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Carolina Power & Light Company Raleigh, N. C. 27602 E. E. Utley	10-16-72	10-19-72	X			

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Mr. O'Leary	1			X	X

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		1	50-261

DESCRIPTION:
Ltr reporting an abnormal occurrence regarding the presence of divergent axial xenon oscillations in the H. B. Ribinson Plant..... W/Attachment CPL Xenon Oscillation Control Test at full power(Figure 3).

ENCLOSURES:

DO NOT REMOVE
ACKNOWLEDGED

PLANT NAMES: H. B. Robinson

FOR ACTION/INFORMATION 10-20-72 AB

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Regulatory File Cy.

50-261

Carolina Power & Light Company

Raleigh, North Carolina 27602

October 16, 1972

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

H. B. ROBINSON UNIT NO. 2
LICENSE DPR-23
AXIAL XENON OSCILLATIONS

Dear Mr. O'Leary:

In the interest of keeping the Commission informed of any unusual events connected with the normal operation of a nuclear power station, Carolina Power & Light Company is reporting, by this letter, the presence of divergent axial xenon oscillations in the H. B. Robinson Plant. Continued operation with this condition existing in the plant is not in violation of any Technical Specifications or safety requirements (FSAR, page 3.1.2-3), and the magnitude of the power oscillation produced by the xenon oscillation is easily controlled by existing plant equipment. This letter is merely to inform the Commission of such a condition, and Carolina Power & Light's method of successfully controlling it.

The normal operation of the Robinson Plant over the last several months has been base load at full power, with only minor deviations due to forced outages, small load changes as required by the system dispatcher, and a weekly test of the turbine stop and governor valves. This valve test is normally the most significant variation from full power operation, and is instrumental in producing significant xenon-iodine imbalances in the axial direction of the core. The power level of the plant is reduced to 70% of full load and the valves are exercised in turn to determine any sticking of the valves. This exercise is performed to fulfill the warranty requirements of the turbine manufacturer. The power reduction is accomplished by inserting Control Bank D to approximately 100 steps and then compensating for the increase in negative xenon reactivity by the removal of control rods and boron dilution. The time required to return to full power is determined by the successful functioning of the valves, and has been as short as one hour and as long as twelve hours or more.

Upon return to full power, the axial offset of the core, as measured by the excore long ion chambers, is normally positive, and continued operation leads to a substantial variation in offset (as much as 30% between positive and negative limits) during the first cycle of the oscillation. The axial stability index of the core has been measured as +0.008, indicating an unstable condition. With this value of stability index, the offset difference mentioned above will increase by approximately 23% from cycle to cycle, eventually leading to a turbine runback as overpower and overtemperature setpoints are exceeded.

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In order to avoid this occurrence, a straightforward method of control of the oscillation involving only movement of Control Bank D has been employed. Although part length rods have been provided in the plant for such a purpose, they have not been employed for any plant operations since initial startup, and are not required for the control of the power oscillations discussed here.

This control procedure is known as First Overtone Control[1/], and has been tested successfully on the Robinson Plant and is currently being used in operation. The procedure employs a carefully timed Bank D insertion to attack simultaneously the first harmonics of the xenon and iodine axial distributions. First Overtone Control is terminated and Control Bank D is withdrawn when the first axial overtones in xenon and iodine have been very significantly reduced and the xenon-iodine oscillation is almost entirely eliminated. The attached figure shows the result of the test performed at Robinson in terms of axial offset and Bank D movement, and the success of the procedure in reducing large variations in axial offset in a simple, reliable manner. Continued use of the procedure is required due to the continued and increasing instability of the core as end of cycle lifetime approaches, and there is every reason to expect that this type of procedure will be required during every subsequent cycle of operation as well. However, it is emphasized again that there is no violation of safety requirements, and that a simple, straightforward procedure involving current plant equipment is entirely adequate to maintain control of the power oscillations.

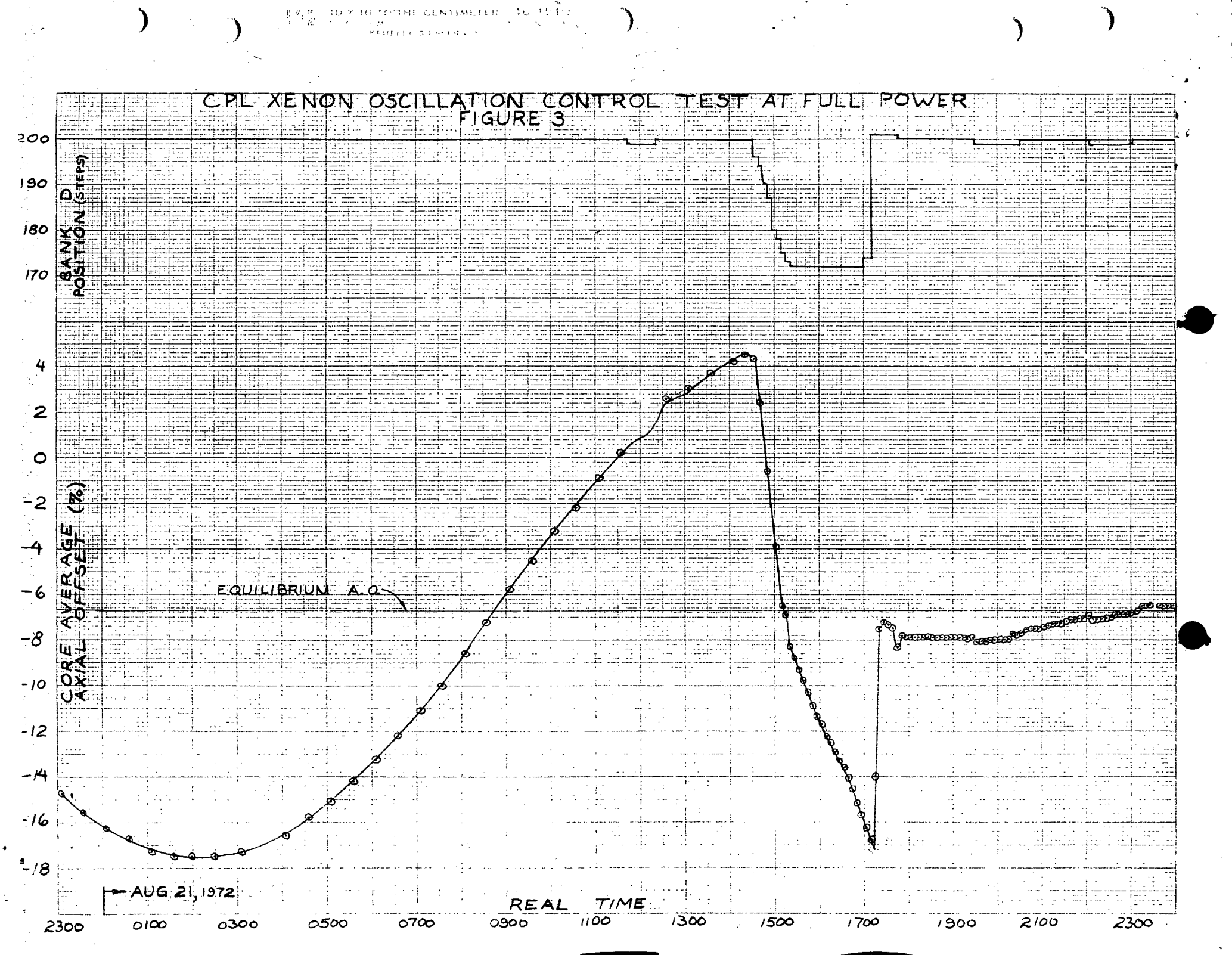
Yours very truly,

E. E. Utley
Vice President
Bulk Power Supply

DBW/za

cc: Mr. C. D. Barham
Mr. N. B. Bessac
Mr. B. J. Furr

1/ Bauer, D.C., "Practical Control Procedure for Xenon Spatial Oscillations", Vols. I and II, PhD Thesis, Carnegie-Mellon University, 1972.


CPL XENON OSCILLATION CONTROL TEST AT FULL POWER
FIGURE 3
BANK D POSITION (STEPS)
200
190
180
170
CORE AVERAGE AXIAL OFFSET (%)
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
EQUILIBRIUM A.O.
AUG 21, 1972
REAL TIME
2300
0100
0300
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1100
1300
1500
1700
1900
2100
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