V. C. Summer Fuel Assembly Inspection Program

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Inspection work was conducted at V. C. Summer by an NSD crew under the supervision of PPE engineer Tom DiMuzio. Responsibility for the reduction and verification of individual portions of the inspection program was assigned to various PPE engineers. Their signatures on this document attest that (1) they have independently verified the sections assigned to them; and (2) they concur with the results documented herein. A listing of the individual data reduction and verification assignments is given below:

	Inspection Program Section	Originating Engineer	Verifying Engineer
1.0	Background & Objectives	A. Konzel	D. Colburn
2.0	Full Length RCCA Drag Tests	D. Davis	D. Colburn
3.0	Guide Thimble Plug Gage Exams	D. Davis	D. Colburn
4.0	F/A Length Measurements	H. Kunishi	A. Konzel
5.0	Overall Summary	D. Colburn	A. Konzel

Signatures On File

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1.0 Background and Objectives

An RCCA insertion anomaly was experienced at Wolf Creek near the end of Cycle 8. The reactor tripped resulting in a SCRAM. During this SCRAM, five RCCAs failed to fully insert. Wolf Creek conducted cold drop tests after the anomaly, and three additional RCCAs did not fully insert. A subsequent inspection program (PPE-96-088)

[ ] a,b,c

The following tests were scheduled to be conducted during the inspection program:

(1) RCCA Drag Tests;
(2) Guide Thimble Plug Gage Exams (also referred to as Single Tube Probe Tests);
(3) Fuel Assembly Length Measurements; and
(4) Fuel Rod-to-Nozzle Gap Measurements.

Fuel assembly length measurements and fuel rod-to-nozzle gap measurements were needed to establish that the growth of the fuel assemblies and fuel rods is within the anticipated range for the listed F/A burnup.

Guide thimble plug gage exams (Item #2 above) and videotaping of the rod-to-nozzle gaps (Item #4 above) for each of the V. C. Summer fuel assemblies was not completed due to time limitations. Plug gage and fuel rod growth data are therefore unavailable for V. C. Summer at this time.

2.0 Full Length RCCA Drag Tests in Spent Fuel Pool

Fuel assemblies fabricated for four different contracts were drag tested in the spent fuel pool. The special features of the fuel assemblies are shown below in Table 2.1. As shown in the table the common feature in the assemblies are as follows:

Integral Fuel Burnable Absorbers (IFBA)
Intermediate Flow Mixing Grids (IFMs)
Removable Top Nozzle
Debris Filter Bottom Nozzle

The CGGF and CGHF assemblies have many of the features included in the Vantage + design. The CGFF assemblies have many of the features included in the Vantage 5H design while the CGIF assemblies have many of the features in the Performance + design.

Table 2.1: Fuel Features of VC Summer 17x17 Optimized Fuel Assemblies a,b,c

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ABN	Solid Axial Blankets (natural)	HIBU+	Modified Assembly for Higher Burnup
HIBU	Modified Assembly for High Burnup	VPS	Variable Pitch Plenum Spring
IFBA	Integral Fuel Burnable Absorber	ZRLC	ZIRLO Fuel Rod Cladding
IFM	Intermediate Flow Mixing Grid	ZRLT	ZIRLO Guide Thimbles/ Instrument Tube
RTN	Removable Top Nozzle	AABE	Annular Axial Blankets (enriched)
DFBN	Debris Filter Bottom Nozzle	CC	Oxide-Coated Cladding
AABN	Annular Axial Blankets (natural)	ZRLMG	ZIRLO Mid-Grid/ IFM

The drag test results are tabulated in Table 2.2 and are graphed in Figures 2.1, 2.2 and 2.3. As shown in Table 2.2 most fuel assemblies were recently discharged from the reactor core and others have been in the spent fuel pool for 1 cycle. a,b,c

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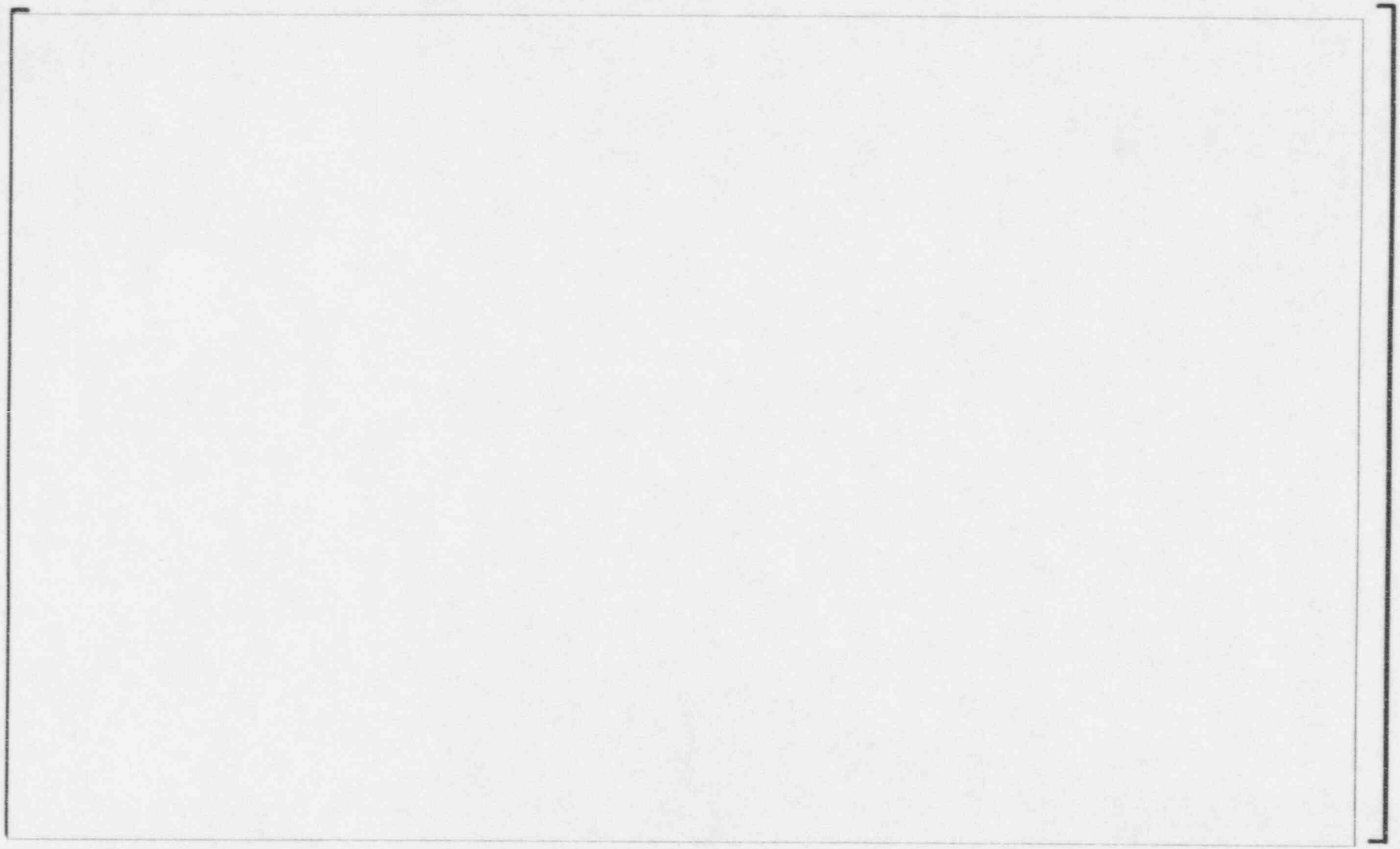
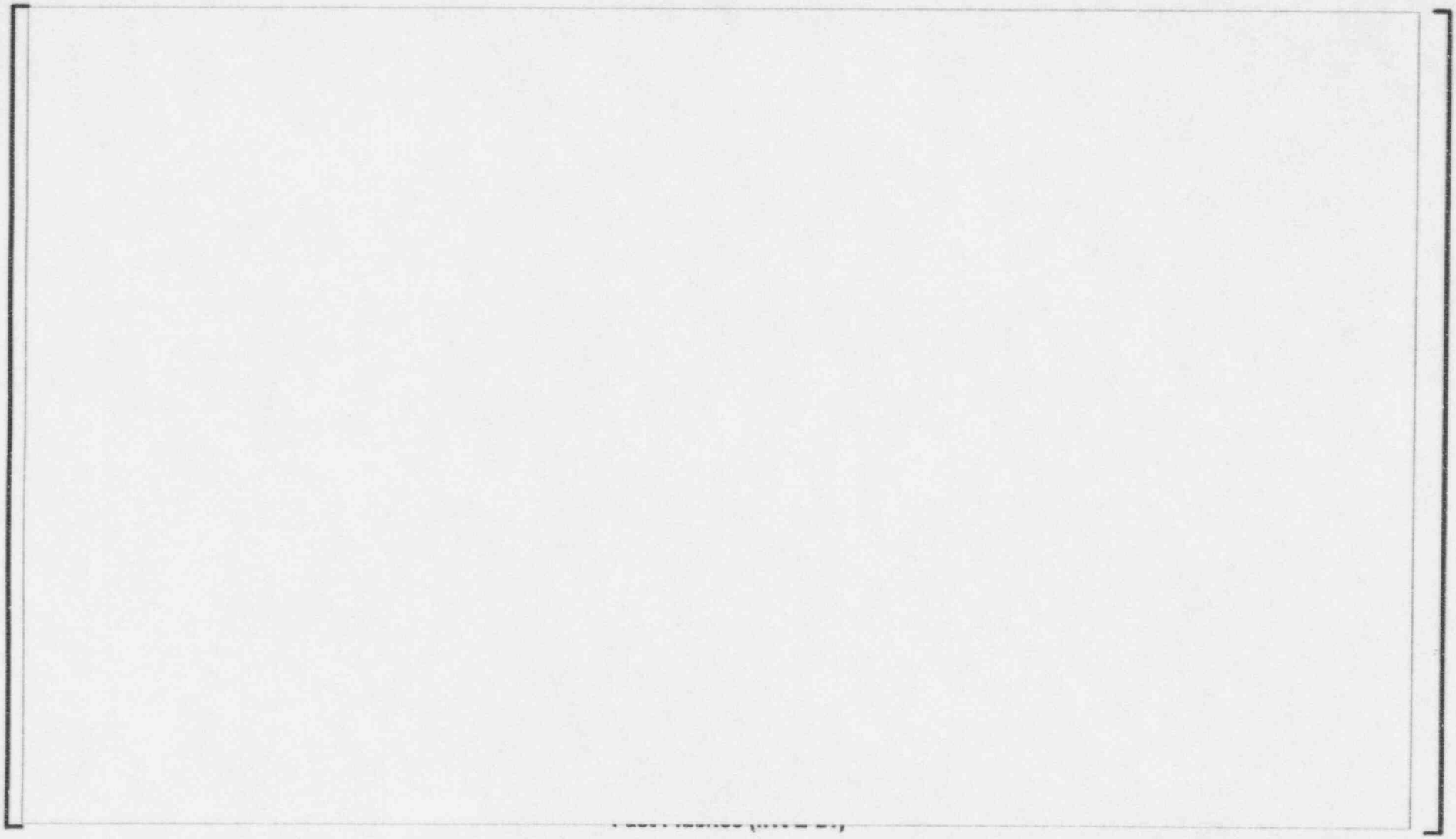
Table 2.2: VC Summer Drag Test Data a,b,c

Figure 2.1: VC Summer Dashpot and Guide Thimble Data



a,b,c

Figure 2.2: VC Summer Dashpot Drag and Fast Fluence Data



a,b,c

Figure 2.3: VC Summer Guide Thimble Drag and Fast Fluence Data

3.0 Single Tube Probe

Single tube probe testing was not conducted at V.C. Summer due to time limitations during the refueling outage.

4.0 Fuel Assembly Growth

Fuel assembly length measurements were performed on a total of 8 assemblies (4 F/As from Region H and 4 F/As from Region J). The measurements were made using a standard of known length and a measuring device with a dial indicator. The data was corrected for the spent fuel pool water temperature. Assembly J34 that was stored in the SFP was re-measured to verify the accuracy of the assembly length measuring tool. Table 4.1 lists the measured assembly length and growth values for each of the 8 assemblies.

"H" assemblies are of the 17x17 Vantage-5 design and "J" assemblies are of 17x17 Vantage+ design. The thimble tube material in assemblies H46 & H51 is Improved Zircaloy-4; assemblies H47 & H50 have standard Zircaloy-4 thimbles; assemblies J09, J10, J13, and J22 have ZIRLO© thimbles .

a,b,c

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Table 4.1: V. C. Summer Fuel Assembly Growth Data a,b,c

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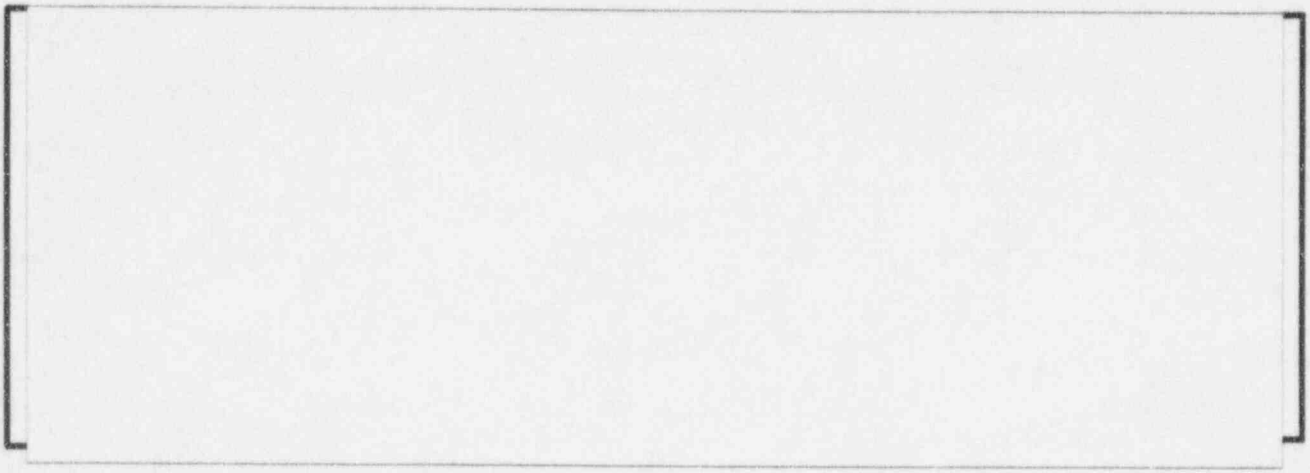
Figure 4.1: Fuel Assembly Growth Plot
SAP, VRA, CGE, WEP, GAE

a,b,c

5.0 Overall Summary



a,b,c