Comparison Calculation of a Large Sodium-Cooled Fast Breeder Reactor Using the Cell Code MICROX-2 in Connection with JEF-2 Neutron Data

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Table D1 Config.	k_{eff} JEF-1.1	k_{eff} JEF-2	k_{eff} ENDF/B-VI	Std. Dev. (%)	D. M. (%)	% Increase JEF-1.1	% Increase ENDF/B-VI
I. C.	1.11890	1.1241492	1.13438	1.80	-0.01	0.47	-0.90
1	1.01104	1.0131720	1.01853	1.29	0.80	0.21	-0.53
2	1.03442	1.0341662	1.04071	1.34	0.75	-0.02	-0.63
3	1.03551	1.0348982	1.04187	1.37	0.84	-0.06	-0.67
4	1.01049	1.0125990	1.01794	1.28	0.80	0.21	-0.52
5	1.00764	1.0095897	1.01485	1.26	0.80	0.19	-0.52
6	1.03096	1.0302482	1.03713	1.34	0.83	-0.07	-0.66
7	1.00356	1.0053863	1.01088	1.31	0.75	0.18	-0.54
8	1.03141	1.0302742	1.03739	1.34	0.82	-0.11	-0.69

Table 1: Eigenvalues k_{eff} for the Eight Configurations, Eigenvalue k_{∞} for the Inner Core (I.C., Configuration 1), Calculated Using JEF-1.1, JEF-2 and ENDF/B-VI Data. The JEF-2 Deviation from the Mean Benchmark Values (D. M.) and Their Percent Increase Compared to the JEF-1.1 and ENDF/B-VI Values.

Table D11	Reactivity Worth JEF-1.1	JEF-2	ENDF/B-VI	Std. Dev. (%)	D. M. (%)	% Increase JEF-1.1	% Increase ENDF/B-VI
Inner Core	0.02312	0.02072	0.02178	12.10	-1.11	-10.38	-4.57
Inner C., Outer Core, Axial Blanket	0.02420	0.02144	0.02292	16.80	8.08	-7.27	-1.96

Table 2: Region Sodium Void Reactivity Worths Calculated Using JEF-1.1, JEF-2 and ENDF/B-VI Data, The JEF-2 Deviation from the Mean Benchmark Values (D.M.) and Their Percent Increase Compared to the JEF-1.1 and ENDF/B-VI Values.

Table D15	Fuel Doppler			Std. Dev. (%)	D. M. (%)	% Increase	
	JEF-1.1	JEF-2	ENDF/B-VI			JEF-1.1	ENDF/B-VI
Configuration 1 Na In	-0.00740	-0.00768	-0.00751	10.80	5.34	3.78	2.28
Configuration 3 Na Voided	-0.00396	-0.00447	-0.00430	14.30	4.24	12.88	4.30

Table 3: Isothermal Core Fuel Doppler Reactivities. Calculated Using JEF-1.1, JEF-2 and ENDF/B-VI Data, The JEF-2 Deviation from the Mean Benchmark Values (D.M.) and Their Percent Increase Compared to the JEF-1.1 and ENDF/B-VI Values.

Table D16	Reactivity Worth			Std. Dev. (%)	D. M. (%)	% Increase	
	JEF-1.1	JEF-2	ENDF/B-VI			JEF-1.1	ENDF/B-VI
Na In (Relative to Fuel)	-0.00336	-0.00354	-0.00361	13.2	0.09	5.36	-2.08
Na In (Relative to Na-Filled Control Rod Position)	-0.00282	-0.00297	-0.00304	14.4	-0.14	5.32	-2.48
Na Void (Relative to Fuel)	-0.00439	-0.00449	-0.00455	10.2	-2.30	2.28	-1.35

Table 4: Reactivity Worths of the Central Control Rod. Calculated Using JEF-1.1, JEF-2 and ENDF/B-VI Data, The JEF-2 Deviation from the Mean Benchmark Values (D.M.) and Their Percent Increase Compared to the JEF-1.1 and ENDF/B-VI Values.

Table D17	Reactivity Worth			Std. Dev. (%)	D. M. (%)	% Increase	
	JEF-1.1	JEF-2	ENDF/B-VI			JEF-1.1	ENDF/B-VI
β_{eff}	0.0038227	0.0041135	0.0039240	2.62	6.36	7.60	4.83
Inhour	1.1398×10^{-5}	1.2193×10^{-5}	1.0823×10^{-5}	1.62	5.88	6.97	12.6
of Reactivity							

Table 5: Effective Delayed Neutron Fraction β_{eff} and Inhour of Reactivity for Configuration 1, Calculated Using JEF-1.1, JEF-2 and ENDF/B-VI Data, The JEF-2 Deviation from the Mean Benchmark Values (D.M.) and Their Percent Increase Compared to the JEF-1.1 and ENDF/B-VI Values.

Table D12 A	Reactivity Worth			Std. Dev. (%)	D. M. (%)	% Increase	
	JEF-1.1	JEF-2	ENDF/B-VI			JEF-1.1	ENDF/B-VI
^{239}Pu	1184.951	1216.175	1221.530	3.73	2.45	2.63	-0.44
^{238}U	-74.16905	-75.68575	-75.78510	4.72	3.48	2.04	-0.13
^{23}Na	-7.715605	-7.215024	-7.530321	9.75	4.44	-6.48	-4.19
Fenat	-9.146503	-9.207703	-9.097450	7.83	3.53	0.67	1.21
^{10}B	-762.1203	-791.6480	-795.2034	5.43	1.18	3.87	-0.45

Table 6: Central Reactivity Worths for Configuration 1 Expressed in $\delta k_{eff}/k_{eff}/(10^{31}$ Atoms) Calculated Using JEF-1.1, JEF-2 and ENDF/B-VI Data, The JEF-2 Deviation from the Mean Benchmark Values (D.M.) and Their Percent Increase Compared to the JEF-1.1 and ENDF/B-VI Values.

Table D12 B	Reactivity Worth			Std. Dev. (%)	D. M. (%)	% Increase	
	JEF-1.1	JEF-2	ENDF/B-VI			JEF-1.1	ENDF/B-VI
^{239}Pu	1337.362	1336.675	1340.550	2.63	0.12	-0.05	-0.29
^{238}U	-77.2040	-77.0472	-76.58864	2.80	1.78	-0.20	-0.60
^{23}Na	-10.83581	-959.4083	-10.13490	12.87	3.13	-11.5	-5.34
Fenat	-11.48101	-11.0474	-11.16548	4.92	3.93	-3.78	-1.06
^{10}B	-721.4733	-738.4782	-741.2405	4.43	-0.49	2.36	-0.37

Table 7: Central Reactivity Worths for Configuration 3 Expressed in $\delta k_{eff}/k_{eff}/(10^{31}$ Atoms) Calculated Using JEF-1.1, JEF-2 and ENDF/B-VI Data. The JEF-2 Deviation from the Mean Benchmark Values (D.M.) and Their Percent Increase Compared to the JEF-1.1 and ENDF/B-VI Values.

Table of Neutron Yields	JEF-1.1	JEF-2	ENDF/B-VI
^{238}U	0.046	0.0481	0.044
^{239}Pu	0.0061	0.0065	0.00645

Table 8: JEF-1.1, JEF-2 and ENDF/B-VI Neutron Yields.

^{238}U and ^{239}Pu yields from	JEF-1.1	ENDF/B-VI
β_{eff}	0.0039469	0.0039803
Inhour of Reactivity	1.1680×10^{-5}	1.1857×10^{-5}

Table 9: Effective Delayed Neutron Fraction β_{eff} and Inhour of Reactivity for Configuration 1. Calculated Using JEF-2 Data and ^{238}U and ^{239}Pu yields from JEF-1.1 and ENDF/B-VI.