5. TRANSMUTATION CAPABILITY OF PROPOSED CONCEPTS

The transmutation capability has been usually discussed using the transmutation rate defined as a ratio of weight of minor actinides which is transmuted by fission and capture to that of initial loading of minor actinides per unit time. There is another definition, so-called burnup rate, which is a ratio of weight of minor actinides incinerated by fission reaction to that of initial loading of minor actinides per unit time [25] . This is because the aim of transmutation is the conversion of long-lived nuclides to shorter-lived or stable nuclides and fission, not capture, is a real transmutation reaction for minor actinides.

Since it is difficult to separate transmutation by fission from by capture in the burnup calculation, the transmutation capability of the proposed concepts is discussed based on the classical definition.

$$\text{Transmutation capability} = \frac{\text{MA(BOEC)} - \text{MA(EOEC)}}{\text{(cycle time)x(thermal power)}}$$

$$\text{Transmutation rate} = \frac{\text{MA(BOEC)} - \text{MA(EOEC)}}{\text{MA(BOEC)x(cycle time)}}$$

where, MA(BOEC) and MA(EOEC): minor actinides quantities at the beginning and end of equilibrium cycle (kg), cycle time: equivalent full power year (EFPY) between BOEC and EOEC, and thermal power: (GWt) .

5.1 Thermal Reactors

Materials inventory and mass balance of PWR based transmutation concepts proposed by the CEA is given in Table 5.1 for the homogeneous arrangement of minor actinides, and in Table 5.2 and 5.3 for the heterogeneous arrangement with Np and Am targets. In the first concept with the homogeneous arrangement,the transmutation capability is 11.3 kg/GWt/EFPY and then the corresponding transmutation rate is 5.0%/EFPY. This substantially low transmutation capability is due to significant buildup of Cm-244. In the second concepts, the transmutation capability is 37.2 kg/GWt/EFPY (11.1%/EFPY) and 17.3 kg/GWt/EFPY (16.8%/EFPY) for the Np and Am targets themselves, respectively.

Materials inventory and mass balance of U02 fueled PWR based transmutation concept proposed by JAERI is given in Table 5.4. The transmutation capability is 11.3 kg/GWt/EFPY (6.8%/EFPY). The JAERI concept has the similar transmutation rate of Np-237 with that of the CEA first concept (5.7%/EFPY).

5.2 Fast Reactors

Materials inventory and mass balance are given in Table 5.5 to 5.12 for fast reactor based transmutation concepts proposed by the organizations.

The transmutation capabilities are 57.9 kg/GWt/EFPY for the CEA first MOX-LMFBR, 58.2 for the PNC-MOX-LMFBR, 53.6 for the CRIEPI-metal fuel LMFBR, 256.4 for the JAERI P-ABR, 290.3 for the JAERI L-ABR and 112.6 for the JAERI-Th loaded LMR, respectively.

The corresponding transmutation rates are 9.0%/EFPY, 7.0, 12.4, 20.6, 10.4 and 5.5,respectively. As for the LMFBR based concepts loaded heterogeneously with minor actinides targets, the transmutation capability is 48.2 kg/GWt/EFPY (4.9%/EFPY) for Np-target and 39.0 kg/GWt/EFPY (3.9%/EFPY) for Am-target, respectively.

The fast reactor based transmutation concepts has higher transmutation capability than LWR based ones, because of their higher minor actinides inventory and higher neutron flux than LWR concepts.

5.3 Accelerator Based Transmutation Concepts

Exact burnup calculation is very much troublesome for the accelerator-driven systems, since various kinds of high energy particle reactions include in the calculation. Therefore, there is a few calculation results related to the material mass balance as shown above for reactor based transmutation systems.

Table 5.13 and 5.14 show simple transmutation rates of transmutation nuclides, without treating their burnup and decay chains, for the "MOX fueled core" and "Particle fueled core" concepts proposed by the BNL. In these tables, transmutation rate of Tc-99 and 1-129 is straight forward. The transmutation capability of the first concept is 84 kg/GWt/EFPY (10.7%/EFPY) for Tc-99 and 13 kg/GWt/EFPY (23.1%/EFPY) for 1-129, and the transmutation capability of the latter is 44.3 kg/GWt/EFPY (6.1%/EFPY) for Tc-99 and 6.4 kg/GWt/EFPY (13.6%/EFPY) for I-129.

Table 5.15 shows materials mass balance of the "Alloy fueled core" concept proposed by the JAERI, using preliminary but more rigorous approach as shown in Fig.5.l. In this concept,the trans-mutation capability of minor actinides is 306 kg/GWt/EFPY (10.7%/EFPY).

Table 5.16 shows material mass balance of the BBR concept proposed at CEA, in which transmutation is made only for Pu-239 and Tc-99. The transmutation capability of Tc-99 is 23 kg/GWt/EFPY (6.3%/EFPY). The table also shows the toxicities of fuel waste and fuel inventory.

Table 5.17 summarizes the data existing in literature concerning the transmutation capability. In the case of the PHOENIX concept, the comparison was performed between the waste inventory and the release limits for 10000 years after disposal (see Fig.5.2).

Table 5.1 Material inventory and mass balance of PWR Based Transmutation Concept
Proposed by CEA - Homogeneous Loading of Minor Actinides –

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit:kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235	209	165	144	- 21
U-236		10	14	+ 4
U-238	84392	83564	83126	-438
Plutonium				
Pu-238	133	268	335	+ 67
Pu-239	4299	3073	2562	-511
Pu-240	1674	1765	1759	- 6
Pu-241	887	873	882	+ 9
Pu-242	427	484	520	+ 36
Minor actinides				
Neptunium				
Np-237	510	411	365	- 46
Americium				
Am-241	262	254	215	- 39
Am-242m	0.7	5.4	4.7	- 0.7
Am-243	154	175	187	+ 12
Curium				
Cm-242		44	45	+ 1
Cm-243	–	1.2	1.9	+ 0.7
Cm-244		56	84	+ 28
Cm-245	–	3.7	7.6	+ 3.9
Other actinides				
Transmutation capability	(kg/GWt EFPY)		11.3	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle. T(EOEC)-T(BOEC)=ΔT=0.8 EFPY

Table 5.2 Material inventory and mass balance of Np Target in PWR Based Transmutation Concept Proposed by CEA - Heterogeneous Loading -

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit:kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235				
U-236				
U-238				
Plutonium				
Pu-238			58	
Pu-239			7.5	
Pu-240			1.2	
Pu-241			0.7	
Pu-242			0.1	
Minor actinides				
Neptunium				
Np-237		232	153	- 79
Americium				
Am-241			0.04	+ 0.04
Am-242m				
Am-243				
Curium				
Cm-242				
Cm-243				
Cm-244				
Cm-245				
Tc-99, 1-129			0.10, 0.03	
Transmutation capability (kg/GWt EFPY)			37.2 (Np)	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle.

Table 5.3 Material inventory and mass balance of Am Target in PWR Based Transmutation Concept Proposed by CEA - Heterogeneous Loading -

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235				
U-236				
U-238				
Plutonium				
Pu-238			19	
Pu-239			3.2	
Pu-240			0.9	
Pu-241			0.6	
Pu-242			4.1	
Minor actinides				
Neptunium				
Np-237				
Americium				
Am-241		52	8.8	- 43
Am-242m		0.14	0.16	+ 0.02
Am-243		20	11	− 9.1
Curium				
Cm-242			4.3	+ 4.3
Cm-243			0.5	+ 0.5
Cm-244			10	+ 10
Cm-245				
Tc-99, 1-1298			0.13, 0.04	
Transmutation capability		(kg/GWt EFPY)	17.3 (Am)	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle.

Table 5.4 Material inventory and mass balance of PWR Based Transmutation Concept Proposed by JAERI

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit:kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235	6475	1295	683	- 612
U-236	0	0	0	
U-238	72981	14596	14162	- 434
Plutonium				
Pu-238		585	585	0
Pu-239		318	318	0
Pu-240		153	153	0
Pu-241		102	102	0
Pu-242		114	114	0
Minor actinides				
Neptunium				
Np-237	2700	540	310	- 230
Americium				
Am-241			11	+ 11
Am-242m			0.4	+ 0.4
Am-243			28	+ 28
Curium				
Cm-242			16	+ 16
Cm-243				
Cm-244			14	+ 14
Cm-245			1.8	+ 1.8
Other actinides				
Transmutation capability		(kg/GWt EFPY)	11.3	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle. T(EOEC)-T(BOEC)=ΔT= 4 EFPY

Table 5.5 Material inventory and mass balance of MOX-LMFBR Based Transmutation Concept Proposed by CEA - Homogeneous Loading of MA -

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235	86	86	37	- 49
U-236	0	0	10	+ 10
U-238	34206	34206	30215	-3991
Plutonium				
Pu-238	161	161	673	+ 512
Pu-239	4970	4970	4450	- 520
Pu-240	2036	2036	2227	- 191
Pu-241	1092	1027	535	- 492
Pu-242	479	479	449	- 30
Minor actinides				
Neptunium				
Np-237	1128	1128	607	- 521
Americium				
Am-241	1128	1193	653	- 540
Am-242m			41	+ 41
Am-243			75	+ 75
Curium				
Cm-242			55	+ 55
Cm-243			7	+ 7
Cm-244			24	+ 24
Cm-245			2	+ 2
Other actinides				
Transmutation capability (kg/GWt EFPY)			57.9	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle. T(EOEC)-T(BOEC)=AT= 4 EFPY

Table 5.6 Material inventory and mass balance of Np target in MOX-FBR Based Transmutation Concept Proposed by CEA - Heterogeneous Loading -

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit:kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235				
U-236				
U-238				
Plutonium				
Pu-238			1108	+1108
Pu-239			151	+ 151
Pu-240			20	+ 20
Pu-241			1	+ 1
Pu-242			0.1	+ 0.1
Minor actinides				
Neptunium				
Np-237		3574	1440	-2134
Americium				
Am-241				
Am-242m				
Am-243				
Curium				
Cm-242				
Cm-243				
Cm-244				
Cm-245				
Other actinides				
Transmutation capability		(kg/GWt EFPY)	48.2 (Np)	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle. T(EOEC)-T(BOEC)=AT= 12.3 EFPY

Table 5.7 Material inventory and mass balance of Am target in MOX-LMFBR Based Transmutation Concept Proposed by CEA - Heterogeneous Loading -

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235				
U-236				
U-238				
Plutonium				
Pu-238			675	+ 675
Pu-239			97	+ 97
Pu-240			126	+ 126
Pu-241				
Pu-242				
Minor actinides				
Neptunium				
Np-237				
Americium				
Am-241		2234	734	-1500
Am-242m		7	70	+ 63
Am-243		1282	49a	- 784
Curium				
Cm-242			440	+ 440
Cm-243			59	+ 59
Cm-244				
Cm-245				
Other actinides				
Transmutation capability (kg/GWt EFPY)			39.0 (Am)	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle. T(EOEC)-T(BOEC)=AT= 12.3 EFPY

Table 5.8 Material inventory and mass balance of MOX-LMFBR Based Transmutation Concept Proposed by PNC

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235		139	116	- 22
U-236		6.2	11	− 4.8
U-238		53870	52590	-1280
Plutonium				
Pu-238		145	259	+ 115
Pu-239		3781	3997	+ 216
Pu-240		1493	1547	+ 54
Pu-241		666	529	- 136
Pu-242		267	288	+ 20
Minor actinides				
Neptunium				
NP-237		719	590	- 129
Americium				
Am-241		459	395	- 64
Am-242m		12	19	+ 7.1
Am-243		240	210	- 29
Curium				
Cm-242		19	27	+ 8.0
Cm-243		1.7	2.4	+ 0.7
Cm-244		113	131	+ 19
Cm-245		8.8	13	+ 4.0
Other actinides				
Transmutation capability	(kg/GWt EFPY)	58.2		

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle. T(EOEC)-T(BOEC)=ΔT= 3 EFPY

Table 5.9 Material inventory and mass balance of Metal Fuel LMFBR Based Transmutation Concept Proposed by CRIEPI

Nuclides	Initial inventory (kg)	Mass balance in EOC" (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235		5.7	2.5	- 3.2
U-236		1.1	1.7	+ 0.6
U-238		5635	4978	- 658
Plutonium				
Pu-238		338	204	- 133
Pu-239		598	634	+ 36
Pu-240		330	328	− 1.5
Pu-241		46	49	+ 2.5
Pu-242		85	75	− 9.8
Minor actinides				
Neptunium				
Np-237		175	90	- 85
Americium				
Am-241		66	32	- 34
Am-242m		2.0	1.7	- 0.2
Am-243		62	41	- 21
Curium				
Cm-242		3.5	4.3	+ 0.8
Cm-243		0.4	0.3	+ 0.0
Cm-244		59	55	− 3.8
Cm-245		12	13	+ 1.6
Other actinides				
Transmutation capability	(kg/GWt EFPY)	53.6		

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle.

Table 5.10 Material inventory and mass balance of Helium-Cooled Actinide Burner (P-ABR) Proposed by JAERI

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235	904	575	425	- 150
U-236	0	125	142	+ 18
U-238	101	131	125	5.7
Plutonium				
Pu-238		379	391	+ 12
Pu-239		62	79	+ 16
Pu-240		49	49	+ 0.0
Pu-241		2.1	3.7	+ 1.6
Pu-242		32	37	+ 4.7
Minor actinides				
Neptunium				
Np-237	1049	808	645	- 163
Americium				
Am-241	493	356	277	- 78
Am-242m	0	6.8	6.8	+ 0.0
Am-243	224	180	147	- 33
Curium				
Cm-242	0	0.53	21	+ 20
Cm-243	0.53	1.6	1.6	+ 0.0
Cm-244	95	122	123	+ 0.53
Cm-245	5.3	16	16	+ 0.53
Other actinides		27	27	+ 0.33
Transmutation capability (kg/GWt EFPY)			256.4	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle.

'fable 5.11 Material inventory and mass balance of LLead-Cooled Actinide Burner (L-ABR) Proposed by JAERI

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235	290	177	138	- 40
U-236	0	33	38	+ 4.6
U-238	32	39	37	− 1.3
Plutonium				
Pu-238		96	104	+ 8.6
Pu-239		13	17	+ 4.0
Pu-240		16	17	+ 0. 36
Pu-241		0.61	0.97	+ 0. 36
Pu-242		8.2	9.7	+ 1.6
Minor actinides				
Neptunium				
Np-237	321	280	230	- 23
Americium				
Am-241	151	122	99	- 23
Am-242m	0	2.2	2.3	+ 0.12
Am-243	69	58	48	- 10
Curium				
Cm-242	0	0.12	4.0	+ 3.9
Cm-243	0.12	0.24	0.24	+ 0.0
Cm-244	29	35	35	+ 0.0
Cm-245	1.6	4.1	4.3	+ 0. 25
Other actinides		7	7	+ 0.0
Transmutation capability (kg/GWt EFPY)			290.3	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle.

Table 5.12 Material inventory and mass balance of Th-Loaded Lead-Cooled Fast Reactor Based Transmutation Concept Proposed by JAERI

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235			10	+ 10
U-236				
U-238				
Plutonium				
Pu-238			599	+ 599
Pu-239		2791	1137	-1654
Pu-240		1160	963	- 197
Pu-241		679	256	- 423
Pu-242		195	196	+ 1.0
Minor actinides				
Neptunium				
Np-237		1796	829	- 967
Americium				
Am-241		870	482	- 388
Am-242m		2.8	20	+ 17
Am-243		308	182	- 126
Curium				
Cm-242		0	22	+ 22
Cm-243		0	0	0
Cm-244		78	120	+ 42
Cm-245		4.4	17	+ 12
Other actinides				
Transmutation capability	(kg/GWt EFPY)		112.6	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle.

Table 5.13 Material Inventory and Transmutation Rate of "MOX Fuel Core" Concept Proposed by BNL

Nuclides	Initial inventory (kg)	Transmutation rate (kg/year)		
		by caputure	by fission	total
Fuel				
Uranium				
U-235	9.1			
U-236				
U-238	4494			
Plutonium				
Pu-238				
Pu-239	646			
Pu-240	268			
Pu-241	156			
Pu-242	446			
Minor actinides				
Neptunium				
Np-237	179	24	8.0	32
Americium				
Am-241	77	11	3.5	15
Am-242m	-			
Am-243	58	4.7	1.7	6.4
Curium				
Cm-242				
Cm-243				
Cm-244	20	1.4	1.3	2.7
Cm-245	-			
Other actinides				
Long-lived FP				
Tc-99	507	31		31
1-129	33	4.5		4.5
(1-127)				
Transmutation capability (kg/GWt EFPY)			---	

Table 5.14 Material inventory and transmutation rate of 'Particle Fuel Core" Concept Proposed by BNL

Nuclides	Initial inventory (kg)	Transmutation rate (kg/year)		
		by capture	by fission	total
Fuel				
Uranium				
U-235				
U-236				
U-238				
Plutonium				
Pu-238	108			
Pu-239	338			
Pu-240	243			
Pu-241	57			
Pu-242	31			
Minor actinides				
Neptunium				
Np-237	764	121	85	206
Americium				
Am-241	360	69	37	107
Am-242m	–			
Am-243	163	18	13	31
Curium				
Cm-242				
Cm-243	74	6.8	10	17
Cm-244	–			
Cm-245				
Other actinides				
Long-lived FP				
Tc-99	550	59		59
1-129	39	9		9
(1-127)	13			
Transmutation capability (kg/GWt EFPY)			---	

'able 5.15 Materials Inventory and Mass Balance of Accelerator-Driven Transmutation Cncept Proposed by JAERI – Alloy Fuel Core System –

Nuclides	Initial inventory (kg)	Mass balance in EOC[1] (unit: kg)		
		BOEC[2]	EOEC[3]	EOEC-BOEC
Fuel				
Uranium				
U-235			0.9	+ 0.9
U-236			0.2	+ 0.2
U-238			0.0	+ 0.0
Plutonium				
Pu-238	13	13	470	+ 457
Pu-239	401	401	156	- 246
Pu-240	292	292	193	- 99
Pu-241	69	69	34	- 35
Pu-242	38	38	47	+ 8.9
Minor actinides				
Neptunium				
Np-237	1861	1861	593	-1268
Americium				
Am-241	292	292	95	- 197
Am-242m	0	0	9.5	+ 9.5
Am-243	133	133	57	- 77
Curium				
Cm-242	0	0	7.2	+ 7.2
Cm-243	0.3	0.3	1.0	+ 0.7
Cm-244	57	57	61	+ 4.8
Cm-245	3.1	3.1	10	+ 7.2
Other actinides				
Transmutation capability (kg/GWt EFPY)			307	

1) Equilibrium Cycle, 2) Begining of Equilibrium Cycle,
3) End of Equilibrium Cycle.
$T(EOEC)-T(BOEC)=\Delta T=6$ EFPY

Table 5.16 Material Inventory and Mass Balance of Accelerator-Driven Transmutation Concept Proposed by CEA

Nuclides	Material balance in EOC (after each 10 years)		
	C-Charge (kg)	D-Discharge (kg)	Transmutation (D-C)/GWt/y
Fuel			
Thorium-232	35500	16700	- 380
Uranium			
U-233		1950	39
U-234		570	11
U-235	-	110	2.2
Plutonium			
Pu-238		5.7	0.11
Pu-239	1100	7.4	- 22
Pu-240	-	40	0.8
Pu-241	-	4.5	0.09
Pu-242		2.5	0.05
Americium			
Am-241	-	4.1	0.08
Am-242m		0.27	0.005
Am-243	-	0.75	0.01
Curium			
Cm-242	-	0.1	0.00
Cm-243	-	0.01	0.00
Cm-244		0.36	0.01
Cm-245	-	0.05	0.00
LLFP (Tc-99)	1850	680	- 23

Table 5.16 **Cont'd**

- Toxicity of fuel waste for "Short'' (10^2-10^4years) and "Long" time intervals (10^2-10^6years) after being discharged;

(for the following fuel losses: U-O. 3%, Pu-0. 5%,Np and TRPu-5%)

$10^{4\ 2}$ Sv/GWt y - L-interval

$10^{5.0}$ Sv/GWt y - S-interval

Decrease of the waste toxicity as compared of the LWR (open cycle):

factors of 800/10000

- Toxicity of the fuel inventory:

$10^{8\ 0}/10^{8\ 7}$ Sv/GWt

Fuel inventory toxicity drop as compared to the LWR-MOX:

factors of 6-100 for L/S intervals

- Neutron flux and specific power distributions:

Max. flux - $< 3 \times 10^{15}$ n/cm^2s

Core Max. spec fic power 70 w/cm^3

- This installation s able to transmute (during 50 years)

5.5 tonnes of Pu-239

6.0 tonnes of Tc-99

with extremly low (as compared with a standard critical reactors) fuel waste toxicity and fuel inventory toxicity.

Table 5.17 Transmutation Capability, Survey of Data

Concept	roton beam energy (MeV)	roton beam current (MA)	Actinide burnup (kg/yr.)	Actinide composition	ctinide nventor: -L!@--	Number of LWR of 3000-3600 MW served	Fission Product burnup (kg/yr.)	Fission Product inventory (kg)
PHOENIX	1600	104		MA		75		
Plant with Sodium-cooled Solid Target/Core	1500	39	250	MA	3160	10		
Molten Salt Target System	1500	25	250	15 mol % Pu. 85 mol % MA		10		
Fission Product Transmutation System	1500	250				10		
ATW	1600	250	1200	30% Pu, 10% M	1300	8	132 Tc, 28 I	Tc between (328 - 397)

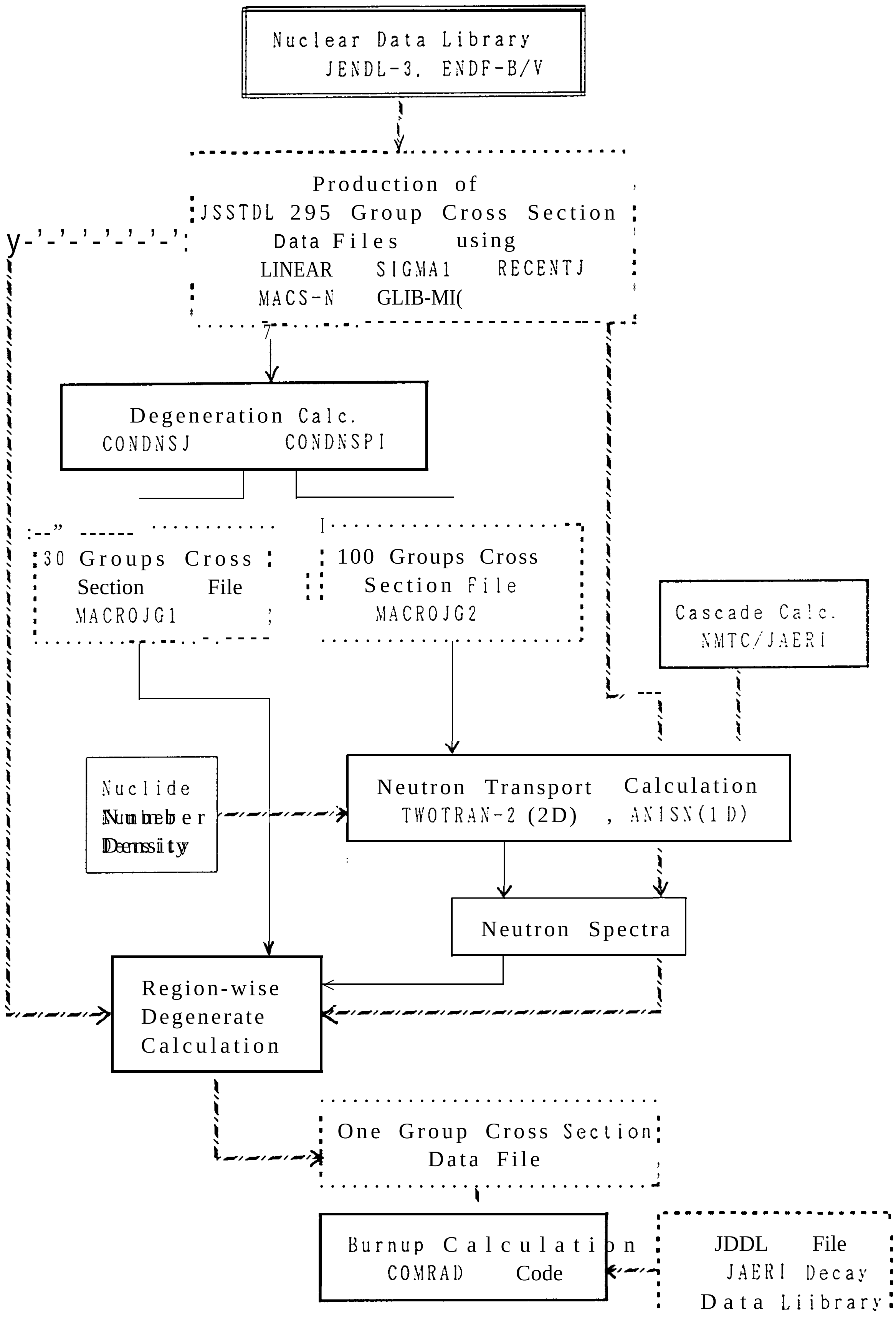
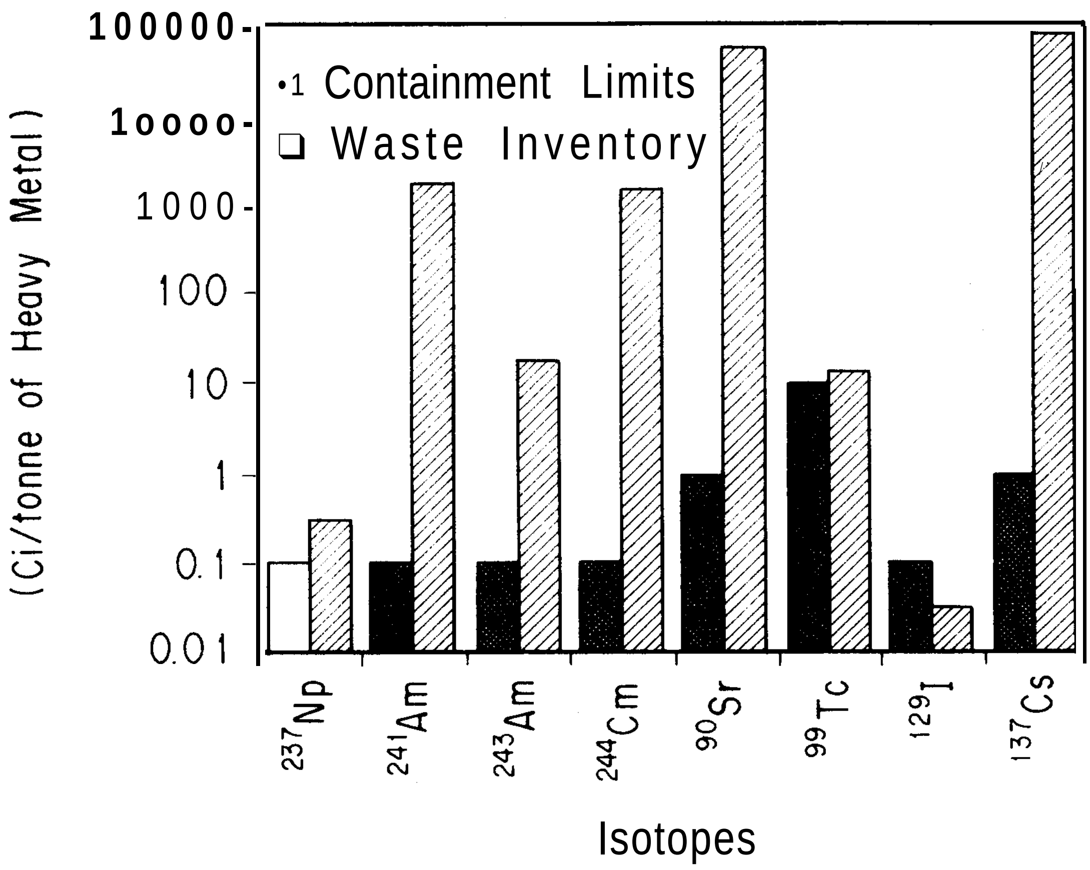


Fig. 5.1 Flow Chart for Burnup Calculation in Accelerator Transmutation System at JAERI



Fiq. 5.2 Waste inventory compared with release limits for 10000 yr after disposal (limits specified m 40 CFR 191 and were in proposed 109 CFR 60). Conclusion Partitioning at 10-5 or better should meet these containment requirements.