ENCLOSURE 2 [Non-proprietary version of APCo September 10, 1981 letter , Appendix A]

APPENDIX A

SUMMARY OF ON-SITE EXAMINATIONS OF FARLEY OPTIMIZED FUEL DEMONSTRATION ASSEMBLIES AFTER ONE CYCLE OF IRRADIATION

INTRODUCTION

Farley Unit 1 completed its second cycle of operation in November 1980. The core loading for this cycle included two 17x17 optimized fuel demonstration assemblies (OFDAs) located in core positions A8 and R8. During the refueling shutdown, the two OFDAs were non-destructively examined to determine their overall integrity and to generally assess the one cycle performance of the optimized fuel. This report presents the key results of the examinations.

VISUAL EXAMINATION OF ASSEMBLIES

Detailed visual examinations at the J. M. Farley plant revealed that the two optimized fuel demonstration assemblies (OFDAs) were in excellent condition after one cycle of irradiation, with no significant anomalies noted. All fuel rods, grids, and nozzles were intact and structurally sound. The visible surfaces of the rods and grids were predominately lustrous, suggesting little or no crud deposition during the cycle.

With specific regard to the grids, the visual inspections showed that they were mechanically sound, with no evidence of grid tearing, severe abrasion, missing pieces of straps, or hangup with adjacent grids. There were no reported incidents of assembly hangup or overloads during removal of the OFDAs from the core. Furthermore, no buckling, indentation, weld deterioration or adverse effects from adjacent standard grids were seen. Many of the Zircaloy grids showed patterns of varying luster outlining the shape of adjacent narrower Inconel grids. On the lower edges of several Zircaloy grids which faced the core baffle, superficial dark areas were seen. None of these conditions is judged to be detrimental to the overall performance of the grids. The Zircaloy grids also showed no evidence of unusual corrosion or local hydriding in particular the visible portions

of laser welds and heat affected zones. These observations are consistent with those made on the Salem optimized fuel demonstration assemblies. Thus performance of the grids from the standpoint of corrosion is expected and is acceptable.

The maximum observed channel closure (fuel rod bow) in the Farley OFDAs was [ ] percent, approximately the same as for the Salem demo assemblies. +(b,c)
Frequency distributions of the overall channel closure data revealed a standard deviation of [ ] percent and a worst span 95th percentile closure +(b,c)
of [ ] percent, which are slightly lower than those in the Salem OFAs. +(b,c)
The Farley channel closures are within the data base of all standard 17x17 fuel at comparable burnups and well below the licensing limit, as shown in Figure 1.

The fuel rod-to-nozzle axial clearance data showed that, as in the Salem OFDAs, none of the fuel rods were close to the bottom nozzle, with clearances of at least [ ] inch. Clearances at the top end of the rods +(b,c)
were significantly greater than at the bottom and exhibited little change from as-built clearances. The sum of the axial clearances at the bottom and top ends were compared with pre-irradiation values and showed net decreases (indicative of fuel rod growth) of [ ] inch, with +(b,c)
the greater changes in the higher burnup rods, as expected. These changes are consistent with previous observations at other plants on standard 17x17 fuel, where higher burnup (fast fluence) rods exhibit greater axial growth.

Grid width data are still being evaluated. Preliminary assessment indicates that the grid growth is within acceptable limits.

BREAKAWAY AND WITHDRAWAL FORCE MEASUREMENTS

Breakaway and withdrawal force measurements for 20 removable rods from Farley indicate [ ] than in +(b,c)
standard 17x17 designs. Overall relaxation of all eight grids, based on breakaway forces averaged for the 20 rods, was [ ] percent. For standard +(b,c)
Inconel grids, overall relaxation at this burnup has been measured at

[ ] percent. From withdrawal force data remaining spring forces in the Zircaloy grids are estimated to be in the range of [ ] lb. per grid. The data show that relaxation of the Zircaloy grids was less than predicted and some positive contact was maintained on the fuel rods, contrary to expectation. The results indicate more margin in grid spring design than anticipated. +(b,c) +(b,c)

VISUAL EXAMINATION OF REMOVABLE FUEL RODS

Detailed video examination of 20 individual removable fuel rods, 10 from each of the Farley demonstration assemblies, revealed that the rods were in good condition and showed no evidence of any fretting wear in areas of grid dimple or spring contact. The grid contact areas were generally distinguishable by a burnished, light-colored appearance, with no depth. In addition, the contact areas at the Zircaloy grids appeared to be essentially the same as at Inconel grids, except for slightly more pronounced markings in the case of the Inconel grids.

Absence of fretting wear was confirmed by eddy current scanning of four of the removable rods from Assembly ZD-3. The eddy current scans showed no signals at the grid spring dimple contact points.

PROFILOMETRY OF REMOVABLE RODS

Profilometer data of three removable rods from assembly ZD-3 revealed an average creepdown of [ ] mils, with a maximum of [ ] mils, over the high power region of the rods. Ovality was typically less than [ ] mil but locally as high as [ ] mils. No periodic ridging of the type associated with pellet interfaces at higher burnup was observed. Detailed computer code analysis has not yet been performed. However, preliminary assessment indicates that the fuel clad creepdown is consistent with design expectations. +(b,c) +(b,c) +(b,c)

CONCLUSIONS

The post-irradiation examinations have verified the excellent performance of the OFDAs in their first irradiation cycle. Specifically, the overall integrity of the OFA fuel was maintained, no evidence of fuel rod fretting wear was detected in grid contact locations, Zircaloy grid

spring relaxation was less than expected, fuel rod bow is well within the licensing basis, and no unusual dimensional changes in fuel rods were noted. More detailed evaluation is in progress.

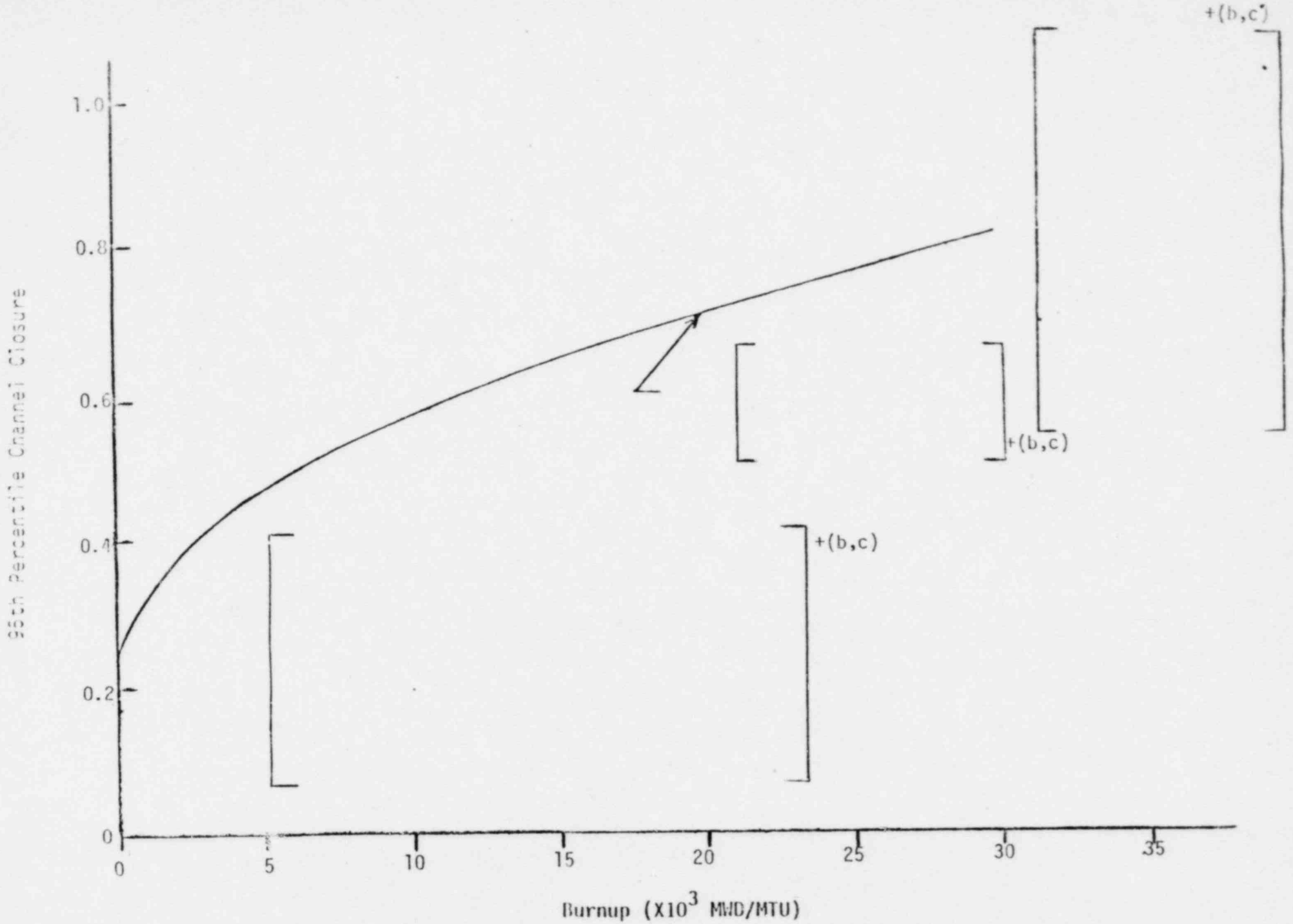

Figure 1: Worst Span 95th Percentile Channel Closure