50-184

On March 19, 1984, following completion of shim arm calibration tests, the reactor was being routinely shut down from a power level of about 100 KW. Normal shutdown is performed by driving the shim arms in to about 12° and then manually scramming. Upon initiating the manual scram, shim arm no. 1 did not fall, the remaining three shims dropped to the bottom normally. Subsequent examination of the shim arm drive confirmed that shim no. 1 was at about 12.5° and that the clutch plate had disengaged. The clutch plate was turned by hand to lower the shim to the bottom, and the shim drive mechanism was removed. Moving the shim arm shaft and shim blade manually showed them to be completely free.

The shim arm drive consists essentially of a large compression spring which is compressed by a ball nut and lead screw when the shim arm is raised. The shim arm shaft is connected to the housing which holds the ball nut and so the arm is raised or lowered as the nut rides up and down the screw. The screw is driven in turn by an electric motor, through a high ratio gear case, and finally through an electromagnetic clutch. Whenever the arm is raised, the compressed spring is pushing on the ball nut, attempting to force it back down to its rest position. This would require the screw to turn which it cannot do because it is connected through the clutch to the output shaft of the gear box. Should the clutch be disengaged, the screw is free to turn and the spring will ram the nut, and so the shim arm back to the "in" position.

The drive for shim no. 1 was carefully examined . Everything appeared normal except that movement by rotating the clutch plate by hand was harder than usual. Upon disassembly, all components appeared normal, and there were no restrictions detected. The drive was reassembled with a new ball



A020
1/0

nut and screw assembly, and the two upper bearings were also replaced. The assembled drive tested satisfactorily in every respect and reactor operations resumed on schedule March 20, 1984.

Sincerely,

R. S. Carter

Robert S. Carter
Chief, Reactor Radiation Division