SCIENTIFIC NOTEBOOK 916E
Volume 1 of 1

JRW 6/29/09

Maintained by Oleg Povetko

SCIENTIFIC NOTEBOOK 916E
Volume 1

Oleg Povetko

Southwest Research Institute
Center for Nuclear Waste Regulatory Analyses
San Antonio, Texas

INITIAL ENTRIES

Scientific Notebook: No. 916E Volume 1

Issued to: Oleg Povetko

Issue Date: 11/26/2007

Account Number: 20.14004.02.001
20.14004.02.001 (new account number added 01/02/2008 op)

Project Title: Technical Assistance to the Division of Spent Fuel Storage and Transportation for Transportation Aging and Disposal Canister Design

Participants: Oleg Povetko (OP), Alexei Kouznetsov (AK),(Tom Baker Cancer Center, Calgary, Canada)

Objective: document activities related to the SFST TAD project

Goal of Project
The objective of this project is to assist NRC staff in preparing for potential technical issues related to the certification of TAD designs under 10 CFR Parts 71 and 72.

11/26//2007 (AK) (OP)

We estimated the total thermal output of the PWR CSNF assembly using reactor campaign, assembly irradiation history, and assembly parameters from "PWR Source Term Generation and Evaluation, Rev 0B, 2004" DOE AMR. These data was used as input for ORIGEN-ARP code. Input/output files are stored on DVD.

#10/01/07

ORIGEN-ARP depletion model developing for heating tally estimation based on South Texas reactor campaign based on data available from "PWR Source Term Generation and Evaluation, Rev 0B, 2004" AMR

I. Assembly Type and its Operating Parameters

Source:	*PWR Source Term Generation and Evaluation*
Document Identifier	*000-00C-MGR0-00100-000-00B*
Pages:	*Page 24 of 33*

The moderator temperature	578	K
Density of the moderator	0.7136	g/cm^3
Thermal Reactor Power	2568	MWt
Assemblies in a core	177	
Power/Assembly	14.50847	MWt
MTU per Assembly	0.46363	MTU
Assembly	15 × 15 for Babcock & Wilcox and	

Enrichement:

See: PWR Source Term Generation and Evaluation, Document Identifier: 000-00C-MGR0-00100-000-00B Page 27 of 33

- Average PWR assembly: 4.0%, 48 GWd/MTU, 25 years cooling time
- Maximum PWR assembly: 5.0%, 80 GWd/MTU, 5 years cooling time

<u>Maximum PWR assembly:</u>

BurnUp	78.25865	GWd/MTU
BurnUp Days	2500.818	days

<u>Average PWR assembly:</u>

BurnUp	48	GWd/MTU
BurnUp Days	1533.9	days

Fuel Type is selected from the list of fuel types and is input for all compositions listed on the first composition screen.

The fuel assembly types include:

8 × 8 (for BWR fuel),PWR fuel).
14 × 14 (for ABB Combustion Engineering–type PWR fuel with large water holes)
w15x15 15 × 15 for Babcock & Wilcox and
17 × 17 - Westinghouse–type

No new entries on this page

#10/02/07
OrigenARP calculation cases developing for different assembly types for average and maximum PWR assemblies.

Table 10/02/07-1. OrigenARP Calculation Cases for Different Assembly Types for Average and Maximum PWR Assemblies

Assembly Type:		BWR fuel	ABB Combustion Engineering–type PWR fuel with large water holes	Babcock & Wilcox	Westinghouse–type
		ge 8×8-4	w14×14	w15×15	w17×17
Burnup / Enrichment:		8	14	15	17
			Calculation Case Codes		
Average PWR assembly (4.0%, 48 GWd/MTU)	**A**	**A8**	**A14**	**A15**	**A17**
Maximum PWR Assembly (5.0%, 80 GWd/MTU)	**M**	**M8**	**M14**	**M15**	**M17**

#10/03/07
OrigenARP calculations performing and verifying for spectra, nuclide densities and total gamma energy release rates estimation to be inputted into the MCNP software

Table 10/03/07-1. OrigenARP Input / Output Files

Code	**OrigenARP Input/Output**
A8	**Origen ARP\A8.inp; Origen ARP\A8.out**
A14	**Origen ARP\A14.inp; Origen ARP\A14.out**
A15	**Origen ARP\A15.inp; Origen ARP\A15.out**
A17	**Origen ARP\A17.inp; Origen ARP\A17.out**
M8	**Origen ARP\M8.inp; Origen ARP\M8.out**
M14	**Origen ARP\M14.inp; Origen ARP\M14.out**
M15	**Origen ARP\M15.inp; Origen ARP\M15.out**
M17	**Origen ARP\M17.inp; Origen ARP\M17.out**

Table 10/03/07-2. OrigenARP Total Gamma Energy Release Rates after 100 Years of Decay

Code	Total Gamma Energy Release Rates, 100 Years Decay Time
	[Watts/basis]
A8	26.2
A14	26.1
A15	26.1
A17	26.1
M8	40.6
M14	40.6
M15	40.6
M17	40.6

No new entries on this page

#10/04/07
Track length cell energy deposition tallies investigation as a MCNP primary method for heating tallies calculation

[MCNP5_manual_VOL_II.pdf, p. 2.83]

C. Track Length Cell Energy Deposition Tallies

The F6 cell heating tallies are track length flux tallies modified to tally a reaction rate convolved with an energy-dependent heating function instead of a flux [1]. The derivation of such modified track length estimators along the lines of the derivation of the track length flux estimator in subsection B.1 on page 2–82 is straightforward. The heating tallies are merely flux tallies (F4) multiplied by an energy-dependent multiplier (FM card); the equivalence is shown in this section.

$$\text{F6} \qquad WT_l\sigma_t(E)H(E)\frac{\rho_a}{m} \qquad H_t = \frac{\rho_a}{m}\int dE\int dt\int dV\int d\Omega\ \sigma_t(E)H(E)\psi(\vec{r},\hat{\Omega},E,t) \qquad \text{MeV/g} \qquad [1]$$

The units of the heating tally are MeV/g.

MCNP computes heating as specified in [1], with a heating function [$H(E)$ or Q] modifying a track length reaction rate tally. In other words, the average energy deposited for all reactions at the incident particle energy is used in the tally, **regardless of the actual reaction that might be sampled at the next collision**.

The heating functions are tabulated in the nuclear data by incident energy.
Great care should be taken to understand exactly what the heating functions include and how they were computed.
The functions $H(E)$ from [1]are generally defined and computed for tabulation in the data tables as follows:
F6 Photons

$$H(E) = E - \sum_{i=1}^{3} p_i(E)[\bar{E}_{i,out}(E)] \qquad [2]$$

Where

i = 1 -> incoherent (Compton) scattering with form factors
i = 1 -> pair production; $E_{iout}E = 2m_0c^2$ = 1.022016 MeV
i = 3 -> photoelectric absorption;

p_iE = probability of reaction i at gamma incident energy E
$E_{iout}E$ = average exiting gamma energy for reaction i at neutron incident energy E.

All energy transferred to electrons is assumed to be deposited locally.

The photon heating tally also can be checked against the *F8 energy deposition tally by dividing the F6 tally by a unit mass with the SD card. Results will only be statistically identical because the tallies are totally independent and use different estimators.

No new entries on this page

#10/05/07
MCNP calculations cases developing for different assembly types for average and maximum PWR assemblies and different source distributions

Table 10/05/07-1 MCNP Calculations Cases for different Assembly Types for Average and Maximum PWR Assemblies and Different Source Distributions

Case	Phys:(N/G)	Assembly***	Source*	Years	Absorber Plates**
Neutrons					
N_M_P_Y100_APB11	N	M	P	100	B11
N_M_C_Y100_APB11			C		
N_M_P_Y500_APB11			P	500	
N_M_C_Y500_APB11			C		
N_M_P_Y2000_APB11			P	2000	
N_M_C_Y2000_APB11			C		
N_M_P_Y10000_APB11			P	10000	
N_M_C_Y10000_APB11			C		
N_M_P_Y100000_APB11			P	100000	
N_M_C_Y100000_APB11			C		
Photons					
G_M_P_Y100_APB11	G		P	100	
G_M_C_Y100_APB11			C		
G_M_P_Y500_APB11			P	500	
G_M_C_Y500_APB11			C		
G_M_P_Y2000_APB11			P	2000	
G_M_C_Y2000_APB11			C		
G_M_P_Y10000_APB11			P	10000	
G_M_C_Y10000_APB11			C		
G_M_P_Y100000_APB11			P	100000	
G_M_C_Y100000_APB11			C		
		Average Assembly			
Neutrons					
N_A_P_Y100_APB11	N	A	P	100	
N_A_C_Y100_APB11			C		
N_A_P_Y500_APB11			P	500	
N_A_C_Y500_APB11			C		
N_A_P_Y2000_APB11			P	2000	
N_A_C_Y2000_APB11			C		
N_A_P_Y10000_APB11			P	10000	
N_A_C_Y10000_APB11			C		
N_A_P_Y100000_APB11			P	100000	
N_A_C_Y100000_APB11			C		
Photons					
G_A_P_Y100_APB11	G		P	100	
G_A_C_Y100_APB11			C		
G_A_P_Y500_APB11			P	500	
G_A_C_Y500_APB11			C		
G_A_P_Y2000_APB11			P	2000	
G_A_C_Y2000_APB11			C		
G_A_P_Y10000_APB11			P	10000	
G_A_C_Y10000_APB11			C		
G_A_P_Y100000_APB11			P	100000	
G_A_C_Y100000_APB11			C		

* "C"-Fuel Rod Sources in Central Channel; "P"- Averaged Sources in Peripheral Channels
** 11 mm Neutronit A978 analogous to 304B6 with 75%% B-10 and B-11
*** "M" – Max; "A"-Average

#10/08/07
Started MCNP Input / Output files producing for the track length cell energy deposition tally calculations

Table 10/05/07-1 MCNP Input/Output files

Case	**MCNP Input/Output files**
Neutrons	
N_M_P_Y100_APB11	
N_M_C_Y100_APB11	
N_M_P_Y500_APB11	
N_M_C_Y500_APB11	
N_M_P_Y2000_APB11	
N_M_C_Y2000_APB11	
N_M_P_Y10000_APB11	
N_M_C_Y10000_APB11	
N_M_P_Y100000_APB11	
N_M_C_Y100000_APB11	
Photons	
G_M_P_Y100_APB11	
G_M_C_Y100_APB11	
G_M_P_Y500_APB11	
G_M_C_Y500_APB11	
G_M_P_Y2000_APB11	
G_M_C_Y2000_APB11	
G_M_P_Y10000_APB11	
G_M_C_Y10000_APB11	
G_M_P_Y100000_APB11	
G_M_C_Y100000_APB11	
Neutrons	
N_A_P_Y100_APB11	
N_A_C_Y100_APB11	
N_A_P_Y500_APB11	
N_A_C_Y500_APB11	
N_A_P_Y2000_APB11	
N_A_C_Y2000_APB11	
N_A_P_Y10000_APB11	
N_A_C_Y10000_APB11	
N_A_P_Y100000_APB11	
N_A_C_Y100000_APB11	
Photons	
G_A_P_Y100_APB11	
G_A_C_Y100_APB11	
G_A_P_Y500_APB11	
G_A_C_Y500_APB11	
G_A_P_Y2000_APB11	
G_A_C_Y2000_APB11	
G_A_P_Y10000_APB11	
G_A_C_Y10000_APB11	
G_A_P_Y100000_APB11	
G_A_C_Y100000_APB11	

No new entries on this page

12/06/2007 (AK)(OP)
The content of the entry below is a Technical Progress Report submitted by Alex Kouznetsov. **Beginning of entry.**

Assembly Decay Heat Generation Rate Evaluation
For the Pressurized Water Reactor (PWR) Assembly
With a Wide Range of Parameters

1. Introduction

Report provides a procedure that specifies proper interpolation for a data base of computed heat generation rates.
Analysis has been performed in the four-dimensional space of parameters:

- Assembly Fission Heat Rate in diapason from 28 to 80 kW/kgU (5 values);
- Burnups in diapason from 10 to 78 GWd/MTU (8 values);
- Initial Enrichments in diapason from 1.5 to 5.5 wt % U-235 (9 valuess);
- Cooling Times in diapason from 5 to 25 Years (3 values);

(See Fig 1. Space of Parameters for Heat Generation Rates Analysis)

SCALE-5 "=arp" sequence has been used for an element's thermal power evaluations.

The software specifications are as follows:

- Software Title: SCALE
- Version/Revision Number: Version 5.1

SCALE 5.1 has been installed on Pentium-4, 3.0 GHz CPU, 1.5 GB of RAM with OS Windows 2003 Data Center, on mirrored Drive "C:" 80 Gigabyte. Required registration via the Internet has been successfully completed at the beginning of Scale 5.1 installation. All needed verifications have been completed.

There were 5 x 8 x 9 x 3 = 1080 OrigenARP inputs produced to perform complete calculations for the total set of parameters. Total set of calculation cases is provided in Table 4.1,
SCALE Input/output files are in Attachement 1 and the EXCEL file with calculations linked as:
SN916E_SupportingFiles\SN November 2007 TAD Project.xls
No new entries on this page

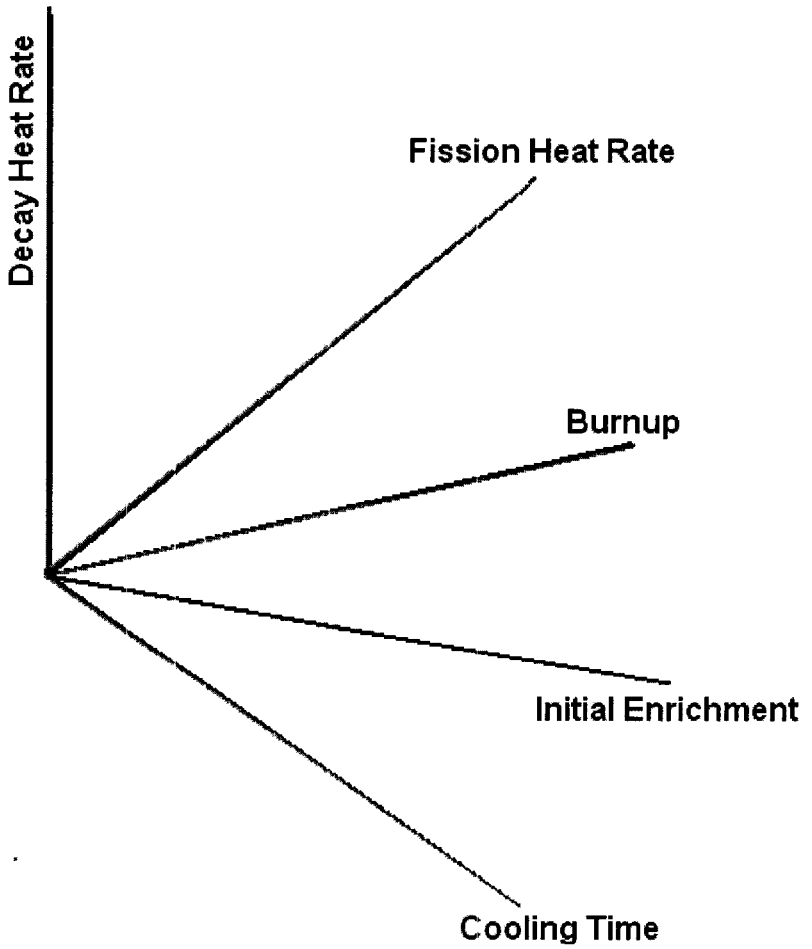


Figure 1. Space of Parameters for Assembly Decay Heat Rate evaluation

No new entries on this page

Assembly Operating Parameters

Source:	PWR Source Term Generation and Evaluation
Document Identifier	000-00C-MGR0-00100-000-00B
Pages:	Page 24 of 33

The moderator temperature	578	K
Density of the moderator	0.7136	g/cm^3
input average boron concentration	552.6316	ppm
Operational history of the assembly in the reactor	one cycle and new libraries at least every 100 days	
Thermal Reactor Power	2568	MWt
Assemblies in a core	177	
Power/Assembly	14.50847	MWt
MTU per Assembly	0.46363	MTU
Power/Assembly	31.29332 kWt/kg	
Assembly	15 × 15 for Babcock & Wilcox and	

Fuel Type is selected from the list of fuel types and is input for all compositions listed on the first composition screen.
The fuel assembly types include:

	8 × 8 (for BWR fuel)
	14 × 14 (for ABB Combustion Engineering–type PWR fuel with large water holes)
w15x15	15 × 15 for Babcock & Wilcox and
	17 × 17 - Westinghouse–type

No new entries on this page

2. Fuel Material Compositions

Materials for the Babcock & Wilcox Assembly Type with 0.46363 MTU per assembly for different enrichments used for OrigenARP calculations are listed in Table 3.

Table 3. Materials for the Babcock & Wilcox Assembly Type with 0.46363 MTU per assembly for different enrichments

	SCALE ID	U-234	U-235	U-236	U-238	o	
#	Enrichment	U-234	U-235	U-236	U-238	Oxygen	U-Total
	Mass	g	g	g	g	g	g
	1.5	55.75213248	6954.289581	32.08377435	456587.8745	62333.51393	463630
1	1.51	56.15187366	7000.659636	32.29416488	456540.8943	62333.58694	463630
2	2	75.73934746	9272.810387	42.60338295	454238.8469	62337.16473	463630
3	2.5	96.77871384	11590.8289	53.12309836	451889.2693	62341.27085	463630
4	3	117.8185003	13908.89474	64.16900463	449539.1178	62345.44775	463630
5	3.5	139.3846005	16226.9974	74.68910671	447188.9289	62349.62471	463630
6	4	160.9510433	18545.13688	85.20937588	444838.7027	62353.80175	463630
7	4.5	183.0438166	20863.31318	95.72981215	442487.9132	62357.45286	463630
8	5	205.1367081	23181.5	106.7762865	440136.587	62361.55927	463630
9	5.5	227.2299004	25499.71838	117.8229113	437785.2288	62365.66573	463630

No new entries on this page

3. Origen ARP Calculation Cases

Total set of the OrigenARP inputs and outputs which consists of 1080 Calculation Cases is listed at the Table 4.1.

Table 4.1. 1080 Calculation Cases of Assembly Decay Heat Generation Rate for different Assembly Fission Heat Rate, Burnups, Initial Enrichments and Cooling Times for the Babcock & Wilcox w15×15 Assembly Type

Calculation Case	Fuel Type	Fission Heat Rate	Initial Enrichment	Burnup	Cooling Time
		kW/kgU	*Watt*	*GWd/MTU*	*Years*
PWR_P28_W15_B10_Y5_N	PWR	28	15	10	5
PWR_P28_W20_B10_Y5_N			20		
PWR_P28_W25_B10_Y5_N			25		
PWR_P28_W30_B10_Y5_N			30		
PWR_P28_W35_B10_Y5_N			35		
PWR_P28_W40_B10_Y5_N			40		
PWR_P28_W45_B10_Y5_N			45		
PWR_P28_W50_B10_Y5_N			50		
PWR_P28_W55_B10_Y5_N			55		
PWR_P28_W15_B20_Y5_N			15	20	
PWR_P28_W20_B20_Y5_N			20		
PWR_P28_W25_B20_Y5_N			25		
PWR_P28_W30_B20_Y5_N			30		
PWR_P28_W35_B20_Y5_N			35		
PWR_P28_W40_B20_Y5_N			40		
PWR_P28_W45_B20_Y5_N			45		
PWR_P28_W50_B20_Y5_N			50		
PWR_P28_W55_B20_Y5_N			55		
PWR_P28_W15_B30_Y5_N			15	30	
PWR_P28_W20_B30_Y5_N			20		
PWR_P28_W25_B30_Y5_N			25		
PWR_P28_W30_B30_Y5_N			30		
PWR_P28_W35_B30_Y5_N			35		
PWR_P28_W40_B30_Y5_N			40		
PWR_P28_W45_B30_Y5_N			45		
PWR_P28_W50_B30_Y5_N			50		
PWR_P28_W55_B30_Y5_N			55		
PWR_P28_W15_B40_Y5_N			15	40	
PWR_P28_W20_B40_Y5_N			20		
PWR_P28_W25_B40_Y5_N			25		
PWR_P28_W30_B40_Y5_N			30		
PWR_P28_W35_B40_Y5_N			35		
PWR_P28_W40_B40_Y5_N			40		

PWR_P28_W45_B40_Y5_N			45		
PWR_P28_W50_B40_Y5_N			50		
PWR_P28_W55_B40_Y5_N			55		
PWR_P28_W15_B50_Y5_N			15	50	
PWR_P28_W20_B50_Y5_N			20		
PWR_P28_W25_B50_Y5_N			25		
PWR_P28_W30_B50_Y5_N			30		
PWR_P28_W35_B50_Y5_N			35		
PWR_P28_W40_B50_Y5_N			40		
PWR_P28_W45_B50_Y5_N			45		
PWR_P28_W50_B50_Y5_N			50		
PWR_P28_W55_B50_Y5_N			55		
PWR_P28_W15_B60_Y5_N			15	60	
PWR_P28_W20_B60_Y5_N			20		
PWR_P28_W25_B60_Y5_N			25		
PWR_P28_W30_B60_Y5_N			30		
PWR_P28_W35_B60_Y5_N			35		
PWR_P28_W40_B60_Y5_N			40		
PWR_P28_W45_B60_Y5_N			45		
PWR_P28_W50_B60_Y5_N			50		
PWR_P28_W55_B60_Y5_N			55		
PWR_P28_W15_B70_Y5_N			15	70	
PWR_P28_W20_B70_Y5_N			20		
PWR_P28_W25_B70_Y5_N			25		
PWR_P28_W30_B70_Y5_N			30		
PWR_P28_W35_B70_Y5_N			35		
PWR_P28_W40_B70_Y5_N			40		
PWR_P28_W45_B70_Y5_N			45		
PWR_P28_W50_B70_Y5_N			50		
PWR_P28_W55_B70_Y5_N			55		
PWR_P28_W15_B80_Y5_N			15	78.25865	
PWR_P28_W20_B80_Y5_N			20		
PWR_P28_W25_B80_Y5_N			25		
PWR_P28_W30_B80_Y5_N			30		
PWR_P28_W35_B80_Y5_N			35		
PWR_P28_W40_B80_Y5_N			40		
PWR_P28_W45_B80_Y5_N			45		
PWR_P28_W50_B80_Y5_N			50		
PWR_P28_W55_B80_Y5_N			55		
PWR_P28_W15_B10_Y15_N			15	10	15
PWR_P28_W20_B10_Y15_N			20		
PWR_P28_W25_B10_Y15_N			25		
PWR_P28_W30_B10_Y15_N			30		
PWR_P28_W35_B10_Y15_N			35		
PWR_P28_W40_B10_Y15_N			40		
PWR_P28_W45_B10_Y15_N			45		

PWR_P28_W50_B10_Y15_N			50		
PWR_P28_W55_B10_Y15_N			55		
PWR_P28_W15_B20_Y15_N			15	20	
PWR_P28_W20_B20_Y15_N			20		
PWR_P28_W25_B20_Y15_N			25		
PWR_P28_W30_B20_Y15_N			30		
PWR_P28_W35_B20_Y15_N			35		
PWR_P28_W40_B20_Y15_N			40		
PWR_P28_W45_B20_Y15_N			45		
PWR_P28_W50_B20_Y15_N			50		
PWR_P28_W55_B20_Y15_N			55		
PWR_P28_W15_B30_Y15_N			15	30	
PWR_P28_W20_B30_Y15_N			20		
PWR_P28_W25_B30_Y15_N			25		
PWR_P28_W30_B30_Y15_N			30		
PWR_P28_W35_B30_Y15_N			35		
PWR_P28_W40_B30_Y15_N			40		
PWR_P28_W45_B30_Y15_N			45		
PWR_P28_W50_B30_Y15_N			50		
PWR_P28_W55_B30_Y15_N			55		
PWR_P28_W15_B40_Y15_N			15	40	
PWR_P28_W20_B40_Y15_N			20		
PWR_P28_W25_B40_Y15_N			25		
PWR_P28_W30_B40_Y15_N			30		
PWR_P28_W35_B40_Y15_N			35		
PWR_P28_W40_B40_Y15_N			40		
PWR_P28_W45_B40_Y15_N			45		
PWR_P28_W50_B40_Y15_N			50		
PWR_P28_W55_B40_Y15_N			55		
PWR_P28_W15_B50_Y15_N			15	50	
PWR_P28_W20_B50_Y15_N			20		
PWR_P28_W25_B50_Y15_N			25		
PWR_P28_W30_B50_Y15_N			30		
PWR_P28_W35_B50_Y15_N			35		
PWR_P28_W40_B50_Y15_N			40		
PWR_P28_W45_B50_Y15_N			45		
PWR_P28_W50_B50_Y15_N			50		
PWR_P28_W55_B50_Y15_N			55		
PWR_P28_W15_B60_Y15_N			15	60	
PWR_P28_W20_B60_Y15_N			20		
PWR_P28_W25_B60_Y15_N			25		
PWR_P28_W30_B60_Y15_N			30		
PWR_P28_W35_B60_Y15_N			35		
PWR_P28_W40_B60_Y15_N			40		
PWR_P28_W45_B60_Y15_N			45		
PWR_P28_W50_B60_Y15_N			50		
PWR_P28_W55_B60_Y15_N			55		

PWR_P28_W15_B70_Y15_N			15	70	
PWR_P28_W20_B70_Y15_N			20		
PWR_P28_W25_B70_Y15_N			25		
PWR_P28_W30_B70_Y15_N			30		
PWR_P28_W35_B70_Y15_N			35		
PWR_P28_W40_B70_Y15_N			40		
PWR_P28_W45_B70_Y15_N			45		
PWR_P28_W50_B70_Y15_N			50		
PWR_P28_W55_B70_Y15_N			55		
PWR_P28_W15_B80_Y15_N			15	78.25865	
PWR_P28_W20_B80_Y15_N			20		
PWR_P28_W25_B80_Y15_N			25		
PWR_P28_W30_B80_Y15_N			30		
PWR_P28_W35_B80_Y15_N			35		
PWR_P28_W40_B80_Y15_N			40		
PWR_P28_W45_B80_Y15_N			45		
PWR_P28_W50_B80_Y15_N			50		
PWR_P28_W55_B80_Y15_N			55		
PWR_P28_W15_B10_Y25_N			15	10	25
PWR_P28_W20_B10_Y25_N			20		
PWR_P28_W25_B10_Y25_N			25		
PWR_P28_W30_B10_Y25_N			30		
PWR_P28_W35_B10_Y25_N			35		
PWR_P28_W40_B10_Y25_N			40		
PWR_P28_W45_B10_Y25_N			45		
PWR_P28_W50_B10_Y25_N			50		
PWR_P28_W55_B10_Y25_N			55		
PWR_P28_W15_B20_Y25_N			15	20	
PWR_P28_W20_B20_Y25_N			20		
PWR_P28_W25_B20_Y25_N			25		
PWR_P28_W30_B20_Y25_N			30		
PWR_P28_W35_B20_Y25_N			35		
PWR_P28_W40_B20_Y25_N			40		
PWR_P28_W45_B20_Y25_N			45		
PWR_P28_W50_B20_Y25_N			50		
PWR_P28_W55_B20_Y25_N			55		
PWR_P28_W15_B30_Y25_N			15	30	
PWR_P28_W20_B30_Y25_N			20		
PWR_P28_W25_B30_Y25_N			25		
PWR_P28_W30_B30_Y25_N			30		
PWR_P28_W35_B30_Y25_N			35		
PWR_P28_W40_B30_Y25_N			40		
PWR_P28_W45_B30_Y25_N			45		
PWR_P28_W50_B30_Y25_N			50		
PWR_P28_W55_B30_Y25_N			55		
PWR_P28_W15_B40_Y25_N			15	40	

PWR_P28_W20_B40_Y25_N			20		
PWR_P28_W25_B40_Y25_N			25		
PWR_P28_W30_B40_Y25_N			30		
PWR_P28_W35_B40_Y25_N			35		
PWR_P28_W40_B40_Y25_N			40		
PWR_P28_W45_B40_Y25_N			45		
PWR_P28_W50_B40_Y25_N			50		
PWR_P28_W55_B40_Y25_N			55		
PWR_P28_W15_B50_Y25_N			15	50	
PWR_P28_W20_B50_Y25_N			20		
PWR_P28_W25_B50_Y25_N			25		
PWR_P28_W30_B50_Y25_N			30		
PWR_P28_W35_B50_Y25_N			35		
PWR_P28_W40_B50_Y25_N			40		
PWR_P28_W45_B50_Y25_N			45		
PWR_P28_W50_B50_Y25_N			50		
PWR_P28_W55_B50_Y25_N			55		
PWR_P28_W15_B60_Y25_N			15	60	
PWR_P28_W20_B60_Y25_N			20		
PWR_P28_W25_B60_Y25_N			25		
PWR_P28_W30_B60_Y25_N			30		
PWR_P28_W35_B60_Y25_N			35		
PWR_P28_W40_B60_Y25_N			40		
PWR_P28_W45_B60_Y25_N			45		
PWR_P28_W50_B60_Y25_N			50		
PWR_P28_W55_B60_Y25_N			55		
PWR_P28_W15_B70_Y25_N			15	70	
PWR_P28_W20_B70_Y25_N			20		
PWR_P28_W25_B70_Y25_N			25		
PWR_P28_W30_B70_Y25_N			30		
PWR_P28_W35_B70_Y25_N			35		
PWR_P28_W40_B70_Y25_N			40		
PWR_P28_W45_B70_Y25_N			45		
PWR_P28_W50_B70_Y25_N			50		
PWR_P28_W55_B70_Y25_N			55		
PWR_P28_W15_B80_Y25_N			15	78.25865	
PWR_P28_W20_B80_Y25_N			20		
PWR_P28_W25_B80_Y25_N			25		
PWR_P28_W30_B80_Y25_N			30		
PWR_P28_W35_B80_Y25_N			35		
PWR_P28_W40_B80_Y25_N			40		
PWR_P28_W45_B80_Y25_N			45		
PWR_P28_W50_B80_Y25_N			50		
PWR_P28_W55_B80_Y25_N			55		
PWR_P31_W15_B10_Y5_N	PWR	31.29322	15	10	5
PWR_P31_W20_B10_Y5_N			20		

PWR_P31_W25_B10_Y5_N			25		
PWR_P31_W30_B10_Y5_N			30		
PWR_P31_W35_B10_Y5_N			35		
PWR_P31_W40_B10_Y5_N			40		
PWR_P31_W45_B10_Y5_N			45		
PWR_P31_W50_B10_Y5_N			50		
PWR_P31_W55_B10_Y5_N			55		
PWR_P31_W15_B20_Y5_N			15	20	
PWR_P31_W20_B20_Y5_N			20		
PWR_P31_W25_B20_Y5_N			25		
PWR_P31_W30_B20_Y5_N			30		
PWR_P31_W35_B20_Y5_N			35		
PWR_P31_W40_B20_Y5_N			40		
PWR_P31_W45_B20_Y5_N			45		
PWR_P31_W50_B20_Y5_N			50		
PWR_P31_W55_B20_Y5_N			55		
PWR_P31_W15_B30_Y5_N			15	30	
PWR_P31_W20_B30_Y5_N			20		
PWR_P31_W25_B30_Y5_N			25		
PWR_P31_W30_B30_Y5_N			30		
PWR_P31_W35_B30_Y5_N			35		
PWR_P31_W40_B30_Y5_N			40		
PWR_P31_W45_B30_Y5_N			45		
PWR_P31_W50_B30_Y5_N			50		
PWR_P31_W55_B30_Y5_N			55		
PWR_P31_W15_B40_Y5_N			15	40	
PWR_P31_W20_B40_Y5_N			20		
PWR_P31_W25_B40_Y5_N			25		
PWR_P31_W30_B40_Y5_N			30		
PWR_P31_W35_B40_Y5_N			35		
PWR_P31_W40_B40_Y5_N			40		
PWR_P31_W45_B40_Y5_N			45		
PWR_P31_W50_B40_Y5_N			50		
PWR_P31_W55_B40_Y5_N			55		
PWR_P31_W15_B50_Y5_N			15	50	
PWR_P31_W20_B50_Y5_N			20		
PWR_P31_W25_B50_Y5_N			25		
PWR_P31_W30_B50_Y5_N			30		
PWR_P31_W35_B50_Y5_N			35		
PWR_P31_W40_B50_Y5_N			40		
PWR_P31_W45_B50_Y5_N			45		
PWR_P31_W50_B50_Y5_N			50		
PWR_P31_W55_B50_Y5_N			55		
PWR_P31_W15_B60_Y5_N			15	60	
PWR_P31_W20_B60_Y5_N			20		
PWR_P31_W25_B60_Y5_N			25		
PWR_P31_W30_B60_Y5_N			30		

PWR_P31_W35_B60_Y5_N			35		
PWR_P31_W40_B60_Y5_N			40		
PWR_P31_W45_B60_Y5_N			45		
PWR_P31_W50_B60_Y5_N			50		
PWR_P31_W55_B60_Y5_N			55		
PWR_P31_W15_B70_Y5_N			15	70	
PWR_P31_W20_B70_Y5_N			20		
PWR_P31_W25_B70_Y5_N			25		
PWR_P31_W30_B70_Y5_N			30		
PWR_P31_W35_B70_Y5_N			35		
PWR_P31_W40_B70_Y5_N			40		
PWR_P31_W45_B70_Y5_N			45		
PWR_P31_W50_B70_Y5_N			50		
PWR_P31_W55_B70_Y5_N			55		
PWR_P31_W15_B80_Y5_N			15	78.25865	
PWR_P31_W20_B80_Y5_N			20		
PWR_P31_W25_B80_Y5_N			25		
PWR_P31_W30_B80_Y5_N			30		
PWR_P31_W35_B80_Y5_N			35		
PWR_P31_W40_B80_Y5_N			40		
PWR_P31_W45_B80_Y5_N			45		
PWR_P31_W50_B80_Y5_N			50		
PWR_P31_W55_B80_Y5_N			55		
PWR_P31_W15_B10_Y15_N			15	10	15
PWR_P31_W20_B10_Y15_N			20		
PWR_P31_W25_B10_Y15_N			25		
PWR_P31_W30_B10_Y15_N			30		
PWR_P31_W35_B10_Y15_N			35		
PWR_P31_W40_B10_Y15_N			40		
PWR_P31_W45_B10_Y15_N			45		
PWR_P31_W50_B10_Y15_N			50		
PWR_P31_W55_B10_Y15_N			55		
PWR_P31_W15_B20_Y15_N			15	20	
PWR_P31_W20_B20_Y15_N			20		
PWR_P31_W25_B20_Y15_N			25		
PWR_P31_W30_B20_Y15_N			30		
PWR_P31_W35_B20_Y15_N			35		
PWR_P31_W40_B20_Y15_N			40		
PWR_P31_W45_B20_Y15_N			45		
PWR_P31_W50_B20_Y15_N			50		
PWR_P31_W55_B20_Y15_N			55		
PWR_P31_W15_B30_Y15_N			15	30	
PWR_P31_W20_B30_Y15_N			20		
PWR_P31_W25_B30_Y15_N			25		
PWR_P31_W30_B30_Y15_N			30		
PWR_P31_W35_B30_Y15_N			35		

PWR_P31_W40_B30_Y15_N			40		
PWR_P31_W45_B30_Y15_N			45		
PWR_P31_W50_B30_Y15_N			50		
PWR_P31_W55_B30_Y15_N			55		
PWR_P31_W15_B40_Y15_N			15	40	
PWR_P31_W20_B40_Y15_N			20		
PWR_P31_W25_B40_Y15_N			25		
PWR_P31_W30_B40_Y15_N			30		
PWR_P31_W35_B40_Y15_N			35		
PWR_P31_W40_B40_Y15_N			40		
PWR_P31_W45_B40_Y15_N			45		
PWR_P31_W50_B40_Y15_N			50		
PWR_P31_W55_B40_Y15_N			55		
PWR_P31_W15_B50_Y15_N			15	50	
PWR_P31_W20_B50_Y15_N			20		
PWR_P31_W25_B50_Y15_N			25		
PWR_P31_W30_B50_Y15_N			30		
PWR_P31_W35_B50_Y15_N			35		
PWR_P31_W40_B50_Y15_N			40		
PWR_P31_W45_B50_Y15_N			45		
PWR_P31_W50_B50_Y15_N			50		
PWR_P31_W55_B50_Y15_N			55		
PWR_P31_W15_B60_Y15_N			15	60	
PWR_P31_W20_B60_Y15_N			20		
PWR_P31_W25_B60_Y15_N			25		
PWR_P31_W30_B60_Y15_N			30		
PWR_P31_W35_B60_Y15_N			35		
PWR_P31_W40_B60_Y15_N			40		
PWR_P31_W45_B60_Y15_N			45		
PWR_P31_W50_B60_Y15_N			50		
PWR_P31_W55_B60_Y15_N			55		
PWR_P31_W15_B70_Y15_N			15	70	
PWR_P31_W20_B70_Y15_N			20		
PWR_P31_W25_B70_Y15_N			25		
PWR_P31_W30_B70_Y15_N			30		
PWR_P31_W35_B70_Y15_N			35		
PWR_P31_W40_B70_Y15_N			40		
PWR_P31_W45_B70_Y15_N			45		
PWR_P31_W50_B70_Y15_N			50		
PWR_P31_W55_B70_Y15_N			55		
PWR_P31_W15_B80_Y15_N			15	78.25865	
PWR_P31_W20_B80_Y15_N			20		
PWR_P31_W25_B80_Y15_N			25		
PWR_P31_W30_B80_Y15_N			30		
PWR_P31_W35_B80_Y15_N			35		
PWR_P31_W40_B80_Y15_N			40		
PWR_P31_W45_B80_Y15_N			45		

PWR_P31_W50_B80_Y15_N			50		
PWR_P31_W55_B80_Y15_N			55		
PWR_P31_W15_B10_Y25_N			15	10	25
PWR_P31_W20_B10_Y25_N			20		
PWR_P31_W25_B10_Y25_N			25		
PWR_P31_W30_B10_Y25_N			30		
PWR_P31_W35_B10_Y25_N			35		
PWR_P31_W40_B10_Y25_N			40		
PWR_P31_W45_B10_Y25_N			45		
PWR_P31_W50_B10_Y25_N			50		
PWR_P31_W55_B10_Y25_N			55		
PWR_P31_W15_B20_Y25_N			15	20	
PWR_P31_W20_B20_Y25_N			20		
PWR_P31_W25_B20_Y25_N			25		
PWR_P31_W30_B20_Y25_N			30		
PWR_P31_W35_B20_Y25_N			35		
PWR_P31_W40_B20_Y25_N			40		
PWR_P31_W45_B20_Y25_N			45		
PWR_P31_W50_B20_Y25_N			50		
PWR_P31_W55_B20_Y25_N			55		
PWR_P31_W15_B30_Y25_N			15	30	
PWR_P31_W20_B30_Y25_N			20		
PWR_P31_W25_B30_Y25_N			25		
PWR_P31_W30_B30_Y25_N			30		
PWR_P31_W35_B30_Y25_N			35		
PWR_P31_W40_B30_Y25_N			40		
PWR_P31_W45_B30_Y25_N			45		
PWR_P31_W50_B30_Y25_N			50		
PWR_P31_W55_B30_Y25_N			55		
PWR_P31_W15_B40_Y25_N			15	40	
PWR_P31_W20_B40_Y25_N			20		
PWR_P31_W25_B40_Y25_N			25		
PWR_P31_W30_B40_Y25_N			30		
PWR_P31_W35_B40_Y25_N			35		
PWR_P31_W40_B40_Y25_N			40		
PWR_P31_W45_B40_Y25_N			45		
PWR_P31_W50_B40_Y25_N			50		
PWR_P31_W55_B40_Y25_N			55		
PWR_P31_W15_B50_Y25_N			15	50	
PWR_P31_W20_B50_Y25_N			20		
PWR_P31_W25_B50_Y25_N			25		
PWR_P31_W30_B50_Y25_N			30		
PWR_P31_W35_B50_Y25_N			35		
PWR_P31_W40_B50_Y25_N			40		
PWR_P31_W45_B50_Y25_N			45		
PWR_P31_W50_B50_Y25_N			50		

PWR_P31_W55_B50_Y25_N			55		
PWR_P31_W15_B60_Y25_N			15	60	
PWR_P31_W20_B60_Y25_N			20		
PWR_P31_W25_B60_Y25_N			25		
PWR_P31_W30_B60_Y25_N			30		
PWR_P31_W35_B60_Y25_N			35		
PWR_P31_W40_B60_Y25_N			40		
PWR_P31_W45_B60_Y25_N			45		
PWR_P31_W50_B60_Y25_N			50		
PWR_P31_W55_B60_Y25_N			55		
PWR_P31_W15_B70_Y25_N			15	70	
PWR_P31_W20_B70_Y25_N			20		
PWR_P31_W25_B70_Y25_N			25		
PWR_P31_W30_B70_Y25_N			30		
PWR_P31_W35_B70_Y25_N			35		
PWR_P31_W40_B70_Y25_N			40		
PWR_P31_W45_B70_Y25_N			45		
PWR_P31_W50_B70_Y25_N			50		
PWR_P31_W55_B70_Y25_N			55		
PWR_P31_W15_B80_Y25_N			15	78.25865	
PWR_P31_W20_B80_Y25_N			20		
PWR_P31_W25_B80_Y25_N			25		
PWR_P31_W30_B80_Y25_N			30		
PWR_P31_W35_B80_Y25_N			35		
PWR_P31_W40_B80_Y25_N			40		
PWR_P31_W45_B80_Y25_N			45		
PWR_P31_W50_B80_Y25_N			50		
PWR_P31_W55_B80_Y25_N			55		
PWR_P40_W15_B10_Y5_N	PWR	40	15	10	5
PWR_P40_W20_B10_Y5_N			20		
PWR_P40_W25_B10_Y5_N			25		
PWR_P40_W30_B10_Y5_N			30		
PWR_P40_W35_B10_Y5_N			35		
PWR_P40_W40_B10_Y5_N			40		
PWR_P40_W45_B10_Y5_N			45		
PWR_P40_W50_B10_Y5_N			50		
PWR_P40_W55_B10_Y5_N			55		
PWR_P40_W15_B20_Y5_N			15	20	
PWR_P40_W20_B20_Y5_N			20		
PWR_P40_W25_B20_Y5_N			25		
PWR_P40_W30_B20_Y5_N			30		
PWR_P40_W35_B20_Y5_N			35		
PWR_P40_W40_B20_Y5_N			40		
PWR_P40_W45_B20_Y5_N			45		
PWR_P40_W50_B20_Y5_N			50		
PWR_P40_W55_B20_Y5_N			55		

PWR_P40_W15_B30_Y5_N			15	30	
PWR_P40_W20_B30_Y5_N			20		
PWR_P40_W25_B30_Y5_N			25		
PWR_P40_W30_B30_Y5_N			30		
PWR_P40_W35_B30_Y5_N			35		
PWR_P40_W40_B30_Y5_N			40		
PWR_P40_W45_B30_Y5_N			45		
PWR_P40_W50_B30_Y5_N			50		
PWR_P40_W55_B30_Y5_N			55		
PWR_P40_W15_B40_Y5_N			15	40	
PWR_P40_W20_B40_Y5_N			20		
PWR_P40_W25_B40_Y5_N			25		
PWR_P40_W30_B40_Y5_N			30		
PWR_P40_W35_B40_Y5_N			35		
PWR_P40_W40_B40_Y5_N			40		
PWR_P40_W45_B40_Y5_N			45		
PWR_P40_W50_B40_Y5_N			50		
PWR_P40_W55_B40_Y5_N			55		
PWR_P40_W15_B50_Y5_N			15	50	
PWR_P40_W20_B50_Y5_N			20		
PWR_P40_W25_B50_Y5_N			25		
PWR_P40_W30_B50_Y5_N			30		
PWR_P40_W35_B50_Y5_N			35		
PWR_P40_W40_B50_Y5_N			40		
PWR_P40_W45_B50_Y5_N			45		
PWR_P40_W50_B50_Y5_N			50		
PWR_P40_W55_B50_Y5_N			55		
PWR_P40_W15_B60_Y5_N			15	60	
PWR_P40_W20_B60_Y5_N			20		
PWR_P40_W25_B60_Y5_N			25		
PWR_P40_W30_B60_Y5_N			30		
PWR_P40_W35_B60_Y5_N			35		
PWR_P40_W40_B60_Y5_N			40		
PWR_P40_W45_B60_Y5_N			45		
PWR_P40_W50_B60_Y5_N			50		
PWR_P40_W55_B60_Y5_N			55		
PWR_P40_W15_B70_Y5_N			15	70	
PWR_P40_W20_B70_Y5_N			20		
PWR_P40_W25_B70_Y5_N			25		
PWR_P40_W30_B70_Y5_N			30		
PWR_P40_W35_B70_Y5_N			35		
PWR_P40_W40_B70_Y5_N			40		
PWR_P40_W45_B70_Y5_N			45		
PWR_P40_W50_B70_Y5_N			50		
PWR_P40_W55_B70_Y5_N			55		
PWR_P40_W15_B80_Y5_N			15	78.25865	
PWR_P40_W20_B80_Y5_N			20		

PWR_P40_W25_B80_Y5_N			25		
PWR_P40_W30_B80_Y5_N			30		
PWR_P40_W35_B80_Y5_N			35		
PWR_P40_W40_B80_Y5_N			40		
PWR_P40_W45_B80_Y5_N			45		
PWR_P40_W50_B80_Y5_N			50		
PWR_P40_W55_B80_Y5_N			55		
PWR_P40_W15_B10_Y15_N			15	10	15
PWR_P40_W20_B10_Y15_N			20		
PWR_P40_W25_B10_Y15_N			25		
PWR_P40_W30_B10_Y15_N			30		
PWR_P40_W35_B10_Y15_N			35		
PWR_P40_W40_B10_Y15_N			40		
PWR_P40_W45_B10_Y15_N			45		
PWR_P40_W50_B10_Y15_N			50		
PWR_P40_W55_B10_Y15_N			55		
PWR_P40_W15_B20_Y15_N			15	20	
PWR_P40_W20_B20_Y15_N			20		
PWR_P40_W25_B20_Y15_N			25		
PWR_P40_W30_B20_Y15_N			30		
PWR_P40_W35_B20_Y15_N			35		
PWR_P40_W40_B20_Y15_N			40		
PWR_P40_W45_B20_Y15_N			45		
PWR_P40_W50_B20_Y15_N			50		
PWR_P40_W55_B20_Y15_N			55		
PWR_P40_W15_B30_Y15_N			15	30	
PWR_P40_W20_B30_Y15_N			20		
PWR_P40_W25_B30_Y15_N			25		
PWR_P40_W30_B30_Y15_N			30		
PWR_P40_W35_B30_Y15_N			35		
PWR_P40_W40_B30_Y15_N			40		
PWR_P40_W45_B30_Y15_N			45		
PWR_P40_W50_B30_Y15_N			50		
PWR_P40_W55_B30_Y15_N			55		
PWR_P40_W15_B40_Y15_N			15	40	
PWR_P40_W20_B40_Y15_N			20		
PWR_P40_W25_B40_Y15_N			25		
PWR_P40_W30_B40_Y15_N			30		
PWR_P40_W35_B40_Y15_N			35		
PWR_P40_W40_B40_Y15_N			40		
PWR_P40_W45_B40_Y15_N			45		
PWR_P40_W50_B40_Y15_N			50		
PWR_P40_W55_B40_Y15_N			55		
PWR_P40_W15_B50_Y15_N			15	50	
PWR_P40_W20_B50_Y15_N			20		
PWR_P40_W25_B50_Y15_N			25		

PWR_P40_W30_B50_Y15_N			30		
PWR_P40_W35_B50_Y15_N			35		
PWR_P40_W40_B50_Y15_N			40		
PWR_P40_W45_B50_Y15_N			45		
PWR_P40_W50_B50_Y15_N			50		
PWR_P40_W55_B50_Y15_N			55		
PWR_P40_W15_B60_Y15_N			15	60	
PWR_P40_W20_B60_Y15_N			20		
PWR_P40_W25_B60_Y15_N			25		
PWR_P40_W30_B60_Y15_N			30		
PWR_P40_W35_B60_Y15_N			35		
PWR_P40_W40_B60_Y15_N			40		
PWR_P40_W45_B60_Y15_N			45		
PWR_P40_W50_B60_Y15_N			50		
PWR_P40_W55_B60_Y15_N			55		
PWR_P40_W15_B70_Y15_N			15	70	
PWR_P40_W20_B70_Y15_N			20		
PWR_P40_W25_B70_Y15_N			25		
PWR_P40_W30_B70_Y15_N			30		
PWR_P40_W35_B70_Y15_N			35		
PWR_P40_W40_B70_Y15_N			40		
PWR_P40_W45_B70_Y15_N			45		
PWR_P40_W50_B70_Y15_N			50		
PWR_P40_W55_B70_Y15_N			55		
PWR_P40_W15_B80_Y15_N			15	78.25865	
PWR_P40_W20_B80_Y15_N			20		
PWR_P40_W25_B80_Y15_N			25		
PWR_P40_W30_B80_Y15_N			30		
PWR_P40_W35_B80_Y15_N			35		
PWR_P40_W40_B80_Y15_N			40		
PWR_P40_W45_B80_Y15_N			45		
PWR_P40_W50_B80_Y15_N			50		
PWR_P40_W55_B80_Y15_N			55		
PWR_P40_W15_B10_Y25_N			15	10	25
PWR_P40_W20_B10_Y25_N			20		
PWR_P40_W25_B10_Y25_N			25		
PWR_P40_W30_B10_Y25_N			30		
PWR_P40_W35_B10_Y25_N			35		
PWR_P40_W40_B10_Y25_N			40		
PWR_P40_W45_B10_Y25_N			45		
PWR_P40_W50_B10_Y25_N			50		
PWR_P40_W55_B10_Y25_N			55		
PWR_P40_W15_B20_Y25_N			15	20	
PWR_P40_W20_B20_Y25_N			20		
PWR_P40_W25_B20_Y25_N			25		
PWR_P40_W30_B20_Y25_N			30		

PWR_P40_W35_B20_Y25_N			35		
PWR_P40_W40_B20_Y25_N			40		
PWR_P40_W45_B20_Y25_N			45		
PWR_P40_W50_B20_Y25_N			50		
PWR_P40_W55_B20_Y25_N			55		
PWR_P40_W15_B30_Y25_N			15	30	
PWR_P40_W20_B30_Y25_N			20		
PWR_P40_W25_B30_Y25_N			25		
PWR_P40_W30_B30_Y25_N			30		
PWR_P40_W35_B30_Y25_N			35		
PWR_P40_W40_B30_Y25_N			40		
PWR_P40_W45_B30_Y25_N			45		
PWR_P40_W50_B30_Y25_N			50		
PWR_P40_W55_B30_Y25_N			55		
PWR_P40_W15_B40_Y25_N			15	40	
PWR_P40_W20_B40_Y25_N			20		
PWR_P40_W25_B40_Y25_N			25		
PWR_P40_W30_B40_Y25_N			30		
PWR_P40_W35_B40_Y25_N			35		
PWR_P40_W40_B40_Y25_N			40		
PWR_P40_W45_B40_Y25_N			45		
PWR_P40_W50_B40_Y25_N			50		
PWR_P40_W55_B40_Y25_N			55		
PWR_P40_W15_B50_Y25_N			15	50	
PWR_P40_W20_B50_Y25_N			20		
PWR_P40_W25_B50_Y25_N			25		
PWR_P40_W30_B50_Y25_N			30		
PWR_P40_W35_B50_Y25_N			35		
PWR_P40_W40_B50_Y25_N			40		
PWR_P40_W45_B50_Y25_N			45		
PWR_P40_W50_B50_Y25_N			50		
PWR_P40_W55_B50_Y25_N			55		
PWR_P40_W15_B60_Y25_N			15	60	
PWR_P40_W20_B60_Y25_N			20		
PWR_P40_W25_B60_Y25_N			25		
PWR_P40_W30_B60_Y25_N			30		
PWR_P40_W35_B60_Y25_N			35		
PWR_P40_W40_B60_Y25_N			40		
PWR_P40_W45_B60_Y25_N			45		
PWR_P40_W50_B60_Y25_N			50		
PWR_P40_W55_B60_Y25_N			55		
PWR_P40_W15_B70_Y25_N			15	70	
PWR_P40_W20_B70_Y25_N			20		
PWR_P40_W25_B70_Y25_N			25		
PWR_P40_W30_B70_Y25_N			30		
PWR_P40_W35_B70_Y25_N			35		
PWR_P40_W40_B70_Y25_N			40		

PWR_P40_W45_B70_Y25_N			45		
PWR_P40_W50_B70_Y25_N			50		
PWR_P40_W55_B70_Y25_N			55		
PWR_P40_W15_B80_Y25_N			15	78.25865	
PWR_P40_W20_B80_Y25_N			20		
PWR_P40_W25_B80_Y25_N			25		
PWR_P40_W30_B80_Y25_N			30		
PWR_P40_W35_B80_Y25_N			35		
PWR_P40_W40_B80_Y25_N			40		
PWR_P40_W45_B80_Y25_N			45		
PWR_P40_W50_B80_Y25_N			50		
PWR_P40_W55_B80_Y25_N			55		
PWR_P60_W15_B10_Y5_N	PWR	60	15	10	5
PWR_P60_W20_B10_Y5_N			20		
PWR_P60_W25_B10_Y5_N			25		
PWR_P60_W30_B10_Y5_N			30		
PWR_P60_W35_B10_Y5_N			35		
PWR_P60_W40_B10_Y5_N			40		
PWR_P60_W45_B10_Y5_N			45		
PWR_P60_W50_B10_Y5_N			50		
PWR_P60_W55_B10_Y5_N			55		
PWR_P60_W15_B20_Y5_N			15	20	
PWR_P60_W20_B20_Y5_N			20		
PWR_P60_W25_B20_Y5_N			25		
PWR_P60_W30_B20_Y5_N			30		
PWR_P60_W35_B20_Y5_N			35		
PWR_P60_W40_B20_Y5_N			40		
PWR_P60_W45_B20_Y5_N			45		
PWR_P60_W50_B20_Y5_N			50		
PWR_P60_W55_B20_Y5_N			55		
PWR_P60_W15_B30_Y5_N			15	30	
PWR_P60_W20_B30_Y5_N			20		
PWR_P60_W25_B30_Y5_N			25		
PWR_P60_W30_B30_Y5_N			30		
PWR_P60_W35_B30_Y5_N			35		
PWR_P60_W40_B30_Y5_N			40		
PWR_P60_W45_B30_Y5_N			45		
PWR_P60_W50_B30_Y5_N			50		
PWR_P60_W55_B30_Y5_N			55		
PWR_P60_W15_B40_Y5_N			15	40	
PWR_P60_W20_B40_Y5_N			20		
PWR_P60_W25_B40_Y5_N			25		
PWR_P60_W30_B40_Y5_N			30		
PWR_P60_W35_B40_Y5_N			35		
PWR_P60_W40_B40_Y5_N			40		
PWR_P60_W45_B40_Y5_N			45		

PWR_P60_W50_B40_Y5_N			50		
PWR_P60_W55_B40_Y5_N			55		
PWR_P60_W15_B50_Y5_N			15	50	
PWR_P60_W20_B50_Y5_N			20		
PWR_P60_W25_B50_Y5_N			25		
PWR_P60_W30_B50_Y5_N			30		
PWR_P60_W35_B50_Y5_N			35		
PWR_P60_W40_B50_Y5_N			40		
PWR_P60_W45_B50_Y5_N			45		
PWR_P60_W50_B50_Y5_N			50		
PWR_P60_W55_B50_Y5_N			55		
PWR_P60_W15_B60_Y5_N			15	60	
PWR_P60_W20_B60_Y5_N			20		
PWR_P60_W25_B60_Y5_N			25		
PWR_P60_W30_B60_Y5_N			30		
PWR_P60_W35_B60_Y5_N			35		
PWR_P60_W40_B60_Y5_N			40		
PWR_P60_W45_B60_Y5_N			45		
PWR_P60_W50_B60_Y5_N			50		
PWR_P60_W55_B60_Y5_N			55		
PWR_P60_W15_B70_Y5_N			15	70	
PWR_P60_W20_B70_Y5_N			20		
PWR_P60_W25_B70_Y5_N			25		
PWR_P60_W30_B70_Y5_N			30		
PWR_P60_W35_B70_Y5_N			35		
PWR_P60_W40_B70_Y5_N			40		
PWR_P60_W45_B70_Y5_N			45		
PWR_P60_W50_B70_Y5_N			50		
PWR_P60_W55_B70_Y5_N			55		
PWR_P60_W15_B80_Y5_N			15	78.25865	
PWR_P60_W20_B80_Y5_N			20		
PWR_P60_W25_B80_Y5_N			25		
PWR_P60_W30_B80_Y5_N			30		
PWR_P60_W35_B80_Y5_N			35		
PWR_P60_W40_B80_Y5_N			40		
PWR_P60_W45_B80_Y5_N			45		
PWR_P60_W50_B80_Y5_N			50		
PWR_P60_W55_B80_Y5_N			55		
PWR_P60_W15_B10_Y15_N			15	10	15
PWR_P60_W20_B10_Y15_N			20		
PWR_P60_W25_B10_Y15_N			25		
PWR_P60_W30_B10_Y15_N			30		
PWR_P60_W35_B10_Y15_N			35		
PWR_P60_W40_B10_Y15_N			40		
PWR_P60_W45_B10_Y15_N			45		
PWR_P60_W50_B10_Y15_N			50		

PWR_P60_W55_B10_Y15_N			55		
PWR_P60_W15_B20_Y15_N			15	20	
PWR_P60_W20_B20_Y15_N			20		
PWR_P60_W25_B20_Y15_N			25		
PWR_P60_W30_B20_Y15_N			30		
PWR_P60_W35_B20_Y15_N			35		
PWR_P60_W40_B20_Y15_N			40		
PWR_P60_W45_B20_Y15_N			45		
PWR_P60_W50_B20_Y15_N			50		
PWR_P60_W55_B20_Y15_N			55		
PWR_P60_W15_B30_Y15_N			15	30	
PWR_P60_W20_B30_Y15_N			20		
PWR_P60_W25_B30_Y15_N			25		
PWR_P60_W30_B30_Y15_N			30		
PWR_P60_W35_B30_Y15_N			35		
PWR_P60_W40_B30_Y15_N			40		
PWR_P60_W45_B30_Y15_N			45		
PWR_P60_W50_B30_Y15_N			50		
PWR_P60_W55_B30_Y15_N			55		
PWR_P60_W15_B40_Y15_N			15	40	
PWR_P60_W20_B40_Y15_N			20		
PWR_P60_W25_B40_Y15_N			25		
PWR_P60_W30_B40_Y15_N			30		
PWR_P60_W35_B40_Y15_N			35		
PWR_P60_W40_B40_Y15_N			40		
PWR_P60_W45_B40_Y15_N			45		
PWR_P60_W50_B40_Y15_N			50		
PWR_P60_W55_B40_Y15_N			55		
PWR_P60_W15_B50_Y15_N			15	50	
PWR_P60_W20_B50_Y15_N			20		
PWR_P60_W25_B50_Y15_N			25		
PWR_P60_W30_B50_Y15_N			30		
PWR_P60_W35_B50_Y15_N			35		
PWR_P60_W40_B50_Y15_N			40		
PWR_P60_W45_B50_Y15_N			45		
PWR_P60_W50_B50_Y15_N			50		
PWR_P60_W55_B50_Y15_N			55		
PWR_P60_W15_B60_Y15_N			15	60	
PWR_P60_W20_B60_Y15_N			20		
PWR_P60_W25_B60_Y15_N			25		
PWR_P60_W30_B60_Y15_N			30		
PWR_P60_W35_B60_Y15_N			35		
PWR_P60_W40_B60_Y15_N			40		
PWR_P60_W45_B60_Y15_N			45		
PWR_P60_W50_B60_Y15_N			50		
PWR_P60_W55_B60_Y15_N			55		
PWR_P60_W15_B70_Y15_N			15	70	

PWR_P60_W20_B70_Y15_N			20		
PWR_P60_W25_B70_Y15_N			25		
PWR_P60_W30_B70_Y15_N			30		
PWR_P60_W35_B70_Y15_N			35		
PWR_P60_W40_B70_Y15_N			40		
PWR_P60_W45_B70_Y15_N			45		
PWR_P60_W50_B70_Y15_N			50		
PWR_P60_W55_B70_Y15_N			55		
PWR_P60_W15_B80_Y15_N			15	78.25865	
PWR_P60_W20_B80_Y15_N			20		
PWR_P60_W25_B80_Y15_N			25		
PWR_P60_W30_B80_Y15_N			30		
PWR_P60_W35_B80_Y15_N			35		
PWR_P60_W40_B80_Y15_N			40		
PWR_P60_W45_B80_Y15_N			45		
PWR_P60_W50_B80_Y15_N			50		
PWR_P60_W55_B80_Y15_N			55		
PWR_P60_W15_B10_Y25_N			15	10	25
PWR_P60_W20_B10_Y25_N			20		
PWR_P60_W25_B10_Y25_N			25		
PWR_P60_W30_B10_Y25_N			30		
PWR_P60_W35_B10_Y25_N			35		
PWR_P60_W40_B10_Y25_N			40		
PWR_P60_W45_B10_Y25_N			45		
PWR_P60_W50_B10_Y25_N			50		
PWR_P60_W55_B10_Y25_N			55		
PWR_P60_W15_B20_Y25_N			15	20	
PWR_P60_W20_B20_Y25_N			20		
PWR_P60_W25_B20_Y25_N			25		
PWR_P60_W30_B20_Y25_N			30		
PWR_P60_W35_B20_Y25_N			35		
PWR_P60_W40_B20_Y25_N			40		
PWR_P60_W45_B20_Y25_N			45		
PWR_P60_W50_B20_Y25_N			50		
PWR_P60_W55_B20_Y25_N			55		
PWR_P60_W15_B30_Y25_N			15	30	
PWR_P60_W20_B30_Y25_N			20		
PWR_P60_W25_B30_Y25_N			25		
PWR_P60_W30_B30_Y25_N			30		
PWR_P60_W35_B30_Y25_N			35		
PWR_P60_W40_B30_Y25_N			40		
PWR_P60_W45_B30_Y25_N			45		
PWR_P60_W50_B30_Y25_N			50		
PWR_P60_W55_B30_Y25_N			55		
PWR_P60_W15_B40_Y25_N			15	40	
PWR_P60_W20_B40_Y25_N			20		

PWR_P60_W25_B40_Y25_N			25		
PWR_P60_W30_B40_Y25_N			30		
PWR_P60_W35_B40_Y25_N			35		
PWR_P60_W40_B40_Y25_N			40		
PWR_P60_W45_B40_Y25_N			45		
PWR_P60_W50_B40_Y25_N			50		
PWR_P60_W55_B40_Y25_N			55		
PWR_P60_W15_B50_Y25_N			15	50	
PWR_P60_W20_B50_Y25_N			20		
PWR_P60_W25_B50_Y25_N			25		
PWR_P60_W30_B50_Y25_N			30		
PWR_P60_W35_B50_Y25_N			35		
PWR_P60_W40_B50_Y25_N			40		
PWR_P60_W45_B50_Y25_N			45		
PWR_P60_W50_B50_Y25_N			50		
PWR_P60_W55_B50_Y25_N			55		
PWR_P60_W15_B60_Y25_N			15	60	
PWR_P60_W20_B60_Y25_N			20		
PWR_P60_W25_B60_Y25_N			25		
PWR_P60_W30_B60_Y25_N			30		
PWR_P60_W35_B60_Y25_N			35		
PWR_P60_W40_B60_Y25_N			40		
PWR_P60_W45_B60_Y25_N			45		
PWR_P60_W50_B60_Y25_N			50		
PWR_P60_W55_B60_Y25_N			55		
PWR_P60_W15_B70_Y25_N			15	70	
PWR_P60_W20_B70_Y25_N			20		
PWR_P60_W25_B70_Y25_N			25		
PWR_P60_W30_B70_Y25_N			30		
PWR_P60_W35_B70_Y25_N			35		
PWR_P60_W40_B70_Y25_N			40		
PWR_P60_W45_B70_Y25_N			45		
PWR_P60_W50_B70_Y25_N			50		
PWR_P60_W55_B70_Y25_N			55		
PWR_P60_W15_B80_Y25_N			15	78.25865	
PWR_P60_W20_B80_Y25_N			20		
PWR_P60_W25_B80_Y25_N			25		
PWR_P60_W30_B80_Y25_N			30		
PWR_P60_W35_B80_Y25_N			35		
PWR_P60_W40_B80_Y25_N			40		
PWR_P60_W45_B80_Y25_N			45		
PWR_P60_W50_B80_Y25_N			50		
PWR_P60_W55_B80_Y25_N			55		
PWR_P80_W15_B10_Y5_N	PWR	80	15	10	5
PWR_P80_W20_B10_Y5_N			20		
PWR_P80_W25_B10_Y5_N			25		

PWR_P80_W30_B10_Y5_N			30		
PWR_P80_W35_B10_Y5_N			35		
PWR_P80_W40_B10_Y5_N			40		
PWR_P80_W45_B10_Y5_N			45		
PWR_P80_W50_B10_Y5_N			50		
PWR_P80_W55_B10_Y5_N			55		
PWR_P80_W15_B20_Y5_N			15	20	
PWR_P80_W20_B20_Y5_N			20		
PWR_P80_W25_B20_Y5_N			25		
PWR_P80_W30_B20_Y5_N			30		
PWR_P80_W35_B20_Y5_N			35		
PWR_P80_W40_B20_Y5_N			40		
PWR_P80_W45_B20_Y5_N			45		
PWR_P80_W50_B20_Y5_N			50		
PWR_P80_W55_B20_Y5_N			55		
PWR_P80_W15_B30_Y5_N			15	30	
PWR_P80_W20_B30_Y5_N			20		
PWR_P80_W25_B30_Y5_N			25		
PWR_P80_W30_B30_Y5_N			30		
PWR_P80_W35_B30_Y5_N			35		
PWR_P80_W40_B30_Y5_N			40		
PWR_P80_W45_B30_Y5_N			45		
PWR_P80_W50_B30_Y5_N			50		
PWR_P80_W55_B30_Y5_N			55		
PWR_P80_W15_B40_Y5_N			15	40	
PWR_P80_W20_B40_Y5_N			20		
PWR_P80_W25_B40_Y5_N			25		
PWR_P80_W30_B40_Y5_N			30		
PWR_P80_W35_B40_Y5_N			35		
PWR_P80_W40_B40_Y5_N			40		
PWR_P80_W45_B40_Y5_N			45		
PWR_P80_W50_B40_Y5_N			50		
PWR_P80_W55_B40_Y5_N			55		
PWR_P80_W15_B50_Y5_N			15	50	
PWR_P80_W20_B50_Y5_N			20		
PWR_P80_W25_B50_Y5_N			25		
PWR_P80_W30_B50_Y5_N			30		
PWR_P80_W35_B50_Y5_N			35		
PWR_P80_W40_B50_Y5_N			40		
PWR_P80_W45_B50_Y5_N			45		
PWR_P80_W50_B50_Y5_N			50		
PWR_P80_W55_B50_Y5_N			55		
PWR_P80_W15_B60_Y5_N			15	60	
PWR_P80_W20_B60_Y5_N			20		
PWR_P80_W25_B60_Y5_N			25		
PWR_P80_W30_B60_Y5_N			30		
PWR_P80_W35_B60_Y5_N			35		

PWR_P80_W40_B60_Y5_N			40		
PWR_P80_W45_B60_Y5_N			45		
PWR_P80_W50_B60_Y5_N			50		
PWR_P80_W55_B60_Y5_N			55		
PWR_P80_W15_B70_Y5_N			15	70	
PWR_P80_W20_B70_Y5_N			20		
PWR_P80_W25_B70_Y5_N			25		
PWR_P80_W30_B70_Y5_N			30		
PWR_P80_W35_B70_Y5_N			35		
PWR_P80_W40_B70_Y5_N			40		
PWR_P80_W45_B70_Y5_N			45		
PWR_P80_W50_B70_Y5_N			50		
PWR_P80_W55_B70_Y5_N			55		
PWR_P80_W15_B80_Y5_N			15	78.25865	
PWR_P80_W20_B80_Y5_N			20		
PWR_P80_W25_B80_Y5_N			25		
PWR_P80_W30_B80_Y5_N			30		
PWR_P80_W35_B80_Y5_N			35		
PWR_P80_W40_B80_Y5_N			40		
PWR_P80_W45_B80_Y5_N			45		
PWR_P80_W50_B80_Y5_N			50		
PWR_P80_W55_B80_Y5_N			55		
PWR_P80_W15_B10_Y15_N			15	10	15
PWR_P80_W20_B10_Y15_N			20		
PWR_P80_W25_B10_Y15_N			25		
PWR_P80_W30_B10_Y15_N			30		
PWR_P80_W35_B10_Y15_N			35		
PWR_P80_W40_B10_Y15_N			40		
PWR_P80_W45_B10_Y15_N			45		
PWR_P80_W50_B10_Y15_N			50		
PWR_P80_W55_B10_Y15_N			55		
PWR_P80_W15_B20_Y15_N			15	20	
PWR_P80_W20_B20_Y15_N			20		
PWR_P80_W25_B20_Y15_N			25		
PWR_P80_W30_B20_Y15_N			30		
PWR_P80_W35_B20_Y15_N			35		
PWR_P80_W40_B20_Y15_N			40		
PWR_P80_W45_B20_Y15_N			45		
PWR_P80_W50_B20_Y15_N			50		
PWR_P80_W55_B20_Y15_N			55		
PWR_P80_W15_B30_Y15_N			15	30	
PWR_P80_W20_B30_Y15_N			20		
PWR_P80_W25_B30_Y15_N			25		
PWR_P80_W30_B30_Y15_N			30		
PWR_P80_W35_B30_Y15_N			35		
PWR_P80_W40_B30_Y15_N			40		

PWR_P80_W45_B30_Y15_N			45		
PWR_P80_W50_B30_Y15_N			50		
PWR_P80_W55_B30_Y15_N			55		
PWR_P80_W15_B40_Y15_N			15	40	
PWR_P80_W20_B40_Y15_N			20		
PWR_P80_W25_B40_Y15_N			25		
PWR_P80_W30_B40_Y15_N			30		
PWR_P80_W35_B40_Y15_N			35		
PWR_P80_W40_B40_Y15_N			40		
PWR_P80_W45_B40_Y15_N			45		
PWR_P80_W50_B40_Y15_N			50		
PWR_P80_W55_B40_Y15_N			55		
PWR_P80_W15_B50_Y15_N			15	50	
PWR_P80_W20_B50_Y15_N			20		
PWR_P80_W25_B50_Y15_N			25		
PWR_P80_W30_B50_Y15_N			30		
PWR_P80_W35_B50_Y15_N			35		
PWR_P80_W40_B50_Y15_N			40		
PWR_P80_W45_B50_Y15_N			45		
PWR_P80_W50_B50_Y15_N			50		
PWR_P80_W55_B50_Y15_N			55		
PWR_P80_W15_B60_Y15_N			15	60	
PWR_P80_W20_B60_Y15_N			20		
PWR_P80_W25_B60_Y15_N			25		
PWR_P80_W30_B60_Y15_N			30		
PWR_P80_W35_B60_Y15_N			35		
PWR_P80_W40_B60_Y15_N			40		
PWR_P80_W45_B60_Y15_N			45		
PWR_P80_W50_B60_Y15_N			50		
PWR_P80_W55_B60_Y15_N			55		
PWR_P80_W15_B70_Y15_N			15	70	
PWR_P80_W20_B70_Y15_N			20		
PWR_P80_W25_B70_Y15_N			25		
PWR_P80_W30_B70_Y15_N			30		
PWR_P80_W35_B70_Y15_N			35		
PWR_P80_W40_B70_Y15_N			40		
PWR_P80_W45_B70_Y15_N			45		
PWR_P80_W50_B70_Y15_N			50		
PWR_P80_W55_B70_Y15_N			55		
PWR_P80_W15_B80_Y15_N			15	78.25865	
PWR_P80_W20_B80_Y15_N			20		
PWR_P80_W25_B80_Y15_N			25		
PWR_P80_W30_B80_Y15_N			30		
PWR_P80_W35_B80_Y15_N			35		
PWR_P80_W40_B80_Y15_N			40		
PWR_P80_W45_B80_Y15_N			45		
PWR_P80_W50_B80_Y15_N			50		

PWR_P80_W55_B80_Y15_N			55		
PWR_P80_W15_B10_Y25_N			15	10	25
PWR_P80_W20_B10_Y25_N			20		
PWR_P80_W25_B10_Y25_N			25		
PWR_P80_W30_B10_Y25_N			30		
PWR_P80_W35_B10_Y25_N			35		
PWR_P80_W40_B10_Y25_N			40		
PWR_P80_W45_B10_Y25_N			45		
PWR_P80_W50_B10_Y25_N			50		
PWR_P80_W55_B10_Y25_N			55		
PWR_P80_W15_B20_Y25_N			15	20	
PWR_P80_W20_B20_Y25_N			20		
PWR_P80_W25_B20_Y25_N			25		
PWR_P80_W30_B20_Y25_N			30		
PWR_P80_W35_B20_Y25_N			35		
PWR_P80_W40_B20_Y25_N			40		
PWR_P80_W45_B20_Y25_N			45		
PWR_P80_W50_B20_Y25_N			50		
PWR_P80_W55_B20_Y25_N			55		
PWR_P80_W15_B30_Y25_N			15	30	
PWR_P80_W20_B30_Y25_N			20		
PWR_P80_W25_B30_Y25_N			25		
PWR_P80_W30_B30_Y25_N			30		
PWR_P80_W35_B30_Y25_N			35		
PWR_P80_W40_B30_Y25_N			40		
PWR_P80_W45_B30_Y25_N			45		
PWR_P80_W50_B30_Y25_N			50		
PWR_P80_W55_B30_Y25_N			55		
PWR_P80_W15_B40_Y25_N			15	40	
PWR_P80_W20_B40_Y25_N			20		
PWR_P80_W25_B40_Y25_N			25		
PWR_P80_W30_B40_Y25_N			30		
PWR_P80_W35_B40_Y25_N			35		
PWR_P80_W40_B40_Y25_N			40		
PWR_P80_W45_B40_Y25_N			45		
PWR_P80_W50_B40_Y25_N			50		
PWR_P80_W55_B40_Y25_N			55		
PWR_P80_W15_B50_Y25_N			15	50	
PWR_P80_W20_B50_Y25_N			20		
PWR_P80_W25_B50_Y25_N			25		
PWR_P80_W30_B50_Y25_N			30		
PWR_P80_W35_B50_Y25_N			35		
PWR_P80_W40_B50_Y25_N			40		
PWR_P80_W45_B50_Y25_N			45		
PWR_P80_W50_B50_Y25_N			50		
PWR_P80_W55_B50_Y25_N			55		

PWR_P80_W15_B60_Y25_N			15	60	
PWR_P80_W20_B60_Y25_N			20		
PWR_P80_W25_B60_Y25_N			25		
PWR_P80_W30_B60_Y25_N			30		
PWR_P80_W35_B60_Y25_N			35		
PWR_P80_W40_B60_Y25_N			40		
PWR_P80_W45_B60_Y25_N			45		
PWR_P80_W50_B60_Y25_N			50		
PWR_P80_W55_B60_Y25_N			55		
PWR_P80_W15_B70_Y25_N			15	70	
PWR_P80_W20_B70_Y25_N			20		
PWR_P80_W25_B70_Y25_N			25		
PWR_P80_W30_B70_Y25_N			30		
PWR_P80_W35_B70_Y25_N			35		
PWR_P80_W40_B70_Y25_N			40		
PWR_P80_W45_B70_Y25_N			45		
PWR_P80_W50_B70_Y25_N			50		
PWR_P80_W55_B70_Y25_N			55		
PWR_P80_W15_B80_Y25_N			15	78.25865	
PWR_P80_W20_B80_Y25_N			20		
PWR_P80_W25_B80_Y25_N			25		
PWR_P80_W30_B80_Y25_N			30		
PWR_P80_W35_B80_Y25_N			35		
PWR_P80_W40_B80_Y25_N			40		
PWR_P80_W45_B80_Y25_N			45		
PWR_P80_W50_B80_Y25_N			50		
PWR_P80_W55_B80_Y25_N			55		

No new entries on this page

4. OrigenARP output results

Assembly Decay Heat Generation Rate are based on OrigenARP' '**element thermal power**' values output for the set of elements from Table 5.1 for the basis equal 0.46363 MTU. "***Origen Output Treatment***" software from Attachment 1 has been designed and written to automate output file treatment and improve reliability of obtained results. It gathered all OrigenARP' Thermal Power values output data to summarize thermal output of all 33 elements from Table 5.1 and produced just a number for each OrigenARP' output keeping it at the greed. "***Origen Output Treatment***" software can work with the set of output files to produce result as a vector for each series of input parameters.

Table 5.1. Set of Elements for the Assembly Decay Heat Generation Rate Estimation

#	Element
light elements	
1	c
actinides	
2	u
3	np
4	pu
5	am
6	cm
fission products	
7	br
8	kr
9	rb
10	sr
11	y
12	zr
13	nb
14	mo
15	tc
16	ru
17	rh
18	pd
19	ag
20	sn
21	sb
22	te
23	i
24	xe
25	cs
26	ba
27	la
28	ce
29	pr
30	nd
31	pm
32	sm

33	eu

No new entries on this page

Two routines ("***ConsoleApplication_TADChangePower***" and "***ConsoleApplication_BurnupTimes***") have been designed to automatize preparing all 1080 OrigenARP inputs and improving quality of obtained results. They are present at the Attachement 2.

Table 5.2 encompasses all 1080 OrigenARP outputs and presents them as a table of Thermal Maps, so each row of the table presents data for the certain assembly's Fission Heat Rate, and each column of the table present data for certain assembly's Cooling Time.
Thermal map axes are:

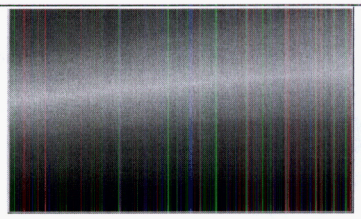
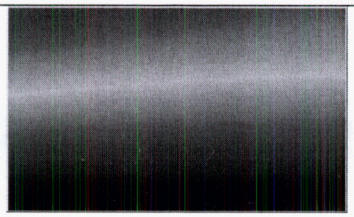
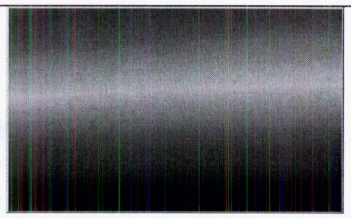
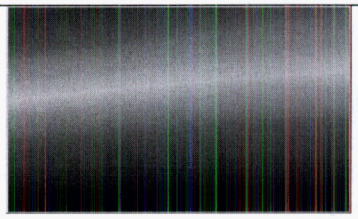
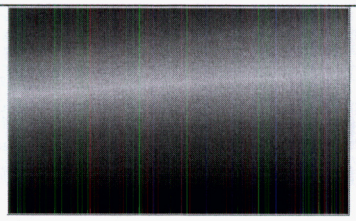
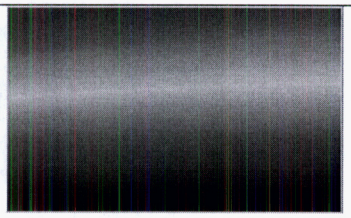
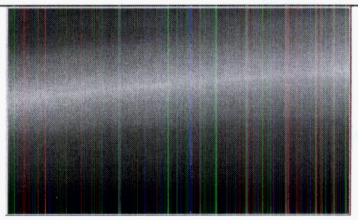
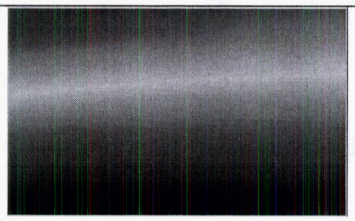
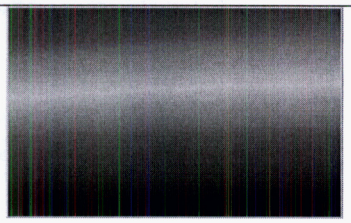
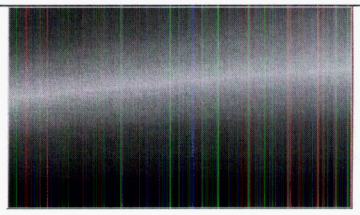
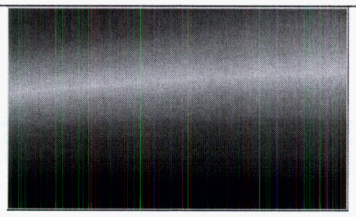
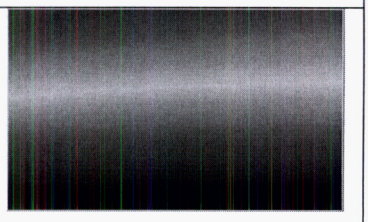
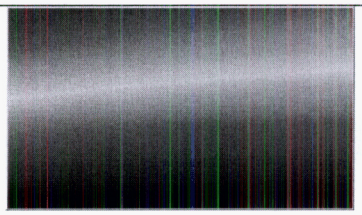
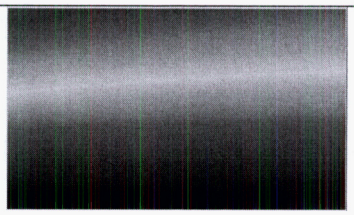
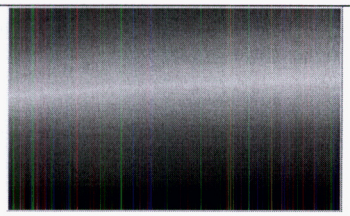
- Initial Enrichment (X-Axis),
- Burnup (Y-Axis)

as shown at the Fig. 5.1 - Thermal Map Axes Values.

Thermal maps have been created by 2-dimensional spline approximation for the OrigenARP output data for the set of input parameters (burnups and initial enrichments) by means of two-dimensional spline approximation implemented in PFA Software that presents at the Attachment 2

No new entries on this page

Table 5.2. Thermal Maps

Heat Rate	Cooling Time 5 Years		Cooling Time 15 Years		Cooling Time 25 Years	
28 kW/ kgU						
	P_{min}= 222.8	P_{max}=2786.8	P_{min}= 128.5	P_{max}=1639.5	P_{min}= 103.2	P_{max}=1235.0
31.3 kW/ kgU						
	P_{min}= 225.18	P_{max}=2843.5	P_{min}= 128.9	P_{max}=1649.4	P_{min}= 103.52	P_{max}=1241.1
40 kW/ kgU						
	P_{min}= 228.8	P_{max}=2972.5	P_{min}= 128.96	P_{max}=1670.6	P_{min}= 103.56	P_{max}=1254.1
60 kW/ kgU						
	P_{min}= 233.9	P_{max}=3173.1	P_{min}= 129.29	P_{max}=1699.2	P_{min}= 103.8	P_{max}=1271.6
80 kW/ kgU						
	P_{min}=235.9	P_{max}=3315.7	P_{min}= 129.1	P_{max}=1716.2	P_{min}= 103.6	P_{max}=1281.9

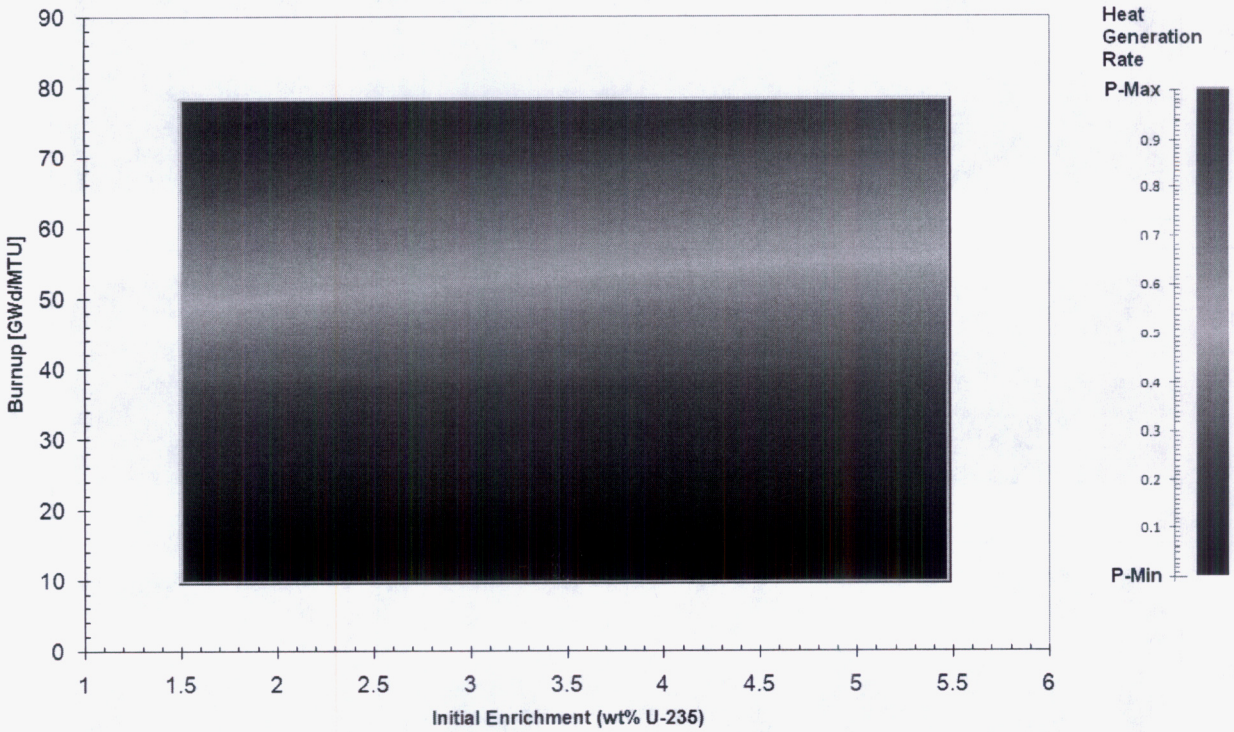


Figure 5.1. Thermal Map Axis Values

No new entries on this page

5. Heat Generation Rate Maps

Heat generation rates calculated using OrigenARP output files provided at the Attachement 1 for the set of elements from Table 5.1 are listed in the Tables 6.1. – 6.15 and show at the Figures 6.1 – 6.15

Each table presents data for certain values of the cooling time and the assembly Fission Heat Rate for the 15 (The same fission heat rate for assembly during its depletion).
Correspondence Thermal Map representation is obtained by 2-D spline approximation of the Table's data.

No new entries on this page

Table 6.1. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for Cooling Time 5 Years and Assembly Power Rate 28 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	2786.8	2696.7	2608	2522.8	2441.9	2365.6	2294.7	2229.5	2169.9
70	2403.7	2318.3	2235.3	2157.1	2084.3	2017.4	1956.9	1902.6	1854.3
60	1959.0966	1883.2608	1812.2738	1747.7111	1689.6592	1638.0561	1592.5017	1552.896	1518.4768
50	1521.6	1460	1404.2	1355.6	1313.7	1278.1	1247.8	1222.3	1200.5
40	1127.2	1083.2	1045.3	1014	988.39	967.43	950.02	935.52	923.22
30	782.49013	758.44282	738.9853	723.58027	711.11203	700.87058	692.26996	684.95151	678.59902
20	490.5	479.84	471.32	464.58	459.06	454.5	450.63	447.3	444.4
10	238.17	234.25	231.27	229.01	227.22	225.79	224.61	223.61	222.76

P_{min}= 222.8 P_{max}=2786.8

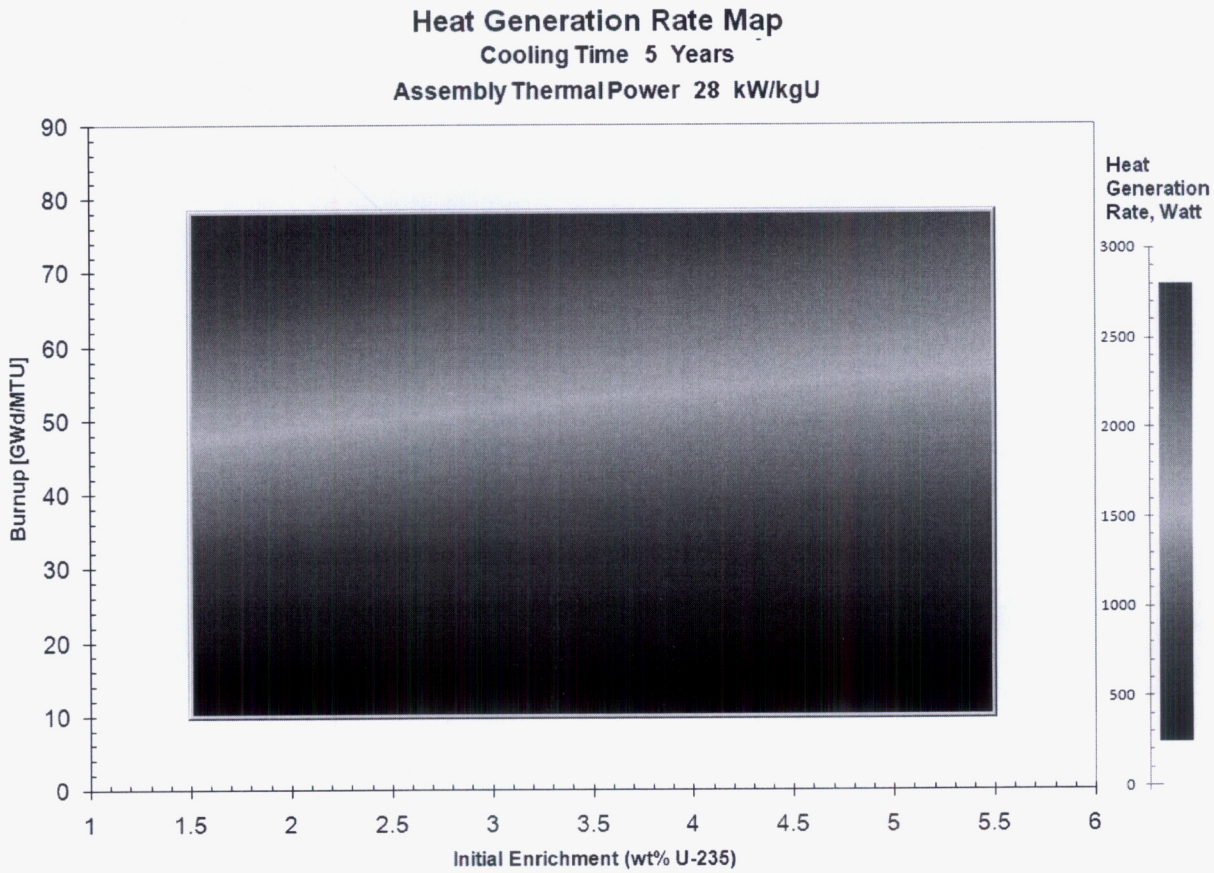


Figure 6.1. Heat Generation Rates Thermal Map for Cooling Time 5 Years and Assembly Power Rate 28 kWt/kg

No new entries on this page

Table 6.2. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 15 Years and Assembly Power Rate 28 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	1639.5	1586.5	1535.3	1487.4	1443.3	1403.2	1367.5	1335.9	1308.1
70	1397.2	1348.2	1301.9	1259.7	1222.2	1189.3	1160.9	1136.5	1115.5
60	1116.7798	1075.4959	1038.7363	1007.2011	980.4153	957.92147	939.06846	923.33628	910.09007
50	852.04	821.67	796.22	775.75	759.38	746.43	735.99	727.54	720.54
40	618.13	600.42	586.94	577.15	569.87	564.41	560.06	556.53	553.52
30	421.7842	416.98907	414.04881	412.15342	410.64182	409.32399	408.04617	406.80591	405.56565
20	265.05	265.65	265.9	265.83	265.49	265.01	264.44	263.83	263.21
10	129.94	130.04	129.88	129.64	129.38	129.13	128.9	128.69	128.5

P_{min}= 128.5 P_{max}=1639.5

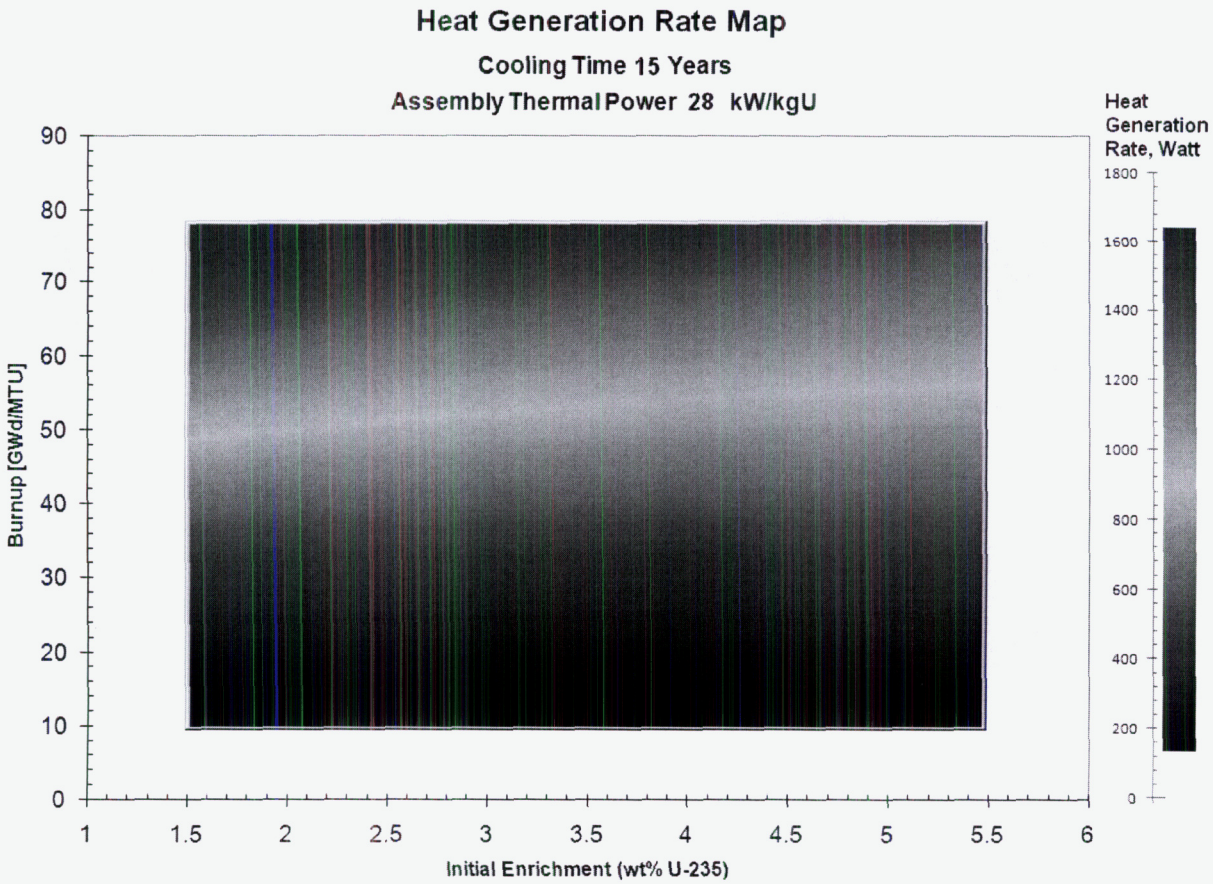


Figure 6.2. Heat Generation Rates Thermal Map for Cooling Time 15 Years and Assembly Power Rate 28 kWt/kg

No new entries on this page

Table 6.3. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 25 Years and Assembly Power Rate 28 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	1235	1204.9	1175.8	1148.5	1123.6	1100.9	1080.7	1062.7	1046.7
70	1062.4	1034.3	1007.9	983.84	962.5	943.74	927.43	913.28	900.9
60	860.93001	837.37991	816.61063	798.80462	783.70566	770.91509	759.94913	750.55913	742.38022
50	669.28	652.08	637.74	626.2	616.81	609.18	602.74	597.25	592.42
40	496.82	486.92	479.34	473.69	469.22	465.58	462.37	459.5	456.82
30	349.10518	346.93492	345.39332	344.06415	342.59254	341.01093	339.30311	337.54285	335.75259
20	224.35	224.11	223.34	222.24	220.95	219.61	218.27	216.98	215.76
10	109.59	108.37	107.22	106.25	105.42	104.73	104.15	103.65	103.22

P_{min}= 103.2 P_{max}=1235.0

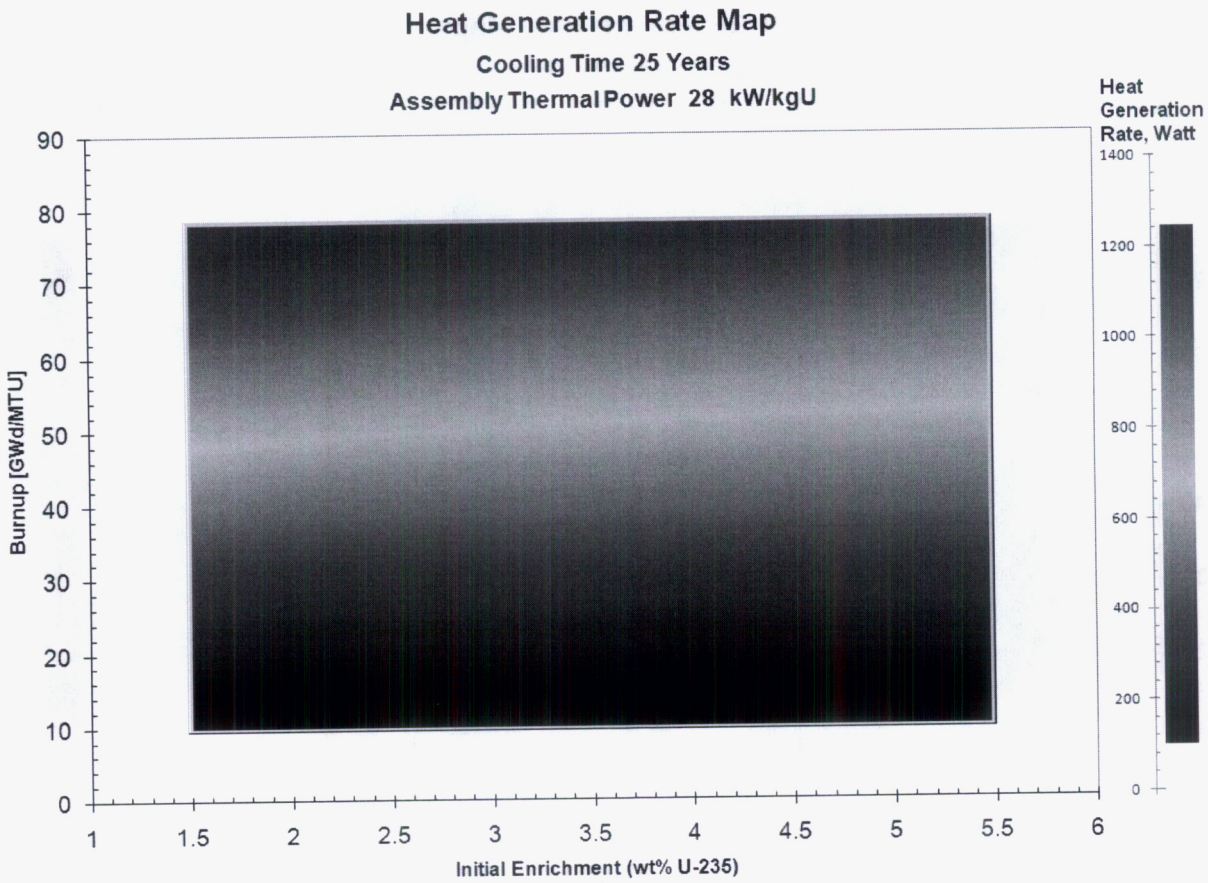


Figure 6.3.Heat Generation Rates Thermal Map for Cooling Time 25 Years and Assembly Power Rate 28 kWt/kg

No new entries on this page

Table 6.4. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 5 Years and Assembly Power Rate 31.29 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	2843.5	2751.5	2660.8	2573.7	2490.9	2412.8	2340.3	2273.5	2212.6
70	2453.6	2366.3	2281.4	2201.3	2126.8	2058.3	1996.3	1940.7	1891.3
60	1993.1	1915.6	1843.1	1777.1	1717.8	1665.1	1618.6	1578.2	1543.1
50	1552.6	1489.4	1432.1	1382.2	1339.2	1302.6	1271.6	1245.4	1223.1
40	1148.7	1103.3	1064.2	1032.1	1005.7	984.12	966.25	951.37	938.76
30	794.31	769.51	749.47	733.63	720.81	710.3	701.48	693.98	687.48
20	498.27	487.12	478.26	471.27	465.57	460.87	456.89	453.48	450.5
10	241.02	236.96	233.89	231.57	229.74	228.28	227.07	226.05	225.18

P_{min}= 225.18 P_{max}=2843.5

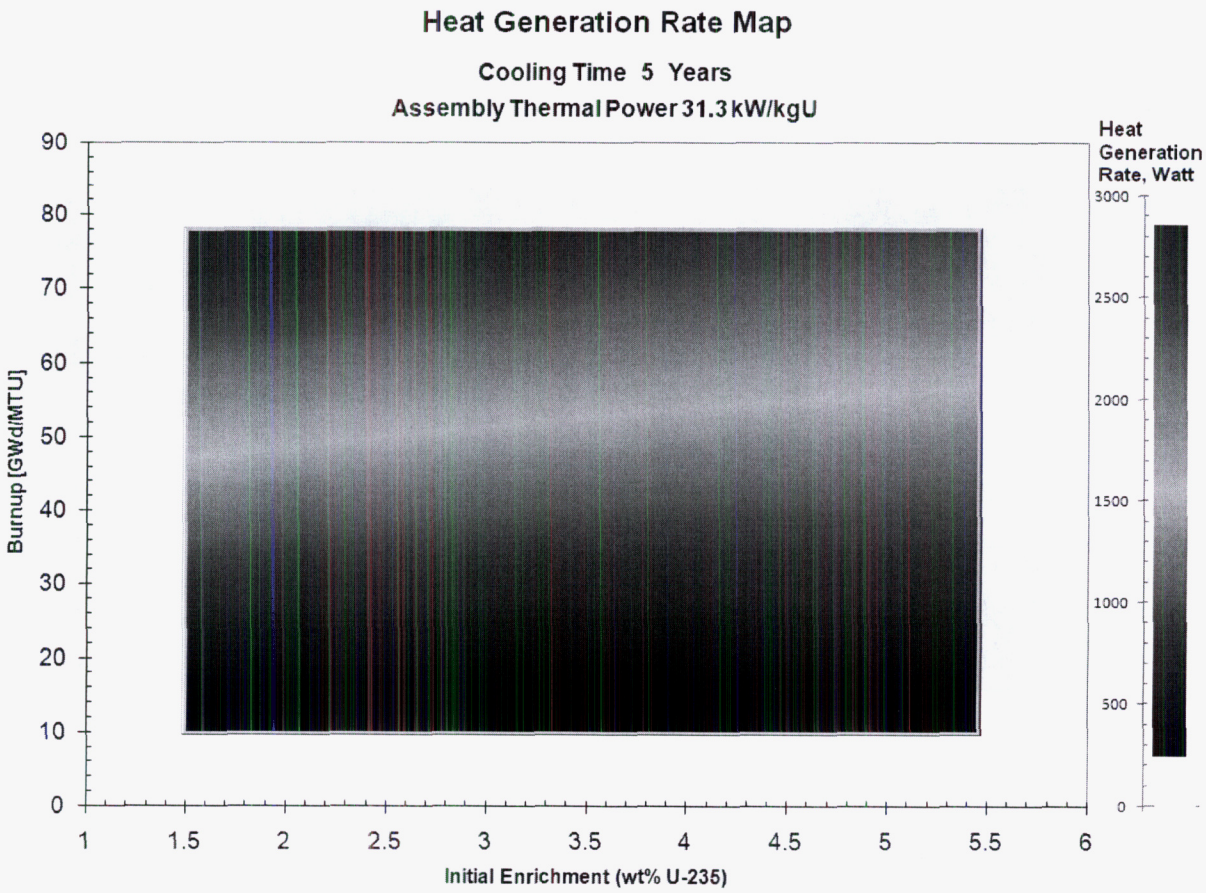


Figure 6.4.Heat Generation Rates Thermal Map for Cooling Time 5 Years and Assembly Power Rate 31.29 kWt/kg

No new entries on this page

Table 6.5. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 15 Years and Assembly Power Rate 31.29 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	1649.4	1595.6	1543.6	1494.9	1450.2	1409.7	1373.5	1341.6	1313.4
70	1405.1	1355.4	1308.4	1265.7	1227.8	1194.5	1165.8	1141.1	1120.1
60	1120.6	1078.9	1041.8	1010	983.01	960.38	941.44	925.67	912.42
50	854.8	824.13	798.48	777.87	761.43	748.47	738.05	729.66	722.73
40	618.77	600.9	587.35	577.54	570.3	564.9	560.63	557.18	554.25
30	422.17	417.39	414.48	412.63	411.16	409.88	408.64	407.43	406.22
20	265.19	265.82	266.12	266.09	265.79	265.34	264.79	264.21	263.61
10	130.31	130.41	130.26	130.02	129.76	129.51	129.28	129.07	128.88

P_{min}= 128.9 P_{max}=1649.4

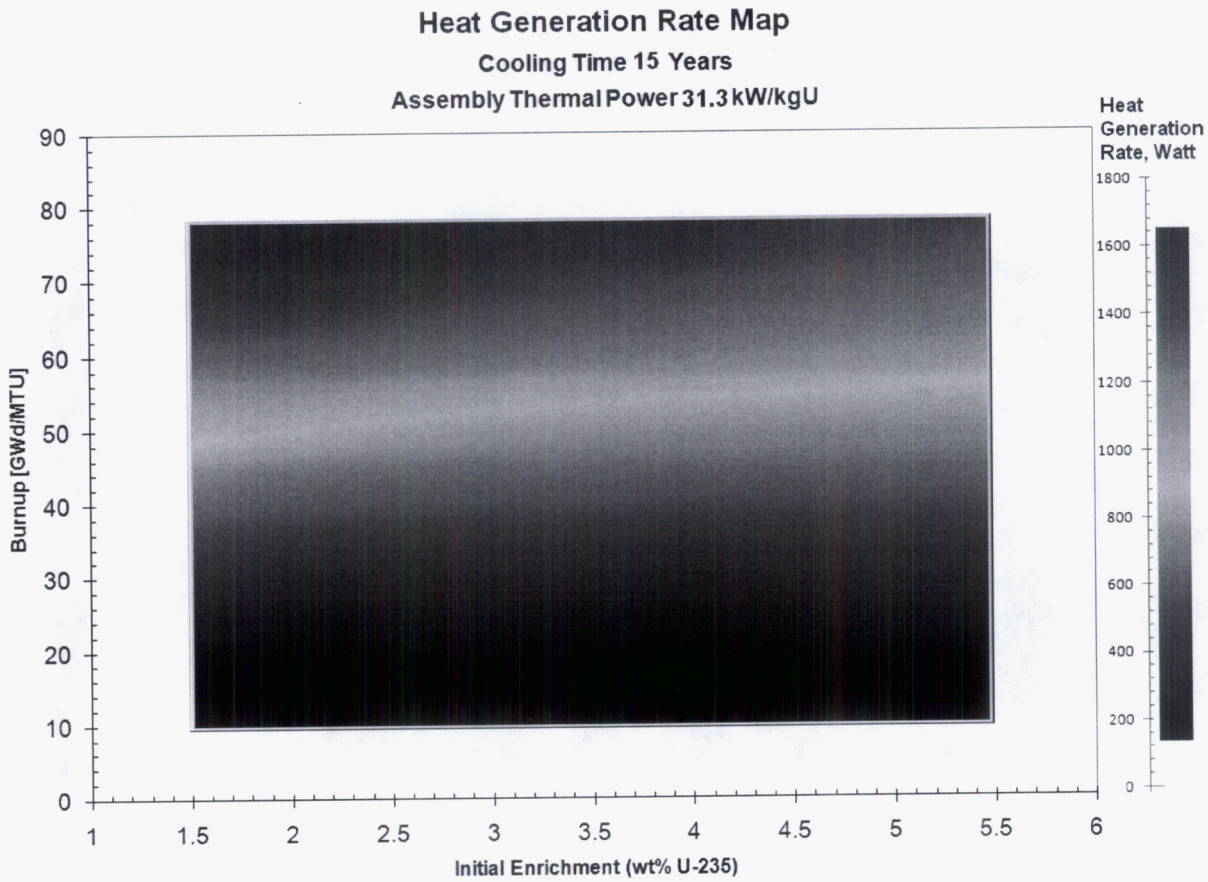


Figure 6.5. Heat Generation Rates Thermal Map for Cooling Time 15 Years and Assembly Power Rate 31.29 kWt/kg

No new entries on this page

Table 6.6. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 25 Years and Assembly Power Rate 31.29 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	1241.1	1210.4	1180.7	1153	1127.6	1104.6	1084.1	1065.9	1049.7
70	1067.2	1038.6	1011.7	987.33	965.68	946.66	930.18	915.91	903.47
60	863.12	839.29	818.29	800.31	785.09	772.22	761.22	751.83	743.67
50	670.71	653.32	638.86	627.25	617.85	610.24	603.85	598.43	593.68
40	496.82	486.82	479.2	473.56	469.14	465.57	462.45	459.66	457.06
30	349.23	347.09	345.59	344.31	342.88	341.34	339.67	337.94	336.18
20	224.35	224.15	223.42	222.36	221.1	219.79	218.48	217.21	216.01
10	109.89	108.67	107.53	106.55	105.72	105.03	104.45	103.95	103.52

P_{min}= 103.52 P_{max}=1241.1

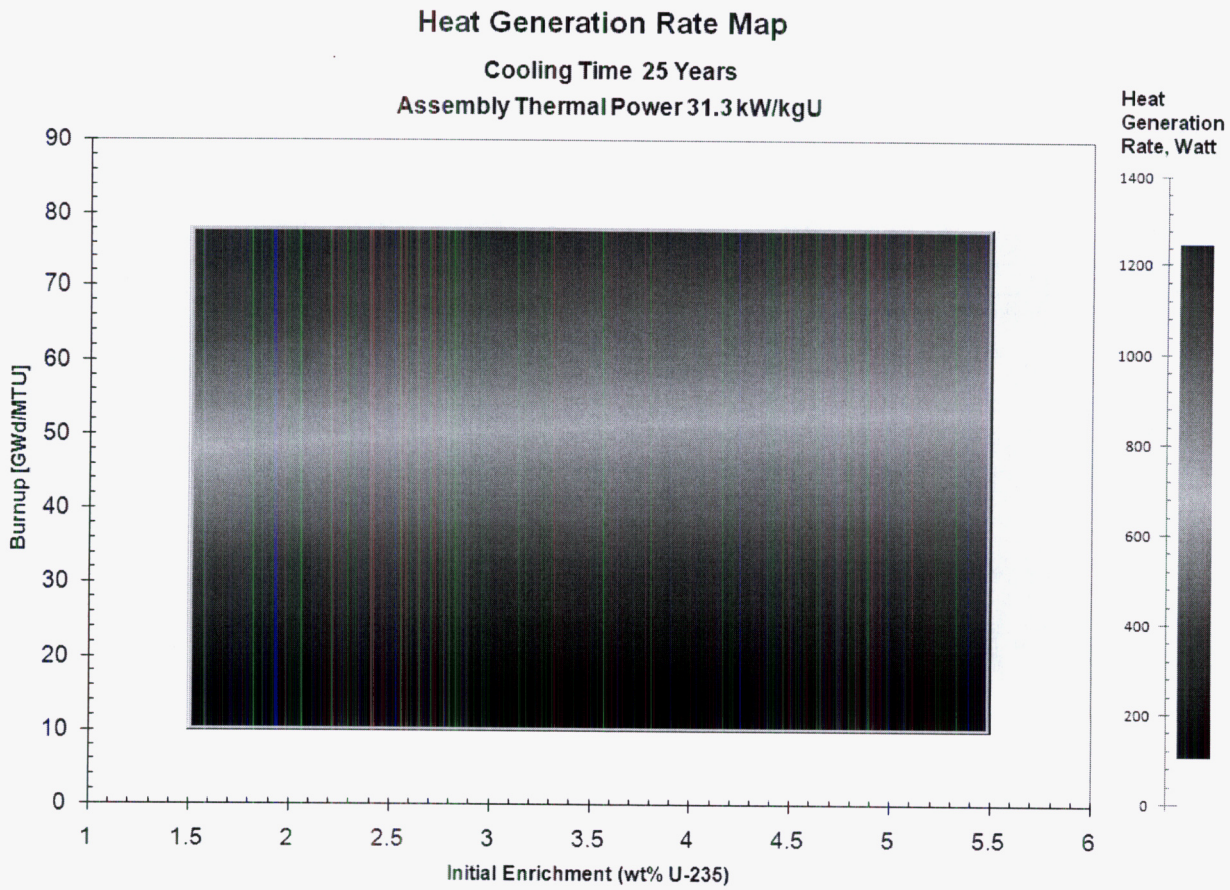


Figure 6.6. Heat Generation Rates Thermal Map for Cooling Time 25 Years and Assembly Power Rate 31.29 kWt/kg

No new entries on this page

Table 6.7. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 5 Years and Assembly Power Rate 40 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	2972.5	2875.8	2780.5	2688.9	2601.7	2519.4	2443	2372.6	2308.5
70	2563.7	2471.8	2382.5	2298.1	2219.5	2147.2	2081.9	2023.4	1971.5
60	2083	2001.1	1924.6	1854.8	1792.2	1736.6	1687.6	1645.1	1608.2
50	1620.5	1553.4	1492.7	1439.7	1394.1	1355.4	1322.7	1295	1271.5
40	1196.2	1148.4	1107.2	1073.3	1045.5	1022.8	1003.9	988.25	974.96
30	825.56	798.77	777.19	760.2	746.45	735.23	725.83	717.85	710.96
20	513.31	501.45	492.05	484.66	478.66	473.71	469.54	465.96	462.86
10	245.37	241.08	237.86	235.44	233.54	232.02	230.76	229.72	228.82

P_{min}= 228.8 P_{max}=2972.5

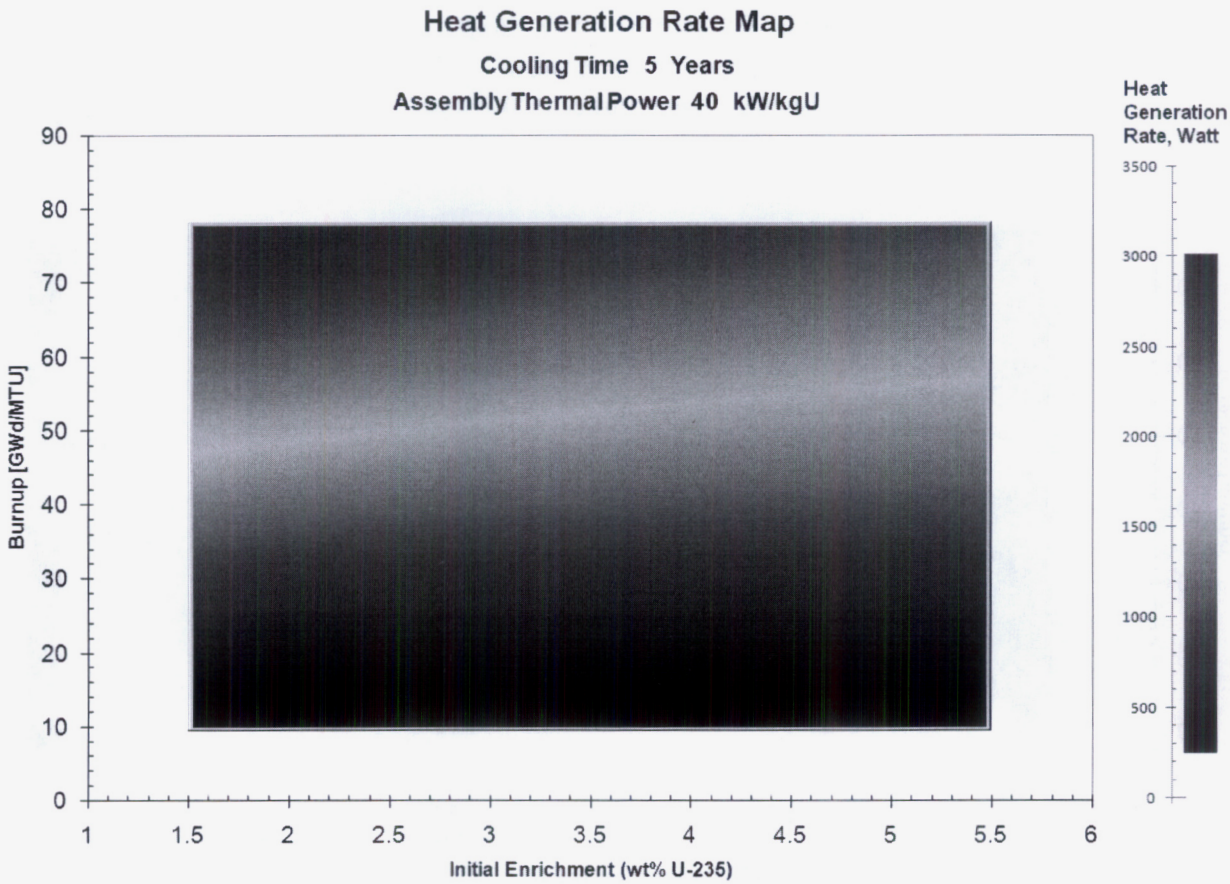


Figure 6.7. Heat Generation Rates Thermal Map for Cooling Time 5 Years and Assembly Power Rate 40 kWt/kg

No new entries on this page

Table 6.8. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 15 Years and Assembly Power Rate 40 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	1670.6	1614.9	1561.2	1510.9	1464.7	1422.9	1385.7	1352.9	1324.1
70	1420.3	1369	1320.6	1276.6	1237.6	1203.4	1174	1148.9	1127.5
60	1130.7	1087.9	1049.9	1017.4	989.87	966.88	947.71	931.84	918.58
50	859.88	828.43	802.2	781.2	764.54	751.48	741.08	732.77	725.96
40	622.39	604.2	590.48	580.62	573.41	568.09	563.92	560.59	557.78
30	423.19	418.45	415.62	413.89	412.53	411.35	410.21	409.08	407.95
20	265.77	266.48	266.86	266.89	266.64	266.23	265.72	265.16	264.58
10	130.39	130.49	130.34	130.1	129.84	129.59	129.36	129.15	128.96

P_{min}= 128.96 P_{max}=1670.6

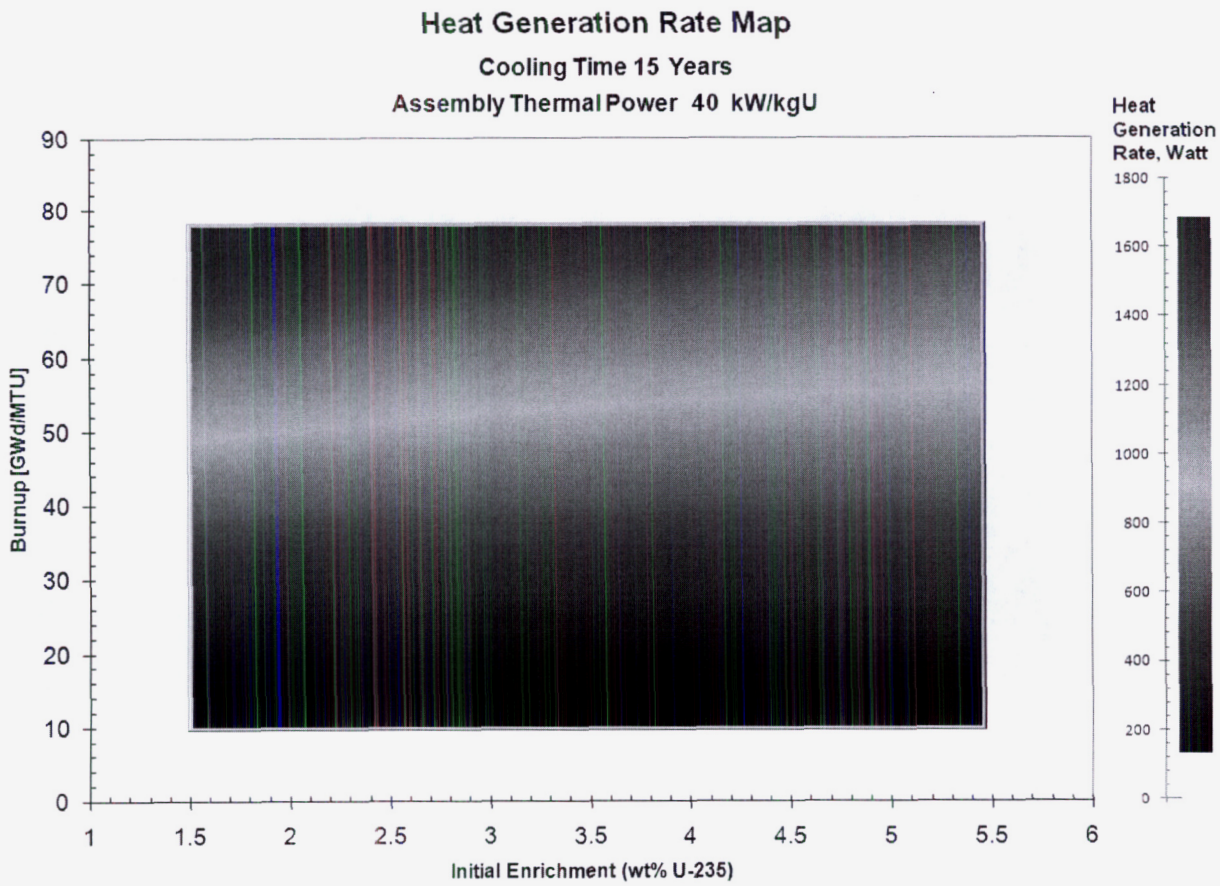


Figure 6.8. Heat Generation Rates Thermal Map for Cooling Time 15 Years and Assembly Power Rate 40 kWt/kg

Table 6.9. Heat Generation Rates (Watts) for 15 × 15 Babcock & Wilcox Assembly With 0.46363 MTU for the Cooling Time 25 Years and Assembly Power Rate 40 kWt/kg

Enrich./ Burnup	1.5	2	2.5	3	3.5	4	4.5	5	5.5
78.26	1254.1	1222.1	1191.2	1162.3	1135.9	1112	1090.8	1072	1055.3
70	1076.1	1046.5	1018.6	993.29	970.88	951.26	934.33	919.75	907.14
60	868.91	844.34	822.73	804.29	788.75	775.67	764.58	755.19	747.08
50	673.14	655.23	640.4	628.55	619.04	611.42	605.1	599.8	595.19
40	498.77	488.59	480.91	475.29	470.94	467.49	464.49	461.83	459.36
30	349.56	347.5	346.11	344.96	343.64	342.21	340.64	338.99	337.31
20	224.69	224.57	223.9	222.91	221.69	220.41	219.13	217.89	216.71
10	109.92	108.7	107.56	106.58	105.76	105.07	104.48	103.99	103.56

P_{min}= 103.56 P_{max}=1254.1

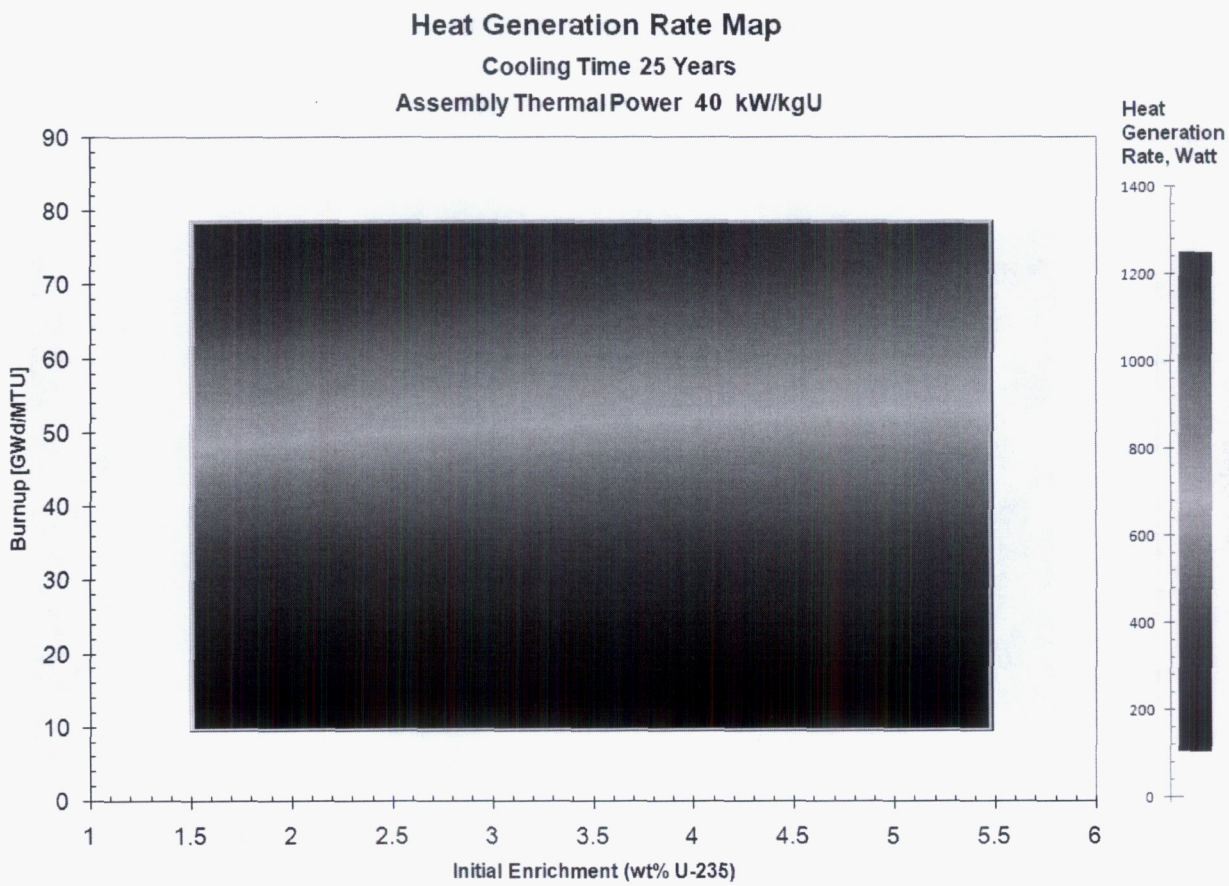


Figure 6.9. Heat Generation Rates Thermal Map for Cooling Time 25 Years and Assembly Power Rate 40 kWt/kg

No new entries on this page