# Consolidated minutes

# mini-CSEWG, Port Jefferson, June 22, 2009 CSEWG, BNL, November 4-5, 2008

#### Drafted by M.B. Chadwick and M. Herman

#### ENDF/B-VII.1 release

Overall theme for VII.1:

a) Improved criticality safety/structural materials

b) Improved Li (n,t), and Be possibly

c) Improvements to minor actinides

d) Include covariances for ~100 materials

Isotope	Lab	Release	Timescale/Actions
3Н	LANL	B-VII.1	FY09 – fix T(n,2n)
6Li	LANL	B-VII.1	FY09 – new (n,a) above 1 MeV by Hale
			& Brown (LLNL) check breakup formats
9Be	LANL	B-VII.1 or 2	Goal - R-matrix with RPI data in FY09, but
			criticality issues complex & may take longer
19F	ORNL/LLNL	B-VII.1	BNL will merge, LLNL and ORNL;
			test against crits
23Na	BNL	B-VII.1	New BNL evaluation with covariances
35,37Cl	ORNL	B-VII.1	Some testing needed
39,41K	ORNL	B-VII.1	Some testing needed
Ti iso	LANL/ORNL	B-VII.1	Consider new RPI data, merge with FY10
			48Ti ORNL data, LLNL fix(47) and retest
V	LANL	B-VII.1	FY09 – hope that modern higher energy eval
			will improve criticality testing.
Mn55	ORNL/ <mark>BNL</mark> /	B-VII.1 or 2	LLNL compare fast region & assess
	LLNL		which merge with ORNL, BNL covariances,
			LANL in future?
Cr iso	ORNL	B-VII.1	Test against crits, incl. ZPRs, IPPE. k-inf.
			LANL evaluation later.
Fe	LANL	B-VII.1	Fix (n,x alpha) if needed, using Haight data.
Ni iso	ORNL/LLNL	B-VII.1	ORNL finish in 09, submit, test. Should

#### Overall summary of isotopes and who has ongoing work for B-VII.1

			LLNL advances be included? LLNL to assess whether fixes keff crit. LANL
Cu63 65	LLNL	B-VII 1	LUNL assess whether their evaluation fixes
Cu05,05		D- V II. I	Zeus & n trans testing: consider adopting
			Wait for possible new LLNL evaluation that
			nerforms better and consider Chinese evals
Gd	ORNL	B-VII 1 or 2	FY10-use new RPI data (~10% change at
	orate	D (11.1 01 2	therm ) test with PSI Chalk R Rusian crits
			Wait for Mughabghab to reassess situation.
Cd	BNL	B-VII.1	Adopt recent upgrade; comp. with RPI data
Kr78	LLNL	B-VII.1	Check capture because of import. in reactors
			as FP: compare with B-VII & others.& test
Y89	LANL	B-VII.1	Ignatvuk savs capture too low at lower
			energies (missing resonances): upgrade?
Zn63-72	LLNL	B-VII.1	Document comparison with experiment and
			B-VII.0, and check with BNL that
			resonances are OK
Zr iso	BNL	B-VII.1	Update Zr90 (beta4) and 91 as necessary,
			use new RPI data, retest at Bettis & KAPL
W iso	IAEA/BNL	B-VII.1	Choose between IAEA and KAERI.
U233	LANL	B-VII.1	Fix DN typo
			Review new nTOF data, but likely ignore it.
U236	LANL	B-VII.1	Modifications to capture and fission
			based on crit reaction rates
U237	LANL/LLNL	B-VII.1	If LANL, use upgraded res. range & fiss to
			further improve match to LANL crits
Am240	LLNL	B-VII.1	Accept LLNL new file to be resent.
			Have Kawano look it over.
Am241	LANL	B-VII.1	Upgrade cap above 30 keV; possibly tweak
			fission based on LANL crit & FCA
	TANT		reaction rates
Am243	LANL		Review new nIOF data, but it appears
			close enough to B/VII.0 to not warrant
D 220	ταντ	D VII 1	changes.
Pu238	LANL	B-VII.1	Ignatyuk says total inelastic is bad etc.
D220	ODNI	D VII 1 2	Upgrade?
Pu239	ORNL	B-VII.1 or 2	Assess whether new Derrien res. Improves
			Consider either edepting UEEE2 2hete
			twoals margad with aviating ENDE higher
			tweak, merged with existing ENDF light
			adopting now Derrice evaluation
			but with the thermal tweak
Pu240	LANL	B-VIL1	Adopt Young's new evaluation

Big3	LANL	B-VII.1	<ul> <li>Fix fiss spec &gt; 10 MeV with finer grid.</li> <li>Morgan White add lost γ-production back, consider adopting Bk, Cf, Es, Fm, 237Pu isotopes from Japanese actinoid file.</li> <li>Yes – see notes below. LLNL (Summers) will review &gt;30 Acinoid files adopted by LLNL for ENDL2008 and will write a doc. reviewing these data and providing</li> </ul>
γ-prod	LANL	B-VII.1	
MA	LANL	B-VII.1	
			doc. reviewing these data and providing recommendations.

#### **Expected for ENDF/B-VII.2**

2H	Chalk River/LANL	B-VII.2	Geel data planned, theory in progress, goal is to improve some of the crit testing.
9Be	LANL		See above.
160	LANL/ORNL/LAPL	B-VII.2	New evaluation, including (n,alpha)?
Ni iso	LANL?	B-VII.2	Add in LANL work from ~FY12
235U	LANL/ORNL/LLNL	B-VII.2	Capture WPEC upgrade if needed, and new
			FIGARO fiss spec
238U	LANL/ORNL/LLNL	B-VII.2	Capt. upgrade if needed, using Wallner data,
			& new FIGARO fiss spec
239Pu	LANL/ORNL/LLNL	B-VII.2	New FIGARO fiss spec; capture upgrade,
			inelastic scattering upgrade if needed.
Big3	LANL	B-VII.2	Possible change to preeq/inelastic based on
			Bethe sphere testing

#### Detailed Minutes - Added into Agenda Listing,

#### CSEWG 2008 actions in red

CSEWG 2008 actions overwritten by the mini-CSEWG 2009 actions in grey mini-CSEWG 2009 actions in orange

• Release files for ENDF/B-VII.0.fix1, Little, 15'

Little described the MCNP ENDF70 library; it contains all ENDF/B-VII.0 except for 3 materials (Be7, Cf253, Es253 – too incomplete); it was produced at 5 temperatures, between 293.6K and 2500K. The library is being made available by users to RSICC, Oak Ridge. Fixes were made, note the S(alpha-beta) set released earlier by BNL was not quite right – owing to the processing for S(alpha-beta) being unclear.

For 1H, a tiny change was made to the capture gamma-ray energy. An NJOY fix was also made to get KERMA right. 45Sc – ang distributions changed to lab frame and poor excitation function definition changed. 89Y MT91 inelastic scattering to the continuum

had negative cross sections! These were fixed, but it should be looked at. ACTION - Patrick Talou to look at this and check that Little's fix is OK – or come up with a new file. 96Zr and Mo-97 – values from Kalbach wrong (9.99 instead of 0.99); Eu153, Mt91 had negative distributions; 242gAm had no angular distribution for MT18 fission, and some strange MT51-54. Patrick Talou fixed these deficiencies.

ACTION - 7 out of 8 fixes have been already sent to BNL, and the last one (Eu) will be sent by Little.

We agreed to make the official version of B-VII.0  $\rightarrow$  B/VII.0fix. BNL may rebuild an NJOY created MCNP library. If they rerun with NJOY, then they will use Bob Little's inputs, including those that are needed to get S(alpha-beta).

## **Detailed Agenda for B-VII.1 Upgrade Plans**

**D.** n-d scattering has discontinuities in the 3-4 MeV region. Elastic cross section has a big influence on certain crits, eg ZED-2 at Chalk River. Theory work is being done using Fadeev methods with various potentials with Canton (Padua), but still more theory is needed.

In data testing, Kozier sees a bias in k-eff as a function of leakage for VI.8. The ENDF/B-VII looks the best so far for the ZED-2 CVR, and things get worse when he adopts results from latest theory. But there's still a bias with B-VII.0. He also noted that earlier he was using an erroneous S(alpha-beta), but now he is using the correct ones.

ACTION - get latest Canton Fadeev results from Kozier, and seek Kozier & Hale's opinion on this work. Also, assess usage of latest Geel data. And consider Hoffman RGM calculations.

**T.** For T(n,2n), fusion people claim B-VII worse than B-VI, apparently Hale agrees.

ACTION – Hale send new T(n,2n) upgrade for VII.1.

**Update on IAEA standards group efforts**. Allan Carlson discussed standards philosophy. We agreed that standards could have covariance data added to them, and to extend the energy range (eg up to 150-200 MeV). The standard group is collecting new data on: the 252Cf spectrum; the 235U thermal fission spectrum; 197Au(n,g) & 238U(n,g) Wallner experiments. Discussed new 'reference cross sections' (not as well known as standards), eg prompt gamma-ray production cross sections for Fe (n,n'g), and some (n,2ng).

Allan also talked about developing more complete covariance evaluations for the full ENDF/B-VII range.

ACTION – for 235,238U and 239Pu, to be checked by Allan that right covariances are in the submitted ENDF/A files

**6Li(n,t).** Fix format error. Hale upgrade based on LANSCE data, and issues related to changing a standard.

ACTION – Hale will merge new results with standard below 1 MeV. We will consider – for discussion – the possibility that the standard be changed a bit below MeV if the matching can be doe more easily there. Carlson noted that the 'lower compromise' B-VII.0 evaluation was both a compromise between the LANL and Chen R-matrix evaluations, and also was influenced by other data in ratio to Li. ACTION - Hale should address the latter issue, and whether this would change his new result below 1 MeV. LLNL will also look at the new evaluation and comment.

Brown (LLNL) has noted ambiguities in what the breakup channels are – due to ambiguities in format treatments, showed toy calculations.

ACTION – Hale, ask Brown for details.

ACTION – Hale, submit file to BNL, and LANL test against Bethe sphere integral data. Check that Brown's concerns have been addressed. Hale should include covariances.

**9Be**. Insights from new RPI data; fix of VII.0 interpolation problem; plans for future improvements. Hale/Danon/Chadwick, 1-2 slide.

ACTION - Hale will show us progress on this, including new angular distribution scattering data from RPI, in addition to the above total cross section data.

**16O**. Comments on whether (n,alpha) should be changed, and when? Also note comments by Edwin Kolbe in his testing paper. Hale/Chadwick, 1 slide. ACTION - Hale, provide an update on FY09 work by the next CSEWG meeting. Tell us whether the new Geel data was included. Work is being done for crit safety, also including covariances of the angular distributions.

#### V. Anything new?

ACTION. Remind Kawano/Kahler/Little commitments by the end of FY09! We have new crits from Russia to test against.

**19F**. Updates from ORNL, LLNL, Dunn/LeaL/LLNL-EGAF 1-2 slides. New Reich-Moore LRF7 format, for cases where 2 inelastic channels open up, were used. The new evaluation was done up to 1 MeV; used 3 transmission measurements done by Larson et al from 5 eV to 20 MeV, and 1 capture measurement at ORELA by Guber up to 700 keV. Also used shape of data from Los Alamos, and used inelastic data from Obninsk. Covariances are being made available too. Dunn noted some intermediate benchmarks are sensitive to fluorine – and these will be tested. This might involve Livermore experiments. Lubitz has some data with fluorine too. ACTION – the data testing committee will establish a small group to test and give feedback on the new evaluation. Try to involve Dave Heinrichs too because of LLNL fluorine crits experience.

Thermal neutron gamma-ray production has been evaluated by Firestone et al. DICEBOX is also used to get discrete and quasi-continuum gammas. The same total capture cross section was used.

ACTION – We agreed to use the new LLNL/LBL data. BNL will merge the 2 files from ORNL and LLNL.

ACTION – LLNL 19F experience in data testing for gamma-ray leakage, which show deficiencies, will be looked at by LLNL who produced the new gamma-production evaluation EGAF.

ACTION - Kahler will organize some testing. BNL/LLNL will merge.

22Na. Resonance-total-width, who?

#### 23Na.

ACTION - BNL is working on a new evaluation that is planned to be submitted. Idaho will do data testing and validation, and others (eg McKnight will do this too).

**Ti isotopes**. VII.0 took Ti from JENDL3.3. New evaluations from LANL. Testing in crits and pulsed spheres? ORNL 48Ti(n,g) – was this used? Note Danon's experimental talk on total x/s measurement 0.5-20 MeV and need for res. energy shift. Kawano/Leal 2 slides; LLNL 47Ti bug fix, Sumners.

Neil Summer found bug in 47Ti(n,n') – previous file had gamma-multiplicities way too high. A TALYS calc was used for the old evaluation, so LLNL recreated this new multiplicity.

ACTION – Kawano will include LLNL fix in his new Ti isotope evaluations.

ACTION - Dunn will provide a new resonance evaluation by end of FY09. He will put these updates into the Kawano files in ENDF/A for testing by Skip. Later upgrades are planned at ORNL in the unresolved region (eg., 48Ti).

ACTION for Dunn - Care is needed to ensure consistency of resonance region cross sections and covariances.

ACTION - Kawano -check that Summers fix was done

ACTION - Kawano – check that Danon's total data were addressed. (Danon didn't think Kawano asked for his data).

Kawano described the new LANL evaluations. New resonance parameters were adopted from the Atlas, and the resonance energy was extended. GNASH calculations were done, also using Dashdorf et al GEANIE / LANSCE data for 48Ti. The elastic scattering distribution is important for matching the crits. Kawano adopted the B-VII.0 data that uses Argonne 1950s era scattering data. He found that rather than using a modern OM model didn't give as good a prediction of the crits. He also reevaluated the total cross section by doing a least square fit of the measured total data (fluctuations exist up to 6 MeV).

Good benchmark testing was obtained for the HMF79,34 crits. and HMM crits. HMF79 was the new Ti benchmark from Russia. We agreed to adopt this new evaluation. Kawano also noted that the transmission testing didn't seem to improve.

ORELA will be working on 48Ti – when they have new data in FY10, Kawano will include it for testing.

ACTION for Kawano: Danon's data at 0.5 MeV (resonance energy shift) and his new total cross section data should be considered; likewise for new ORNL data.

**55Mn**. New ORNL evaluation. Results including comments on ZPR performance. Has LLNL worked on this too? Leal/McKnight/Marco Pigni, Summers 2 slides.

New data from GELINA Geel was included, as well as new ORNL data. Benchmark testing has been done with the NEA. McKnight has also done data testing and things look much better for the ZPR.

BNL has done covariance estimates for 55Mn in the fast region. There is also an effort by Capote at the IAEA at higher energies, which will be a complete file with covariances. LANL is also scheduled to do high energy next year. The resonance structure in the MeV range needs to be carefully accounted for. LLNL is doing an evaluation at higher energies. We also encourage LLNL and Capote/IAEA to interact.

ACTION – Brown will send 55Mn to BNL, who will review it, and the IAEA evaluation.

ACTION -LLNL and IAEA have retracted their planned efforts. LANL still plans on doing a new evaluation in future years. BNL also had some plans to do covariances. Little will help coordinate issues to ensure that unnecessary overlap doesn't occur. A new file should take advantage of the new IAEA dosimetry file for n2n.

McKnight has tested against ZPR6/10. B-VII gave a 4% error. Earlier testing showed that 239Pu may be part of this (using B-V does better). Similar problems cf B-V for Cr and

Mn appeared. The new ORNL Mn evaluation seems to have the same good effect as using B-V for the Mn.

ACTION - The file33 needs updating according to Dunn, and will resubmit by September 2009.

**35,37Cl**. ORNL evaluation submitted Feb 07; has it been tested? Dunn/Leal 1-2 slides. New evaluation has been processed by NJOY08 (allows LRF7). It will also enable testing of covariances.

ACTION – Skip will delegate some data testing.

ACTION - Skip will do testing (even if minimal), and McKnight will look into a possible integral calculation. LRF=7 file is not processable by currently available NJOY.

**39,41K**. ORNL evaluation submitted Oct 2008, Leal/Dunn, 1 slide

ACTION – Skip will delegate some data testing.

ACTION - Skip will do testing (even if minimal), and McKnight will look into a possible integral calculation.

50,52,53,54Cr. ORNL measurements and plans to submit evaluation in FY 2009, Leal/Dunn, 1 slide

Leal has a preliminary set for 52,53Cr. He is also working on 50, 54. 53Cr and nat-Cr transmission & capture were done recently by Guber. They go up to the first inelastic channel.

Most data testing doesn't have enough Cr in steel to show much effect. But the ZPR6.10 with carbon and Cr is very sensitive. Blair Briggs noted a k-infinity benchmark is quite sensitive to chrome – at IPPE. ENDF/B-V did a good job – it was elemental.

ACTION – Leal will finalize Cr evaluations this year (FY09) – and these will then be tested by Kahler et al.

ACTION - Dunn will send to testers by the end of FY09 for testing in time for the next CSEWG.

LANL is doing high-energy work, but not till FY 2011.

**58,60Ni**. ORNL measurements and plans to submit evaluation in FY09, Leal/Dunn, 1 slide

LANL is doing high energy work, but not till FY12. LLNL has done some work in the high energy region.

Data testing needed for LLNL's 58,60Ni to see if HMF3 improved. Livermore has retracted their evaluation, as it needs more work before being released.

Derrien has worked on this with Leal. New Guber measurements have been included. ORNL will finish in future.

ACTION - Dunn will submit new evaluations by the next CSEWG. The goal is to have this submitted by the end of FY09 so that McKnight can test by the next CSEWG.

**LLNL evaluation work**. Overview of LLNL evaluation methodology and summary of evaluations for isotopes of Kr, Co, Ni, Cu, Zn, Ga, Summers – a few slides. LLNL is submitting two sets of evaluations, 78Kr and 63-72Zn. There are two projects - partial activation cross sections for ENDF/A, which are now being extended:

- First set was done with STAPRE by Hofmann. Koning global potential used. Regional systematics developed for level densities, strength function, etc, to allow extensions to unstable region. More recently, TALYS was used to calculate distributions – spectra and angular distributions, ENDL files created, and then ENDF files made.
- TALYS used for whole evaluation for Co, Ni, Cu, Zn, Ga. They are not evaluating ones that exist in ENDF, but use them to calibrate/test their simulations for the off-stability targets.

**78Kr** – LLNL when finalized it will be sent and likely be adopted.

ACTION – pay attention especially to capture because of its importance in reactor applications as FP. Compare with earlier VII evaluation, which was part of the NEA/WPEC Subgroup 23.

ACTION - LLNL will have some file by next CSEWG. The capture has not been changed. Mainly n2n is changed.

**63-72Zn** – LLNL has new evaluation for these isotopes. They continued over information on resonance parameters. ACTION – LLNL will finish, submit evaluations and documentation (esp. pictures) to show various reaction channels. Livermore did use resonance parameters from earlier VII.0 evaluation (the elemental eval gave the individual elemental parameters) - LLNL will also work with BNL/Mughabghab to check if they are OK.

# Pb, W, Ta, Re, Al-LLNL.

ACTION for Pb, W, Ta, Re, Al – Summers will tell us if any of the ENDF stables need updating.

ACTION - 185,8Re and 181Ta reactions may need updating, according to LLNL. Neil Summers will send comparisons for (n,2n) reations. These will be used to see if we want to release updated ENDF files.

**63,65Cu**. Testing against crits including Zeus? New Chinese evaluation is underway. Future ORNL work in FY11? Chadwick, comments. Mosteller has noted problems in the fast range from his testing of the Zeus assembly. ORNL is working on intermediate range.

ACTION – Mosteller will send Zeus MCNP decks to LLNL (Marie-Anne Descalle), and she will see if new LLNL Cu63,65 evaluations perform better in Zeus. Likewise, it would be good to see if the LLNL evaluations perform better than B-VII for 14 MeV transmission experiments (B-VII performed poorly).

ACTION - LLNL data testing has not been successful, but LLNL will continue to work this and see if they can develop an improved file. LANL noted that a new Chinese evaluation exists for 63,65Cu that might perform well.

ACTION - Herman will ask the Chinese representative to WPEC to provide us these files for consideration. Data testing will need to be done to see if the new evaluation solves some of the issues noted by Mosteller over the years, eg., for the Zeus crit.

**Fe(n,a).** Did B-VII.0 at higher energies use Haight's (n,xa) data, and if not, can we do this. **Talou/Haight.** 

ACTION - Have Talou send updated file to BNL.

**Gd**. Note planned RPI capture expts this year; ORNL evaluation planned for 2010. Mosteller comments from reactor community experience – longstanding view that 155,157Gd (the main absorbers) is that "Gd burns out too fast".

RPI paper was published on the Gd measurements, 155 and 157Gd isotopes will be remeasured, to augment the elemental measurements. A 10% change was observed in 157Gd at thermal in the previous. ORNL's work will be done in FY10, though Danon will have resonance parameters earlier.

If we get a preliminary file from Danon (using his measured resonance parameters) we will test against some Russian experiments, and Chalk River & Cadarache (PSI experiments). Limited testing was already done at Cadarache claiming better results. Olivier Serot noted that the isotope and elemental capture values are inconsistent.

ACTION - Mughabghab will review the conflicting data and give recommendations.

**90Zr**. Should the beta4 version be released? Feedback from KAPL & Kozier, as well as possible issues in VII.0 noted by Trkov in reactor testing. Note Yaron Danon's expt talk on elemental Zr total x/s measurement 0.5-20 MeV suggesting B/VI.8 was better. Marco Pigni, 1-2 slides.

RPI total cross section shows VI.8 was better than VII.0 below 16 MeV.

Propose deleting the bound level in 90Zr and adjust gamma-width of first few levels in 91Zr. New data suggest raising the 91Zr capture cross section at thermal (with a corresponding change to 90Zr) so as to also match the Zr data.

ACTION – the new evaluation will be sent to Bettis and KAPL as well as Kozier to test.

Trkov noted worse performance. Danon showed data in the higher energy region  $\sim 4$  MeV. BNL should consider using these data.

ACTION - ENDF/B-VII.0 is problematic near 4 MeV. Herman and Capote will work with Danon etc to try to resolve these issues over the next year, and interact more with Bettis and KAPL.

**Cd.** Adoption of BNL upgrade and positive results from data testing? Note Danon's expt talk on how RPI capture and transmission data support the change in the thermal region. Herman/Mughabghab/Mosteller, 1-2 slides

ACTION – Bettis will test Cd evaluation.

ACTION - Remind Mike Zerkle to test the new Cd.

**182,183,184,186W**. ORNL resonance measurement (evaluation not till FY11?); LLNL work; adoption of new IAEA evaluation shown by Trkov at Physor08? Herman/Leal/Kim/(LLNL-EGAF) 1-2 slides

There are two evaluations:

- Now available, KAERI evaluation that uses EMPIRE. They used ENDF/B-VII resonance parameters, but made some changes to the unresolved resonances (G\_gamma) in order to improve criticality predictions. Their evaluation does better against the 11 MeV (n,xn) spectra. Slight improvement to 14 MeV Octavian and FNS leakage spectra, but still discrepancies (slight improvements over B-VII). For criticality, ZPRs look much better.
- The IAEA evaluation. ORNL did covariances, but did not change the cross sections (except changing the representation). ORNL will do measurements in FY09.

The present file is complete and has covariances. The match to ZPR etc criticals was improved (but not by changing resonance parameters); Ignatyuk - odd isotopes are responsible since the capture cross sections are highest and low energy inelastic – this should be addressed in case improvements in the odd isotopes are possible.

ACTION - We will adopt the IAEA/Capote/Trkov work, but hope to see it updated to use LLNL levels. Capote will study the possible use of these, and test it to see if the integral performance is not degraded.

**Pu and U isotopes**. Fix fiss spec > 10 MeV to have finer points, Chadwick 1 slide

**239Pu**. **Main** ACTION – consider accepting JEFF3.2beta's tweak to ENDF/B-VII.0 (which was unchanged since ENDF/B-VI.2 in the resonance region), as this has helped in matching the solution crits that were previously poorly calculated. This has the major implication that ORNL (with JEFF?) needs to develop a new covariance file. Also, consider another pathway of adopting Derrien's file, but with the new thermal Tweak from JEFF3.2. Ask Leal/CEA collaborators to make such a file soon for testing.

ACTION - LANL (Young/Talou/Kawano?) make a file for testing that is VII.0 but with JEFF3.2beta inserted for resonances/thermal. Do some testing of Pu-sol-therm crits and ZPRs etc..

ACTION - Leal/CEA – make a file for testing that is the ENDF/A file (ie Derrien etc+ LANL high energy) but with new JEFF3.2 thermal tweak inserted. Do testing of of Pusol-therm crits and ZPRs etc.

Resonance region, including collaboration with JEFF, Leal, 1-2 slides

ACTION - Assess (building on Olivier Bouland's work at LANL) new ORNL/Dierrien 0-2.5keV analysis. This new work has resonance information and new covariances. The previous evaluation is from 1992. The new evaluation uses additional data and is more consistent overall.

ACTION – interact with JEFF to see if they plan to adopt Derrien's work too, and if not, why not (note that JEFF3.2beta file is tweaking the earlier VI.2 file at/near thermal to reduce overestimation of isothermal temp coeff in MOx lattices (NSE144,47 (2003)). Ask someone to assess the quality of the covariances (eg in the context of subgroup 26).

ACTION – Mike Dunn – get a write-up of this work for our B-VII.1 documentation.

#### <u>Nubar</u>

McKnight has tested the new 239Pu evalution,. In fast systems, there are no changes in calculated k-eff. =pii001 is modeled more poorly. Mpi002 (one of the ZPR) also gets slightly worse (was 4%, is now slightly worse still) (Dick hasn't used the updated manages in this simulation, which helps quite a bit).

ACTION – understand what is different in 239Pu in ENDF/B-V versus VI versus ENDF/A-new that causes the changes in the ZPRs (since B-V performed well).

#### **Solutions**

In general the new evaluation performs slightly worse than before. Previously there was an average C/E discrepancy of say +0.5% (big) and things get slightly worse. With a higher concentration of fuel, as the spectrum gets harder, the agreements tend to get worse.

RQ has looked at 14N data – thermal (n,p) may need changing – RQ later retracted these concerns based on his looking at Kohler's data. Many of the Pu solutions are plutonium nitrate solutions, and this can have a significant effect. Kahler notes that the uranium solutions might complicate this interpretation since he doesn't remember difference in biases between F and N uranium thermal solutions.

ACTION – send file to LANL to check proposed RQ changes.

Dosimetry properties have been tested by the IAEA for 239Pu file, looking at the (n,g) reaction. In the 1-10 eV discrepancies exist with EXFOR data – but Talou notes the EXFOR data may be wrong, as they have been revised. Main point – we want the dosimetry file to be consistent.

**240Am.** New LLNL evaluation, Summers, 1 slide. No previous evaluation. They used TALYS, and used Younes/Britt surrogate data for the fission. They used 242(m probably) Am resonances.

ACTION – accept LLNL file, and have LANL/Kawano look at it for completeness.

ACTION - LLNL will recreate their 240Am - having fixed some issues - and resubmit.

# 241Am (n,g) upgrade – higher cross-section, Kawano, 1-2 slide

ACTION – we will adopt this new evaluation above 30 keV. Kawano will also fix thermal values (e.g. capture) as necessary – including insights from DANCE – and also Japanese and Plompen talk (?) from Santa Fe workshop.

ACTION - accept new LANL file, which increases the capture a bit (5% say) that allows a better reproduction of capture rates. Kawano also updated the fission cross sections in the fission threshold region, though data testing against fission rates in critical assemblies shows little change to the VII.0 results.

**MA**. Possible adoption of certain Japanese minor actinide files in B-VII.1, Kawano proposes using recent JENDL files (JENDL4 "Actinoid") for Bk, Cf, Es, Fm and 237Pu.

ACTION – Kawano will provide a list of new evaluations.

ACTION - Neil Summers will provide us a list of recommendations on accepting Actinoid JENDL files for possibly 30+ evaluations.

Possible modification to fission cross sections for 241,243Am, 237U, etc based on LANL reaction rate crit assembly testing and Japan FCA testing, Chadwick, 2 slides

## **236U**.

ACTION – LANL submit new 236U evaluation where capture was increased by 10% in the keV and MeV region. This evaluation is consistent with the fundamental cross section data, and allows a better agreement with integral capture data from LANL in critical assemblies.

237U from LLNL. Summers, LANL 237 upgrades, Chadwick1-2 slide

ACTION – LANL submit revised 237U evaluation. This fixes a kink below 0.01 MeV, and has a small change in the MeV region to better match critical assembly 237U fission rate data from Los Alamos.

Possible cumulative FP yield upgrades of E&R for certain fission products, Chadwick, 1-slide

ACTION – keep an eye on this issue as it develops.

233U delayed neutrons fix to B-VII.0, Little, 1 slide. We will adopt this.

ACTION – ask Bill Wilson to ensure the fixed values are in reasonable agreement with measurements/WPEC evaluation.

ACTION - LANL review new nTOF data – but it appears to MBC to be too high and should not be adopted.

# Am243

ACTION – LANL review new nTOF data, but it appears close enough to B/VII.0 to not warrant changes.

**237Np planned upgrade** – (n,2n), chi? Anything else planned? Kawano/Chadwick 1 slide.

ACTION – LANL finish up 237Np upgrades

ACTION: Kawano will also include upgrade (Mughabghab) to 237Np(n,g) at thermal.

240Pu upgrade in fast region. Any testing results? Talou, 2-slides

ACTION – adopt Young's new 240Pu evaluation, including upgrades for capture, fission, nubar,(n,xn) etc. Data testing with Jezebel and dirty Jezebel demonstrate that we still have good results. Previously we had some canceling errors in ENDF/B-VII.0 (eg., even though k-eff was modeled well, nubar was poor in VII.0).

**Missing photon data** that was erroneously not-carried-over from B-VI, and plans to include in B/VII.1, White 1 slide

ACTION - Morgan will review what needs to be added in again.

**S-alpha-beta** in ENDF/B-VII.0 and in fix1. Comments, including observations from PHYSOR08 meeting, Little 1 slide

ACTION - Little will provide NJOY processing values/input decks used to create ENDF70 SAB to the NNDC for posting. Kahler/MacFarlane/Little will address the ambiguities present in NJOY by clarifying how to do this in the NJOY manual.

Need to be able to use LEAPR to generate data at arbitrary temperatures – requested by Kahler and MacFarlane. Need Bob's help to document this. Chalk River says that Bob had found the old files, but they didn't reproduce the B-VII values.

## Detailed Agenda for longer-range issues for possible B-VII.2 release

1H(n,p) scattering, Strakovsky, 10' + slide from Hale. They have a low-energy fit below 25 MeV (LE08). The latest Arndt evaluation agrees within ~1% with ENDF/B-VII.0.

Showed new data from Ohio-08? Carlson said it would be interesting to see what differences the Arndt v Hale methods would give if they used the same database. We asked if he could compare his scattering length with the value HALE noted, where there are discrepant measurements.

ACTION – Hale will review this analysis and consider adopting insights from it as necessary. Hale will work with standards community to consider using these new analyses to extend B-VII.0 up to higher energies (~150 MeV).

**2D**. Any new data from Geel? Comments from Kozier, Hale. No new data yet from Geel.

**Dy**. ORNL measurements and plans to submit evaluation in FY11, Leal/Dunn, 1 slide

**239Pu**. Resonance region, including collaboration with JEFF, Leal, 1-2 slides

**239Pu, 235,238U**. Fission chi spectrum LANL/LLNL plans; 235U recent Geel expt, Shusaku Noda, 2 slides

239Pu, 235,238U 14 MeV inelastic scattering/preeq plans and Bethe sphere testing. Chadwick, 2 slides

**235U**. Capture update, WPEC subgroup, Leal/Kawano, 1 slide

**238U**. Capture & standard evaluation & Walner measurement, Chadwick comments

**239Pu** – new Derrien ORNL resonance file is available for testing.

ACTION – Kahler, Talou et al, check which is the file in ENDF/A – we need to test the new ORNL file against solution crits, ZPRs etc.

240Pu upgrade in fast region. Any testing results? Talou, 2-slides

ACTION – adopt Young's new 240Pu evaluation, including upgrades for capture, fission, nubar,(n,xn) etc. Data testing with Jezebel and dirty Jezebel demonstrate that we still have good results. Previously we had some canceling errors in ENDF/B-VII.0 (eg., even though k-eff was modeled well, nubar was poor in VII.0).

Actinide inelastic scattering in fast region. Future theory and evaluation work, Kawano, 1-2 slides

#### **Covariances Planning for ENDF/B-VII.1**

232Th, 233,235,238U, 239Pu are in very good shape. BNL can create MF32 for resonance region from Atlas, for many nuclides. Our goal is to produce covariances for  $\sim$  100 materials. It is understood that the full set of preliminary covariance data produced for GNEP/AFCI data adjustment project contain 108 materials:

- 19 actinides 5 high-fi in ENDF/A; 14 MA are based SG26+Maslov update. Mark Williams replaced low energy Atlas with his own ORNL assessment. But overlap between GNEP and low-fi is a bit ambiguous. GNEP version had Atlas at low energies, but there were some problems at thermal and this is being modified.
- 75 low fi covariance files
- Light nuclei from LANL (~10); H, 6Li, 7Li, 10B of good quality; 16O is simple Kawano's estimate.
- Remaining structural, heavy, FPs from BNL.

We should use ORNL structural etc – K, Mn55, Cl, F; Ti, Gd in pipeline.

#### Proposal for discussion at the CSEWG meeting:

Take present starting point as ~108 materials which have high-fi, medium, and low-fi covariance data and upgrade as necessary:

- Adding ORNL work (4-8 materials)
- Add normal LANL upgrades Ti, V, Pu240, 241Am, 16O, 237Np med/high quality
- Add fission spec for big 3
- Add 16O ang dist uncertainty (mu-bar)
- Add ang dist for 239Pu, 238U, 56Fe, 23Na
- Replace low energy Williams low-fi with Atlas (MF32)

Goal – complete covariance files, even though some crude, in ENDF/B-VII.1 that can be used by customers.