Evaluation of the CM-PRESTO Nodal Code Accuracy in
Modeling a SVEA 96/GE9 Mixed Core

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ABSTRACT

The Hope Creek Generating Station will be loading the first batch of SVEA 96 10X10 fuel in April 2000. The advanced 2 group nodal code, CM-PRESTO, is used to perform reload design, and operational support calculations. An evaluation was performed with the EPRI CPM-3 lattice code to verify the accuracy of the CM-PRESTO code in modeling the SVEA 96 and GE9 mixed core. The evaluations were performed using a 2x2 geometry at beginning of life and exposed conditions.

The first phase of the evaluation was to benchmark CPM-3 2x2 calculations to MCNP-4B. Comparisons were performed with the fuel temperature at 300 K using ENDF/B-VI cross sections, and at 900 K using ENDF/B-V cross sections. The 300 K comparisons are better because CPM-3 also uses ENDF/B-VI cross sections. The beginning of life eigenvalue comparisons are within 0.0012 delta k, and the maximum difference for the fission and absorption rate comparisons is 3%. The second phase of the evaluation was to benchmark CM-PRESTO 2x2 calculations to CPM-3. CPM-3 single assembly depletions were performed to provide the cross section, discontinuity factor and pin power inputs to CM-PRESTO. The eigenvalue comparisons between CPM-3 and CM-PRESTO are within 0.002 delta k, and the differences for the pin power comparisons are 2-3%. The evaluation demonstrates that CM-PRESTO is accurately modeling the SVEA 96 fuel design loaded adjacent to the GE9 fuel design.

Introduction

Hope Creek is a General Electric BWR 4 that is currently operating with a full core of the GE9 8x8 fuel design. The first batch of the SVEA 96 10x10 design is scheduled to be loaded in April 2000. The SVEA 96 design does not have a constant fuel rod pitch within the lattice, and is composed of four mini bundles separated by a water cross. Each mini bundle has 24 fuel rods arranged in a 5x5 array. The reload design, and operational support calculations are performed with CM-PRESTO[1], which is an advanced 2 group nodal code with pin power reconstruction[2]. An evaluation was performed to verify that CM-PRESTO will accurately model the SVEA 96 and GE9 mixed core.

The EPRI CPM-3[3] code is used to evaluate the pin power reconstruction model in CM-PRESTO. CPM-3 2x2 calculations are performed at beginning of life, and at exposed conditions representing a fresh, once burned and twice burned configuration and compared to the CM-PRESTO results. The CPM-3 eigenvalues and reaction rates are benchmarked to MCNP-4B[4] results at beginning of life and exposed conditions.

Calculations and Results

The evaluation is performed using the 2x2 geometry shown in Figure 1. The bundles are oriented such that the control blade is in the center of the problem. The full SVEA 96 assembly has an average enrichment of 3.47, ranging in fuel rod enrichment from 2.0 to 4.0 weight percent, with 10 gadolinia pins at 5.0 weight percent. The GE9 half assemblies have an average enrichment of 3.07, ranging in fuel rod enrichment from 1.8 to 3.8 weight percent, with 8 gadolinia pins at 4.0 weight percent.

The EPRI CPM-3[3] code is used as a reference calculation to evaluate the 2 group and pin power reconstruction models in CM-PRESTO. The CPM-3 2x2 calculations have previously been benchmarked against MCNP-4B[4] results at beginning of life[5]. The CM-PRESTO eigenvalue and pin power distributions are compared to CPM-3 2x2 cases at beginning of life, and at exposed conditions representing a fresh, once burned and twice burned configuration.

MCNP to CPM-3 BEGINNING of LIFE COMPARISONS

The eigenvalue comparisons are shown in Table I. There are two sets of comparisons in the table. The hot full power (HFP) cases are executed with Tfuel=900K, Tclad=600K, and Tmod=600K. Because hot (600K or 900K) ENDF/B-VI cross sections are not available, the MCNP cases were executed with ENDF/B-V cross section. The cold zero power cases (CZP) are executed with Tfuel=300K, Tclad=300K, and Tmod=300K. The MCNP cases are executed with ENDF/B-VI, release 2 cross sections. The 97 group library in CPM-3 was derived from ENDF/B-VI, release 4. The differences show a trend versus increased void for both the HFP and CZP comparisons. However, the CZP comparisons show a smaller change.

The fission rate and absorption rate results for the HFP cases from CPM-3 are compared to the normalized fission and absorption rate data from MCNP. The results are shown in Figures 2 to 4. The fission rates have a maximum error of 3% for all rods, and about 2.5% for all non-gadolinia rods. The absorption rates have a maximum error of about 3% for all rods.

MCNP to CPM-3 EXPOSED COMPARISONS

Single assembly depletions are performed at 00%, 40% and 70% void for bundle G2. The nuclide number densities from these depletions are used as input to the 2x2 exposed cases. The hot full power (HFP) and cold zero power (CZP) cases are executed at the same temperatures as described above for the beginning of life cases. There are approximately 250 fission products modeled in the CPM-3 depletions, and all these nuclides are not available in the MCNP libraries. The 70 nuclides available on the MCNP library are shown below for the HFP and CZP MCNP cases. The HFP cases used primarily ENDF/B-V cross sections, and the CZP cases used primarily ENDF/B-VI cross sections. The CPM-3 cases were executed using the same nuclides as the MCNP cases.

Hot Zero Power MCNP Isotopic Library Identifiers

92234.50c 92235.54c 92236.50c 92237.50c 92238.54c 92239.35c 93237.50c
93238.60c 94238.50c 94239.59c 94240.59c 94241.59c 94242.59c 94243.60c
95241.50c 95242.50c 95243.50c 96242.50c 96244.50c 33075.35c 35081.55c
36082.50c 36083.50c 36084.50c 36086.50c 37085.55c 37087.55c 39089.50c
40093.50c 42095.50c 43099.50c 44101.50c 44103.50c 45103.50c 45105.50c
46105.50c 46108.50c 47109.50c 53127.55c 53135.50c 54131.50c 54134.35c
54135.54c 55133.50c 55135.50c 56138.50c 59141.50c 60143.50c 60145.50c
60147.50c 60148.50c 61147.50c 61148.50c 61149.50c 62147.50c 62149.50c
62150.50c 62151.50c 62152.50c 63151.50c 63153.50c 63154.50c 63155.50c
64154.59c 64155.59c 64156.59c 64157.59c 64158.59c 64160.50c

Cold Zero Power MCNP Isotopic Library Identifiers

92234.60c 92235.60c 92236.60c 92237.50c 92238.60c 92239.35c 93237.60c
93238.60c 94238.60c 94239.60c 94240.60c 94241.60c 94242.60c 94243.60c
95241.60c 95242.60c 95243.50c 96242.60c 96244.60c 33075.35c 35081.55c
36082.50c 36083.50c 36084.50c 36086.50c 37085.55c 37087.55c 39089.60c
40093.50c 42095.50c 43099.60c 44101.50c 44103.50c 45103.50c 45105.50c
46105.50c 46108.50c 47109.60c 53127.60c 53129.60c 53135.50c 54131.50c
54134.35c 54135.50c 55133.60c 55134.60c 55135.60c 55136.60c 55137.60c
56138.50c 59141.50c 60143.50c 60145.50c 60147.50c 60148.50c 61147.50c
61148.50c 61149.50c 62147.50c 62149.50c 62150.50c 62151.50c 62152.50c
63151.60c 63153.60c 63154.50c 63155.50c 64154.60c 64155.60c 64156.60c
64157.60c 64158.60c 64160.60c

The eigenvalue comparisons are shown in Tables II and III. The CZP comparisons are better, because both calculations were performed with ENDF/B-VI cross sections. The maximum overprediction is 0.004 delta k. This case is at 70% void, and has one of the GE9 bundles at 25 Gwd/T. This delta is larger than the acceptance criteria of 0.002 to 0.003 delta k. An evaluation would need to be performed to determine which nuclides are contributing to the observed difference.

CM-PRESTO to CPM-3 COMPARISONS

Single assembly CPM-3 depletions are performed for the GE9 lattice at 00%, 40% and 70% void, and beginning of life calculations are performed for the SVEA 96 lattice at 00%, 40% and 70% void. The cross sections, pin powers and discontinuity factors from these single assembly cases are used as input to the CM-PRESTO 2x2 model. The edge, top and bottom albedos in CM-PRESTO are set to one to simulate reflective boundary conditions, and the thermal hydraulic, doppler, and xenon feedback models are all disabled.

The eigenvalue comparisons at BOC are shown in Table IV. Cases 1 through 3 modeled only the SVEA 96 fuel in all four locations, and cases 4 through 6 modeled only the GE9 fuel in all four locations. As expected, the CM-PRESTO 2x2 eigenvalue matched the CPM-3 single assembly eigenvalue. The CM-PRESTO pin powers also matched the CPM-3 single assembly pin powers.
The eigenvalue comparisons for cases 7 through 9 are less than 0.0005 delta k. The voids for these cases are the same for each bundle. The pin power comparisons for cases 7 through 9 are shown in Figures 5 to 7, and have a maximum average error of about 0.13% with a maximum standard deviation of 1.34%. The maximum error of 4.3% occurs for the fuel rod in the control blade corner for the SVEA 96 bundle. This error is slightly higher than the acceptance criteria of 2%-3%. The corner rod, excluding control blade history effects, is never the limiting rod. Control blade history cases need to be run to determine if the corner rod is still being underpredicted.

The voids in case 10 are different for each assembly, and the difference increases to -0.002 delta k. The pin power comparisons in Figure 8 for case 10 have a maximum average error of about 0.13% with a maximum standard deviation of 3.52%. The pin power maximum error also increases to 6.46% for the fuel rod in the control blade corner for the SVEA 96 bundle. However, this case was run at a void mismatch condition that would not be encountered during steady state operating conditions.

The eigenvalue comparisons at exposed conditions are shown in Table V. The differences are less than 0.0013 delta k. The pin power comparisons for cases 1 through 7 have a maximum average error of about 0.05% and a maximum standard deviation of 2.16%. The pin power comparisons for cases 2 and 5 are shown in Figures 9 and 10, respectively. The data shows that cases which have a constant void across the 2x2 geometry have lower errors than the cases with varying void. For example, case 8 has a constant void of 40%, and in case 9, the void for bundle G2 was lowered to 00%. The lattice exposures for both cases are the same. As shown in Figures 11 and 12, the maximum error increased from 0.59% to 3.27% in bundle G2. This same behavior is also seen

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between cases 6 and 7. Although the results are acceptable, they may be improved by better accounting for the spectrum mismatch between assemblies.

Conclusions

This evaluation demonstrates that the CM-PRESTO 2 group model can accurately model the GE9 and SVEA 96 mixed core loading when performing reload design, reload licensing, and operational support calculations. The eigenvalue comparisons show very good agreement, and are within 0.001 delta k. The pin power reconstruction method in CM-PRESTO also shows good agreement, and the results are within 2-3% of the CPM-3 results.

References

1.   User Manual, CM-PRESTO-91, Scandpower, July 1993.

2.   S.Ö. Lindahl, "Pin Power Reconstruction in PRESTO", Proc. ANS Topical Meeting, Jackson Hole, 111-157, (1988).

3.   D.B. Jones, et. al., "CPM-3 Computer Code Manual Vol. 2: User Manual", EPRI RP-3418, EPRI, July 1998.

4.   J. Briesmeister, "MCNP- A General Monte Carlo N-Particle Transport Code, Version 4B", LA-12625-M, Los Alamos National Laboratory, March 1997.

5.   S.P. Baker, W.W. Wilson, K Buckwheat, "Benchmark of CPM-3 2x2 Calculations to Support Evaluation of SVEA 96 Reload", Proc. ANS Topical Meeting, Long Beach, Ca, November 1999.
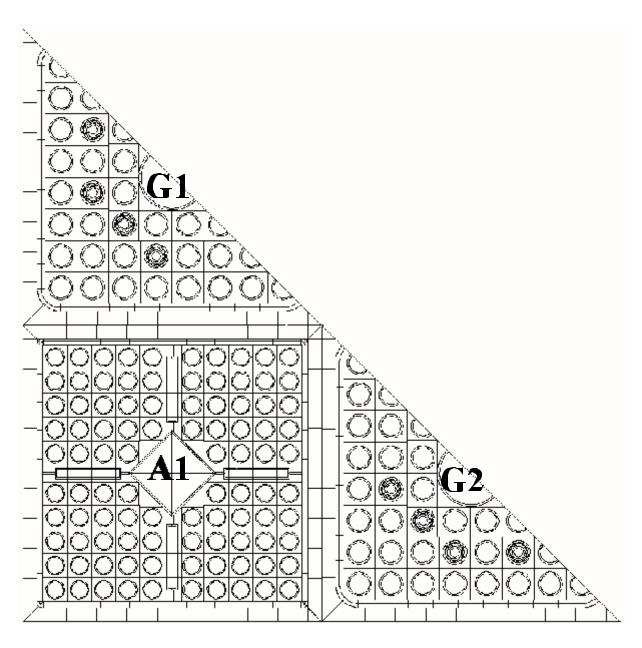
Figure 1   CPM-3 and MCNP 2X2 Geometry

Table I   MCNP to CPM-3 2x2 Beginning of Life Eigenvalue Comparisons

Case		Lattice Void			MCNP ENDFB V	MCNP ENDFB VI	CPM-3	Δk_∞ M(V)-C	Δk_∞ M(VI)-C
		G1	G2	A1					
1	HFP	0%	0%	0%	1.05983	N/A	1.06051	-0.00068	N/A
2	HFP	40%	40%	40%	1.03776	N/A	1.03970	-0.00194	N/A
3	HFP	70%	70%	70%	1.01348	N/A	1.01699	-0.00351	N/A
4	HFP	0%	40%	70%	1.03063	N/A	1.03181	-0.00118	N/A
5	CZP	0%	0%	0%	1.11109	1.10931	1.10927	0.00182	0.00004
6	CZP	40%	40%	40%	1.08637	1.08722	1.08753	-0.00116	-0.00031
7	CZP	70%	70%	70%	1.05964	1.06131	1.06251	-0.00287	-0.00120

Fission Rate Comparison
Bundle G1 00% Void. Exposure=00 G/T
(MCNP-CPM3)/CPM3*100

```
2.56%
0.99%   0.20%
-0.54%  1.09%  -0.90%
-0.61% -1.04%  -0.90%    W
-2.35%  1.45%  -0.51%    W      W
-0.84% -0.20%   0.73%  -0.20%  0.53%   0.00%
1.00%   0.37%  -0.30%   2.09% -0.54%  -0.09%   0.00%
1.24%   0.17%  -0.33%  -0.50%  0.33%  -0.17%   0.44%   1.91%
```
Control Blade

Mean Error	0.15%
Standard Deviation	1.01%
Maximum Error	2.56%
Maximum Error-Non Gad	2.56%

Bundle A1 00% Void.Exposure=00 G/T
Control Blade

```
1.24%   0.52%  -1.21%  -0.77%  -1.04%  -0.48%   0.17%   0.92%   0.91%   2.06%
0.87%   0.21%   2.77%  -0.69%  -0.67%  -0.99%  -0.09%   2.68%   0.10%   0.66%
-0.62%  2.37%  -1.63%  -1.02%  -0.72%  -0.94%   0.69%   0.52%   2.68%  -0.08%
-0.70% -0.50%  -0.57%   2.36%  -0.87%  -0.35%  -0.56%   0.39%  -0.75%  -0.50%
-0.25%  0.09%  -0.09%   1.06%    W       W     -0.62%  -0.85%  -0.74%  -0.63%
0.65%  -0.17%   0.09%   0.00%    W       W     -0.96%  -0.36%  -0.76%   0.08%
-0.96%  0.39%   1.39%   0.11%  -0.18%  -0.19%   1.97%   0.11%  -0.30%  -0.43%
-0.71%  1.55%   0.00%   0.40%   0.09%  -0.64%   0.45%  -0.25%   2.37%   0.52%
0.09%   0.11%   1.94%   0.39%  -0.50%  -0.68%  -0.40%   2.37%   0.32%   0.52%
1.71%   1.33%   0.27%   0.44%   0.24%   0.65%  -0.79%  -0.44%   1.40%   1.45%
```

Mean Error	0.20%
Standard Deviation	1.01%
Maximum Error	2.77%
Maximum Error Non-gad	2.06%

Absorption Rate Comparison
Bundle G1 00% Void. Exposure=00 G/T
(MCNP-CPM3)/CPM3*100

```
1.66%
1.31%   2.56%
-0.46% -1.35%   1.09%
0.00%   0.53%   0.34%    W
-1.38% -0.72%   0.68%    W      W
0.30%   0.17%  -1.13%   1.34%  0.31%   1.09%
1.13%   1.59%   1.01%  -0.99%  0.80%   1.38%   0.30%
1.86%   0.56%   0.58%   0.73%  1.29%   0.85%   1.51%   1.69%
```
Control Blade

Mean Error	0.63%
Standard Deviation	0.96%
Maximum Error	2.56%
Maximum Error-Non Gad	2.56%

Bundle A1 00% Void.Exposure=00 G/T
Control Blade

```
0.28%  -0.15%  -1.65%  -1.19%  -1.27%  -1.12%   0.00%   1.47%   0.85%   1.78%
0.59%   1.38%   1.08%  -0.17%  -0.31%   0.00%  -0.33%   0.56%   0.84%   0.00%
0.15%   1.81%   0.57%  -0.18%  -0.16%  -0.93%   0.68%   0.57%   0.79%   0.44%
-0.60% -0.34%   0.00%  -1.91%  -0.47%   0.30%   0.34%   0.68%  -0.33%   0.88%
0.00%   0.15%  -0.16%   1.40%    W       W      0.00%  -0.15%  -0.45%   0.42%
0.00%   0.61%  -0.31%  -0.45%    W       W      0.00%  -0.48%  -1.38%  -0.14%
-1.49%  0.67%   1.87%  -0.68%  -0.89%  -0.62%  -1.62%  -0.36%   1.03%   0.00%
-0.60% -2.17%   0.95%  -0.17%  -0.77%   0.32%  -0.55%   0.38%   0.70%   0.60%
-0.29%  0.00%  -1.04%  -0.34%   1.22%   0.00%   0.17%   1.63%   0.69%   0.00%
0.85%   0.00%   0.00%   0.15%  -0.28%  -0.28%  -0.75%  -1.21%   0.59%   0.14%
```

Mean Error	0.02%
Standard Deviation	0.82%
Maximum Error	1.87%
Maximum Error Non-gad	1.87%

Figure 2 MCNP to CPM3 Fission and Absorption Rate Comparison, BOC 00% Void

Fission Rate Comparison
Bundle G1 00% Void. Exposure=00 G/T
(MCNP-CPM3)/CPM3*100

2.56%							
0.99%	0.20%						
-0.54%	1.09%	-0.90%					
-0.61%	-1.04%	-0.90%	W				
-2.35%	1.45%	-0.51%	W	W			
-0.84%	-0.20%	0.73%	-0.20%	0.53%	0.00%		
1.00%	0.37%	-0.30%	2.09%	-0.54%	-0.09%	0.00%	
1.24%	0.17%	-0.33%	-0.50%	0.33%	-0.17%	0.44%	1.91%

Control Blade

Mean Error	0.15%
Standard Deviation	1.01%
Maximum Error	2.56%
Maximum Error-Non Gad	2.56%

Bundle A1 00% Void. Exposure=00 G/T
Control Blade

1.24%	0.52%	-1.21%	-0.77%	-1.04%	-0.48%	0.17%	0.92%	0.91%	2.06%
0.87%	0.21%	2.77%	-0.69%	-0.67%	-0.99%	-0.09%	2.68%	0.10%	0.66%
-0.62%	2.37%	-1.63%	-1.02%	-0.72%	-0.94%	0.69%	0.52%	2.68%	-0.08%
-0.70%	-0.50%	-0.57%	2.36%	-0.87%	-0.35%	-0.56%	0.39%	-0.75%	-0.50%
-0.25%	0.09%	-0.09%	1.06%	W	W	-0.62%	-0.85%	-0.74%	-0.63%
0.65%	-0.17%	0.09%	0.00%	W	W	-0.96%	-0.36%	-0.76%	0.08%
-0.96%	0.39%	1.39%	0.11%	-0.18%	-0.19%	1.97%	0.11%	-0.30%	-0.43%
-0.71%	1.55%	0.00%	0.40%	0.09%	-0.64%	0.45%	-0.25%	2.37%	0.52%
0.09%	0.11%	1.94%	0.39%	-0.50%	-0.68%	-0.40%	2.37%	0.32%	0.52%
1.71%	1.33%	0.27%	0.44%	0.24%	0.65%	-0.79%	-0.44%	1.40%	1.45%

Mean Error	0.20%
Standard Deviation	1.01%
Maximum Error	2.77%
Maximum Error Non-gad	2.06%

Absorption Rate Comparison
Bundle G1 00% Void. Exposure=00 G/T
(MCNP-CPM3)/CPM3*100

1.66%							
1.31%	2.56%						
-0.46%	-1.35%	1.09%					
0.00%	0.53%	0.34%	W				
-1.38%	-0.72%	0.68%	W	W			
0.30%	0.17%	-1.13%	1.34%	0.31%	1.09%		
1.13%	1.59%	1.01%	-0.99%	0.80%	1.38%	0.30%	
1.86%	0.56%	0.58%	0.73%	1.29%	0.85%	1.51%	1.69%

Control Blade

Mean Error	0.63%
Standard Deviation	0.96%
Maximum Error	2.56%
Maximum Error-Non Gad	2.56%

Bundle A1 00% Void. Exposure=00 G/T
Control Blade

0.28%	-0.15%	-1.65%	-1.19%	-1.27%	-1.12%	0.00%	1.47%	0.85%	1.78%
0.59%	1.38%	1.08%	-0.17%	-0.31%	0.00%	-0.33%	0.56%	0.84%	0.00%
0.15%	1.81%	0.57%	-0.18%	-0.16%	-0.93%	0.68%	0.57%	0.79%	0.44%
-0.60%	-0.34%	0.00%	-1.91%	-0.47%	0.30%	0.34%	0.68%	-0.33%	0.88%
0.00%	0.15%	-0.16%	1.40%	W	W	0.00%	-0.15%	-0.45%	0.42%
0.00%	0.61%	-0.31%	-0.45%	W	W	0.00%	-0.48%	-1.38%	-0.14%
-1.49%	0.67%	1.87%	-0.68%	-0.89%	-0.62%	-1.62%	-0.36%	1.03%	0.00%
-0.60%	-2.17%	0.95%	-0.17%	-0.77%	0.32%	-0.55%	0.38%	0.70%	0.60%
-0.29%	0.00%	-1.04%	-0.34%	1.22%	0.00%	0.17%	1.63%	0.69%	0.00%
0.85%	0.00%	0.00%	0.15%	-0.28%	-0.28%	-0.75%	-1.21%	0.59%	0.14%

Mean Error	0.02%
Standard Deviation	0.82%
Maximum Error	1.87%
Maximum Error Non-gad	1.87%

Figure 3 MCNP to CPM3 Fission and Absorption Rate Comparison, BOC 40% Void

Fission Rate Comparison
Bundle G1 70% Void. Exposure=00 G/T
(MCNP-CPM3)/CPM3*100

-0.92%							
-1.00%	-0.58%						
-1.08%	1.60%	0.32%					
-0.89%	0.51%	-0.30%	**W**				
-1.95%	2.41%	0.70%	**W**	**W**			
-1.38%	0.29%	2.15%	1.10%	0.81%	0.18%		
0.00%	0.00%	0.29%	2.34%	1.64%	0.27%	0.00%	
-0.27%	-0.51%	-0.17%	-0.59%	0.17%	0.09%	0.09%	0.85%

Control Blade

Mean Error	0.19%
Standard Deviation	1.04%
Maximum Error	2.41%
Maximum Error-Non Gad	1.64%

Bundle A1 70% Void.Exposure=00 G/T
					Control Blade				
-0.42%	-0.60%	-1.38%	-1.57%	-1.84%	-0.99%	0.00%	-0.42%	0.66%	0.50%
0.17%	0.60%	2.35%	0.00%	0.17%	-0.42%	0.65%	2.30%	0.67%	0.33%
-0.26%	2.94%	-0.35%	1.20%	0.09%	-0.79%	0.69%	0.62%	2.59%	0.00%
-1.07%	0.29%	1.32%	2.08%	-0.30%	-1.48%	0.47%	-0.10%	-0.09%	-0.85%
-1.45%	-0.26%	0.09%	0.30%	**W**	**W**	-1.02%	0.00%	0.08%	-0.91%
-0.51%	0.09%	-0.89%	-0.93%	**W**	**W**	-0.40%	0.56%	-0.26%	-1.00%
-0.09%	0.58%	1.10%	0.00%	-0.65%	0.30%	2.08%	1.20%	0.19%	-1.66%
0.00%	2.03%	0.25%	0.90%	0.27%	0.56%	1.10%	0.71%	2.35%	-0.95%
0.71%	1.62%	2.32%	0.48%	0.43%	0.09%	0.49%	2.65%	0.40%	-0.34%
1.19%	0.62%	-0.27%	-0.27%	-0.76%	-0.60%	-0.53%	-1.05%	0.17%	0.42%

Mean Error	0.20%
Standard Deviation	1.03%
Maximum Error	2.94%
Maximum Error Non-gad	1.62%

Absorption Rate Comparison
Bundle G1 70% Void. Exposure=00 G/T
(MCNP-CPM3)/CPM3*100

0.13%							
-0.94%	1.25%						
0.14%	-1.45%	0.00%					
0.00%	2.47%	-0.94%	**W**				
-0.85%	0.24%	1.10%	**W**	**W**			
-0.56%	1.28%	-0.04%	1.25%	0.74%	0.90%		
0.27%	1.07%	1.27%	-0.89%	2.18%	0.75%	0.15%	
0.00%	0.00%	-0.27%	0.28%	-0.28%	0.27%	-0.27%	-0.24%

Control Blade

Mean Error	0.27%
Standard Deviation	0.89%
Maximum Error	2.47%
Maximum Error-Non Gad	2.47%

Bundle A1 70% Void.Exposure=00 G/T
								Control Blade	
-0.90%	-0.41%	0.14%	-0.84%	-1.06%	-0.40%	-0.69%	-0.41%	2.54%	0.76%
0.41%	0.32%	0.84%	1.30%	0.15%	0.00%	1.11%	-1.18%	1.88%	1.34%
-0.28%	1.26%	0.36%	1.37%	0.46%	0.30%	0.49%	2.15%	-0.53%	-0.27%
0.00%	0.65%	1.20%	-1.60%	-1.03%	-0.43%	0.66%	0.00%	0.48%	-0.69%
-1.07%	-1.47%	0.61%	-0.29%	**W**	**W**	-0.86%	0.00%	-0.44%	0.00%
-0.13%	0.15%	-0.15%	-0.72%	**W**	**W**	-0.15%	1.37%	0.73%	-0.40%
0.42%	0.81%	1.16%	0.83%	0.86%	0.59%	-1.71%	2.06%	1.30%	-0.98%
-0.28%	-1.23%	1.08%	1.32%	0.90%	0.46%	0.17%	0.36%	0.84%	0.00%
0.27%	1.28%	-1.65%	0.64%	1.17%	0.29%	0.82%	1.34%	1.44%	1.08%
1.04%	0.14%	0.14%	-0.28%	-0.13%	0.00%	-0.28%	-0.70%	-0.68%	-0.64%

Mean Error	0.22%
Standard Deviation	0.89%
Maximum Error	2.54%
Maximum Error Non-gad	2.54%

Figure 4 MCNP to CPM3 Fission and Absorption Rate Comparison, BOC 70% Void

Table II   MCNP to CPM-3 HFP 2x2 Exposed Eigenvalue Comparisons

Case	Bundle A1		Bundle G1		Bundle G2		MCNP	CPM-3	MCNP-CPM-3
	Exp G/T	Void %	Exp G/T	Void %	Exp G/T	Void %			
1	0	0	5	0	10	0	1.10069	1.09926	0.00143
2	0	40	5	40	10	40	1.07776	1.07724	0.00052
3	0	70	5	70	10	70	1.05151	1.05195	-0.00044
4	0	0	10	0	25	0	1.08764	1.08442	0.00323
5	0	40	10	40	25	40	1.06748	1.06534	0.00214
6	0	70	10	70	25	70	1.04382	1.04247	0.00135
7	0	70	10	70	25	40	1.04444	1.04300	0.00145
8	0	40	10	40	45	40	1.03564	1.03212	0.00038
9	0	40	10	40	45	0	1.02415	1.02066	0.00349
10	0	40	25	40	45	0	.99138	0.98604	0.00534

Table III   MCNP to CPM-3 CZP 2x2 Exposed Eigenvalue Comparisons

Case	Bundle A1		Bundle G1		Bundle G2		MCNP	CPM-3	MCNP-CPM-3
	Exp G/T	Void %	Exp G/T	Void %	Exp G/T	Void %			
1	0	0	5	0	10	0	1.12911	1.12999	-0.00088
2	0	40	5	40	10	40	1.10634	1.10868	-0.00234
3	0	70	5	70	10	70	1.07946	1.08301	-0.00355
4	0	0	10	0	25	0	1.10775	1.11036	-0.00261
5	0	40	10	40	25	40	1.09007	1.09314	-0.00307
6	0	70	10	70	25	70	1.06683	1.07106	-0.00423
7	0	70	10	70	25	40	1.06587	1.06964	-0.00377
8	0	40	10	40	45	40	1.0544	1.05693	0.00038
9	0	40	10	40	45	0	1.03883	1.04189	-0.00306
10	0	40	25	40	45	0	1.00283	1.00574	-0.00291

Table IV   CPM-3 to CM-PRESTO BOC 2x2 Eigenvalue Comparisons

Case	Bundle/Void Conditions	CPM-3	CM-PRESTO (CMP)	CPM3-CMP
1	All SVEA 96 - 00% Void	1.07636	1.07636	0.00000
2	All SVEA 96 - 40% Void	1.05488	1.05488	0.00000
3	All SVEA 96 - 70% Void	1.03244	1.03244	0.00000
4	All GE9 - 00% Void	1.04236	1.04236	0.00000
5	All GE9 - 40% Void	1.02258	1.02258	0.00000
6	All GE9 - 70% Void	0.99959	0.99959	0.00000
7	A1=00%, G1=00%, G2=00% Void	1.06051	1.06013	0.00038
8	A1=40%, G1=40%, G2=40% Void	1.03970	1.03937	0.00033
9	A1=70%, G1=70%, G2=70% Void	1.01699	1.01658	0.00041
10	A1=70%, G1=40%, G2=00% Void	1.03218	1.03425	-0.00207

Table V   CPM-3 to CM-PRESTO Exposed 2x2 Eigenvalue Comparisons

Case	Bundle A1		Bundle G1		Bundle G2		CPM-3	CM-PRESTO (CMP)	CPM3-CMP
	Exp G/T	Void %	Exp G/T	Void %	Exp G/T	Void %			
1	0	0	5	0	10	0	1.09926	1.09892	0.00034
2	0	40	5	40	10	40	1.07724	1.07697	0.00027
3	0	70	5	70	10	70	1.05195	1.05180	0.00015
4	0	0	10	0	25	0	1.08442	1.08404	0.00038
5	0	40	10	40	25	40	1.06534	1.06495	0.00039
6	0	70	10	70	25	70	1.04247	1.04288	-0.00041
7	0	70	10	40	25	70	1.04300	1.04214	0.00086
8	0	40	10	40	45	40	1.03212	1.03268	-0.00056
9	0	40	10	40	45	00	1.02066	1.02063	0.00003
10	0	40	25	40	45	00	0.98604	0.98472	0.00132

Bundle G1 00% Void, Exposure=00 G/T

```
-0.73%
-1.09%  0.00%                                                    Mean Error                 0.13%
-0.99%  0.28%  0.33%                                             Standard Deviation         1.34%
-0.88%  0.42%  0.81%   W                                         Maximum Error              3.33%
 0.00%  1.13%  0.83%   W     W                                   Maximum Error-Non Gad      1.54%
-0.43%  0.50%  2.57%  1.24%  1.54%  1.23%
-0.92%  0.38%  0.90%  3.33%  1.19% -0.09% -0.55%
-0.53% -0.42%  0.42%  1.19%  0.25% -1.36% -2.77% -3.55%
                                  Control Blade
```

Bundle G2 00% Void, Exposure=00 G/T

```
       Control Blade
-3.55%
-2.77% -0.55%
-1.36%  0.00%  1.23%                                             Mean Error                 0.13%
 0.25%  1.19%  1.54%   W                                         Standard Deviation         1.34%
 1.19%  3.33%  1.24%   W     W                                   Maximum Error              3.33%
 0.42%  0.90%  2.57%  0.83%  0.81%  0.33%                        Maximum Error-Non Gad      1.54%
-0.42%  0.38%  0.50%  1.13%  0.42%  0.28%  0.00%
-0.53% -0.92% -0.43%  0.00% -0.88% -0.99% -1.09% -0.73%
```

Bundle A1 00% Void, Exposure=00 G/T

```
                                                    Control Blade
 1.04%  0.70%  0.26% -0.52% -1.37% -0.40%  0.60%  2.08%  3.56%  4.31%
 0.62%  0.00% -3.21% -0.98% -1.52% -0.99% -0.75% -2.85%  2.05%  3.56%
 0.72% -2.06% -0.37% -1.32% -1.44% -1.11% -1.36% -1.00% -2.85%  2.08%   Mean Error              -0.15%
 0.80%  0.00% -0.67% -2.35% -1.52% -0.89% -1.11% -1.36% -0.75%  0.60%   Standard Deviation       1.33%
 0.59%  0.00% -0.46% -0.96%   W      W    -0.89% -1.11% -0.99% -0.40%   Maximum Error            4.31%
 1.09%  0.60%  0.44%  0.54%   W      W    -1.52% -1.44% -1.52% -1.37%   Maximum Error-Non Gad    4.31%
 0.71%  0.29%  0.20%  0.79%  0.54% -0.96% -2.35% -1.32% -0.98% -0.52%
 0.54%  0.00%  0.78%  0.20%  0.44% -0.46% -0.67% -0.37% -3.21%  0.26%
 0.90%  0.85%  0.00%  0.29%  0.60%  0.00%  0.00% -2.06%  0.00%  0.70%
 0.64%  0.90%  0.54%  0.71%  1.09%  0.59%  0.80%  0.72%  0.62%  1.04%
```

Figure 5 CPM-3 to CM-PRESTO Pin Power Comparison
BOL G1=00%, G2=00%, A1=00%

Bundle G1 40% Void, Exposure=00 G/T

-0.64%							
-1.00%	0.10%						
-0.81%	0.50%	0.33%					
-0.80%	0.41%	0.81%	W				
0.18%	1.26%	0.72%	W	W			
-0.43%	0.30%	2.03%	1.23%	1.37%	0.98%		
-0.76%	0.28%	0.79%	3.23%	0.92%	-0.18%	-0.83%	
-0.45%	-0.43%	0.52%	1.03%	0.17%	-1.30%	-2.74%	-3.25%

Control Blade

Mean Error	0.11%
Standard Deviation	1.24%
Maximum Error	3.23%
Maximum Error-Non Gad	1.37%

Bundle G2 40% Void, Exposure=00 G/T

Control Blade

-3.25%							
-2.74%	-0.83%						
-1.30%	-0.18%	0.98%					
0.17%	0.92%	1.37%	W				
1.03%	3.23%	1.23%	W	W			
0.52%	0.79%	2.03%	0.72%	0.81%	0.33%		
-0.43%	0.28%	0.30%	1.26%	0.41%	0.50%	0.10%	
-0.45%	-0.76%	-0.43%	0.18%	-0.80%	-0.81%	-1.00%	-0.64%

Mean Error	0.11%
Standard Deviation	1.24%
Maximum Error	3.23%
Maximum Error-Non Gad	1.37%

Bundle A1 40% Void, Exposure=00 G/T

Control Blade

1.36%	0.97%	0.53%	-0.26%	-1.15%	-0.16%	0.60%	2.07%	3.56%	4.32%
0.89%	0.00%	-2.86%	-1.07%	-1.36%	-0.84%	-0.47%	-2.81%	2.10%	3.56%
0.99%	-2.36%	-0.24%	-1.41%	-1.73%	-0.96%	-1.26%	-1.10%	-2.81%	2.07%
0.99%	-0.10%	-0.99%	-2.62%	-1.92%	-0.82%	-1.12%	-1.26%	-0.47%	0.60%
0.51%	-0.09%	-0.83%	-1.45%	W	W	-0.82%	-0.96%	-0.84%	-0.16%
1.11%	0.43%	0.27%	0.37%	W	W	-1.92%	-1.73%	-1.36%	-1.15%
0.72%	0.29%	0.00%	0.34%	0.37%	-1.45%	-2.62%	-1.41%	-1.07%	-0.26%
0.54%	0.00%	0.38%	0.00%	0.27%	-0.83%	-0.99%	-0.24%	-2.86%	0.53%
1.00%	0.63%	0.00%	0.29%	0.43%	-0.09%	-0.10%	-2.36%	0.00%	0.97%
0.64%	1.00%	0.54%	0.72%	1.11%	0.51%	0.90%	0.99%	0.89%	1.36%

Mean Error	-0.16%
Standard Deviation	1.37%
Maximum Error	4.32%
Maximum Error-Non Gad	4.32%

Figure 6 CPM-3 to CM-PRESTO Pin Power Comparison
BOL G1=40%, G2=40%, A1=40%

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Bundle G1 70% Void, Exposure=00 G/T

```
-0.28%
-0.84%   0.10%
-0.81%   0.45%   0.21%
-0.63%   0.41%   0.71%    W
 0.27%   1.35%   0.60%    W       W
-0.26%   0.29%   2.05%   0.71%   1.01%   0.54%
-0.61%   0.29%   0.58%   2.90%   0.46%  -0.36%  -0.85%
-0.27%  -0.35%   0.61%   1.05%   0.17%  -1.33%  -2.53%  -2.86%
                                    Control Blade
```

Mean Error	0.08%
Standard Deviation	1.11%
Maximum Error	2.90%
Maximum Error-Non Gad	1.05%

Bundle G2 70% Void, Exposure=00 G/T

```
      Control Blade
-2.86%
-2.53%  -0.85%
-1.33%  -0.36%   0.54%
 0.17%   0.46%   1.01%    W
 1.05%   2.90%   0.71%    W       W
 0.61%   0.58%   2.05%   0.60%   0.71%   0.21%
-0.35%   0.29%   0.29%   1.35%   0.41%   0.45%   0.10%
-0.27%  -0.61%  -0.26%   0.27%  -0.63%  -0.81%  -0.84%  -0.28%
```

Mean Error	0.08%
Standard Deviation	1.11%
Maximum Error	2.90%
Maximum Error-Non Gad	1.05%

Bundle A1 70% Void, Exposure=00 G/T

```
                                        Control Blade
 1.05%   0.88%   0.62%  -0.35%  -1.09%   0.00%   0.61%   1.73%   3.04%   3.72%
 0.89%  -0.20%  -3.27%  -1.16%  -1.21%  -0.60%   0.00%  -2.53%   1.86%   3.04%
 0.90%  -2.36%   0.00%  -1.50%  -1.83%  -0.35%  -0.88%  -0.96%  -2.53%   1.73%
 0.82%  -0.29%  -1.08%  -2.61%  -1.85%   0.00%  -0.91%  -0.88%   0.00%   0.61%
 0.43%  -0.18%  -1.11%  -1.47%    W       W      0.00%  -0.35%  -0.60%   0.00%
 1.13%   0.44%   0.63%   0.85%    W       W     -1.85%  -1.83%  -1.21%  -1.09%
 0.63%   0.48%   0.00%   0.35%   0.85%  -1.47%  -2.37%  -1.50%  -1.16%  -0.35%
 0.36%   0.00%   0.12%   0.00%   0.63%  -1.11%  -1.08%   0.00%  -3.27%   0.62%
 0.72%   0.31%   0.00%   0.48%   0.44%  -0.18%  -0.29%  -2.36%  -0.20%   0.88%
 0.32%   0.72%   0.36%   0.72%   1.13%   0.43%   0.82%   0.90%   0.89%   1.05%
```

Mean Error	-0.15%
Standard Deviation	1.28%
Maximum Error	3.72%
Maximum Error-Non Gad	3.72%

Figure 7 CPM-3 to CM-PRESTO Pin Power Comparison
BOL G1=70%, G2=70%, A1=70%

Bundle G1 00% Void, Exposure=00 G/T

```
-4.74%
-4.56% -2.69%
-3.95% -4.70%  0.00%
-3.34% -0.20%  1.95%   W
-1.83% -1.62%  3.33%   W     W
-1.96%  0.98%  2.85%  6.07%  6.98%  6.43%
-2.24%  0.66%  2.55%  6.32%  4.80%  3.34%  1.65%
-2.56% -1.49% -0.18%  0.91%  0.54% -0.92% -2.91% -5.33%
                                  Control Blade
```

Mean Error	0.13%
Standard Deviation	3.52%
Maximum Error	6.98%
Maximum Error-Non Gad	6.98%

Bundle G2 40% Void, Exposure=00 G/T

```
        Control Blade
-5.53%
-4.11% -1.13%
-2.22%  0.18%  2.26%
-0.44%  1.69%  3.14%   W
 0.62%  5.81%  3.09%   W     W
 0.27%  1.30%  3.81%  2.13%  1.91%  0.86%
-0.70%  0.29%  0.69%  1.73%  0.81%  0.00% -0.10%
-1.19% -1.36% -0.93% -0.35% -1.21% -1.39% -1.61% -1.32%
```

Mean Error	0.21%
Standard Deviation	2.21%
Maximum Error	5.81%
Maximum Error-Non Gad	3.14%

Bundle A1 70% Void, Exposure=00 G/T

```
                                              Control Blade
 2.76%  2.37%  1.70%  0.40% -0.62%  0.85%  2.09%  3.86%  5.62%  6.46%
 1.99%  0.19% -7.96% -2.18% -2.51% -1.75% -0.97% -7.19%  2.89%  5.42%
 1.25% -5.09% -2.47% -3.91% -4.57% -3.22% -3.46% -3.45% -6.00%  3.44%
 0.92% -2.17% -3.63% -6.05% -5.51% -3.72% -3.87% -3.23% -1.10%  1.96%
 0.81% -1.35% -3.47% -4.80%   W      W    -3.13% -2.53% -1.26%  1.24%
 2.50%  0.37% -0.38% -0.97%   W      W    -4.11% -3.12% -1.38%  0.42%
 2.52%  1.23% -0.11% -0.24% -0.59% -3.30% -3.13% -2.05% -0.68%  1.59%
 2.53%  3.57%  1.18%  0.00%  0.09% -2.11% -1.77% -0.12% -3.32%  2.92%
 3.04%  2.08%  3.32%  1.44%  0.74% -0.18% -0.20% -1.46%  1.64%  3.66%
 2.92%  2.74%  2.13%  2.33%  2.61%  1.75%  2.19%  2.72%  3.31%  4.18%
```

Mean Error	-0.23%
Standard Deviation	3.00%
Maximum Error	6.46%
Maximum Error-Non Gad	6.46%

Figure 8 CPM-3 to CM-PRESTO Pin Power Comparison
BOL G1=70%, G2=70%, A1=70%

Bundle G1 40% Void, Exposure=05 G/T
(CPM3-CMP)/CMP*100

```
 0.00%
-0.61%  0.00%
-0.64%  0.16%   0.31%
-0.82% -0.10%   0.50%    W
 0.09%  0.32%   0.20%    W      W
-0.27%  0.30%   0.99%   0.40%  0.85%  0.76%
-0.63%  0.40%   0.60%   1.38%  0.58% -0.19% -0.40%
-0.09% -0.18%   0.45%   0.99%  0.36% -1.02% -2.07% -2.52%
                                 Control Blade
```

Mean Error	0.00%
Standard Deviation	0.81%
Maximum Error	1.38%
Maximum Error-Non Gad	0.99%

Bundle G2 40% Void, Exposure=10 G/T

```
   Control Blade
 0.00%
-0.32%  1.01%
 0.31%  0.96%   1.86%
 1.10%  1.12%   1.68%    W
 1.26%  1.13%   0.88%    W      W
 0.49%  0.60%   0.58%   0.19%  0.29% -0.19%
-0.40%  0.10%   0.10%  -0.45% -0.48% -0.86% -0.77%
-0.30% -0.97%  -0.75%  -0.56% -1.65% -1.56% -1.70% -1.52%
```

Mean Error	0.04%
Standard Deviation	0.96%
Maximum Error	1.86%
Maximum Error-Non Gad	1.86%

Bundle A1 40% Void, Exposure=00 G/T

```
                                       Control Blade
 1.92%  1.52%   1.16%   0.36% -0.67% -0.17%  0.17%  1.04%  2.08%  2.35%
 1.54%  0.62%  -1.85%  -0.49% -0.95% -0.85% -0.57% -2.30%  1.00%  1.81%
 1.46% -1.06%   0.48%  -0.88% -1.19% -0.70% -1.27% -1.22% -2.54%  0.68%
 1.46%  0.40%  -0.44%  -1.59% -1.45% -0.55% -1.12% -1.36% -0.75% -0.25%
 0.95%  0.26%  -0.37%  -1.07%   W      W    -0.73% -1.04% -1.16% -0.65%
 1.38%  0.70%   0.54%   0.56%   W      W    -1.91% -1.80% -1.51% -1.30%
 0.81%  0.49%   0.10%   0.58%  0.46% -1.54% -2.34% -1.50% -1.06% -0.26%
 0.54%  0.53%   0.64%   0.00%  0.27% -0.92% -0.98% -0.24% -2.81%  0.43%
 1.00%  0.73%   0.53%   0.49%  0.43% -0.26% -0.39% -2.07% -0.20%  0.60%
 0.76%  0.91%   0.54%   0.72%  1.02%  0.42%  0.71%  0.71%  0.61%  0.71%
```

Mean Error	-0.11%
Standard Deviation	1.12%
Maximum Error	2.35%
Maximum Error-Non Gad	2.35%

Figure 9 CPM-3 to CM-PRESTO Pin Power Comparison
G1= 5 G/T 40%, G2=10 G/T 40%, A1= 0 G/T 40%

Bundle G1 40% Void, Exposure=10 G/T

```
-1.61%
-1.78% -0.86%                                          Mean Error              0.03%
-1.55% -0.97%  -0.10%                                  Standard Deviation      1.01%
-1.64% -0.57%   0.39%    W                             Maximum Error           1.97%
-0.65% -0.45%   0.19%    W      W                      Maximum Error-Non Gad   1.97%
-0.75%  0.10%   0.70%  0.98%  1.79%  1.97%
-0.97%  0.21%   0.70%  1.25%  1.22%  0.96%  0.90%
-0.30% -0.30%   0.59%  1.26%  1.10%  0.21% -0.54% -0.33%
                                        Control Blade
```

Bundle G2 40% Void, Exposure=25 G/T

```
        Control Blade
-0.63%
-0.53%  0.76%
 0.00%  0.52%   1.10%                                  Mean Error             -0.01%
 0.90%  0.70%   0.88%    W                             Standard Deviation      0.61%
 1.07%  0.63%   0.10%    W      W                      Maximum Error           1.10%
 0.30%  0.39%   0.21% -0.28%  0.10% -0.29%             Maximum Error-Non Gad   1.10%
-0.20%  0.41%   0.10% -0.42% -0.48% -0.73% -0.50%
 0.10% -0.30%  -0.29% -0.19% -1.05% -1.07% -0.97% -0.51%
```

Bundle A1 40% Void, Exposure=00 G/T

```
                                            Control Blade
0.51%  0.51%   0.34% -0.34% -1.37% -0.81% -0.51%  0.34%  1.38%  1.74%
0.52% -0.20%  -3.30% -1.15% -1.51% -1.32% -1.02% -3.04%  0.50%  1.56%
0.70% -2.57%  -0.35% -1.50% -1.88% -1.12% -1.55% -1.59% -2.81%  0.70%    Mean Error             -0.14%
0.71% -0.29%  -1.08% -2.85% -2.10% -0.82% -1.23% -1.37% -0.85%  0.00%    Standard Deviation      1.21%
0.51% -0.17%  -0.91% -1.63%    W      W   -0.64% -0.88% -0.93% -0.08%    Maximum Error           2.04%
1.19%  0.60%   0.45%  0.46%    W      W   -1.36% -1.20% -0.87% -0.34%    Maximum Error-Non Gad   2.04%
0.90%  0.58%   0.20%  0.58%  0.74% -0.88% -1.86% -0.88% -0.30%  0.72%
0.72%  0.27%   0.64%  0.20%  0.72% -0.28% -0.33%  0.36% -1.86%  1.44%
1.18%  0.94%   0.53%  0.69%  0.87%  0.35%  0.50% -1.07%  0.63%  1.71%
0.97%  1.28%   0.91%  1.18%  1.56%  1.13%  1.56%  1.56%  1.55%  2.04%
```

Figure 10 CPM-3 to CM-PRESTO Pin Power Comparison
G1=10 G/T 40%, G2=25 G/T 40%, A1= 0 G/T 40%

Bundle G1 40% Void, Exposure=10 G/T
(CPM3-CMP)/CMP*100

-2.14%							
-2.19%	-1.13%						
-1.89%	-1.17%	-0.19%					
-1.89%	-0.66%	0.48%	**W**				
-0.82%	-0.56%	0.38%	**W**	**W**			
-0.93%	0.20%	0.70%	1.28%	2.10%	2.09%		
-1.06%	0.21%	0.80%	1.37%	1.44%	1.08%	1.03%	
-0.41%	-0.30%	0.69%	1.47%	1.32%	0.32%	-0.33%	0.00%

Control Blade

Mean Error	0.04%
Standard Deviation	1.19%
Maximum Error	2.10%
Maximum Error-Non Gad	2.10%

Bundle G2 40% Void, Exposure=45 G/T

Control Blade

-1.40%							
-1.08%	0.41%						
-0.40%	0.30%	0.59%					
0.39%	0.39%	0.29%	**W**				
0.59%	0.41%	-0.29%	**W**	**W**			
0.30%	0.30%	0.10%	-0.38%	-0.10%	-0.20%		
-0.20%	0.52%	0.10%	-0.21%	-0.30%	-0.21%	0.00%	
-0.10%	0.10%	0.20%	0.40%	-0.40%	-0.30%	-0.31%	0.40%

Mean Error	0.00%
Standard Deviation	0.45%
Maximum Error	0.59%
Maximum Error-Non Gad	0.59%

Bundle A1 40% Void, Exposure=00 G/T

Control Blade

-0.20%	0.00%	-0.08%	-0.75%	-1.74%	-1.19%	-0.75%	0.17%	1.20%	1.85%
0.00%	-0.58%	-4.23%	-1.50%	-1.81%	-1.48%	-1.02%	-3.54%	0.40%	1.75%
0.26%	-3.27%	-0.80%	-1.89%	-2.13%	-1.20%	-1.55%	-1.72%	-3.61%	0.97%
0.26%	-0.67%	-1.28%	-3.33%	-2.27%	-0.81%	-1.12%	-1.38%	-0.77%	0.35%
0.17%	-0.43%	-1.17%	-1.81%	**W**	**W**	-0.37%	-0.62%	-0.69%	0.34%
1.01%	0.43%	0.44%	0.46%	**W**	**W**	-0.98%	-0.84%	-0.44%	0.35%
0.71%	0.48%	0.20%	0.69%	0.93%	-0.49%	-1.88%	-0.56%	0.10%	1.57%
0.72%	-0.26%	0.63%	0.30%	0.90%	0.09%	0.11%	0.74%	-1.91%	2.24%
1.17%	0.94%	0.00%	0.78%	1.05%	0.72%	0.92%	-1.10%	0.97%	2.53%
0.86%	1.27%	1.00%	1.18%	1.74%	1.40%	1.87%	1.88%	1.97%	2.91%

Mean Error	-0.15%
Standard Deviation	1.40%
Maximum Error	2.91%
Maximum Error-Non Gad	2.91%

**Figure 11 CPM-3 to CM-PRESTO Pin Power Comparison
G1=10 G/T 40%, G2=45 G/T 40%, A1= 0 G/T 40%**

Bundle G1 40% Void, Exposure=10 G/T
(CPM3-CMP)/CMP*100

-1.94%								
-2.01%	-0.94%							
-1.80%	-0.95%	0.00%						
-1.80%	-0.47%	0.58%	**W**					
-0.73%	-0.45%	0.47%	**W**	**W**				
-1.03%	0.20%	0.82%	1.28%	2.00%	1.88%			
-1.06%	0.31%	1.00%	1.26%	1.24%	0.76%	0.46%		
-0.20%	0.10%	0.99%	1.57%	1.12%	-0.11%	-0.99%	-0.88%	

Control Blade

Mean Error	0.02%
Standard Deviation	1.13%
Maximum Error	2.00%
Maximum Error-Non Gad	2.00%

Bundle G2 00% Void, Exposure=45 G/T

Control Blade

-1.19%							
-0.21%	2.23%						
0.41%	2.67%	3.27%					
0.91%	2.49%	2.73%	**W**				
0.71%	1.96%	1.84%	**W**	**W**			
0.00%	1.19%	1.32%	0.38%	-0.10%	-1.05%		
-0.72%	0.62%	0.29%	-0.51%	-1.34%	-2.03%	-2.32%	
-1.01%	-0.61%	-0.70%	-1.18%	-2.45%	-2.87%	-3.10%	-2.59%

Mean Error	-0.03%
Standard Deviation	1.74%
Maximum Error	3.27%
Maximum Error-Non Gad	3.27%

Bundle A1 40% Void, Exposure=00 G/T

Control Blade

1.20%	1.44%	1.19%	0.34%	-0.88%	-0.64%	-0.51%	0.42%	1.70%	2.71%
1.20%	0.69%	-3.04%	-0.86%	-1.42%	-1.73%	-1.66%	-5.26%	0.49%	2.71%
1.40%	-2.31%	-0.23%	-1.60%	-2.15%	-1.98%	-2.78%	-3.14%	-6.27%	1.86%
1.33%	0.00%	-0.97%	-3.37%	-2.76%	-2.07%	-2.78%	-2.98%	-1.57%	0.93%
1.01%	0.09%	-0.92%	-2.03%	**W**	**W**	-2.17%	-2.42%	-1.74%	0.57%
1.89%	1.13%	0.54%	0.28%	**W**	**W**	-3.09%	-2.83%	-1.70%	0.16%
1.72%	1.28%	0.51%	0.70%	0.38%	-2.16%	-4.26%	-2.52%	-1.18%	1.40%
1.74%	1.08%	1.29%	0.51%	0.64%	-1.23%	-1.79%	-1.33%	-6.07%	2.30%
2.31%	2.14%	1.63%	1.30%	1.25%	0.00%	-0.51%	-3.78%	0.31%	2.69%
2.43%	2.80%	2.43%	2.52%	2.67%	1.60%	1.60%	1.59%	1.94%	3.23%

Mean Error	-0.22%
Standard Deviation	2.11%
Maximum Error	3.23%
Maximum Error-Non Gad	3.23%

Figure 12 CPM-3 to CM-PRESTO Pin Power Comparison
G1=10 G/T 40%, G2=45 G/T 00%, A1= 0 G/T 40%