

Minutes of the CSEWG Meeting on ENDF/B-VII Validation
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Action Items

Edited by P. Oblozinsky, NNDC, Dec 7, 2005

General items

1. Standards. These will be incorporated into full evaluations as much as possible. In addition, new standards sub-library will be created, probably as NSUB=13 (ENDF-102 should be modified accordingly). Carlson will submit a complete set of standards to the NNDC for inclusion into b2. **Action Carlson.**
2. Covariances. These are currently taken from ENDF/B-VI.8. In b1, there are 4 materials with mf32 and 36 with mf33, often old and with limited information. Only covariances of good quality should be adopted for ENDF/B-VII. Don Smith will review by mid Feb 2006, distribute for comments to endf@lists.bnl.gov, BNL will implement in b2. It is anticipated that only a few covariances now in b1 will make it to b2. **Action Don Smith.**
3. Timetable for ENDF/B-VII.0 paper. All comments, contributions, etc by all to Mark asap, validation chapter more extensive than originally indicated (Dick), list of authors to be finalized (Mark). Full draft complete in March 2006. Then, final review and submittal either to NSE (long processing time, therefore submit early, final touches on tables, figures later) or to PRC? **Action all, coordination Mark.**
4. Timetable for ENDF/B-VII.0 release
 - February 28, 2006 All updated and new files sent to the NNDC.
 - March 15, 2006 Beta2 released by the NNDC for final testing.
 - June 27, 2006 CSEWG validation meeting at BNL to bless the library.
 - July 15, 2006 Official release of the library by the NNDC.

Neutron evaluations

5. ²³⁷Np fission. Look at LANSCE new data at lower energies. **Action Kawano & Talou.**
6. Fix format errors (van der Marck list – ⁸⁴Kr, 4 MAs, 11 FPs; Sublet list – ¹¹³In, ¹²⁶Xe, ¹⁵²Eu; others) in all files as much as possible. **Action Herman.**
7. ²³⁸Np was adopted from JENDL-3.3.

8. Ti isotopes were adopted from JEFF-3.1.
9. New Zr isotopes largely taken from JENDL3.3. Some modifications to capture were made (Kawano; also BNL). More iteration needed, based on Lubitz feedback. What about further Zr testing? We have changed Zr significantly. See also action 10.
10. Lubitz noted that comparing the old Zr data with newer SG23 data, Zr90 thermal abs went from 11 to 78mb in SG23, but Zr91 went from 1240 to 832. The resonance integral went from 0.95 to 1.09 for natural. Cecil noted that the exp spread is large, often 15-20%, increasing up to 50-60% in some cases for radiation width of parameters. **Recommendation: Stick with SG23** for now and Bettis and KAPL will study to assess any integral basis for changing these data.
11. Fix mf2 for 16 FPs where RRR data are not available (Kr-85, Rb-86, Y-90, Ag-111, Cd-115m, Sn-125, Sb-126, Te-132, I-130, La-140, Ce-138, 139, 143, Pr-142, Pm-151, Eu-157. **Action BNL.**
12. Finalize assessment of ^{232}Th from IAEA/CRP that includes Leal resonances. **Action Trkov.**
13. Submit LANL ^9Be evaluation to b2. **Action Hale.**
14. Assess ^{233}U performance (Mosteller's comments). **Action LANL.**
15. Adopt ^{204}Pb and also ^{208}Pb (?) from Koning, see also next item. **Action Herman.**
16. Track down Pb data testing results. Any improvements in data testing using the new ^{206}Pb , ^{207}Pb from JEFF-3.1? Testing of Pb needs more work, it seems that b1 evaluations (Koning) did not improve the situation and we may return to b0 evaluations (LANL). **Action MacFarlane.**
17. Remove natural W as it is of very poor quality (MacFarlane). **Action Herman.**
18. Make sure standards are included into ENDF/B-VII, including Au (n,g) and ^{11}B (n,a) and (n,a)g). **Action Hale.**
19. ^2H (deuterium). Dennis McNabb thought the n_2n spectra looked off (it is based on phase space model, but some experimental info points to importance of di-neutron interaction). **Mark will ask Gerry to check.**
20. $^{2\text{D}}\text{S}$ -alpha-beta still uses GA values. Could move to Mattes' too, if Bob has time to do this. **Action MacFarlane.**
21. ^{232}Th will be finalized soon by the IAEA/CRP group led by Trkov. Needs to finalize and fix format issues. His preliminary testing was encouraging – as good as previous

evaluations, better in some cases. We need to have tested by Mosteller and by the wider community.

22. When comparing capture RI with Mughabghab Atlas data, some of the discrepancies will be studied and potentially fixed. **Action Oblozinsky.**
23. Need to have Gd isotopes all processed properly, so that Van der Marck can complete data testing for Gd. **Action Rochman.**
24. Gd covariances for 8 isotopes will be completed (mf32 Leal, mf33 Rochman/Herman & Kawano) and submitted to b2. **Action Leal, Herman, Rochman.**
25. Li6 (n,t) standard from thermal to 1 MeV should be included in B-VII. As should the 10B evaluations for (n,a) and (n,a1g), Hale will do this. Gold should be included for 0.2 – 2.5MeV, and thermal, Kawano will do this. **Final action Carlson** – submit all standards to BNL.
26. 238U fission is a standard from 2-200 MeV; Pu fission; 235U fission. Should update beta-1 to use these “final-final” standard data. **Action LANL.**
27. Lubitz also described a recent JAERI /Wu discussion on how 235U in ENDF/B-VII could be improved, by decreasing the resonance integral capture to increase reactivity. He rejects this because it leads to an unacceptable leakage trend.
28. Lubitz mentioned how the 16O(n,a) cross section mod could lead to a further slight increase (say +50) in reactivity for U238 systems. 13C(a,n) and O16(n,a) measurements could solve this. New Harissopulos is 0.63 to 0.72 smaller than the B-VI evaluation, based on Bair and Hass. Other new data (in the low energy region – threshold to 1 MeV in the inverse alpha energy) by Heil also supports a lower cross section. The original Bair data was claimed to have been too low and should be increased by a factor of 2 – Hale took this seriously for B-VI, but it seems the JAERI file never did this. **Action – Hale and Page** will produce a new 16O evaluation within 2 months for (n,a) – using these Harissopulos and other data.
29. Blair. 235U fast systems. Russian Godiva calculates a bit, 3 series of HEU-MET bare metal cylinders (first bare, 2nd reflected with graphite, 3rd poly reflected). Bob showed endf/5 with a .3-0.5 pc bias. HEU-MET-FAST-51 (most are single cylinder, and fairly simple). Kahler noted the usefulness of HMF7 19-43 cases for testing HEU – we are currently slightly high (0.1-0.2%), unlike Russian Godiva where were slightly low (B-VI versus beta1 have gone up about 0.3%). **Action: LANL** will focus on these fast HEU benchmarks, from independent sources, to assess our 235U reactivity.
30. Temperature dependence and Huria’s observation. Although for cold systems our criticality has increased by ~0.3 %, for hot systems it goes down slightly. MacFarlane’s beta-1 numbers show similar effects – though at the hot temp he doesn’t see such a decrease, more like a flat dependence compared to VI.8.

MacFarlane has tried to track the effect down... by substituting back old 238, 235 etc, he hasn't been able to isolate the effect! Perhaps there are coherent non-linear effects between 235 and 238! Unfortunately much temp-dependent data are proprietary.

31. Kahler's data testing. Plots above-thermal-leakage dependence of k-eff for various systems (HST). ENDF/B-VI.8 was excellent as a starting point. With beta-1, we see a very slight drop in reactivity with the new data; very good still. LCT2 and LCT10 involve lead walls next to lattices, and we see a bias where k-eff is too high.
32. ZPRs with spectra a bit softer than Bigten. Overall agreement is good, similar to B-VI. There are some reflector biases still, eg for W. The Pu C-reflected 6/10 (?) is terrible. Why reflector biases always +ve? Bob Bloch thinks that at the higher energies (eg for Fe etc) there are structures and holes in the resonances that may be washed out. If so, transmission is not done rightly – and too much is reflected.
33. Bob Schaefer showed some significant changes in delayed neutron parameters compared to B-VI, for beta-0 and beta-1. He saw big changes between beta0 and beta1. Perhaps Bill Wilson's values changed between beta-0 and beta 1. Bob's bottom line was that the overall impact on beta-1 library for beta-effective looks small (fortunately, from their perspective). Bob also saw big changes in the individual 6-group time constants and fractions – though the overall effects was small – this presumably reflects that the important point is the integrated effect of the sum of all 6-groups.
34. Bob Little will send in Gerry's n+T evaluation for use in beta-2. **Action Little.**
35. Through interactions with Koning and van der Marck, we have noted that with beta1 we don't see much improvement for Pb reflectors. For JEFF3.1, they still have problems with the thermal reflector, LCT-10 cases 1-4, but they do much better on the fast reflectors, eg HMF-64. Since beta-1 already uses JEFF for 206, 207, we should also try adopting 204,208Pb, and see if we can do better on HMF-64.
36. Dave Heinrichs on 233U. Looked at thermal, intermediate, and fast 233U assemblies. He showed likely problems in the intermediate energy range assemblies. This should be confirmed for beta-2 testing – but likely no one has time to solve this for our B-VII library. (Van der Marck's testing was positive for 233U, but didn't include these intermediate assemblies).
37. Mosteller's feedback, based on beta-0 testing. 233u issues: 233U fast looked very good, but the Falstaff intermediate spectrum low. The new Thorium from Trkov might help with THOR. Mosteller also looked at intermediate spectra probed by the ZEUS TA-18 HEU-Graphite assembly – we see a trend – perhaps due to deficiencies in the intermediate energy 235U spectra. Cu: Fast Cu reflection looked bad, with B-V looking better. Re Np237, JENDL3.3 gives 0.9967 whereas B-VI is still at 0.9927. Fast Np issues? What did JAERI do re. nubar and fission for Np – would be good to

sort out the differences between 235 and 237 in this benchmark? Pu thermal problems too!

38. Ken Kozier. Problems with n+D, really D-U systems. The new ang distributions for elastic (<3.2 MeV and >20 MeV). HST-004, 020. HEU with D2O reflection. Sees a bias versus leakage. This curve is shifted compared to B-VI.4. He has ZED-2 reactor benchmark information. See a big change in reactivity. McNabb suggested trying JENDL data that are based on Fadeev calculations. At 3.75 MeV, for instance, the n2n angular distribution is much broader in JENDL. The corresponding energy distributions are different too. **Mark will ask Gerry to look into this.**
39. Oblozinsky will work with Trkov to check into any important discrepancies in FP RI data, arising from Trkov k₀ comparisons. **Action Oblozinsky, Trkov.**
40. Briggs noted his new criticality safety benchmark handbook for 2005, see <http://icsbep.inel.gov>, no action
41. Dunn/RQ Wright. New 247Cm evaluation should be adopted from RQ. His new 238Np is also available, and we should adopt. He also has new Pa-232. RQ suggests also adding 23 other minor actinides from JENDL. We will adopt. **Action Herman.**
42. Livermore should add delayed gammas into the file for 235, 238U and 239Pu, NJOY should be able to process them. **Action LLNL.**
43. Add missing actinide evaluations from RQ Wright. **Action BNL.**
44. Extend and include four LANL dosimetry evaluations (89Y, 191,193Ir, 169Tm), after completing them. **Action LANL & BNL.**
45. Include Zinc (6 isotopes, 64-68 and 70Zn), to be evaluated from scratch. **Action BNL?**
46. Some incomplete evaluations may be useful, e.g. for transmutation, they should not be excluded from B-VII (MacFarlane), 253Es? 249Cf? **Action BNL.**
47. C-nat as included in ENDF/B-VI and adopted in b1 is composed of the original 12C evaluation for ENDF/B-V plus 13C resonance that was added for B-VI (Carlson).
48. Temperature effects need to be further studied. **Action MacFarlane.**
49. D needs attention still (see Chalk River talk), and D in D2O from Mattes needs testing. **Action MacFarlane.**
50. List of files modified in b2 compared to b1 should be explicitly provided as a part of b2 release. **Action Herman.**

51. It would be most useful to have official version of NJOY for ENDF/B-VII processing, before b2 is released. No commitment from LANL was made, **action MacFarlane & Kahler?**
52. 238-U (Phil Young, added after CSEWG): The file, issued as ENDF/B-VII beta1, is evaluation u238la8o instead of the most recent version u238la8p, completed around April 2005. The only difference between the two is that u238la8p contains updated resonance parameters from Courcelle. The latest version should be submitted to BNL. **Action LANL.**

Other evaluations

53. p+13C and p+10B from Page will be included in b2 or in ENDF/A. **Action Page.**
54. Resonance extension for g+14N and g+16O from BNL/LANL will be included in b2. **Action Oblozinsky.**
55. Decay data sub-library will be updated, considerably extended and submitted to b2. **Action Sonzogni.**
56. Missing sub-libraries will be included into b2. **Action Herman.**

Concluding items

57. Next meeting
- CSEWG validation meeting will be held on June 27, 2006 (Tue) at BNL, followed by NDAG, June 28, 2006 (Wed). **Action Oblozinsky.**
 - Next full CSEWG meeting will be held on Nov 6-8, 2006 (Mo-Wed), USNDP on Nov 7-9 (Tue-Thu) and NDAG on Nov 9 (Thu), all at BNL. There should be no parallel sessions in the CSEWG meeting. **Action Oblozinsky.**
58. Full list of neutron materials to be removed or added (partial list for 'to be replaced')
- 3H (currently from 1965!), replace by new Hale
 - W-nat, remove
 - 208Pb, replace by Koning
 - 204Pb, add Koning
 - 22Na, 58,58mCo (Sublet list), add after review
 - 64-68,70Zn, add if completed (entirely new evaluations, to be done by BNL?)
 - 89Y, 191,193Ir (LANL dosimetry), replace if complete new evaluations available
 - 169Tm (LANL dosimetry), add if complete new evaluation available
 - 253Es, add even if incomplete

59. ENDF/B-VII beta2 total neutron materials expected

- 387 total in b1
- 1 remove (W)
- 12 add (Pb, 3xSublet, 6xZn, Tm, Es)
- **398 total in b2**, probably too optimistic
