L32 910212 800

(12)

February 11, 1991

9102270223

Mr. Paul Burnett
Nuclear Regulatory Commission Region II
Suite 2900
101 Marietta Street, NW
Atlanta, Georgia 30323

Dear Mr. Burnett:

RESPONSE TO QUESTIONS ON BROWNS FERRY RECONSTITUTED FUEL

Reference: Letter from S. Black to O. D. Kingsley, Jr., dated September 13, 1989, "Revised Reload Technical Specifications (TAC 00450) (TS 254) Browns Ferry Nuclear Plant Unit 2"

As requested in our recent telephone conversation, enclosed are responses to your questions concerning the use of reconstituted fuel in Browns Ferry Unit 2, Cycle 6. This information supplements the Summary Report submitted to NRC to support review of the technical specification changes for the revised core design which incorporates the results of the 1988 Fuel Inspection and Reconstitution Program (reference).

If you have questions, please call me at 615-751-3115.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

T. D. Beu, Engineering Specialist
BWR Fuel Engineering

TDB:LCM
Enclosure
cc (Enclosure):
RIMS, MR 2F-C
R. R. Calabro, BR 6A-C
J. E. McCarthy, PAB 1C-BFN
BFE Files (BFE-162)

Verification Statement

The results reported in this document were verified in accordance with NFI 5.3.

A. L. Bruce, 2-12-91
A. L. Bruce Date

1276T

Enclosure

Response to NRC Region II Questions
Browns Ferry Reconstituted Fuel

Question 1

How many fuel rods were reconstituted per bundle?

Response

The average number of unacceptable fuel rods replaced per reconstituted bundle is given on page 6 of the Summary Report; the maximum was about three times the average. The average does not include the bundles which were found to be acceptable as-is (without any reconstitution).

Note that the number of rods replaced is not an accurate indication of the acceptability of the reconstituted bundle. As discussed in the Summary Report, the effect of reconstitution on the bundle's neutronics characteristics must be used for this purpose because of sensitivity to the match between the donor rod and the rod being replaced. For example, a bundle with one rod replaced by a marginally acceptable donor could experience a larger change in characteristics than a bundle with several rods replaced by closely matched donors.

Question 2

Does Figure 4-5 of the Summary Report represent the actual final loading pattern? If not, please provide an updated final loading pattern map.

Response

The final loading pattern has changed slightly from that given in the Summary Report. Several Reload 2 and 3 bundles have been swapped in order to increase the cycle length allowed within licensed exposure limits for the fuel. Only one swap exchanged bundles from a different reload batch. As a result, a Reload 3 bundle now resides in core location 27-10 and a Reload 2 bundle is in location 19-56. This change is reflected in the revised final loading pattern map given in Figure 1.
Figure 2 indicates the number of cycles each bundle has resided in the core prior to Cycle 6.

It should be noted that the swapped bundles are high in exposure (low reactivity) and have the same nuclear design. An evaluation showed that the change in loading pattern does not invalidate the conclusion given in the Summary Report, ie that the final core design meets all design criteria and the current operating limits are valid.

Question 3

What is the typical bundle power experienced by reconstituted fuel during the cycle? Please provide results for maximum, average, and minimum power bundles.

Response

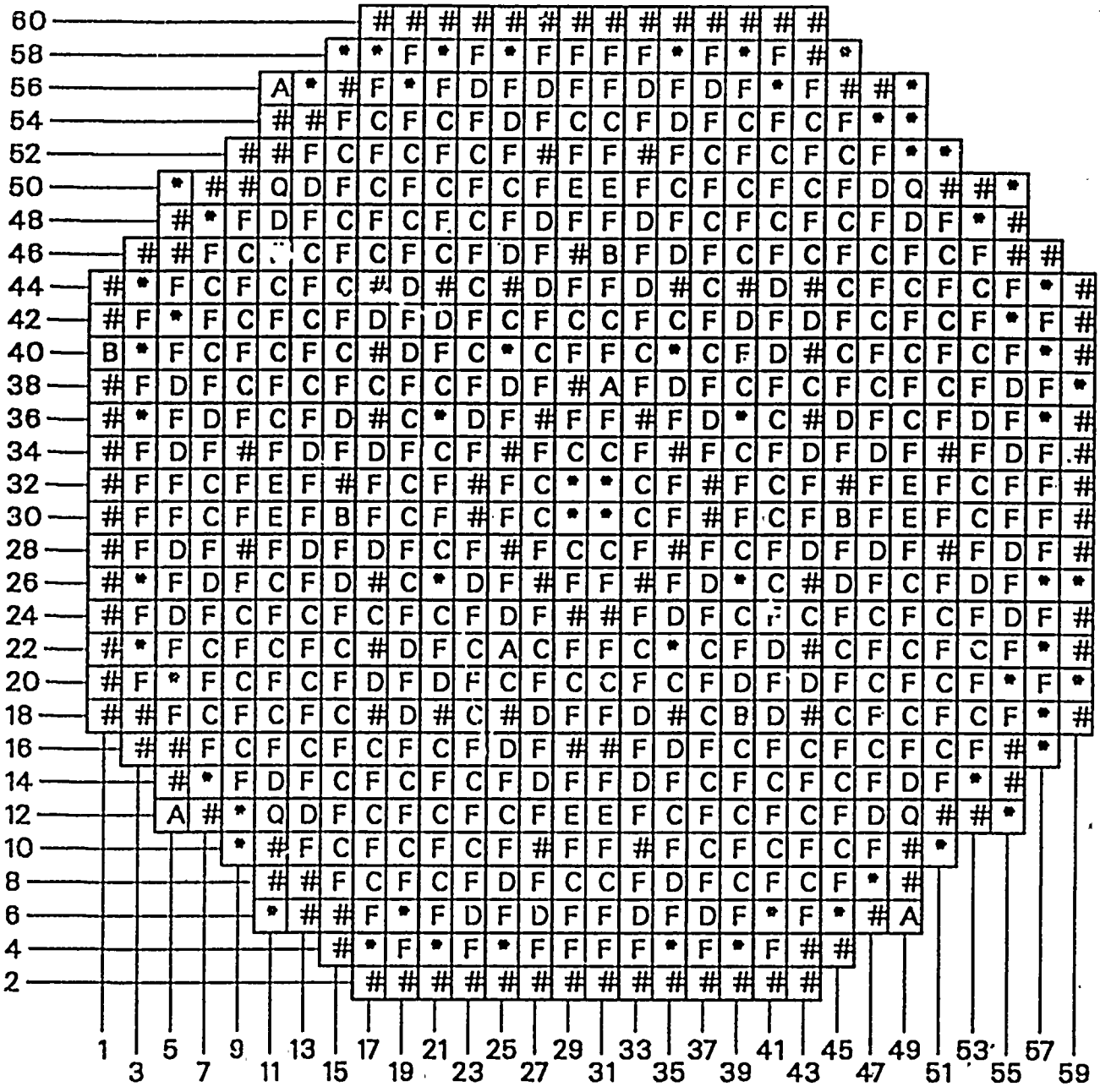
The results discussed below are for the control rod patterns from the Cycle Management Report and are based on predicted core operation through the cycle. These rod patterns were developed for rated conditions and assume the rod sequences are exchanged every 1000 MWd/ST in the order A2-B2-A1-B1. The calculations included the effects of reconstitution and the long shutdown.

Figure 3 compares the maximum power of the Reload 2 and 3 bundles to the lead bundle power for the entire core. The results show that Reload 2 and 3 (ie reconstituted) fuel will operate through the cycle with significant margin to the maximum power bundle in the core. This result is expected since Reload 2 and 3 are the highest exposure bundles in the core.

Figure 4 provides the relative power for individual Reload 2 and 3 bundles during the cycle. Each figure contains results for the four bundles in 1/4 core symmetric locations. The locations were chosen to cover a wide range of bundle power and, when possible, to allow comparison of reconstituted and non-reconstituted bundles. The results show that there is essentially no difference in power among the symmetric locations and between reconstituted and non-reconstituted bundles. This result is expected since the differences in neutronics characteristics following reconstitution were generally small and the effects were modeled in the analyses to determine the final loading pattern.

Verification that the reconstituted fuel will operate within acceptable power levels is by comparison to fuel thermal-mechanical limits provided by the fuel vendor. These limits effectively define the maximum allowed power at which the fuel can be operated through the cycle. As stated in the Summary Report, analyses for the final core design, including reconstitution effects, show that all fuel loaded in this cycle met these limits.

FIGURE 1
REVISED FINAL LOADING PATTERN
BROWNS FERRY UNIT 2 - CYCLE 6



A= 8DRB284L,U2R2

B=P8DRB284L,U2R3

C=P8DRB265H,U1R5

D=P8DRB284L,U1R5

E=P8DRBB84Z,U1R5

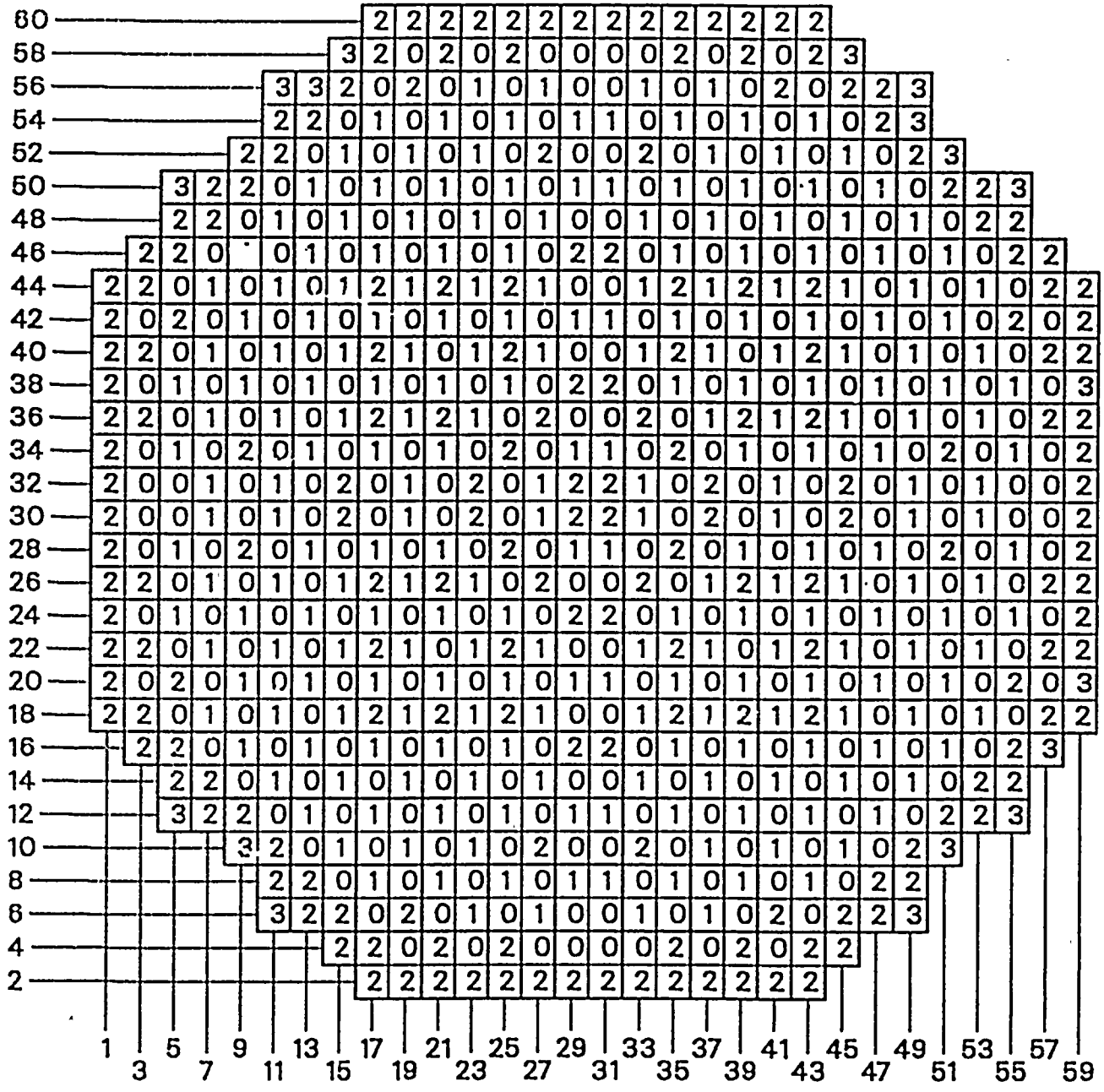
F=P8DRB284L,U2R5

Q=QUAD+DEMO,U2R5

*= 8DRB284L,U2R2-RECON

#=P8DRB284L,U2R3-RECON

FIGURE 2
REVISED FINAL LOADING PATTERN
BROWNS FERRY UNIT 2 - CYCLE 6



0 = FRESH

1 = ONCE BURNED

2 = TWICE BURNED

3 = THRICE BURNED

Figure 3: Lead Bundle Power

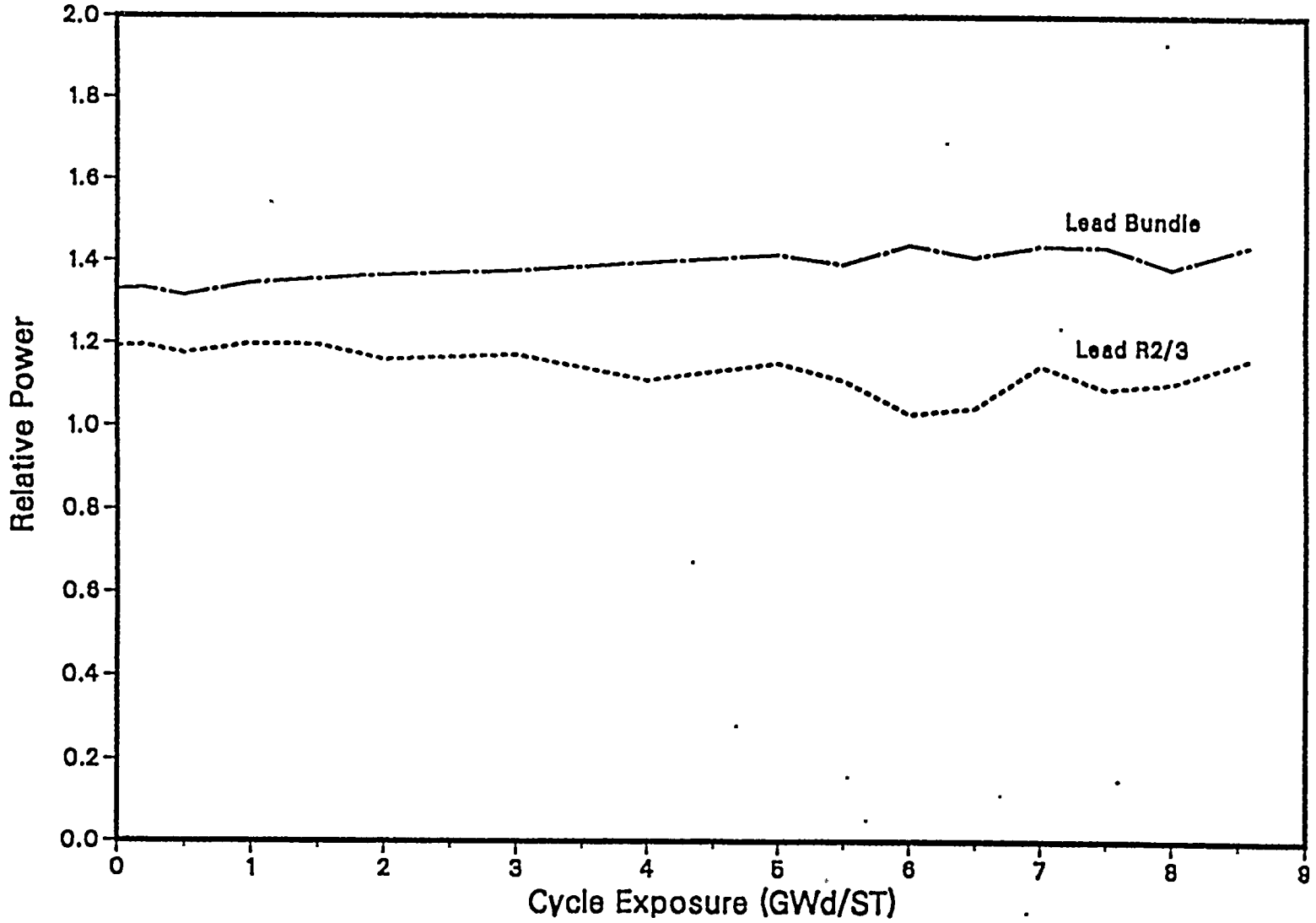


Figure 4: Symmetric R2/3 Bundle Power

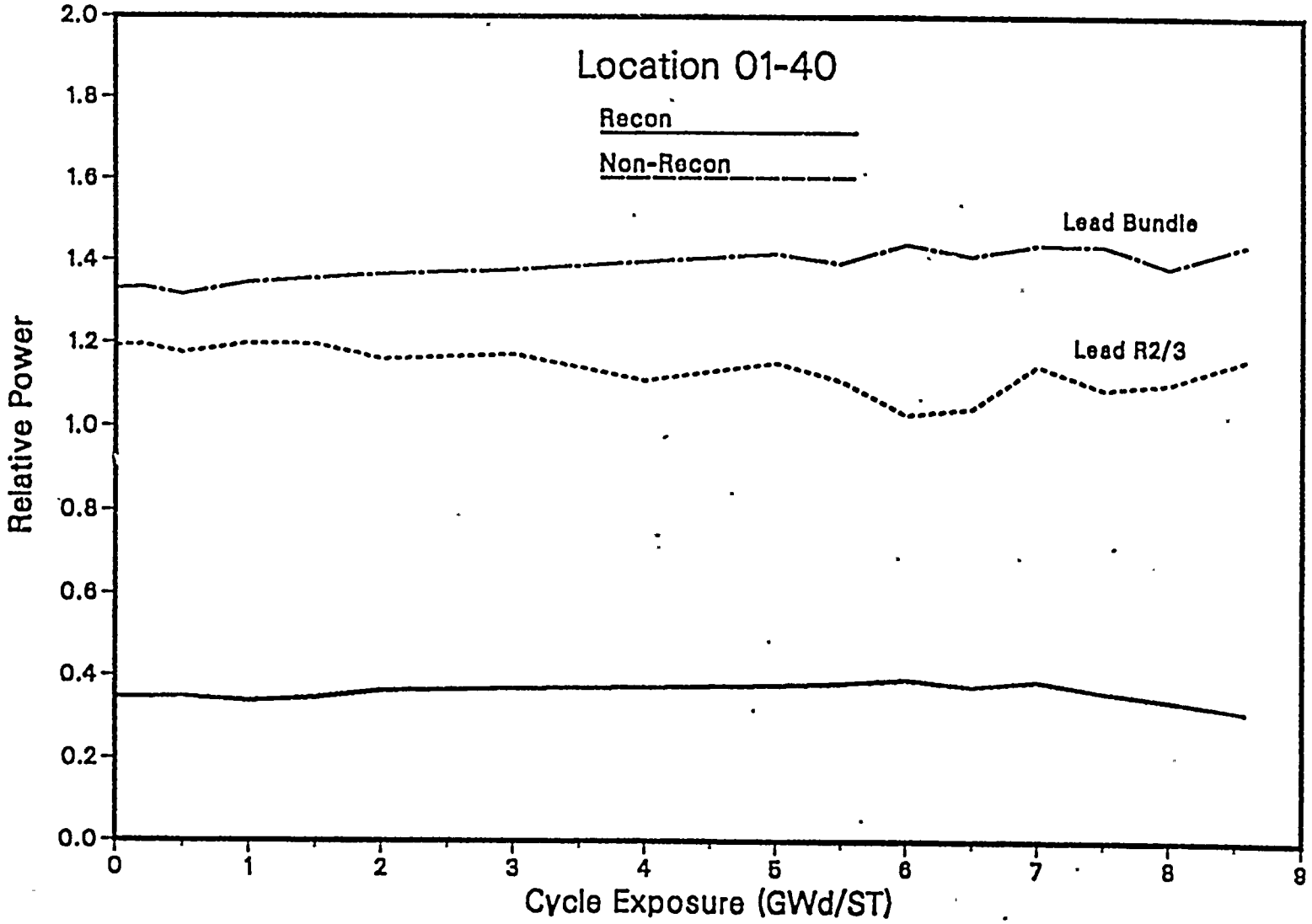


Figure 4: Symmetric R2/3 Bundle Power

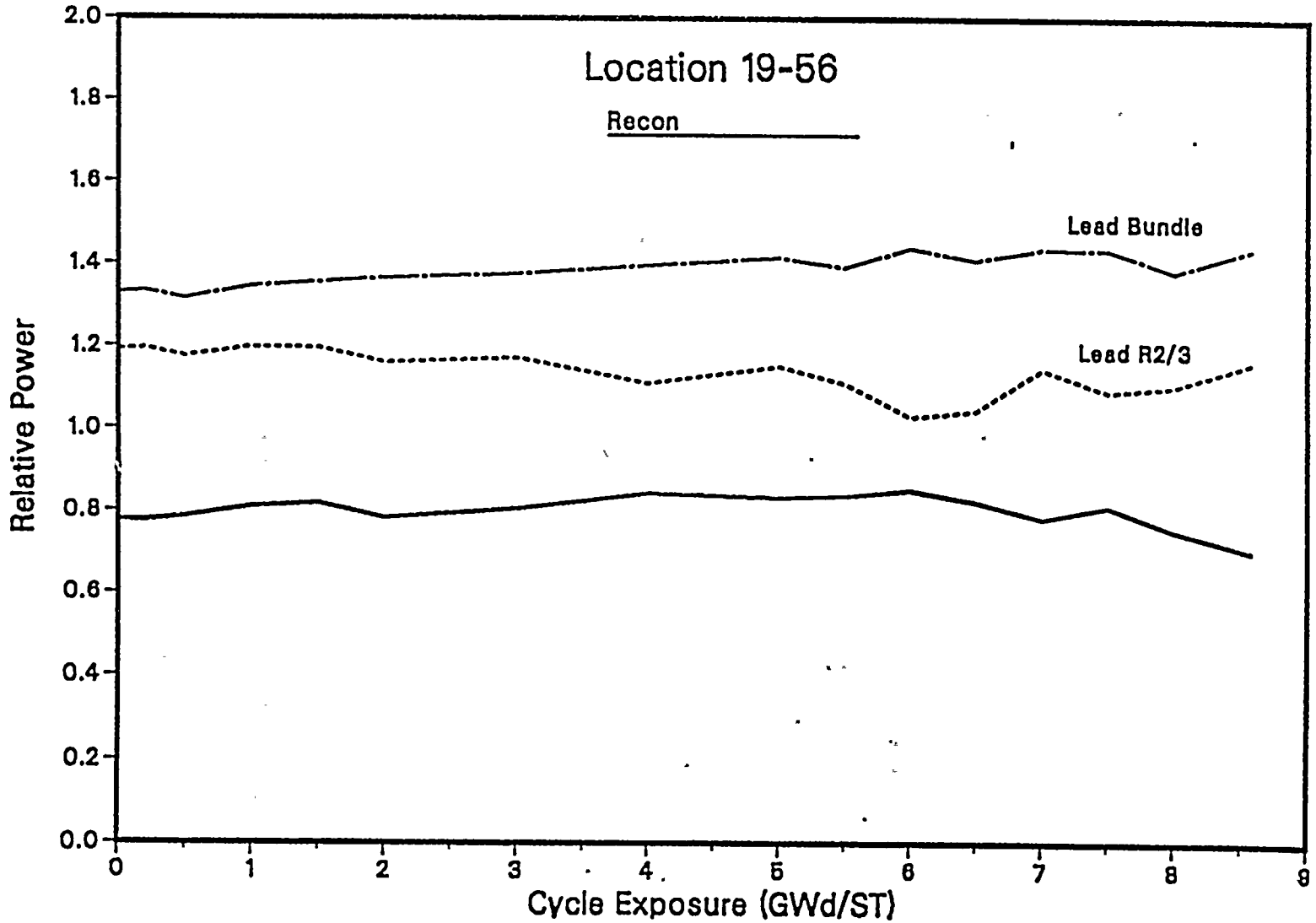


Figure 4: Symmetric R2/3 Bundle Power

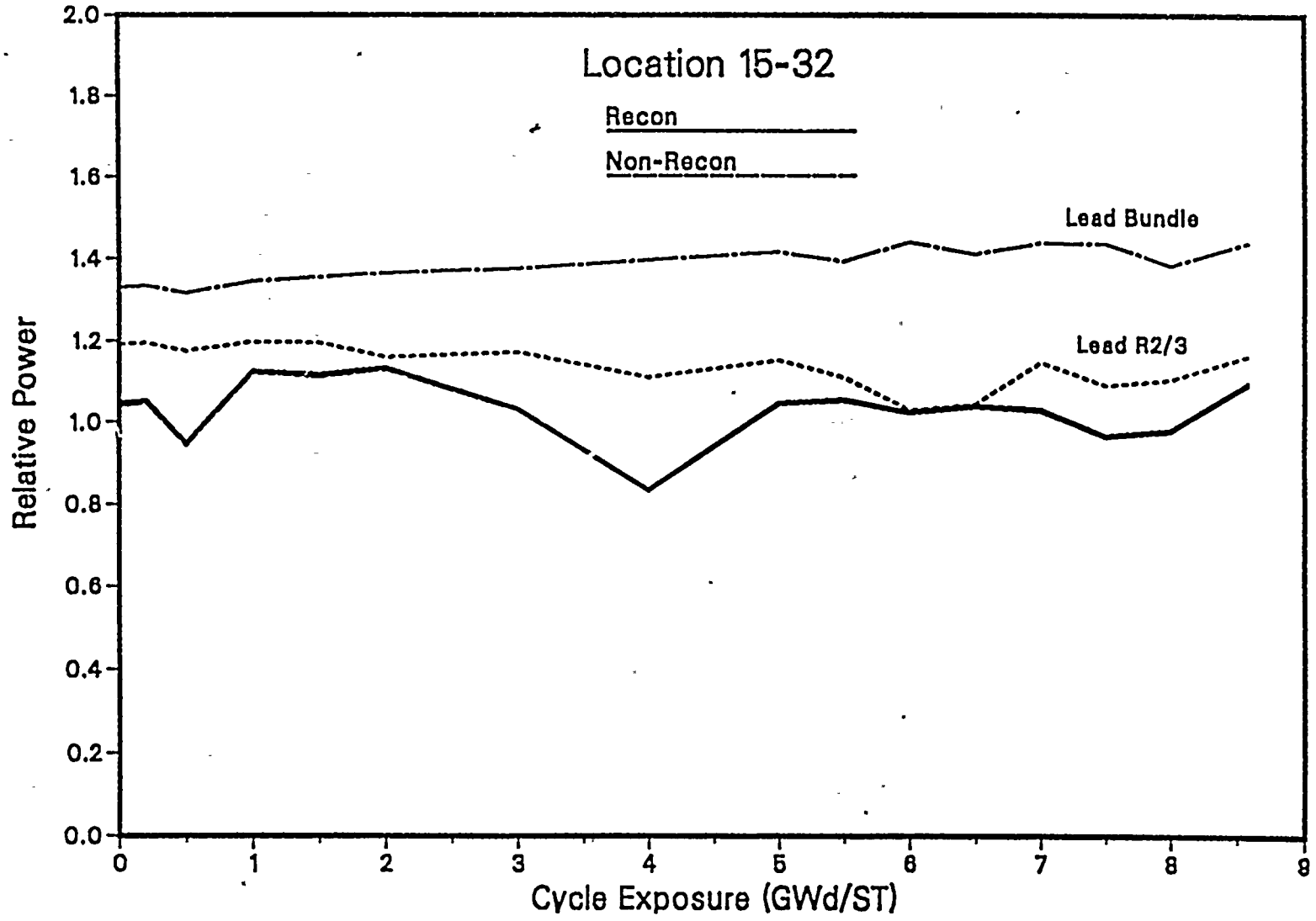


Figure 4: Symmetric R2/3 Bundle Power

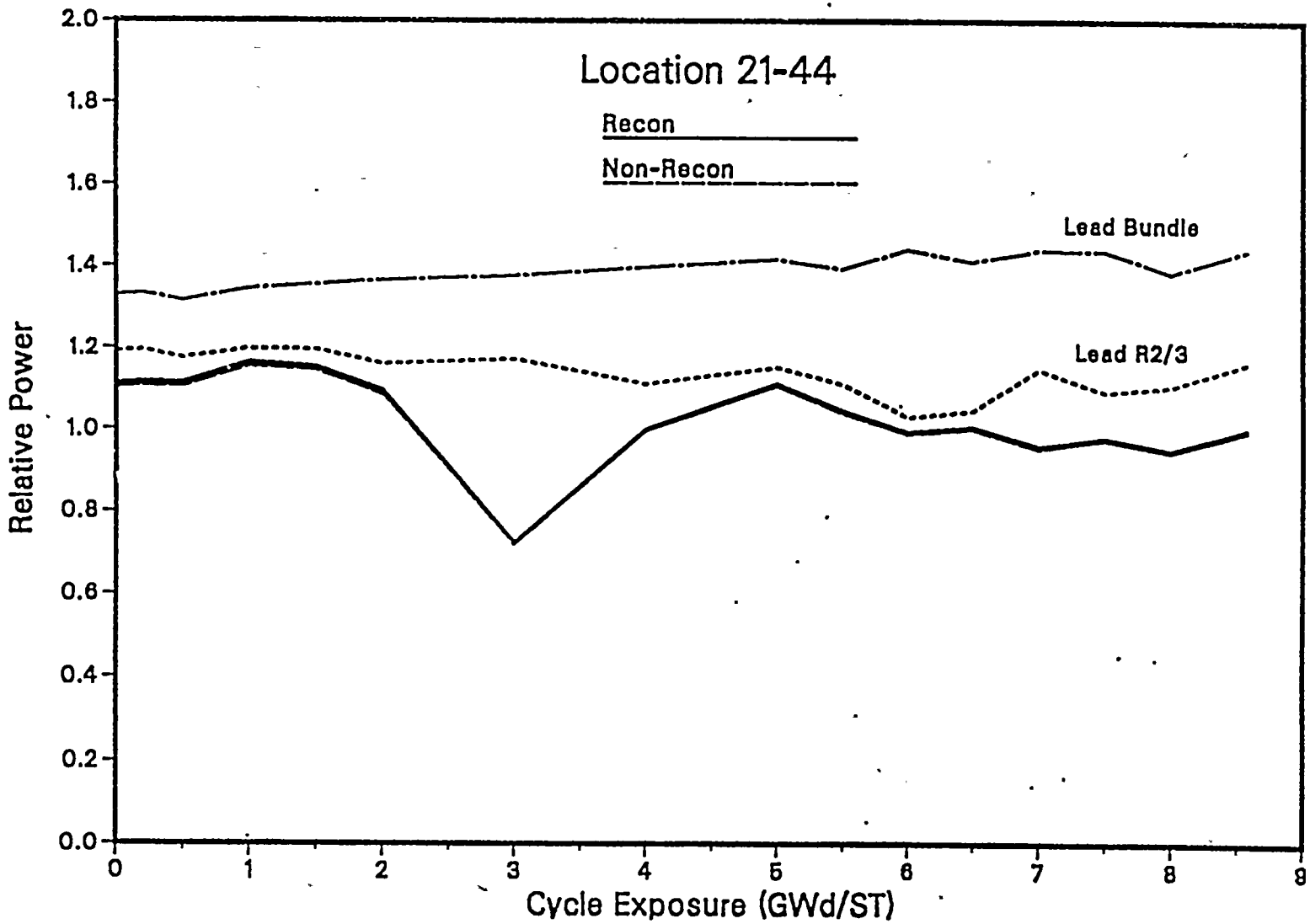


Figure 4: Symmetric R2/3 Bundle Power

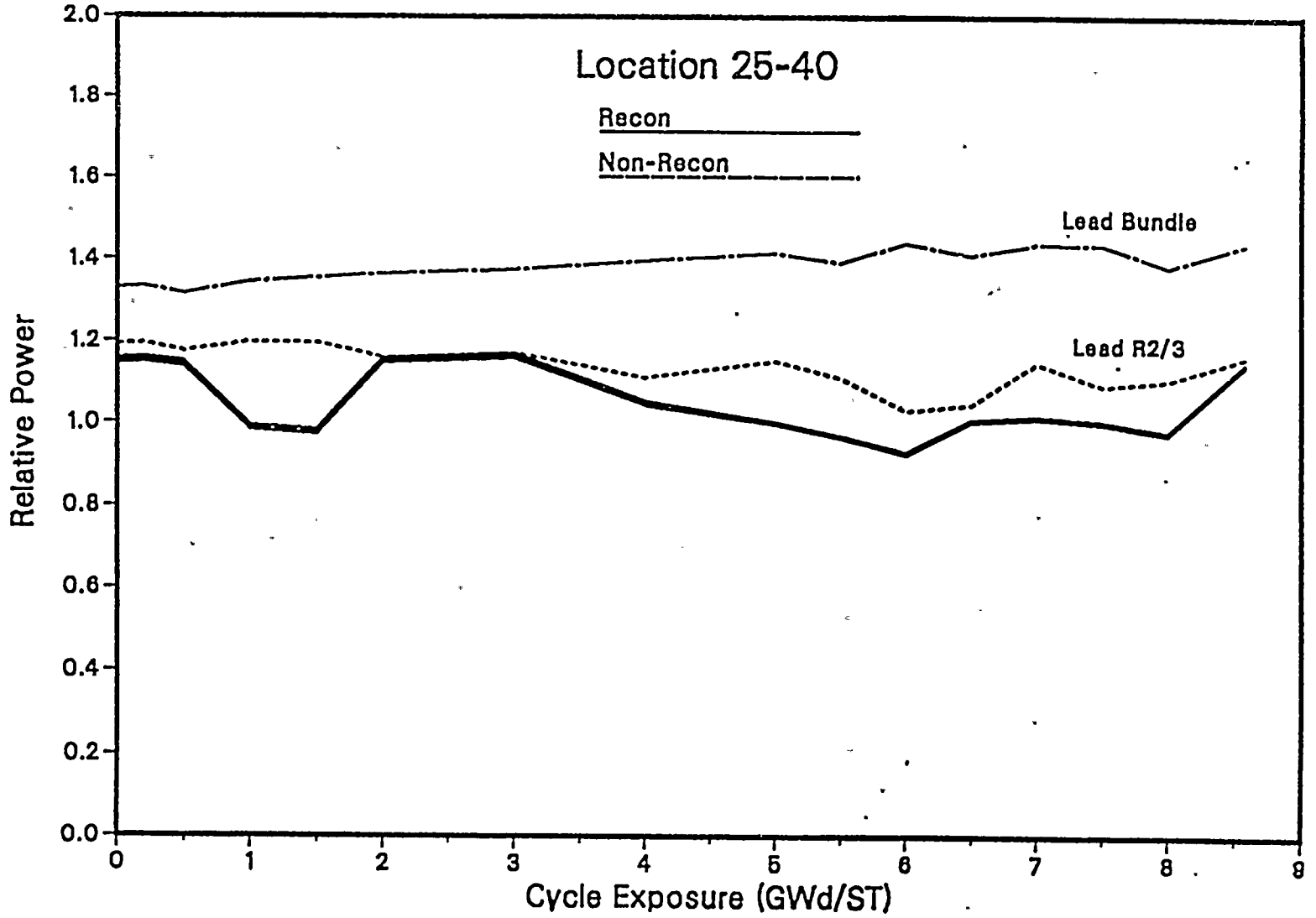


Figure 4: Symmetric R2/3 Bundle Power