UCRL-PRES-216768

^{233}U Critical Data Testing at LLNL

Presentation to the CSEWG on November 8-10, 2005 at BNL

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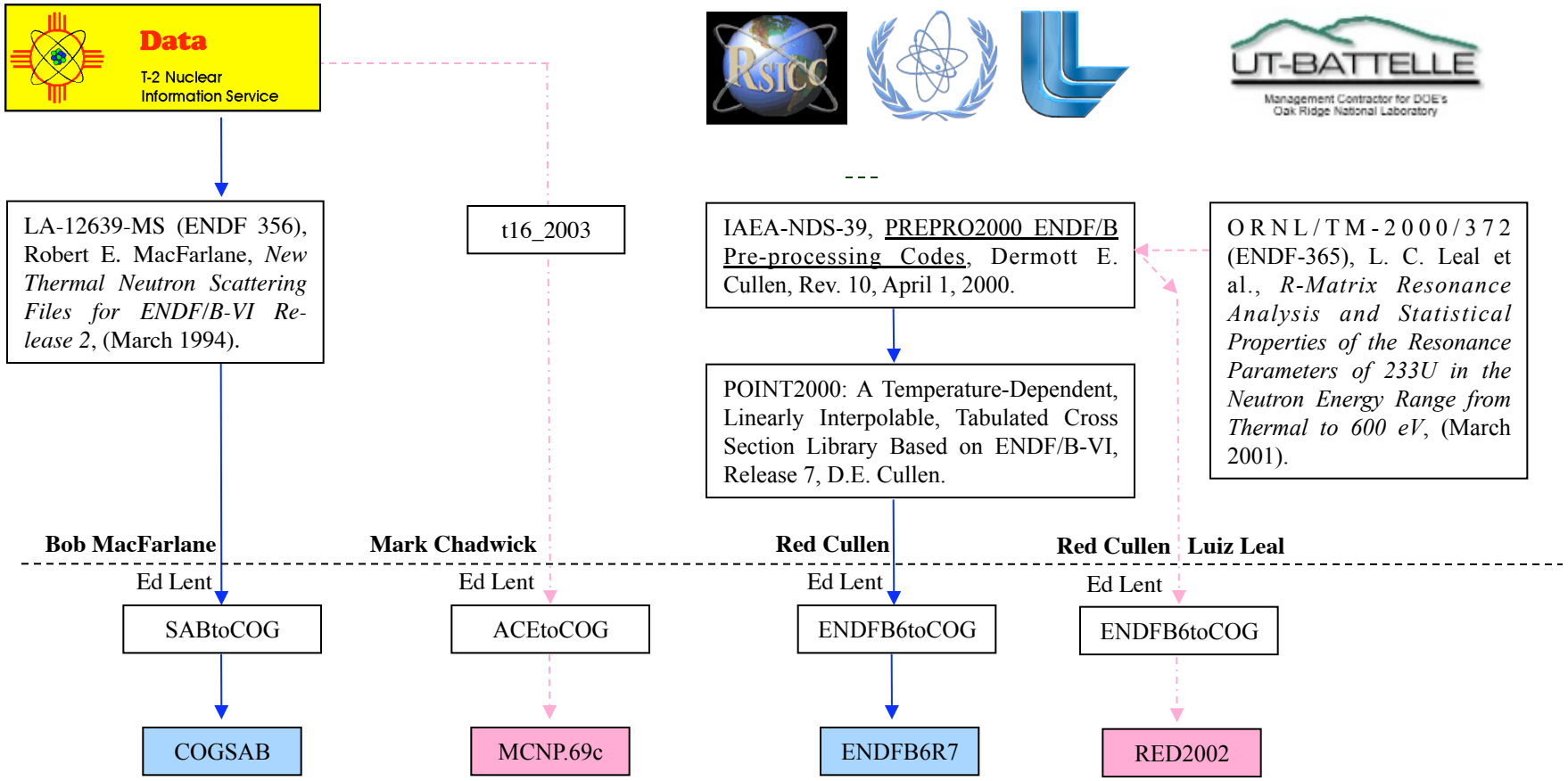
This work was performed under the auspices of the U.S. Department of Energy by University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

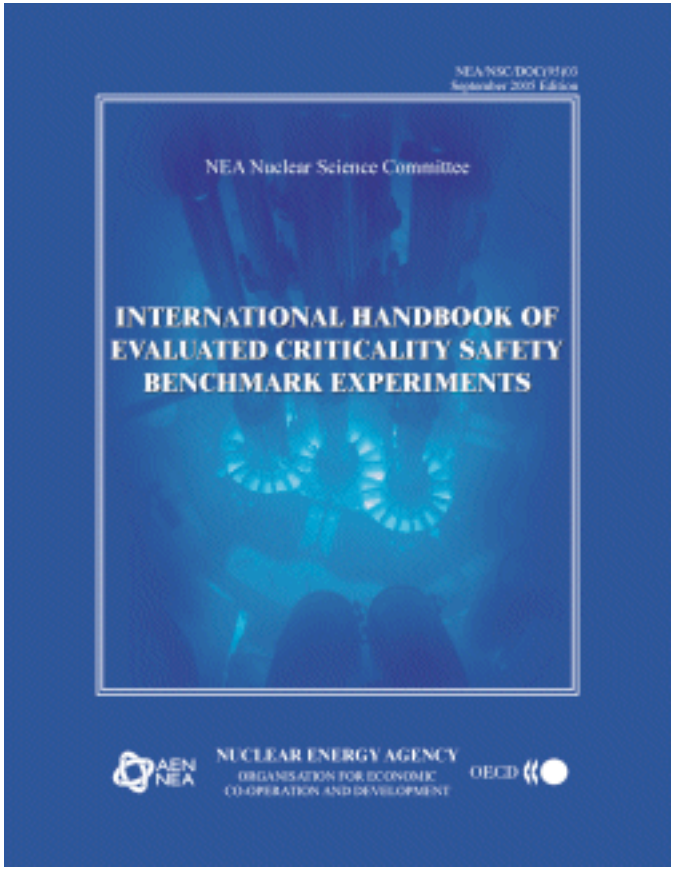
Data Processing *for* COG



^{233}U:	ENDFB6R7: EVAL-DEC78 STEWART ET AL, L. WESTON RED2002: EVAL-MAR01 LEAL ET AL MCNP.69c: ENDFB7β0

^{233}U Benchmark Experiments

ICSBEP Handbook



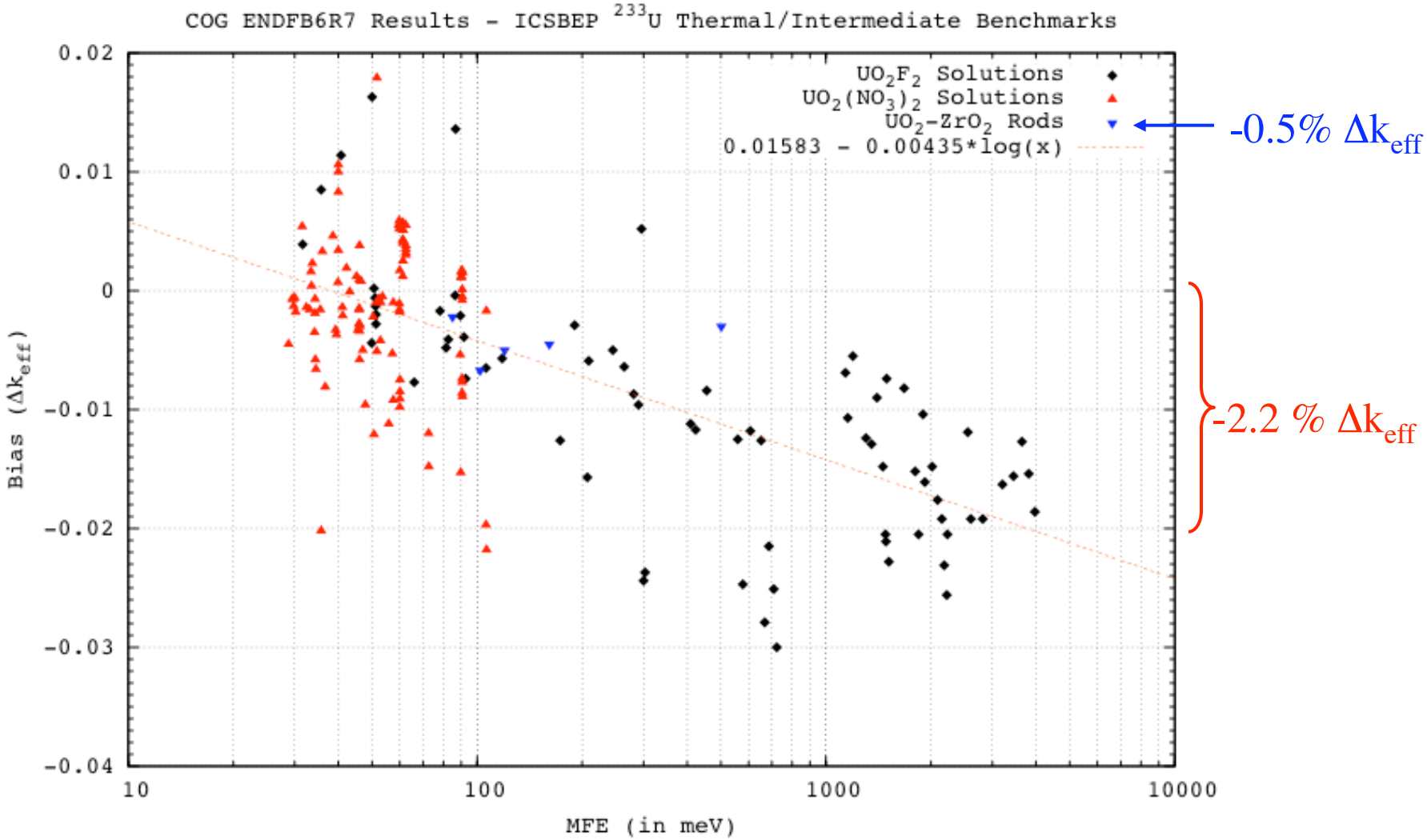
10	^{233}U Metal (LANL)
5	$^{233}UO_2$-ZrO_2 Lattices (Bettis)
64	$^{233}UO_2F_2$ Solution (LLNL)
9	$^{233}UO_2F_2$ Solution (ORNL)
105	$^{233}UO_2(NO_3)_2$ Solution (ORNL)
193	Total ^{233}U Benchmarks

Fast Metal Systems

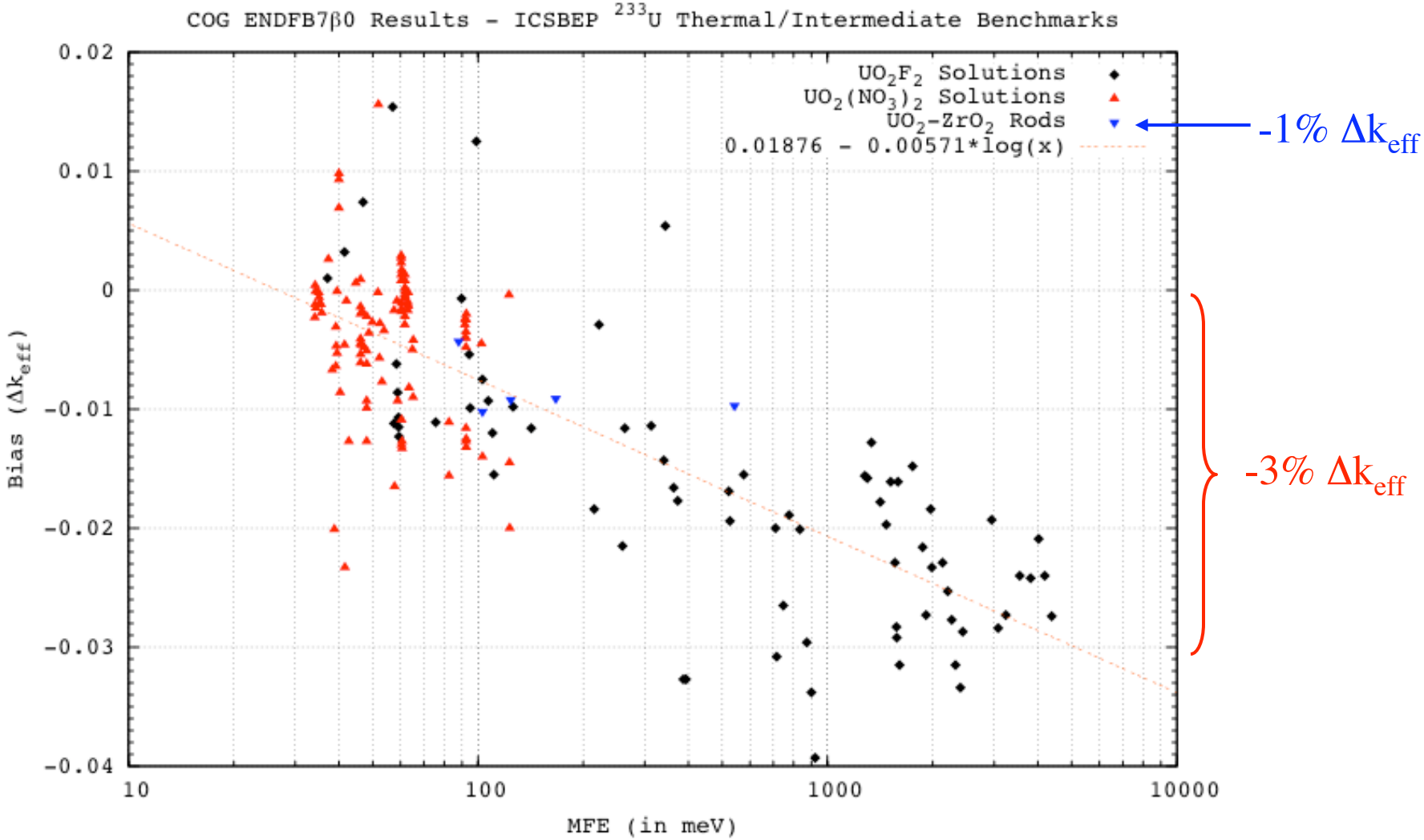
No.	Reference	^{233}U	Reflector	Benchmark	ENDFB6R7	LEAL	ENDFB7β0
1	U23MF001-1	16.535 kg	None	1.0000(10)	0.9913(3)	0.9984(3)	0.9972(3)
2	U23MF002-1	10.012 kg	Oy	1.0000(10)	0.9943(3)	0.9970(3)	0.9959(3)
3	U23MF002-2	7.601 kg	Oy	1.0000(11)	0.9971(3)	0.9980(3)	0.9972(3)
4	U23MF003-1	10.012 kg	Nat-U	1.0000(10)	0.9957(3)	0.9985(3)	0.9969(3)
5	U23MF003-2	7.601 kg	Nat-U	1.0000(10)	0.9977(3)	0.9987(3)	0.9987(3)
6	U23MF004-1	10.012 kg	W-Alloy	1.0000(07)	1.0025(3)	1.0077(3)	1.0032(3)
7	U23MF004-2	7.601 kg	W-Alloy	1.0000(08)	1.0047(3)	1.0100(3)	1.0039(3)
8	U23MF005-1	10.012 kg	Be	1.0000(30)	0.9938(3)	0.9994(3)	0.9951(3)
9	U23MF005-2	7.601 kg	Be	1.0000(30)	0.9965(3)	1.0025(3)	0.9952(3)
10	U23MF006-1	5.740 kg	Flattop	1.0000(14)	0.9993(3)	0.9995(3)	0.9975(3)

Mean (w/o W-Alloy and Be cases)	1.0000(5)	0.9959(26)	0.9984(8)	0.9972(8)
Range (w/o W-Alloy and Be cases)		0.80%	0.25%	0.28%

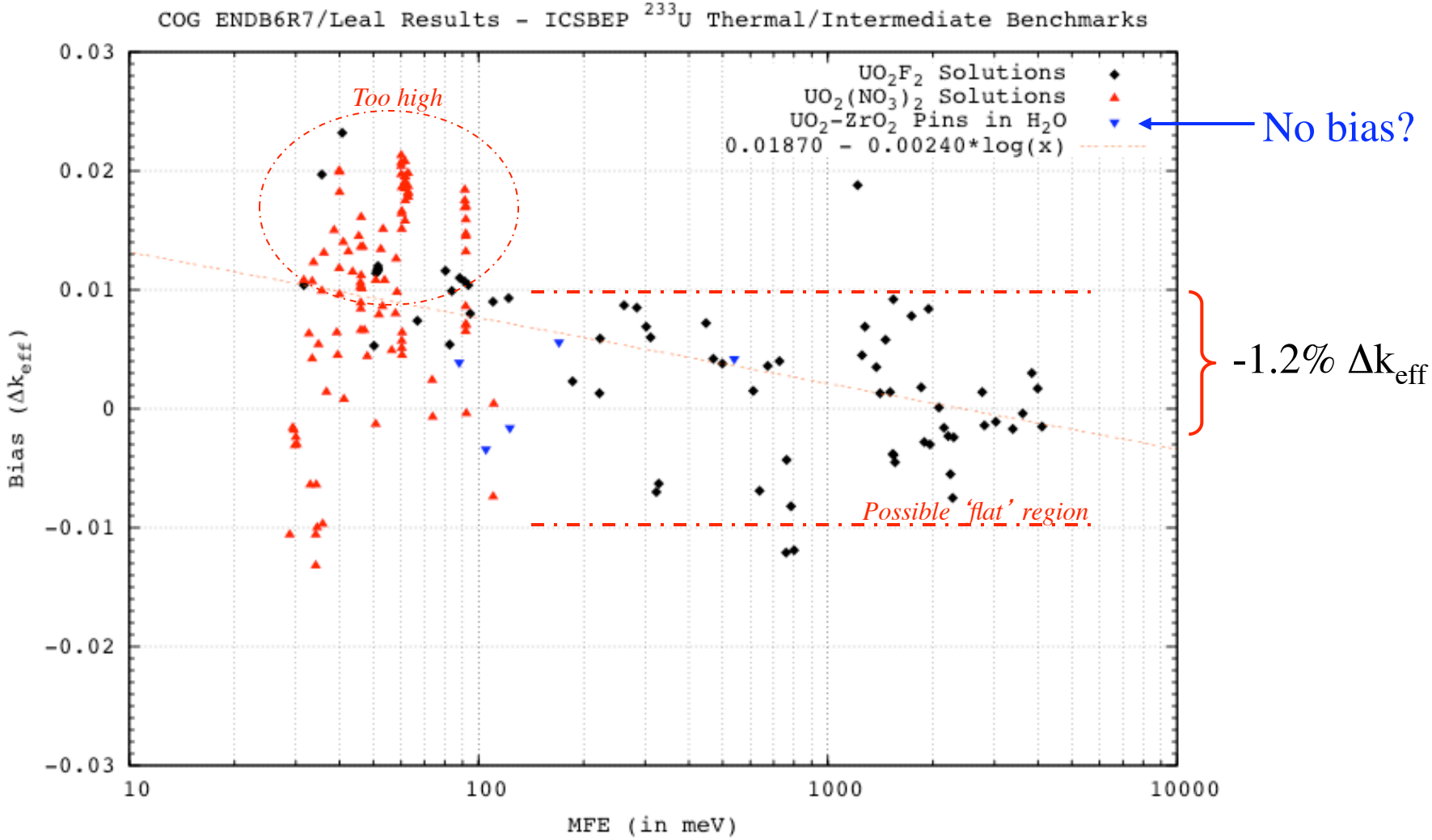
Thermal/Intermediate Systems - ENDFB6R7



ThermalIntermediate Systems - β0



ThermalIntermediate Systems - β(-1)



Conclusions

Fast Energies:

ENDFB7β0 and 'LEAL' are an improvement over ENDFB6R7. The spread in k_{eff} is reduced (from 0.80%) by a factor of three (to 0.25% and 0.28%) and $\langle k_{eff} \rangle$ is increased (from 0.996 to 0.998 and 0.997).

Intermediate Energies:

ENDFB6R7 (bad) and ENDFB7β0 (worse) both underpredict $\langle k_{eff} \rangle$ with a significant downward trend in energy. 'LEAL' results are superior with much less of a trend (if any).

Thermal Energies:

'LEAL' results have some that are too high and ENDFB7β0 and ENDFB6R7 have some that are too low. <u>All</u> results show a 3% Δk_{eff} spread in the critical values with MFE < 100 meV. This is a problem.