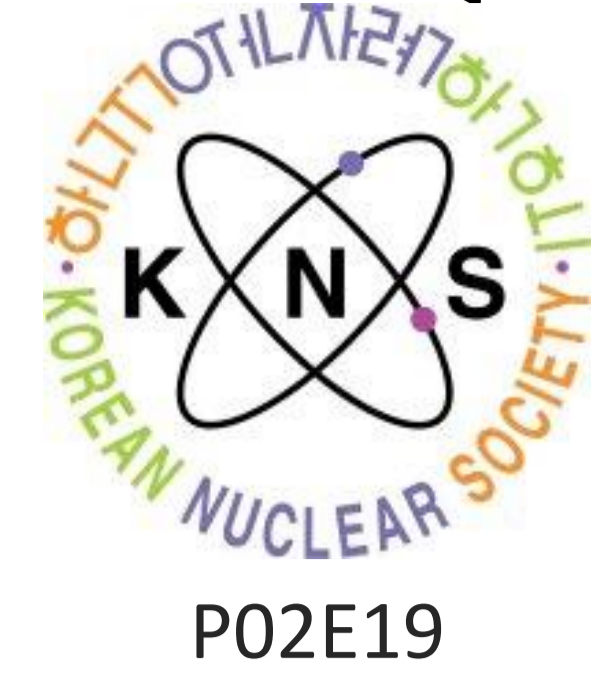


Application of MCS Code to Yonggwang Unit 3 Cycle 1 BOC Analysis

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INTRODUCTION

- A in-house MC code of CORE at UNIST, MCS
- Large scale reactor analysis with 3-D geometry and various feedbacks
- Solve large-scale reactor to Yonggwang Unit 3 Cycle 1 at BOC
- Comparison to the in-house two step code system STREAM/RAST-K 2.0.

CBC Comparison

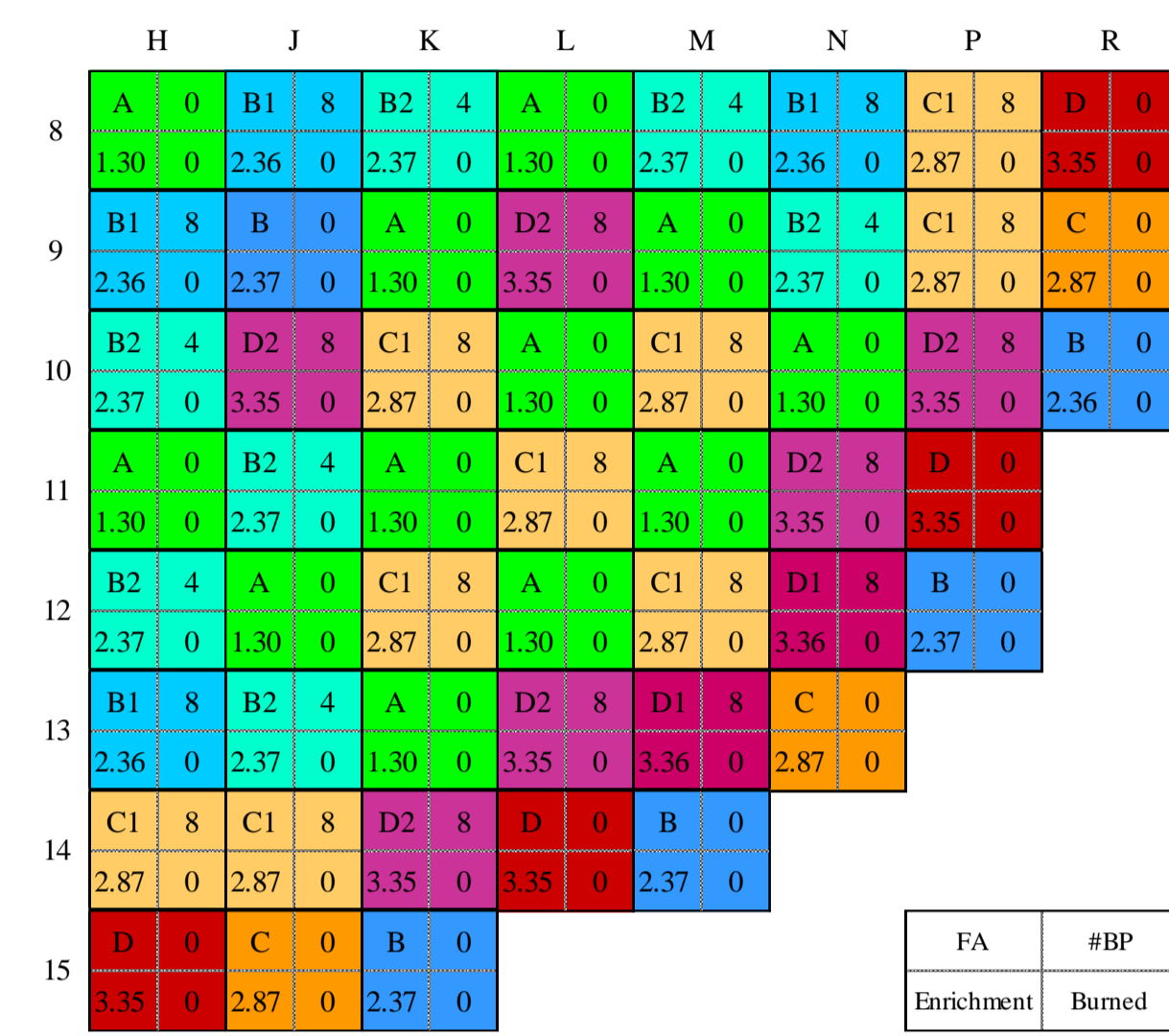
Core status	Critical Boron Concentration (ppm)			Differences (ppm)	
	NDR	ST/R2	MCS	MCS-NDR	MCS-ST/R2
HZP	-	1115	1114±1	-	-1
HFP	802	790	796±1	-6	6

YGN3 CORE DESIGN

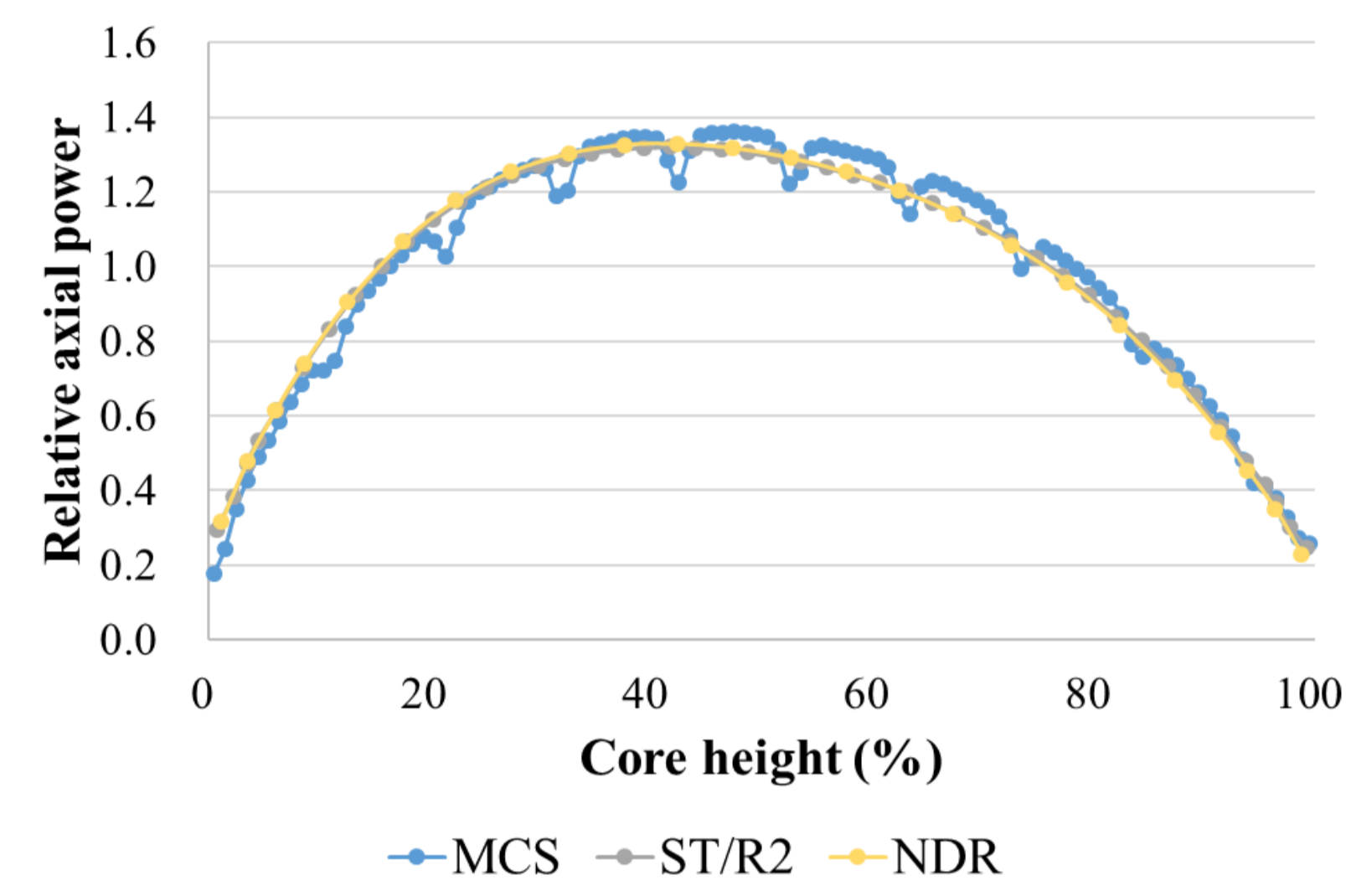
Core Parameters of YGN3

Parameters	Value	Unit
Reactor type	PWR	
Thermal power	2815	MWt
Number of FAs	177	
Fuel rods at each FA	236	
FA type	16x16	
Fuel material	UO ₂	
BA material	Gd ₂ O ₃	
Active core height	381	cm

Loading Pattern



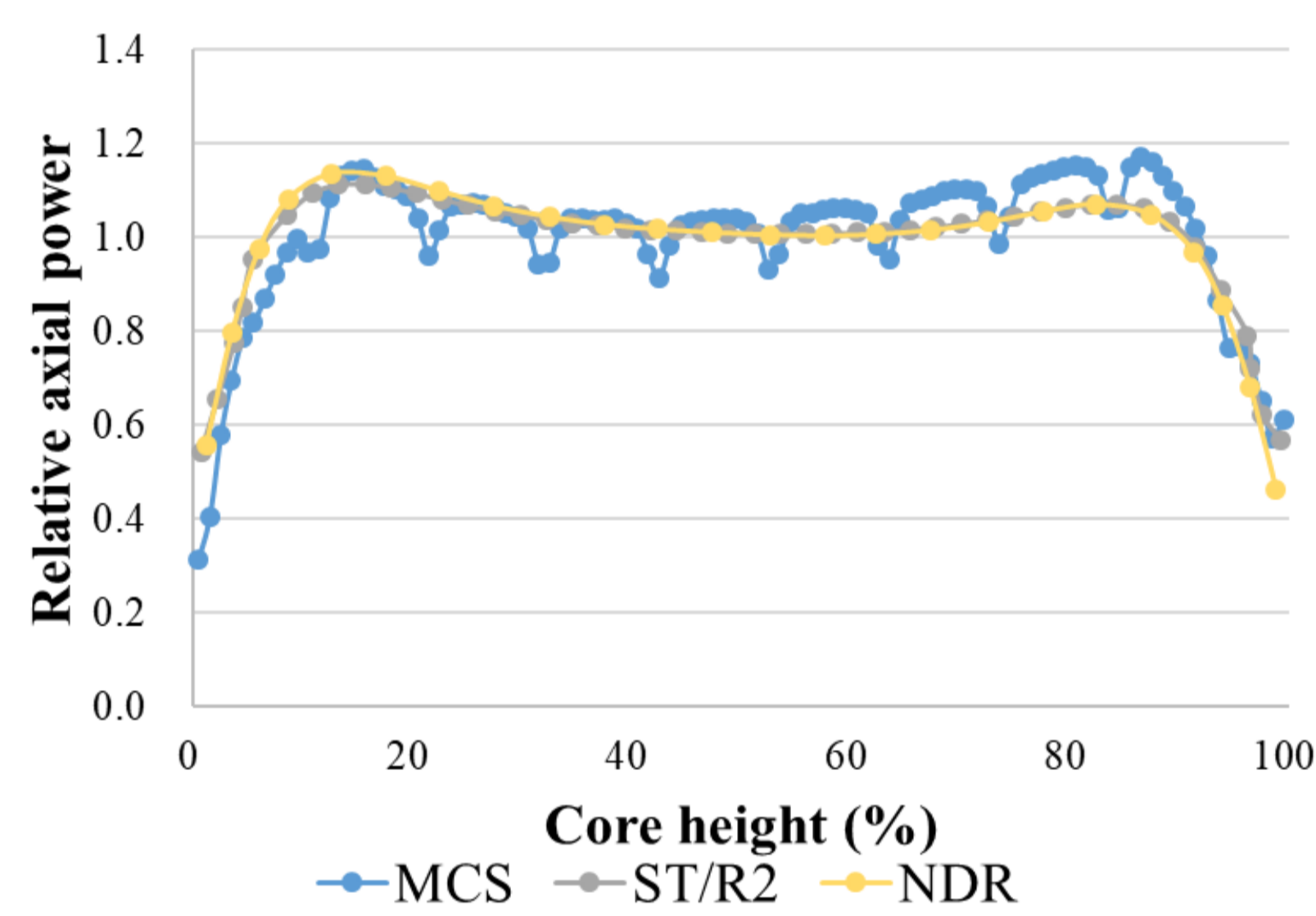
Axial Power Distribution (BOC)



Radial Power Distributions (BOC)

	H	J	K	L	M	N	P	R
8	0.850	1.036	1.201	0.866	1.186	1.042	1.182	0.980
9	0.815	1.016	1.184	0.847	1.189	1.052	1.204	1.000
10	1.036	1.250	0.876	1.263	0.857	1.193	1.145	0.839
11	1.184	0.849	1.156	0.807	1.161	0.851	1.124	0.577
12	1.201	0.876	1.174	0.824	1.162	0.852	1.104	0.574
13	1.184	0.849	1.156	0.807	1.161	0.851	1.124	0.577
14	1.201	0.876	1.174	0.824	1.162	0.852	1.104	0.574
15	1.184	0.849	1.156	0.807	1.161	0.851	1.124	0.577

Axial Power Distribution (EOC)

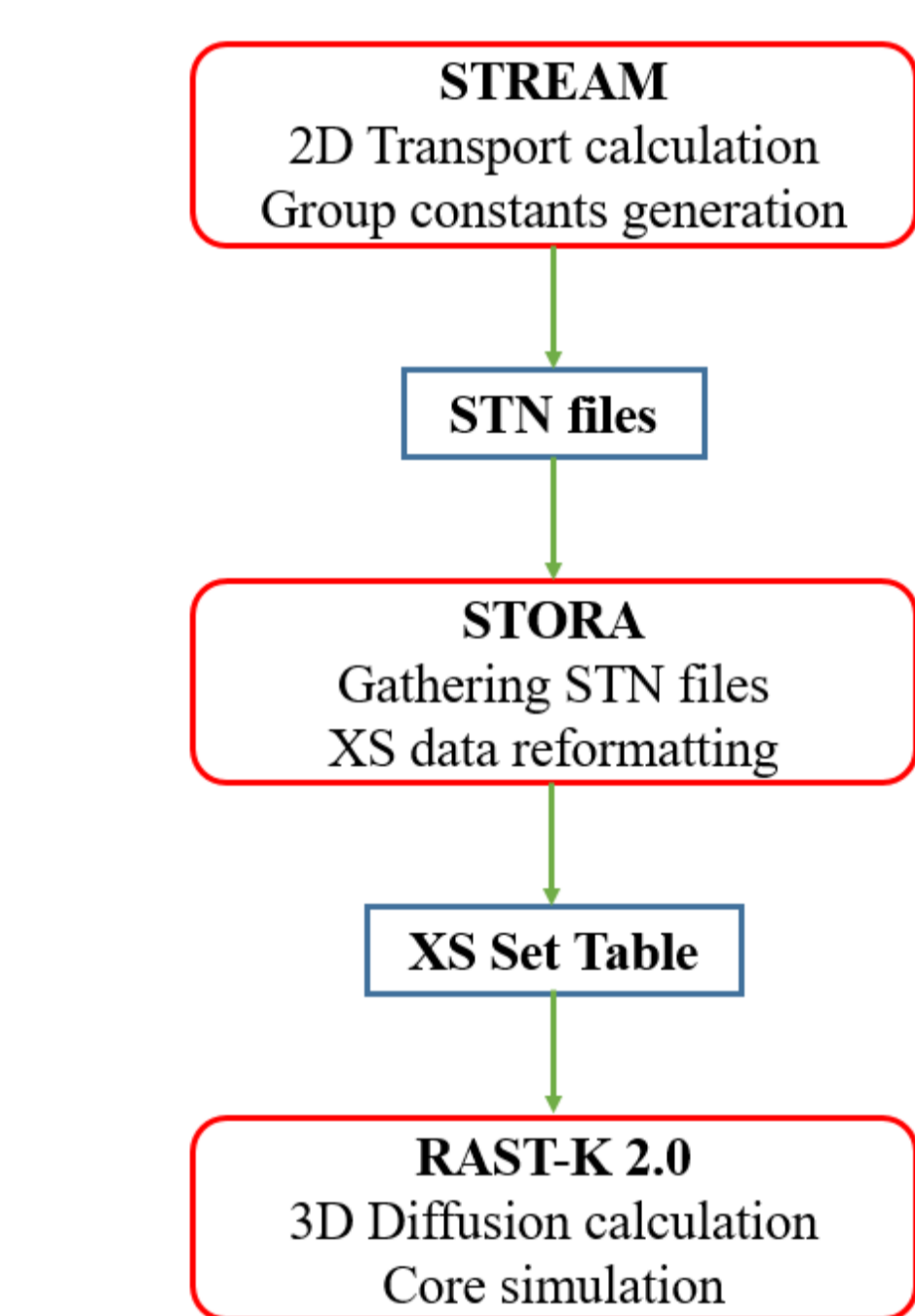


Radial Power Distributions (EOC)

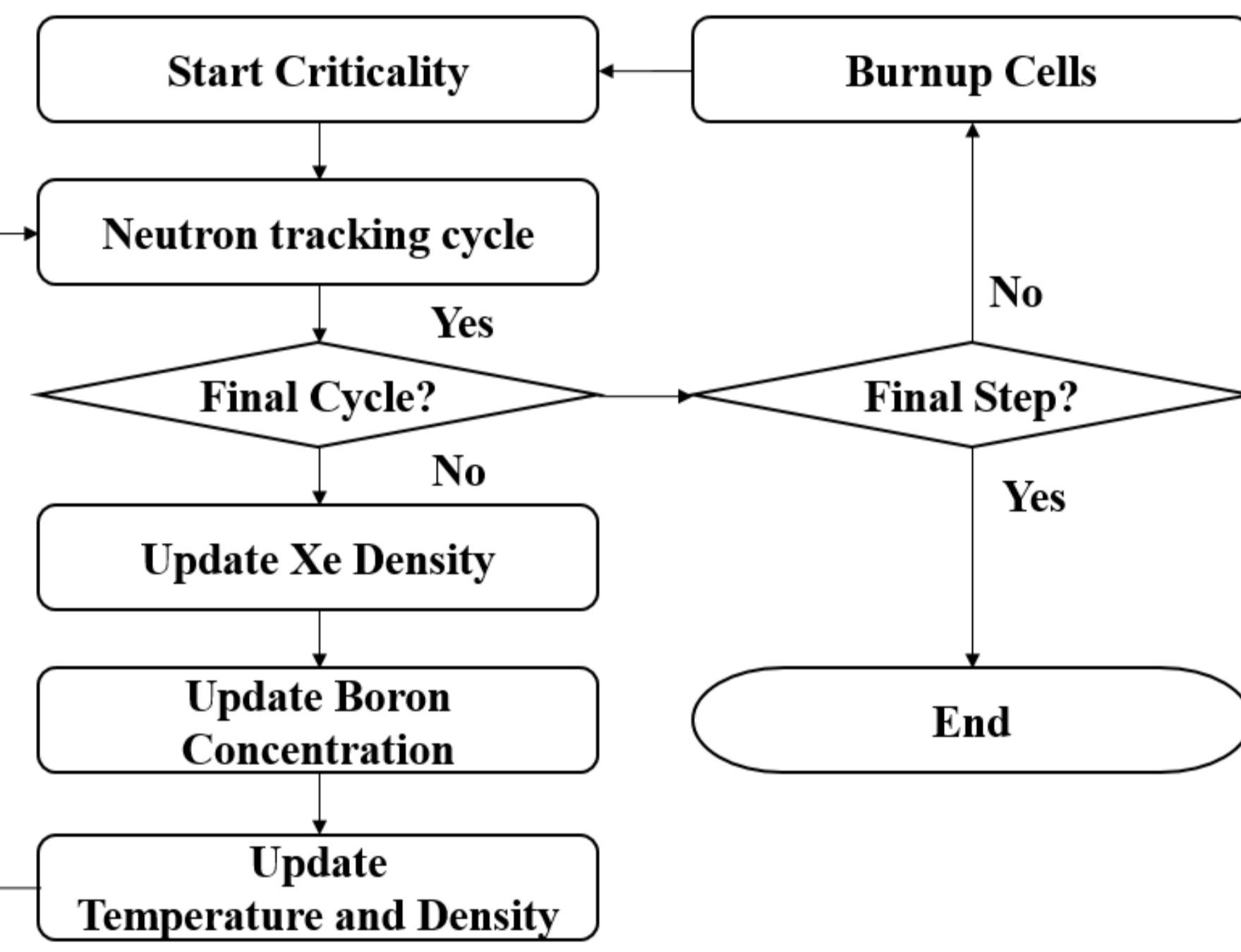
	H	J	K	L	M	N	P	R
8	0.957	1.092	1.135	0.955	1.123	1.090	1.124	0.841
9	0.935	1.072	1.119	0.946	1.120	1.086	1.129	0.856
10	1.092	1.139	0.958	1.246	0.950	1.118	1.095	0.793
11	1.072	1.121	0.946	1.236	0.945	1.119	1.104	0.768
12	1.135	0.956	1.195	0.960	1.182	0.923	1.055	0.561
13	1.119	0.946	1.181	0.953	1.176	0.929	1.065	0.571
14	1.090	1.118	0.923	1.173	1.069	0.687	1.044	0.574
15	1.086	1.119	0.929	1.183	1.080	0.699	1.044	0.574

CODE DESCRIPTION

STREAM/RAST-K Flowchart



MCS Flowchart

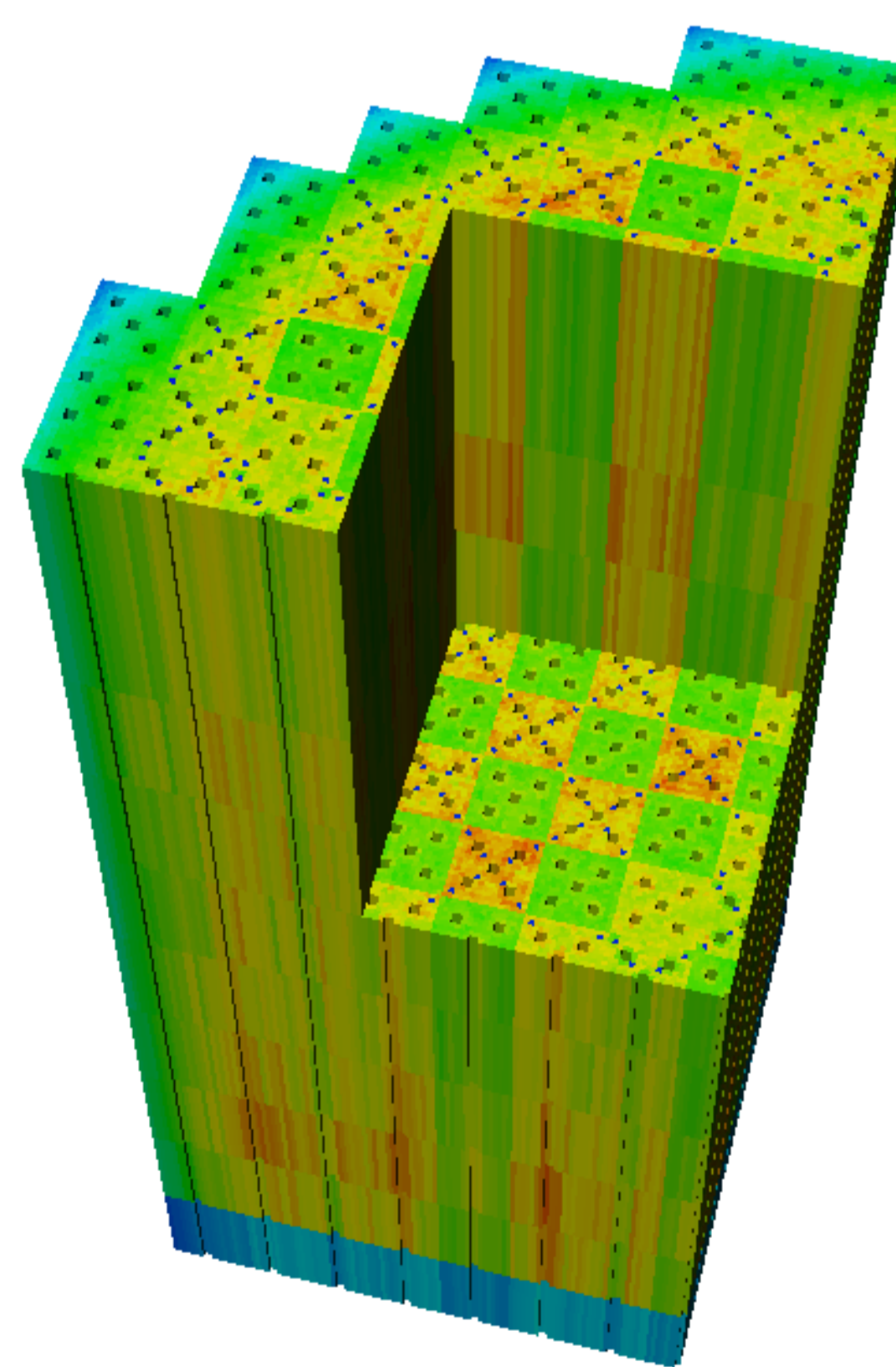


RESULTS

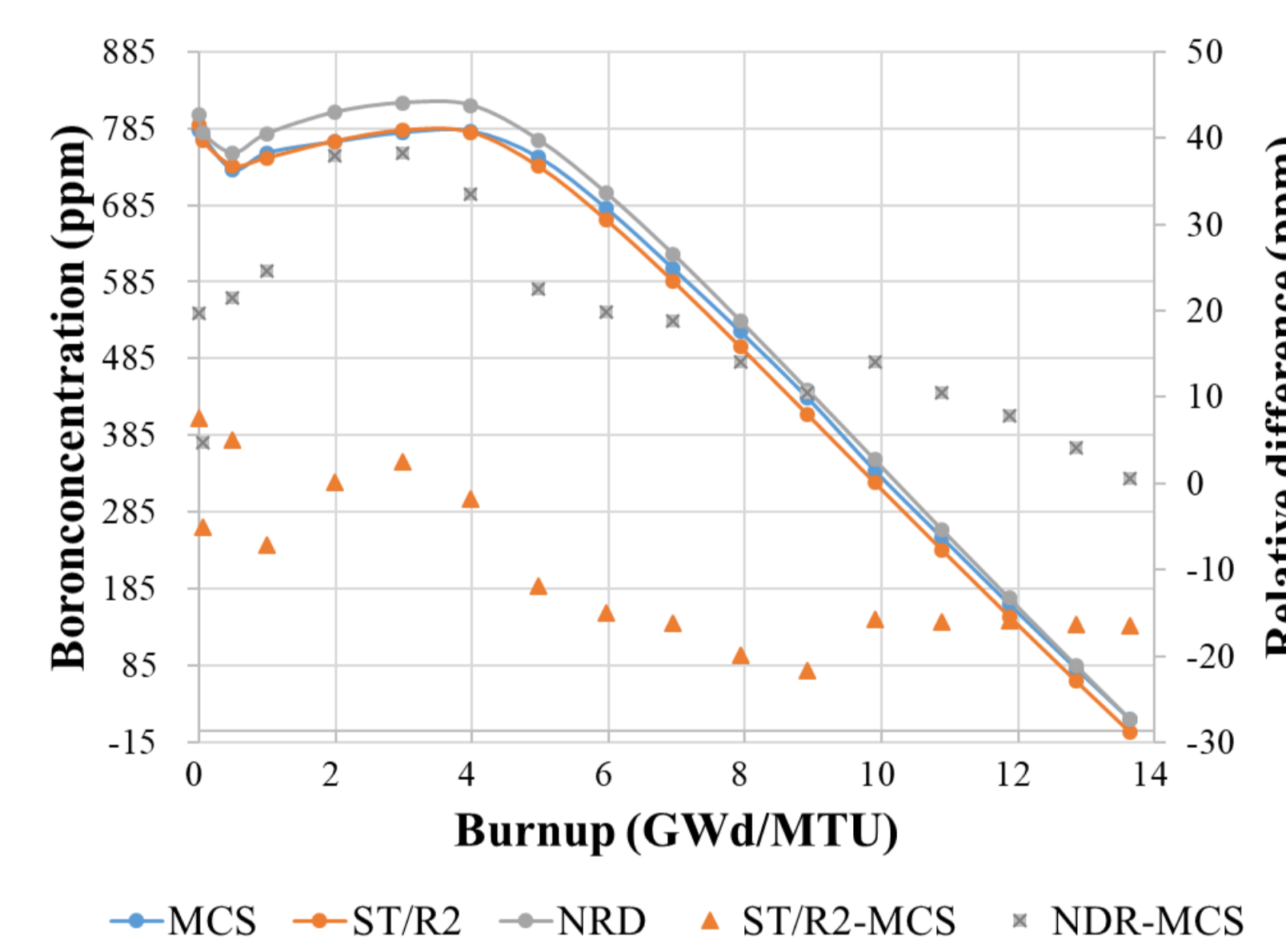
Summary of MCS and ST/R2 Simulation

	HZP	HFP
Power	2815 MW(t)	2815 MW(t)
Power Rating	0 %	100 %
Pressure	158.18 kg/cm ²	158.18 kg/cm ²
Inlet temperature	600K	569.26K
Control rods	All rods out	All rods out
TH feedback	Off	On
Equi-Xenon	Off	On
OpenW library	Off	On
XS library	ENDF-B/VII.1	ENDF-B/VII.1

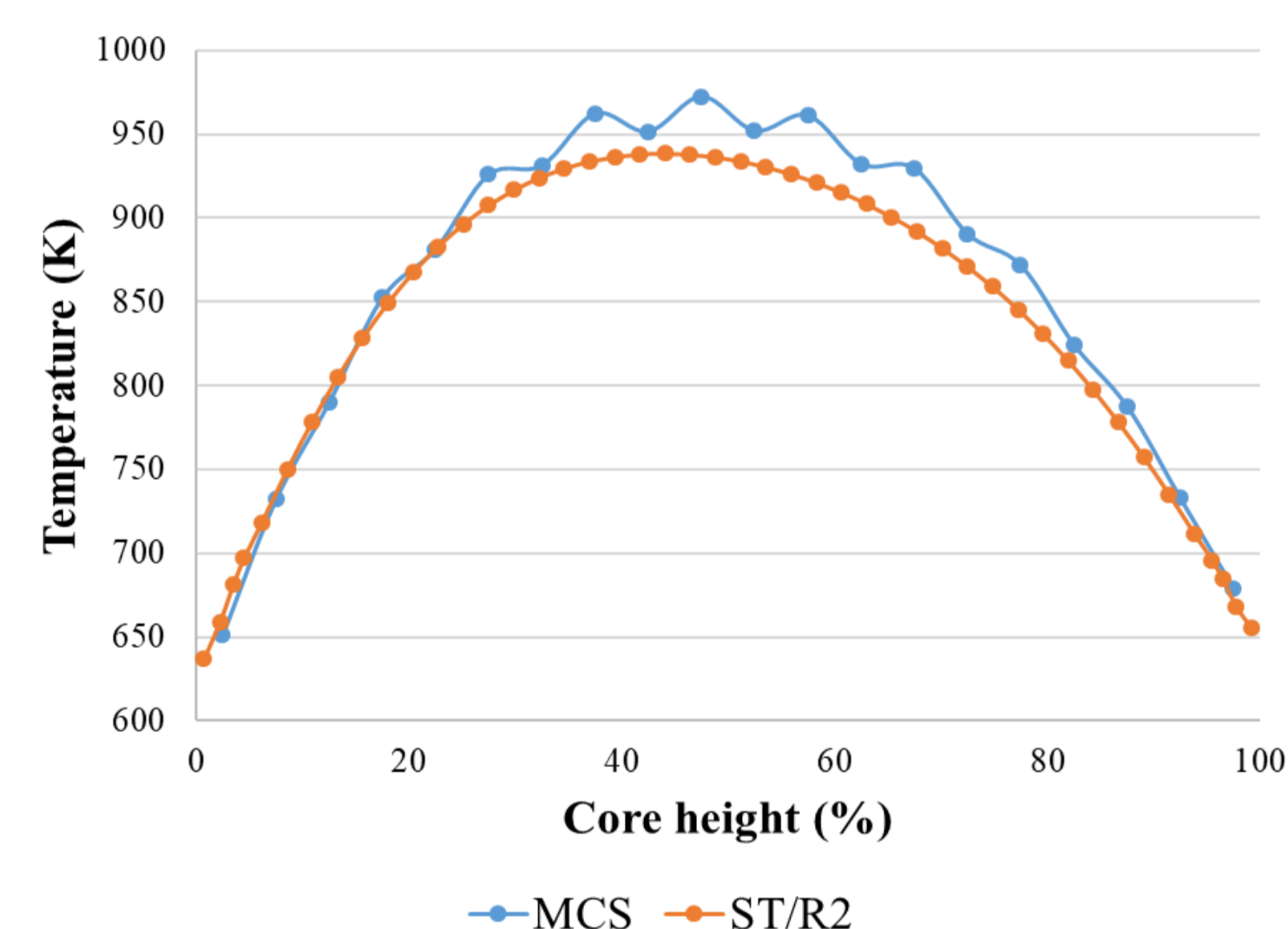
Power distribution (EOC)



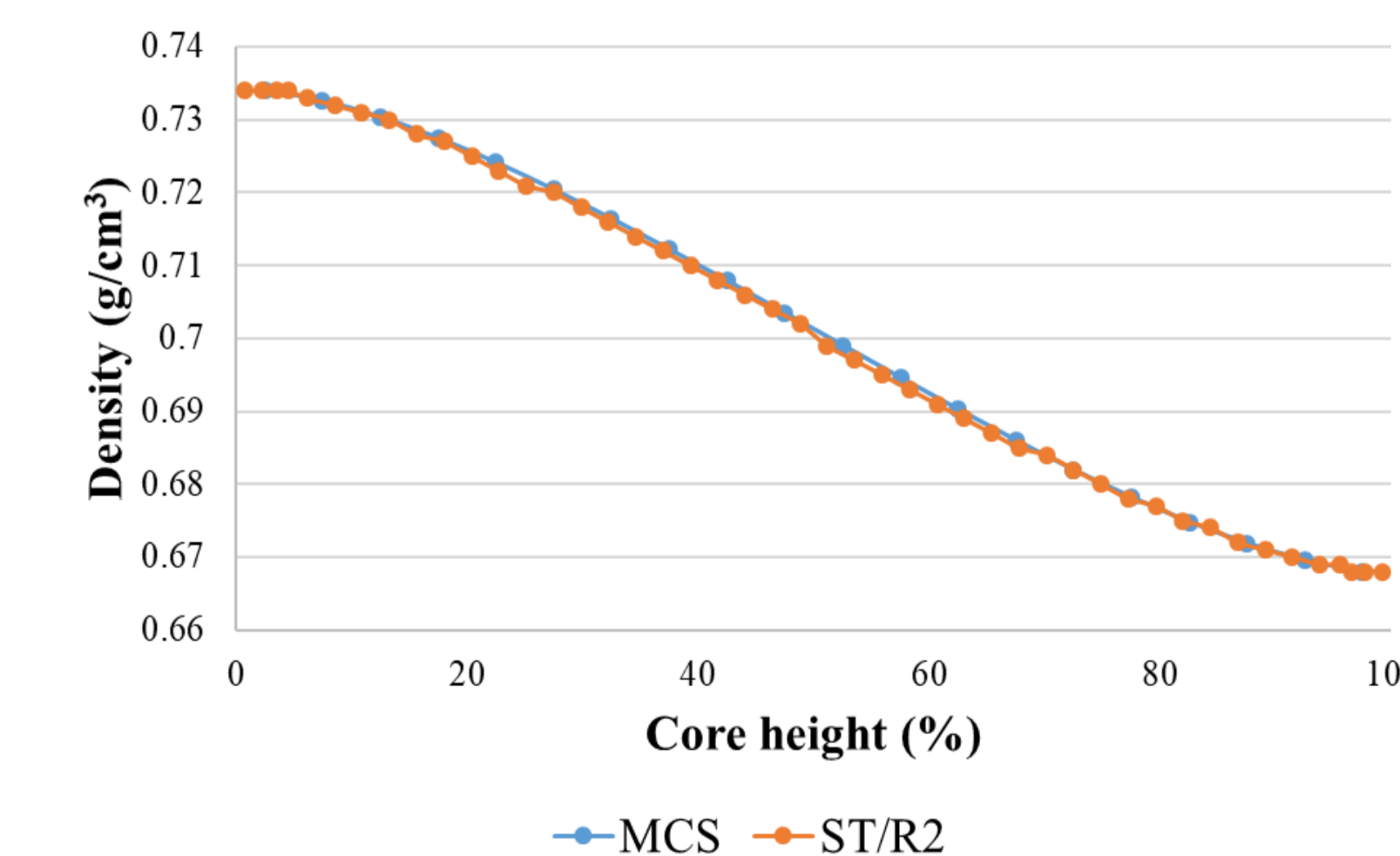
Critical Boron Concentration



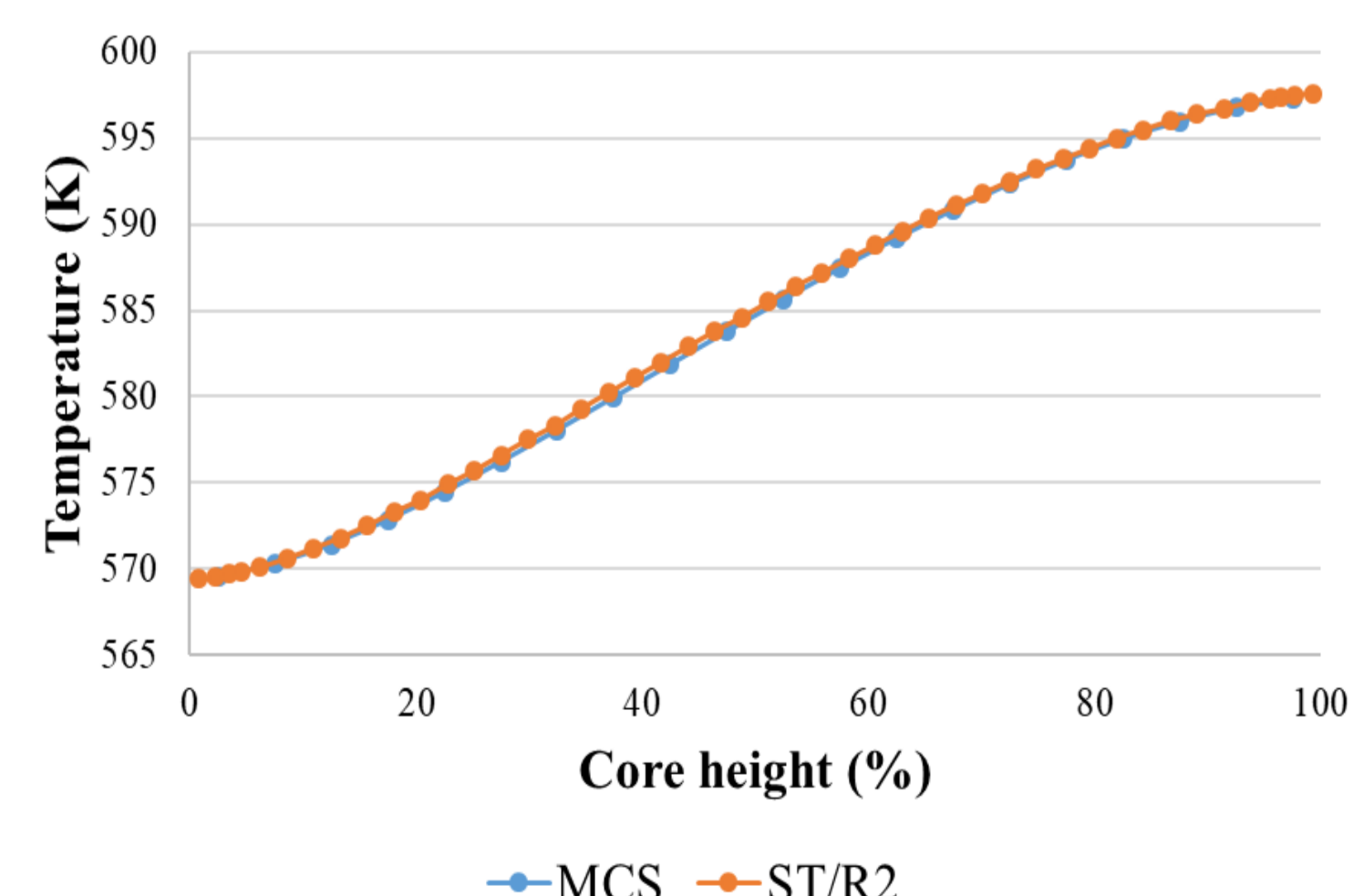
Axial Fuel Temperature



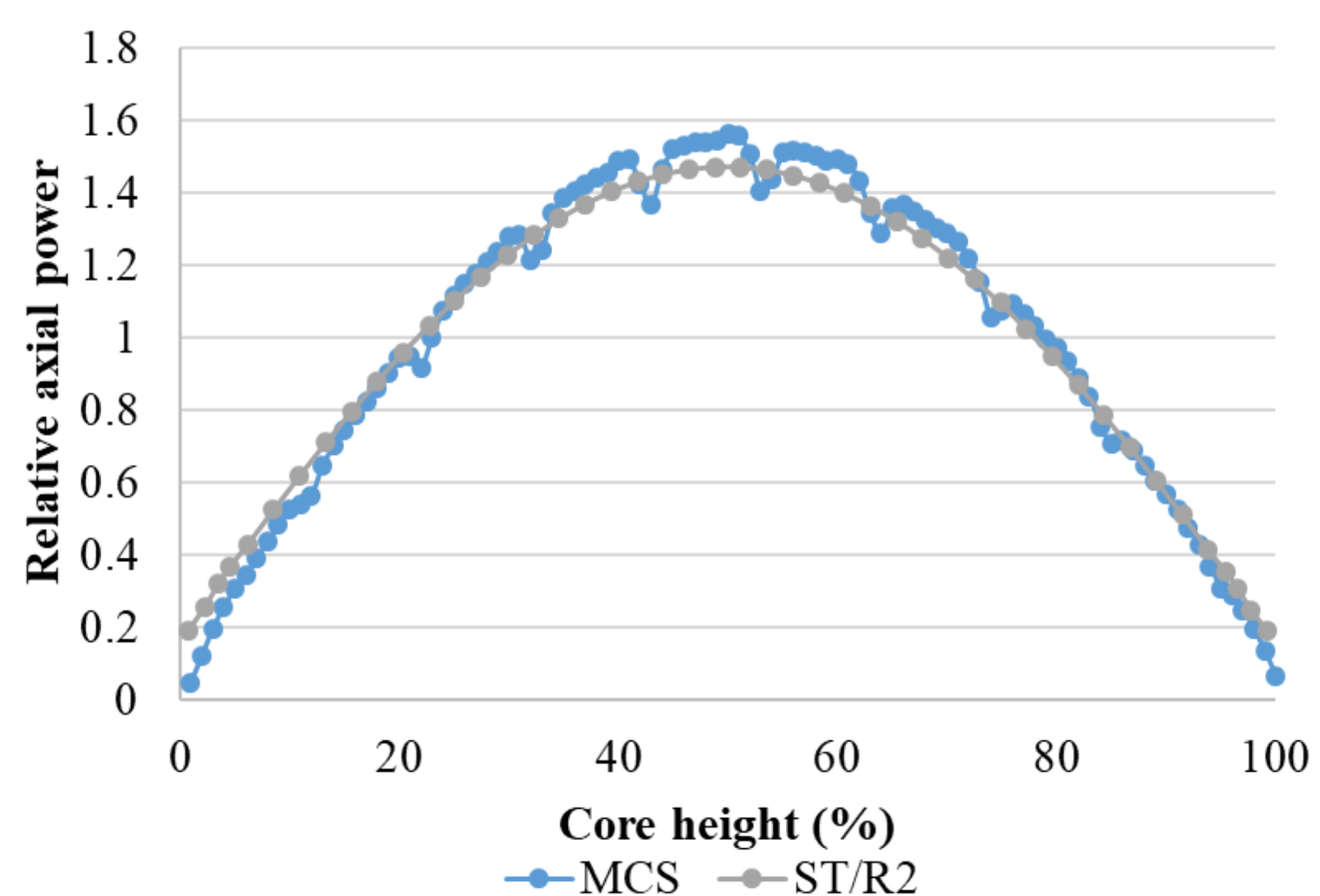
Axial moderator density



Axial Moderator Temperature



Axial Power Distribution (HZP)



Radial Power Distributions (HZP)

	H	J	K	L	M	N	P	R
8	0.783	0.983	1.154	0.829	1.181	1.063	1.231	1.016
9	0.793	1.005	1.181	0.834	1.205	1.076	1.249	1.022
10	1.217	2.292	2.322	0.547	2.053	1.230	1.532	0.559
11	0.983	1.194	0.821	1.251	0.838	1.224	1.190	0.859
12	1.005	1.207	0.831	1.270	0.839	1.235	1.202	0.862
13	2.292	1.093	1.164	1.510	0.152	0.923	0.991	0.393
14	1.154	0.821	1.143	0.796	1.169	0.851	1.138	0.575
15	1.181	0.831	1.157	0.793	1.176	0.850	1.149	0.571

DISCUSSION AND SUMMARY

- The Yonggwang Unit 3 core cycle 1 was simulated by MCS. The CBC, axial power, assembly wise power, axial fuel temperature, moderator temperature distribution at BOC were obtained by MCS and ST/R2.
- The comparison between MCS and ST/R2 results shows good agreement.
- In the future, the whole core depletion analysis for Yonggwang unit 3 multi-cycle will be conducted for further analysis of MCS.