June 3, 2014

DISTRIBUTION

SUBJECT: SUMMARY OF THE INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT WORKING GROUP MEETING (MAY 2014)

Attached is a summary of the annual International Criticality Safety Benchmark Evaluation Project Meeting that was held in Paris, France May 16-17, 2014. A list of ICSBEP participants and a copy of the final meeting agenda are also enclosed.

Thanks to each one of you for your support of this project and for your contribution to a very successful meeting.

Sincerely,

John Bess, Chairman
International Criticality Safety
Benchmark Evaluation Project

Enclosures:
As Stated

SUMMARY OF THE 2014 INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT MEETING

16-17 May, 2014
Paris, France

The annual International Criticality Safety Benchmark Evaluation Project (ICSBEP) Meeting was held in Paris, France May 16 - 17, 2014. Representatives from 7 of the 20 participating countries attended, including the United States (BAPL, INL, ANL, DOE-ID, LANL, LLNL), Japan (JAEA), Russian Federation (IPPE), France (IRSN, CEA), Slovenia (JSI), Brazil (IPEN) Switzerland. A total of 25 individuals participated in the meeting, including Jim Gulliford and Ian Hill of the OECD NEA.

The following individuals participated in the meeting:

J. Bess	INL	R. Lell	ANL
J. B. Briggs	INL	M. Marshall	INL
A. Brynov	IPPE	M. Murphy	OECD/NEA Subcontractor
A. Garcia	DOE-ID	C. Percher	LLNL
H. Gougar	INL	B. Richard	LANL
P. Grivot	CEA	Y. Rozhikhin	IPPE
J. Gulliford	OECD NEA	A. dos Santos	IPEN
D. Heinrichs	LLNL	L. Scott	OECD/NEA Subcontractor
I. Hill	OECD NEA	L. Snoj	J. Stefan Inst.
J. Hutchinson	LANL	K. Tonoike	JAEA
T. Ivanova	IRSN	A. Tsiboulia	IPPE
G. Keefer	LLNL	M. Zerkle	BAPL
N. Leclaire	IRNS		

Five new evaluations and fourteen revisions of previously published ICSBEP evaluations were reviewed and discussed. All of the new evaluations were approved for publication, subject to satisfactory resolution of all assigned actions. If all of the approved evaluations are completed in time for publication of the 2014 Edition of the *International Handbook of Evaluated Criticality Safety Benchmark Experiments*, the Handbook will contain approximately 4839 critical or subcritical configurations, 24 criticality-alarm/shielding configurations, and 207 configurations categorized as fundamental-physics measurements that are relevant to criticality-safety applications.

Proceedings of the May 2014 Meeting

Jim Gulliford (OECD NEA) and J. Blair Briggs (INL) opened the meeting with a brief welcome to participants.

A summary of the evaluations discussed at the ICSBEP Working Group meeting is enclosed. Action items are noted on this summary. If you have been assigned an action item that is unclear, please contact Lori Scott or myself for clarification as soon as possible. *Action items for evaluations that were either "approved" or "approved pending completion of action items" at the meeting should be completed and verified by internal and independent reviewers (and subgroup members if one was formed) and an electronic WORD copy of the revised evaluation should be submitted to John Bess (john.bess@inl.gov) by the date assigned to each evaluation.*

In addition to the sample input listings provided in the text of each evaluation, please provide ASCII input listings for ALL acceptable benchmark configurations along with the submittal of your finalized evaluation(s). Input listings should be prepared and submitted via email to john.bess@inl.gov and should contain all input files for the sample calculations given in Section 4.0

A directory structure similar to the structure provided below should be followed for the purpose of consistency when preparing the files:

abbreviated evaluation identification number (aein)*

*Evaluation identification numbers should be abbreviated as follows:

Evaluation Identification Number	aein
HEU-SOL-THERM-001	HEUST.001
IEU-MET-FAST-010	IEUMF.010
MIX-MISC-MIXED-001	MMCM.001

aein\code name (cn)**

****Code names (cn) should be given as follows:
KENOHR, KENO27, MCNP, ONEDANT, TWODANT, MONK

aein\cn\case_1
aein\cn\case_2
aein\cn\case_3
...
...

The above structure should be repeated for each code used for sample calculations. An input file for each corresponding case listed in Section 4.0 of the evaluation should be provided.

ASCII input listings should be submitted to John Bess by 07/18/14. **Please make an extra effort to provide the appropriate input listings.**

Authors are asked to check their evaluations contained on the most recent edition of the DVD and inform me of any problems, errors, or concerns, so evaluations can be corrected on the next DVD. Likewise, errors found in input listings should be corrected and sent to me as well. These revisions should be submitted by 07/18/14.

Evaluators are asked to submit an e-mail note or letter stating that their evaluation(s) has been reviewed for classified information, unclassified controlled nuclear information, and export controlled information and that the evaluation(s) does not contain any such information. (Some of these classifications are only relevant to U.S. evaluations.) This e-mail note or letter should be submitted to John Bess by 07/18/14.

Gulliford announced that Blair Briggs has retired, and the ICSBEP Technical Working Group unanimously agreed that John Bess would step up as the new ICSBEP Chair.

The next ICSBEP Working Group Meeting will be held at the OECD/NEA building in Issy-les-Moulineaux, in Paris France. The meeting will be held May 13-15, 2015.

SUMMARY ACTIONS
ICSBEP TECHNICAL REVIEW GROUP MEETING
15 – 16 MAY, 2014

GENERAL ACTION

Hill will provide new publication number.

EVALUATION ID: HEU-MET-FAST-100
(REVISION)

REPRESENTED AUTHOR: MARSHALL
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-COMP-FAST-001/SCCA-SPACE-EXP-001
(REVISION)

REPRESENTED AUTHOR: MARSHALL
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-COMP-FAST-002/SCCA-SPACE-EXP-002
(REVISION)

REPRESENTED AUTHOR: MARSHALL
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-COMP-FAST-004/SCCA-SPACE-EXP-003
(REVISION)

REPRESENTED AUTHOR: MARSHALL
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-MET-FAST-051
(REVISION)

REPRESENTED AUTHOR: BESS
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-MET-FAST-071
(REVISION)

REPRESENTED AUTHOR: BESS
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-MET-THERM-033
(REVISION)

REPRESENTED AUTHOR: BESS
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: MIX-MISC-THERM-006
(REVISION)

REPRESENTED AUTHOR: LECLAIRE
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: MIX-COMP-FAST-001
(REVISION)

REPRESENTED AUTHOR: LELL
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: IEU-COMP-INTER-003
(REVISION)

REPRESENTED AUTHOR: ROZHIKHIN
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: IEU-COMP-INTER-004
(REVISION)

REPRESENTED AUTHOR: ROZHIKHIN
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: U233-COMP-THERM-004
(REVISION)

REPRESENTED AUTHOR: ZERKLE
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (N/A). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: PU-COMP-FAST-004
(REVISION)

REPRESENTED AUTHOR: BRIGGS
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (Heinrichs, Marshall, Hutchinson, Rozhikhin, Garcia). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-MET-FAST-086
(REVISION)

REPRESENTED AUTHOR: HEINRICHS
INDEPENDENT REVIEWER(S):

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
2				Goda will provide revised evaluation file or at least a summary of known issues with the benchmark report that need addressed.
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (Heinrichs, Marshall, Hutchinson, Rozhikhin, Garcia). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JUNE 27, 2014.

EVALUATION ID: HEU-MET-THERM-035
(EVALUATION TO BE COMPLETED 2015)

REPRESENTED AUTHOR: HEINRICHS

EVALUATION ID: HEU-MET-FAST-077
(EVALUATION TO BE REMOVED FROM THE HANDBOOK)

REPRESENTED AUTHOR: HEINRICHS

EVALUATION ID: MIX-MISC-THERM-007

REPRESENTED AUTHOR: LECLAIRE
INDEPENDENT REVIEWER(S): SNOJ

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
2	Briggs			Bess will provide a MST cross reference file for Cases 1, 2 and 11-20.
3	Briggs	--	TITLE	MIX-MISC-THERM-007 Applies to Cases 3 – 10 and 21 – 24. Briggs should assign XREF ID: MIX-SOL-THERM-0?? to Cases 1 – 2, and 11 – 20, write the XREF, and send to Lori. Leclaire should break the DICE Input form into forms for MIX-MISC-THERM-007 and MIX-SOL-THERM-0??.
4	Marshall			Update header and footer on acknowledgment page.
5	Marshall		1	Subscripts on UO2-PUO2 would look better.
6	Marshall	1.1	1	Last bullet point: I'm not positive what you mean but "241Am pins" leads one to think there are pins of Am. Perhaps you mean 241Am content in the pins?
7	Mennerdahl	1.1	2	Editorial. Two sentences are essentially repeated. 3rd and 4th paragraphs after numbered list. The sentence starting with: "These documents have been gathered in a report written in the framework of the evaluation of this program (Reference 4)" can be deleted and the related text modified.
8	Bess	1.1	1	Please place a period after the sentence ending with "benchmark experiments".
9	Lell	1.2.3	4	3rd ¶, 1st line, correct values for Inner and Outer diameters.
10	Santos	1.2.6	6	Expand discussion on extrapolation to critical.
11	Zerkle	1.2.6	6	Include multiplication levels for final measurements.
12	Marshall	1.2.7	17-20	Figures 1-9 through 12: On the figure can you provide a legend to identify the solid black circles versus the white circles vs. the 4 white circles at the edge of core w/ the larger diameter.
13	Zerkle	1.2.7	7	Table 1-1, clarify that the data include all configurations. Suggestion to combine table rows for clarity.
14	Marshall	1.3.1	22	Table 1-4. Just to confirm, all these values were calculated and provided by the experimenters and not the evaluator, correct?
15	Marshall	2		Throughout Section 2 the uncertainty is often assumed to be one-half the last significant digit. This is assumed to be equiprobable and bounding. I do not think that the equiprobable and bounding assumption is justified and potentially underestimates the uncertainty. What is the justification for the sqrt(3) scaling? (A specific example is the last paragraph of Section 2.1.2 on page 28 but this is not the only instance.)
16	Zerkle	1.4 2.1.1	24 26	Clarify that temperatures for solution and reflection are not the same, and that solution temperature was not measured, where appropriate.
17	Bess	2.0	28+	When no tolerance is provided, an uncertainty of half the last significant digit is then treated as a bounding uncertainty. In other benchmark evaluations it is typical to either treat half the last significant digit as a 1σ uncertainty or treat the last significant digit as a bounding uncertainty. So for a value of 0.3 cm, either 1σ=0.05 cm or $1\sigma=1/\sqrt{3}$ cm. This can be discussed more at the meeting. If changes are made, this applies throughout Section 2.
18	Marshall	2.0		Expand discussion on bounding measurements for clarity and for justification. Verify case-by-case and justify, where applicable.
19	Ivanova	1.3.1	21 22	Indicate mass of plutonium.
20	Mennerdahl	2.0	26	Editorial. 3rd line before section 2.1. "the it is" should probable be "it is".
21	Marshall	2.1.4	30	Last two paragraphs: The UO2 pellets and spring dimensions were assumed or inferred from other dimensions or drawings. Did you evaluate these dimensions at a higher uncertainty level than other dimensions because they are assumed and not actually measured?
22	Briggs	2.1.4	30	With regard to Unresolved Issue #2 from the Independent Reviewer, Reported information should be put into Section 1, supplemented information into Section 2.
23	Mennerdahl	2.1.4	30	Editorial. 3rd line and Table 2-2 3rd column head: "linear mass" should be "linear density" (or newer but uncommon "lineic mass").

24	Mennerdahl	2.1.4	30	Table 2-2. The deviations (biases) are half the size of the standard deviation and should be much more important since the signs are known.
25	Snoj	2.1.1	27	2nd to last ¶, last line, better estimate the uncertainty or clarify justification based on recent measurements. Remove the word 'arbitrary'.
26	Snoj	2.1.1 2.1.3	27 29	1st ¶, and Table 2-1, also include this new information in §1.0 and where else applicable. Also footnote that the logbook information is from the previous experiment in this series.
27	Lell	2.2.1.1	31	2nd ¶ concerning temperature issue given for water but not solution, discuss which will be reflected in solution densities. Consider and discuss the bias. Estimate solution temperature in order to derive the bias between solution and water.
28	Marshall	2.2.2.1	34	Bullets following the 241Pu and 241Am equations: Could you be more precise if your units. For example, the first bullet, I believe 0.106 g is more precisely 0.106 g per g of Pu before decay.
29	Marshall	2.2.2.1	35	There are some jumps between units of grams and units of percent that are confusing, see last two paragraphs compared w/ previous paragraphs.
30	Santos	2.2.12	32	Verify and correct data for 1000 pcm uranium content.
31	Santos			In a footnote, provide source information for the ßeff factor for uranium.
32	Lell	2.2.2	33	Verify if magnesium and nickel are negligible. If so, they can be ignored. Otherwise, include non-negligible data where applicable.
33	Marshall	2.2.3	35	I presume the density of the UO2 is reduced because the uranium mass is homogenized over the axial hole of the pellet. Is this correct? Could you state this here?
34	Marshall	2.2.4	36	Last paragraph of section. It is unclear when you give uncertainty as ±1% (or 1/√3 %) if that is ± 1 wt.% of ± 1 % of the given isotopic content.?
35	Lell	2.2.5	36	Verify and correct the high overestimate (.25) for steel.
36	Santos	2.3.2	38	Provide the uncertainty for the extrapolation measurement.
37	Ivanova	2.3.5	39	Pin position in uncertainty should be random. Consider percentages used for random vs. systematic uncertainties. They should be considered on a case-by-case basis.
38	Dydra	2.3.5	40	Because of positioning effects, I would suggest an exploration of any possible bias that may exist between the actual 'randomized' configuration that is assumed as built and the 'homogenized' one modeled. Even a reasonable number of calculational runs, with rods at random locations would give an indication of any effect and its extent.
39	Mennerdahl	2.3.4	38-39	First bullet. Only significant for a few experiments and never dominating. "A hole positioning uncertainty is ± 0.0105 cm, which is due to the uncertainty of the adjustment of the hole-piercing apparatus. This value was obtained on 41 measurements using a grid for another program … The standard deviation of the mean is 0.0105/√41 cm." It is not clear how the standard deviation of the mean of the 41 measurements is relevant for the effect on a grid with N holes filled with rods. 41 should be replaced by N? Since N is 40, it is very close to 41 but the procedure appears incorrect. With millions of measurements the uncertainty of the mean would have been zero. The uncertainty of using just a few holes (N) would not be reduced by the number of measurements. It would also be helpful to specify that each hole position measurement is relative to a neighbor hole. It is not an absolute uncertainty and this is also confirmed in LCT-029. The individual positions of rods within each position will not change the average pitch. The pitch effect thus is over-estimated. Since it is small this is not a problem but maybe this should be pointed out to prevent future misunderstandings.
40	Mennerdahl	2.3.7	41	This section refers to the bias obtained by analyzing the solutions at 21ºC while most of the experiments were made at other temperatures, most at 17ºC (sometimes higher if the water temperature is used). The correction method appears reasonable but not the temperatures used and the uncertainty is very large, considering that the water temperatures were measured and that the density increase is quite well understood. Also, as expressed during earlier meetings, I prefer to see the benchmark simplifications discussed in Section 3.1. It is now discussed also in Section 2 and in Section 3.4. It is not needed in 3.4 where the text appears incorrect to me. The bias is not accounted for correctly, sometimes overestimated significantly.

				The experiments were made below 21ºC and the analyzed densities should be determined to correspond to the experiments, using best-estimate information. Example: Case 23. The specified temperature bias correction is -95 pcm. The water temperature is 19.5 (Table 2-1). The bias corrections should thus be less than half of that, perhaps -40 pcm. This is clearly significant.
41	Marshall	2.3.7	41	Did you compare the measured density versus the calculation Sakurai equation density? The difference between the Table F.1 densities and the measured densities range from about -0.03 to +0.02 g/cc. Do you believe this discrepancy is due entirely to the three reasons given in the last paragraph of the section?
42	Marshall	2.3.7	41	I think the first paragraph belongs in Section 2 as an temperature uncertainty of ± 1 oC, evaluated using the effect on density a 1oC change in temperature has. And the final two paragraphs belong in Section 3 as a bias.
43	Marshall	2.3.7	41	Second paragraph: it appears that in App. F the $\Delta\rho/\rho$ of -0.24% is actually calculated for ΔT of 25 → 21 ºC. This paragraph leads one to believe it is calculated for a ΔT of 21→17 ºC. Can you verify that that the magnitude of the $\Delta\rho/\rho$ for 17→21 ºC is equal to 25→21 ºC.
44	Marshall	2.3.7	41	Last paragraph: I am not convinces the effects are sufficiently well known to justify bounding this uncertainty.
45	Marshall	2.4.1	44-60	The temperature effect and structure bias from Table 2-10 through 2-26 should be in Section 3
46	Marshall	2.4.1	55	The Table for Case 17 and 18 is missing.
47	Marshall	2.4.1	58	Table 2-24 (case 22): third to last row, benchmark is misspelled.
48	Briggs	2.4	44 – 60	Tables 2-10 through 2-26: Benchmark Model Bias information belongs in Section 3.1. It is not ideal, but is OK to leave the information in the Section 2 Tables, but there needs to be a clear map back to the information. Either move the information to Section 3.1 (preferred method) or provide a clear path back to the information.
49	Briggs	2.4	56	Title to Table 2-22: Should read, Cases 19 and 20 (data also apply to Cases 17 and 18) . . .
50	Mennerdahl	2.4.1	43	Item 12. I note that it is recognized that there are unaccounted correlations between solution density, U and Pu concentrations. It is good to have this recognition. It can be accounted for later, if there is a need.
51	Dydra	2.5	62	The approximate 1% over prediction before inclusion of any pin array may point to a possible omission or bias in the basic configuration. This could include unaccounted systematic error in solution parameters or its height. Another possibility might be unknown submerged equipment that displaces solution – can you confirm whether all of this has been adequately investigated and ruled out?
52	Tsiboulia			Explain that results are driven by the solution, or otherwise. Make reference to PST31, regarding that the uncertainty due to the pins will go up, and should be treated as systematic.
53	Hill	2.5	61	Equation, expand discussion regarding random vs. systematic uncertainties, or remove ¶.
54	Marshall	2.5	61	Table 2-27. value for Case 24 does not match Table 2-26.
55	Marshall	2.5	61	I do not think your random/systematic uncertainty approach is correct. Random/systematic distinctions should be applied on a by parameter basis not as a sweeping assumption. Additionally, I do not think that the statement that "the calculated statistical uncertainties that are shown in Tables 2-10 through 2-26" is correct. I do not think those uncertainties are random uncertainties. I think they are actually predominately systematic uncertainties. For example, when you assume the uncertainty in a dimension is ± one-half the last significant digit, which is a systematic uncertainty reflecting the accuracy of the device used. Also, material property uncertainties, in my experience, are typically systematic unless multiple batches and measurements are involved. I think the uncertainties in which it is most important to consider systematic versus random is for the dimensions, positioning, and pitch of the pins. Just dividing by the sqrt(N) on these parameters will underestimate the uncertainty but assuming 100% systematic will over estimate it.
56	Marshall	2.6	61-62	Table 2-28: Under the column title Benchmark Models, are the keff1 values the benchmark values or are they calculated? Do the values in column "Configurations without pins keff2" correspond to an experimental configuration or just a model you created. Entire section: I am unsure of the purpose of this data but I feel like it either

				belongs in Section 4 as interesting sample calculations or earlier in Section 2, maybe around Section 2.3.6, as justification for uncertainties?
57	Marshall	3.1.1	63	Item 1): where applicable specify "…were modeled in the detailed model" This clarification, while a little redundant, will help. Table 3-1: footnote a reference to bolded cases but no cases appear to be bolded in the table.
58	Briggs	3.1.1	63	Table 3-1: Include units (pcm) in the last column header.
59	Briggs	3.1	65	Table 3-2: (1) The reviewer cannot duplicate the Total Uncertainty values, please check and clarify how they are determined. (2) Include the Decay Bias Uncertainty. (3) Make a clear distinction (possibly with double vertical lines) between the bias and bias uncertainty columns. (4) Since all of the values that go into the Total Uncertainty are not included in the table, please clarify or define the meaning of Total Uncertainty and indicate where the missing values can be found.
60	Dydra	3.1.1	64	It might be more accurate to discuss these first issues as modeling or simplification biases, rather than just biases. This is since they are introduced wholly by the evaluator, unlike the temperature and 241Am effects.
61	Dydra	3.1.1 3.1.2	64 - 65	Could you make more clear whether the omission of the tie rods, the pin modifications and loss of holes in the grid plate are made to the detailed model or to the benchmark model? These should only be introduced as simplifications to the benchmark model, with appropriate biases applied. Since the 'Structure' biases in Table 3-2 are different to the biases in Table 3-1, there is a lack of clarity on what has been applied.
62	Marshall	2.6	61	Move applicable array data to §2.3.6
63	Zerkle	3.1.1	64	Item 3, regarding the worth of the approximation, remove discussion of the simplification.
64	Bess	3.1.2	65	Table 3-2, verify table values, and add column for decay bias uncertainty.
65	Santos	3.1	63	Move discussion of Table 3-1 to before the table. Also include the relevant computer code.
66	Hill	3.1.2	64	Review the bias for the remaining uncertainties, or add them.
67	Tsiboulia	2.5	61	Table 2-27, add experiment numbers to the table.
68	Marshall	3.1.2	65	Table 3-2, case 15, 16. The temperature bias uncertainty listed does not agree w/ Table 2-21.
69	Marshall	3.2	69-72	Figure 3-3 through 3-6. The four holes at the edge of the grid plates. Were these explicitly modeled? Were the holes void?
70	Marshall	3.3	73	Paragraph after Table 3-5: the reference Table xxx I believe needs to be updated.
71	Marshall	3.4	75	The experiment temperatures… experiment should be singular.
72	Briggs	3.4	75	First Sentence: Remove the words, ". . .are in the . . ." and add a comma immediately after 20ºC.
73	Briggs	3.5	75	(1) Change the Section number to 3.5 instead of 3.6. (2) Last Sentence, Table 3-2 also includes rounded numbers contrary to the statement.
74	Bess	3.6	75	Section 3.6 should be Section 3.5.
75	Marshall	4.0	77	Table 4-1. If there is room, for ease of reference could you also provide the Benchmark keff uncertainty on these tables.
76	Marshall	4.0	79	In the final paragraph you attribute the overestimation in part to a potential experimental bias. What do you mean by this? If there is a "potential experimental bias" should it not have been explored, described, and quantified in Section 3?
77	Ivanova	4.0	77	Expand discussion for the unknown systematic bias.
78	Santos	4.0	77 78	Tables 4-1a and b, add uncertainty data for C-E/E
79	Briggs	4.0	77 – 79	Please Expand the titles to Tables 4-1a, 4-1b, and 4-2 so the differences are clear. For example Table 4-1a uses cell weighted JEF2.2 cross section data while Table 4-1b uses JEF-3.1 data.
80	Marshall	5.0	81	The references should only be fore documents about and specific to the evaluated experiments. Many of your references refer to experiments at the facility but maybe a different program… I personally think those are fine but the Sakurai equation should be a footnote and not a reference.
81	Briggs	5.0	81	Reference 8 is not an experimental reference specific to these experiments and

				therefore should be incorporated as a footnote in the appropriate locations.
82	Mennerdahl	5.0	80	Ref. 4. The year of the issue of the addition to the report is not provided. 1977 appears to be the first report. There should be a later date?
83	Tonoike	1.2.3	4	2nd and last ¶s, verify value of ‘0.55 cm’ for the pins. Also make reference to Appendix B in last ¶.
84	Hill	App B		Confirm and discuss how water height uncertainties were derived.
85	Zerkle	App C	117	Table C-1, better describe table data in the text.
86	Santos	App C	122	Table C-2, reduce the number of significant digits in the last 5 columns. If the uncertainty is increased, it will be too high and inconsistent. Therefore the experiment should not be evaluated. Discrepancies are not typical to a plutonium experiment, and data may not be benchmark quality. Add discussion of inconsistent data.
87	Briggs	APPENDIX E	131	SUGGESTION: Consider changing the title to “SUPPORTING PHOTOGRAPHS AND DRAWINGS”
88	Marshall	App F	141	Paragraph following equation 2, last sentence. I believe you mean to say “The solution was not pure…”
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (Bess, Ivanova, Marshall, Rozhikhin, Santos, Tsiboulia). EVALUATION DUE DATE: DUE TO SUBGROUP: JULY 18, 2014. ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY AUGUST 1, 2014.

EVALUATION ID: PU-MET-FAST-043

REPRESENTED AUTHOR: LELL
INDEPENDENT REVIEWER(S): PERCHER

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
2				Note: Many comments on evaluations PMF43 and PMI4 are generic and may apply to each evaluation.
3	Mennerdahl	Key words	1	"Intermediate" what does that refer to? The spectrum is fast with a substantial fraction in the intermediate range.
4	Briggs			Change evaluation identifier to PU-MET-INTER-003
5	Snoj	1.1		Clarify energy ranges. MCNP model will be included.
6	Briggs			Add page numbers to evaluation.
7	Percher			Add figure showing axial dimensions. INL will draw the figure. White will determine the practicality of providing additional figures for an appendix.
8	Percher	1.2.2		Figures 1-5 and 1-6, indicate that the detection drawers are empty.
9	Zerkle	1.2.2		3rd ¶ on page following Figure 1-7, provide figure showing xy projection, in order to better understand the geometry. INL will draw figure.
10	Mennerdahl	2.3	29	Just below middle of page. The following quote sounds strange to me: "It was assumed that the average hydrogen content in the graphite plates was 35 ppm with a 35 ppm, i.e., 100%, uncertainty. The computed worth of the 35 ppm hydrogen uncertainty is 0.1113 %Δk" How can the 1σ uncertainty be 100%? I got the impression that the hydrogen content is less than 70 ppm. Takin 35 ppm with a flat uncertainty distribution between 0 and 70 is then perhaps reasonable. The 1σ uncertainty then becomes 35/sqrt(3) ppm. This is now the dominating experiment uncertainty (not for the benchmark though). In PU-MET-INTER-003 the same issue applies. The steel uncertainty for the matrix tubes is dominating the experiment uncertainty and the room return uncertainty the benchmark uncertainty.
11	Bess	2.3		The assumed 10B content of 5 ppm in the graphite based on TREAT reactor graphite is incorrect. The unique fabrication process for producing the graphite fuel for TREAT accidently introduced boron (estimates of 6 or 7.6 ppm, depending on the report) because of the special baking process. The raw materials only had an estimated 1 ppm boron content. Typical nuclear grade graphite used in TREAT was from CP-2, and had an EBC of ~1 ppm. It appears that they treated the uncertainty could be treated as bounding with the upper limit at 2 ppm, as actual compositions varied between 0 and 2 ppm for the few samples measured. I will send you a more recent analysis of CP-2 graphite that supports a 1 ppm natural EBC content.
12	Bess	2.3		It would seem more appropriate to treat the 25 wt.% uncertainty in the Teflon content as a bounding uncertainty with uniform probability distribution and not a 1σ, as a 3σ uncertainty would produce negative Teflon content or 125 wt.% content. Also since the 'range' is stated as between 25 and 75 wt.%
13	Bess	2.3		More recent measurements of CP-2 graphite unfortunately did not look for hydrogen content. Early measurements of the graphite to detect water appeared to have on average ~0.02 wt.%. However, the length of exposure of the graphite to water and then afterwards to dry air could significantly impact the water content and final results supported that the water content in TREAT is most likely inconclusive. I think the current assessment is adequate with the information available. However, I think it should be treated as a bounding uncertainty with uniform probability distribution instead of 1σ.
14	Percher	2.3		1st and 2nd pages of §2.3, remove discussion of Pu-U-Mo.
15	Percher	2.3		Text following Table 2-1, include discussion of where the data were taken.

16	Rozhikhin	3.2		Use similar models in this evaluation that were used in previous evaluations in this series for showing RZ and XYZ models.
17	Tsiboulia	3.2		Add figure for as-built model. INL will provide the figure.
18	Percher	3.2		Consider creating a more detailed simplified model. Tsiboulia will help.
19	Bess	3.3		The graphite would have had an EBC of ~1 ppm if compared with contemporary graphite used at ANL facilities. The benchmark model should have some boron in the composition, or a bias included to address removal of the boron from the graphite.
20	Mennerdahl	3.5.	38-39	Editorial. There appears to be some redundant text in the three paragraphs preceding Table 3. "The 0.020 %Δk excess reactivity actually corresponds to a temperature of 40 °C or 313 K." "It became the practice to adjust reported excess reactivities to a standard temperature of 40 °C or 313 K , and the 0.020 %Δk excess reactivity corresponds to this temperature." "It was the practice at ZPR-3 to adjust excess reactivities to a temperature of 40 °C." In PU-MET-INTER-003 the repetition is less obvious.
21	Mennerdahl	3.5	39	Table 3.3. Depending on the result of the consideration of proposed Action No. 2, the uncertainty of the no-moisture-in-graphite bias may become lower.
22 23	Mennerdahl	3.5	40	The large uncertainty 0.2%Δk due to Monte Carlo homogenization appears to be large but I do not want to challenge this. I would like to propose an alternative for somebody in the future. A more accurate geometry could be set up by using the average plate geometry and composition. In MNCP this could create a "universe" without complicated input preparation. The advantage is that the homogenization uncertainty would be removed. For this case, it is the dominating benchmark uncertainty. I have had the same idea for the FR-0 benchmarks where the simple cylindrical models could be filled by a universe with slabs. The advantage you have with ZPR is that you have the actual individual plates and could generate the average plate properties exactly. This should be done before you lose the detailed information or the knowledge how to handle that information.
24	Bess	3.5		Typically bias information is provided in Section 3.1 but often in Section 3.5 for ZPR/ZPPR benchmarks. Please provide a note in Section 3.1 to direct the reader to Section 3.5 for additional bias information in regards to model transformation and adjustments.
25	Bess	3		There were discussions of producing an RZ model for PU-MET-INTER-004. I think this would be a good addition to what is currently provided.
26	Hill	3.5		Text after Tables 3-3 and 3-4, calculate and provide sensitivity of the transformation bias for detailed and simplified models for the ~2% keff uncertainty. Calculation of the transformation bias with additional cross section libraries will also facilitate whether the bias is dependent upon specific nuclear data.
27	Hill	App A.1		Provide inputs or remove section and renumber section headers accordingly.
28	Heinrichs	5.0		Provide reference for 'ANL-7695'.
28	Percher	5.0		Provide reference for the manufactured data database.
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (Heinrichs, Rozhikhin). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JULY 11, 2014.

EVALUATION ID: PU-MET-INTER-004

REPRESENTED AUTHOR: LELL
INDEPENDENT REVIEWER(S): PERCHER

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
2				Note: Many comments on evaluations PMF43 and PMI4 are generic and may apply to each evaluation.
3	Richard	1.2.2		Table 1-1, last column header, change to 'ZPR 3/58'.
4	Zerkle	2.2		Last ¶, include concrete structure in room return.
5	Leclaire	2.3		Verify and correct table numbers on table headers and in the text.
6	Briggs	DICE Input Form		Include graphite as a moderator.
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (Heinrichs, Rozhikhin). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JULY 11, 2014.

EVALUATION ID: SUB-LEU-COMP-THERM-002

REPRESENTED AUTHOR: SANTOS
INDEPENDENT REVIEWER(S): MURPHY

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
2	Marshall	1.1	2	Last paragraph, last sentence: "..the remaining twenty two are subcritical."
3	Briggs	1.1 1.2.7 1.2.7.1 1.2.9 2.2	1 17 24 59 70 & 74	IPEN(MB01)-LWR-RESR-014 is not part of the ICSBEP Handbook. Therefore, it must be referenced as a footnote as follows: International Handbook of Evaluated Reactor Physics Benchmark Experiments, NEA/NSC/DOC(2006)1, Organization for Economic Co-operation and Development-Nuclear Energy Agency (OECD-NEA), NEA No. 7173 – March 2014.
4	Briggs	1.1	2	Suggestion: Rewrite the last paragraph as follows: Twenty-three configurations were evaluated, all are considered to be of benchmark quality. The first configuration is a critical configuration while the remaining twenty-two are subcritical.
5	Lell	1.1		Measure and include neutron source in the calculations.
6	Hutchinson	1.2.4	13	Figure 7, footnote that the photo is a generic photo and may not be the same as the experimental setup.
7	Mennerdahl	I.2.4	13	First new paragraph, line 1: Should it be "withdrawn", as in "bottom surface of the withdrawn absorber"?
8	Mennerdahl	1.2.7.1	22	In the list of parameters, the generalized reactivity contains a reference to section 4.1. This is not clear to me. Is it section 4.1 in a Gandini/Salvatores reference? Equation (9) on next page contains an equation describing how to obtain the parameter.
9	Mennerdahl	1.2.7.1	23	In eq. (3) the parameter "i" is not defined (or I can't find it)..
10	Snoj	1.2.6	16	Table 3, add source to the table.
11	Richard	1.2.7.2	24	1st ¶, acknowledge that the criteria for ßeff in prompt neutron lifetime was small.
12	Snoj	1.2.4	12	Verify accuracy in the position of the control rods. Make reference to the paper in a footnote.
13	Marshall		26	Double period at end of paragraph after Fig 16.
14	Briggs	1.2.9	52	TABLE 6: Change "Countings" in the Header to "Counts" (3 Places).
15	Ivanova	1.2.9	52	Table 6, 2nd column, add presence of the additional source.
16	Gulliford	1.2.7.2	25 26	Explicitly state that the processing system was not subject to distortion.
17	Rozhikhin	1.2.9	54 58	Tables 8 and 12, clarify the detector transition between low to medium to high. Justify or explain why there are no overlapping values.
18	Bess Gulliford	1.2.7.1		For detector transitions, clarify which detector locations are dependent and what was done and which detectors are dependent on source strength.
19	Hutchinson	1.2.9	60	Equation 17 and Table 13, verify that results are consistent and correct for keff.
20	Mennerdahl	1.3	63	Sentence before Table 17: "As recommended by the experimentalists, the temperature of all materials is 20.00ºC. This is the temperature at which all material analyses were done." Recommended by experimentalists means what? That this was a target for the experiments or that this is what should be used for documentation of material properties? The actual temperatures are specified.
21	Snoj	1.3	61	Table 14, add 'Sample 1' and 'Sample 2' to 3rd and 4th headers.
22	Snoj			Measurements provided by the manufacture should be averaged with the other measurements. State the method of measurements.
23	Ivanova	1.2.9	60	Table 13, average values also for Configurations 1-10, or clarify what was done and why, since the uncertainties are different for the two methods.
24	Snoj	1.3	63	Reword the text above Table 17 to indicate that the temperature was not measured.

25	Snoj	1.0		State that experimental data were used and not data from the Handbook.
26	Snoj			State that the uncertainty in the fuel was the standard deviation and was not measured.
27	Snoj	1.3	65	Table 17, last row, specify which are impurities. For footnote 'b', provide measured mass.
28	Snoj	1.3	65	Table 18, last row, use SI units or define term.
29	Bess	2.0	66	Did you check to see which βi and λi parameters had the most significant impact? Typically 1 or 2 groups dominate the uncertainty in this perturbation of delayed parameters. It would be good to indicate which parameters were the most important (i.e. had the largest impact).
30	Marshall	2.0	67	Table 19: Uncertainty for Case 18-23 do not agree between Table 13, 19, and 27.
31	Marshall	2.2.1	68	Shouldn't cm rather than mm be used in Section 2 through 4?
32	Marshall	2.1-2.2	69-72	-I am having a hard time following the progression from the standard uncertainties given in Tables 20, 21 and 22 to the 1sigma uncertainties in Tables 23 and 24. I believe you are saying that Tables 20 and 21 represent random uncertainties and Table 22 represents the systematic uncertainty due to equipment limitations. How are the two combined? -I do not understand how the paragraph preceding Table 23 is applied. I do not think this is reflected in the Table 23 values. -Please recheck and clarify how the Table 23 and 24 values are obtained from Tables 20, 21, and 22.
33	Mennerdahl	2.1	68	Pitch uncertainty. How can the hole and rod diameters influence the average pitch? The pitch between two specific rods can be influenced but the pitches towards neighboring rods will be influenced in the opposite direction. If all or rods are off-center in the same direction, there is no change in pitch. Epsilon-single is OK but for the epsilon-pitch, the D should be neglected. The pitch measurements are uncorrelated; i.e. the distance between two holes is determined independently from the previous and next measurements. The rod positions, hole and rod diameters are correlated since a positive perturbation in on hole will lead to an anticorrelated perturbation in the neighbouring holes. The reactivity influence of the pitch uncertainty is very small. It is probably quite different in the X- and Y-directions for some cases, e.g. in Figure 39 where there are many more rods in the X-direction. You could envision this by making the X-dimension infinite – the pitch reactivity uncertainty would not be zero. However, since the reactivities are so small, it is not worth looking at this.
34	Mennerdahl	2.1.	69	Table 20. Footnote (a) in the last row is not described.
35	Bess	2.1	69	Table 20, Footnote (a) is missing below the table.
36	Bess	2.2	71-72	Tables 23+24, The primary composition uncertainties in the cladding should be perturbed individually instead of all at once. Please confirm if this was done.
37	Bess	2.2	73	Table 25, There are different font sizes used in the table; please correct.
38	Richard	2.1	70	Table 22, where appropriate, consider if the values given for 'Accuracy' should be changed.
39	Snoj	2.1	69	Table 21, reevaluate uncertainty due to fuel mass and fuel density using the methodology given in the Uncertainty Guide. Expand discussion in the text.
40	Ivanova	2.2	71	Table 23, for outer clad diameter, consider using 50% systematic and 50% random uncertainties.
41	Bess Briggs	2.0		Ensure that all uncertainties are correct and verify that all uncertainties are propagated into the final results.
42	Gulliford			Quantify effect in prompt generation type in keff.
43	Richard	2.2	70	State how many energy codes are used and other related information, if applicable.
44	Marshall	3.2	79	Table 29, footnote b. Please re-give the fully withdrawn fuel rod position here.
45	Marshall	3.5	81-82	I believe the majority of the last paragraph, from "because thermocouples…" to "..total bias is -43.81 pcm" should be moved to Section 3.1 with the bias descriptions.

46	Briggs	3.2	78	First Sentence, First Paragraph: Rewrite as follows: ". . . Figures 17 through 39 (Section 1.2.8)."
47	Briggs	3.5	81	First Sentence, First Paragraph: Rewrite as follows: ". . . parameters are given . . ."
48	Bess	3.3	81	Discussion of the treatment of 18O in modeling should be done in Section 4 and not Section 3. Also, Oxygen is listed as an element in Section 3.3 and not in isotopic form unless it has been enriched beyond standard isotopic concentrations.
49	Bess	3.5	81	Discussion of bias correction should be provided in Section 3.1.
50	Bess	3.3	81	Last ¶ below Table 30, move to §4.0. Table 30, combine O-16 and 17, and describe how they were modeled.
51	Marshall	3.5	81	Last ¶, text after 1st sentence, move to §3.1.
52	Briggs	4.0	83	First Paragraph: Use the word "Cases" or "Case" instead of "Configurations" or "Configuration" (3 Places).
53	Gulliford Briggs	4.0	83	Table 32, footnote that accurate information is not given for Δk for Cases 8-23, and state that they are not acceptable as a benchmark model, or clarify how they may be useful.
54	Rozhikhin	4.0	83	Calculate the uncertainty in Δk, not k.
55	Tsiboulia	1.2.9	60	Table 13, provide 1-keff and experimental data.
56	Gulliford	4.0	83	Add a table showing C/E data in terms of Δk. Consider also adding a figure.
57	Bess	2.0		Include discussion to explain that the uncertainties in keff do not matter for Δk. Bess can help.
58	Mennerdahl	Appendix A	85	First sentence. The MCNP5 is stated as using 4050 cycles. This should be 2050?The number of neutrons per cycle is specified as 800 000. Should it not be 10 000?
				STATUS: Evaluation approved. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (Bess, Gulliford, Hutchinson, Marshall, Richard, Rozhikhin, Snoj, Tonoike). EVALUATION DUE DATE: ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY JULY 18, 2014.

EVALUATION ID: SUB-PU-MET-FAST-003

REPRESENTED AUTHOR: RICHARD, HUTCHINSON
INDEPENDENT REVIEWER(S): WATSON

Action No.	Action From	Section	Page	Action
1				RESOLVE ALL INDEPENDENT REVIEW COMMENTS
2	Bess	0	0	The purpose of an ICSBEP benchmark is to provide a k_eff /k_sub value that is code and measurement method independent. While the means to effectively determine k_exp/k_sub can be of various form and include additional benchmark experiment measurements (in this case R1, R2, and ML), the final eigenvalue with comprehensive assessment of experiment uncertainties, biases, and bias uncertainties needs to be included. The common user will want to have confidence in their calculation of k_eff/k_sub using their nuclear simulation codes and nuclear data. Most users will not or cannot calculate the directly measured experiment values. Please compare with SUB-LEU-COMP-THERM-002. Otherwise, publish as a Fundamental Physics measurement; coordinate with John Bess to obtain an identifier.
3	Bess	1.0	3	In the second paragraph there is a discussion of the earlier CSDNA and Feynman measurements being rejected as a draft at ICSBEP. It would be more appropriate to provide the following details: Provide references to the journal articles and presentations at ANS or ICNC (as footnotes) instead of pointing to an earlier draft of this benchmark report that most people do not have a copy of. Indicate that inconsistencies between the derived k_sub values between these two methods could not be resolved at the time due to the inability to adequately quantify the total experimental uncertainty and biases, if any, in the different methods. Indicate that because of these initial setbacks, the current experimental method was proposed and performed, and was subsequently evaluated as the benchmark experiment within this report.
4	Bess	1.0	3	Rewrite the final sentence of this section as “The seven subcritical configurations are considered acceptable as benchmark experiments.”
5	Bess	1.2	3	An overview figure of the orientation of the carts and distances between detectors and the center of the experiment would be of great benefit in describing the conditions of the experiment.
6	Bess	1.2.1	7	It is not clear why NCERC is bold and underlined in this section.
7	Bess	1.2.2	9	Table 1, The dimensions of the Inner and Outer Radius of the SS-304 cladding and flange were originally reported as 1.50067/1.5185 and 1.5185/1.7228 in., respectively. Rounding of measured data in Section 1 of a benchmark evaluation should not be done. Furthermore, propagating rounding errors throughout the benchmark report will introduce uncertainties and biases that will impact your final results. Please correct this table and all subsequent tables, calculations, models, etc.
8	Bess	1.2.2	10-11	There is no Figure 12. Please renumber Figures throughout the report in the final version and make sure the text pointing to the Figures is correct.
9	Bess	1.2.2	10	There is no mention of the radiograph measurement performed to verify no voids in the Pu sphere and show that the sphere sat at the bottom of the BERP shell instead of perfectly centered. Discussion in Section 3 relating to the centering of the sphere would have been supported by this information. Not clear why it was not included.
10	Bess	1.2.3	18	There is no discussion of the Nashua tape, how it was used to hold the shells together, and how it was applied.
11	Bess	1.2.4.1	19	Is the front face of both NPODs facing the BERP ball?
12	Bess	1.2.4.1	19	Is there supporting material around the cadmium sheeting?
13	Bess	1.2.4.1	19	What is the top portion of the NPOD detectors?

14	Bess	1.2.4.1	19	Is the 50 cm between the detectors and the center of the BERP ball the distance to the front face of the NPOD or the center of the NPOD?
15	Bess	1.2.4	19	The detector information for the other non-NPOD detectors has not been provided. It is better to provide everything herein so that information does not need to be tracked down at a later date only to be found as "missing".
16	Bess	1.2.5	19	Was there any bowing of the aluminum base plate? If not, it would still be good to indicate that even with the recesses provided in the plate, there was no bowing of the experiment with addition of the BERP ball and Ni reflectors. If there was bowing, then that needs to be addressed with your experiment height uncertainty.
17	Bess	1.2.4	20	Figure 21, Please provide a more informative figure. Label components Indicate which side is the front face Provide a key for materials Indicate active height of detectors At one time I remember seeing a more detailed drawing of this figure, albeit without all the unknown stuff at the top. There is obviously more details to the NPOD detectors than described in the text. Neglecting information should not be done in Section 1. Sections 2 and 3.1 are utilized to throw out what is considered unimportant for modeling and simulation.
18	Bess	1.2.4	20	Please provide drawings for the other detectors following the directions provided in the previous comment regarding the drawing of the NPODs.
19	Bess	1.2.6	20	Rewrite the first sentence of this section as follows: "The aluminum base plate rests on a mild carbon steel cart, which has dimensions shown in Figure 24.
20	Bess	1.2.6	23	Figure 24, There are discrepancies between the dimensions provided for the cart in the text and figure. Also, original specs from the cart manufacturer do not agree with the dimensions provided herein. Also, the wheels are actually 5 in. in height with a reinforced wheel base structure and brace. The total height is still most likely the 15.8 cm reported in the figure.
21	Bess	1.2.7	24	LA-UR-13-26060, and other external reports that are cited in this benchmark, are not currently available or accessible. While they can be included on the ICSBEP Handbook DVD and linked to this report, the summary of their information should still be provided in the benchmark report. External reports are useful for providing the in-depth knowledge that doesn't need discussed in the benchmark report. However, information regarding the experiment geometry, material, methods, and measurements still need to be included.
22	Bess	1.2.7	24	A summary of the Hage-Cifarelli formulism, equations, method, and how the uncertainties are derived should still be provided in this report.
23	Bess	1.2.7	24	A more detailed discussion of how the measurements were performed and measured should be provided. Assumptions should be documented. Someone reading through the benchmark in detail at the moment would not know how measurements were performed or the quality of those measurements. It is not readily clear how one obtains the numbers in Table 11 from the detectors. How are the electronics systems set up? What is the quality of the detectors? Dead time? Efficiency? Etc. etc.
24	Bess	1.2.7	24	Assumptions regarding the determination of ML should be explained, especially if these are the values needed to ultimately derive k_sub.
25	Bess	1.2.7	24	Table 11, Are the uncertainties reported in this table the statistical uncertainties only or do they include the uncertainty derived for these values from the measurement method? If it is just the statistical uncertainty, that needs stated. If it is the method uncertainty, which includes the statistical uncertainty, this should also be noted; then details regarding the derivation of the method uncertainty should be discussed in more detail. Your experimental uncertainties calculated in Section 2 are much larger than the uncertainties reported here, which makes me think they are purely statistical and the uncertainty in the methods have been ignored.
26	Tsiboulia Rozhikhin	1.2.7	24	Provide a brief definition of each variable (R1, R2, M1).
27	Snoj	1.2.1	7	Where dimensions are measured in both 'in' and 'cm', footnote that measurements were performed using both units.
28	Keefer	1.2.1	7	Discuss how the seatings were lined up.
29	Marshall			Verify and correct conversions from inches to cm in the text and figures.
30	Marshall	1.2		Renumber figures and associated text accordingly.
31	Marshall	1.2	8	Expand discussion of the uncertainties on dimensions for clarity.

32	Marshall	1.0		Add information regarding tolerances. All known descriptive information should be moved or repeated in §1.0. Mass uncertainty on measurement of mass from §2.0 should also be discussed in §1.0.
33	Santos	2.0	30	Footnote '1', expand discussion on multiplication patch, and include additional information in an appendix. Experiment information should also be included in the main document. How keff is calculated for subcritical measurements if fundamental is used should also be included.
34	Zerkle	1.2.6	20	Correct Figure 21. Add additional labels for clarity.
35	Marshall	1.2.6	20	1st ¶, reword for clarity.
36	Snoj	1.2.7	24	Where applicable, clarify quantities of nuclear measurements. Include units.
37	Keefer	1.2		Provide the same detailed information for parameters as was do for previous evaluations in this series. Additional information can be included as an appendix. If appendix is added, show comparison of other basic codes.
38	Briggs			Evaluation will be defined as a FUND benchmark with keff included as an appendix.
39	Briggs			Renumber tables and associated text throughout accordingly.
40	Briggs			Discuss where the uncertainties came from.
41	Bess	1.3.2	25	Table 3, The original Pu memo reports a mass density of 19.655 g/cc for the Pu sphere. This error is not addressed in this report. The BERP ball is used in other benchmarks. Prolific users of the handbook will note this inconsistency that needs addressed.
42	Bess	1.3.2	25	Table 3, Should be Table 12. However, there are problems of unlabeled tables in this report as well. Please renumber all Tables and Figures throughout the report.
43	Bess	1.3.2	25	Table 3, The mass density of the steel shell is definitely wrong. SS304 cannot have a density of 8.9, which can be obtained with a special tungsten steel or is the density of hastelloys, nickel, and copper/bronze alloys. In the previous iterations of this benchmark, the SS304 density was reported as 7.74262 g/cc. MIX-MET-FAST-013, which should be addressed here as well, reports a density of 7.848 g/cc, and was assumed incorrect in the previous iteration. Calculation of the density using the current (rounded) dimensions, I get a density of 7.596 g/cc. If I use dimensions from a previous report I get 7.7035 g/cc. Apparently calculation of this value needs discussed in more detail and a larger uncertainty in this density may need to be applied. What do volume calculations in MCNP provide compared to what can be calculated by hand?
44	Bess	1.3.2	25	The unknown Pu mass component of 0.35 wt.% is large and needs addressed in the uncertainty analysis later.
45	Bess	1.3.4	28	Is the type of aluminum or cadmium metals in the NPOD known. Are the impurities known for the detector gas or polyethylene?
46	Bess	1.3.5	28	Is there a strong reason to believe that the aluminum support structure is Al6061? If not, then any assumptions (and the composition table) should be moved to Section 2.
47	Bess	1.3.6	28	The cart coating is a plastic hybrid powder coating
48	Bess	1.3.6	28	The wheels of the cart are polyurethane.
49	Mennerdahl	1.3.7 1.4	28-29	Editorial: The Temperature subsection has recently become subsection 1.4 while Supplemental Experimental Measurements become Section 1.5.
50	Bess	1.3.7	28	Please explain in more detail the information provided in this section. Was the Pu sphere temperature measured? Measured information should still be provided. There were temperature variations measured in the earlier experiment set. Neglect of the temperature effects should still be evaluated computationally (uncertainty + bias) to validate your reasoning.
51	Bess	1.3	29	What is the Nashua tape composition? What are compositions of the other detectors?
52	Bess	1.4	29	Section 1.4 is now the Temperature section.
53	Bess	1.4	29	Are the detectors all maintained at room temperature? NPOD, SNAP, HPGe?
54	Bess	1.5	29	Supplemental measurements are now reported under Section 1.5.
55	Bess	1.5.1	29	SNAP measurements are not provided in Appendix B. Please also provide a discussion in Section 1 as to why SNAP measurements were performed even though they are not used in this analysis. In Appendix B, please provide a brief explanation with more details of how to use the SNAP data. These measurements could be later evaluated in the IRPhEP Handbook.
56	Bess	1.5.2	29	Please provide HPGe measurements in an Appendix with an explanation in

				Section 1 of why these measurements were performed. Then in the Appendix also explain with more details how to use these data. These measurements could be later evaluated in the IRPhEP Handbook. Also, it will be easier to include these data now then try to track them down years from now.
57	Percher	1.3.7	28	Expand temperature discussion.
58	Snoj			Move Tables 6 and 10 to §2.0
59	Snoj	1.4.1	29	Provide Appendix B as noted within the text.
60	Snoj	1.4.2	29	Remove 2nd sentence.
61	Bess	2.0	30	There are a lot of uncertainty sources not addressed. Uncertainties that might not impact the multiplication factor may impact measurement detection. The authors noted that these measurements are sensitive to the detector system; already that raises a flag that a more thorough analysis is needed. Uncertainties are evaluated via calculation and/or justification. Even if an uncertainty is deemed to not have an effect, it still needs addressed in Section 2. Then readers know whether the authors have done a thorough job in the analysis and reviewers have points of discussion regarding the comprehensive nature and results from the uncertainty analyses.
62	Bess	2.0	30	The references in the footnotes are incomplete. They need publication years and the quotation marks are not consistent.
63	Bess	2.1.1	31	The calibration certificates are not discussed in Section 1. Any and all calibration data should be either provided in Section 1 or discussed in a little more detail in Section 2 as additional information.
64	Bess	2.1.1	31	More recent measurements of the total BERP ball mass were performed? Were these not used to address uncertainties in the mass?
65	Bess	2.1.2	31	Why is the systematic uncertainty in the mass of the nickel shells zero? There would have been a calibration limit for their measurement as well.
66	Bess	2.1.2	32	Table 13 has commas instead of periods.
67	Bess	2.2	32	SS-304 cladding, not classing.
68	Bess	2.2	33	Table 14, The uncertainty in the nickel and SS-304 cladding should probably be treated as bounding instead of one-sided bounding. Even though they are modeled as touching, there would still could be either both small or both large. The current assessment of their uncertainties doesn't account for this.
69	Bess	2.3	33	The SNAP and HPGe are not included in the uncertainty analysis because of distance. Was this verified with calculations or experimentaion that their removal would not produce a bias with bias uncertainty? If the bias was large, then experimental uncertainties would be expected as well.
70	Bess	2.3	33	I thought the SNAP and HPGe were on carts and not tables?
71	Bess	2.1.1	31	Explain why masses are different and if this impacts the uncertainties in mass.
72	Keefer	2.1.1	31	Table 12, explain how SS cladding mass was obtained.
73	Percher	2.3.1	34	Explain how the uncertainty in the unscrewed length of the stand was measured.
74	Percher	2.3.2	34	Address the uncertainty due to the NPOD.
75	Percher	2.3.2	34	Address the uncertainty in the density of the gas.
76	Keefer	2.1.2	32	Table 13, use decimals instead of commas.
77	Keefer	2.2	32	Expand discussion on the gap between shells, where applicable.
77	Marshall	1.2.3	18	Address the reduction in density and quantify.
78	Snoj	2.3.1	34	Last ¶, note by how much the other cases were overestimated.
79	Keefer	2.4.2	36	Last sentence, clarify that the estimations were performed for all shells.
80	Zerkle	2.2	33	Table 14, verify all uncertainties and how they were derived. Also verify that equations are typed correctly.
81	Snoj	2.4.1	35	1st ¶, revise for clarity.
82	Snoj	1.3.3	28	Table 8, use 1 composition for each element.
83	Bess	2.4.1	35	Was the evaluation of the plutonium composition performed with or without accounting for depletion corrections? This should be clarified.
84	Bess	2.4.2	35	In the Nickel shells, not all impurities have a "detection threshold". How were these uncertainties treated? Also, what about the quantified impurities in the Pu? What about the ranges for SS304 and Al6061?
85	Bess	2.4.2	35-36	If the uncertainty in perturbing the composition of a material is significant, then the individual impurities should be perturbed individually and their individual uncertainties combined (square root of the sum of the squares) to obtain the total impurity uncertainty. I would expect Mn to dominate SS304

86	Bess	2.4.2	35-36	How is the unknown impurity content in the Pu treated? This could be a significant uncertainty depending on the material.
87	Bess	2.4.2	35-36	The impurity uncertainty in Nickel would be a function of shell thickness. This should be broken down for the different experiments.
88	Bess	2.5	37	Does removal of the concrete from the benchmark have an impact on the detectors or multiplication? If it is significant, then an uncertainty will need to be addressed. Otherwise an explanation as to why it doesn't matter should be provided.
89	Bess	2.5	37	How is the NPOD detection efficiency impacted by the impurities/composition of the NPOD itself? If moving them makes such a huge uncertainty, then I would be concerned other uncertainties would as well: Poly impurity He impurity Detector pressure Detector temperature Dimensions Cd thickness Other components?
90	Bess	2.5	37	As in the above comment, I wonder if other components of the experiment, while not impacting multiplication, might have a significant impact on the detector measurements. This would then impact your measurement results and your derivation of k_sub. There are biases and uncertainties not being properly addressed in this case.
91	Bess	2.5	38	Still a question of whether the measurement uncertainty is statistical only or actually includes a method uncertainty. It seems way too small.
92	Bess	2.5	38	Measurement method uncertainty needs discussed in more detail somewhere in Section 1 or Section 2.
93	Bess	2.5	38	While the cart coating is proprietary, an assessment could be made regarding its composition/density/thickness to demonstrate that additional biases and uncertainties have been assessed. Plastic hybrid powder coat is a polyester-epoxy. Material properties and thickness could be derived from typical coating information on the internet from other sources. While you may not include it in your models, at least you can show that it doesn't matter or provide an uncertainty accounting for it.
94	Lell	2.5	37	Table 17, expand discussion of what is included in the table and what is not and why certain data were left out.
95	Snoj	3.1.1	36	2nd ¶, include mentioned document in an appendix.
96	Snoj	3.0		Remove all MCNP terminology.
97	Snoj	3.1.1	39	Include description of detector.
98	Murphy	3.1.2	39	2nd ¶, first sentence: "Tables" are mentioned whereas everywhere else they are called "carts".
99	Murphy	3.1.2	39	2nd ¶, last sentence: "It has also concerns five nickel layers, in contact to the inward previous layer in the detailed description.", might be better as, "It also concerns the five nickel layers, each in contact with the previous inner layer in the detailed
100	Bess	3.1	39	There are some biases that should be discussed (and others I may have missed): Discussion of the cut in the inner Ni shell should be addressed. Even though the bias/uncertainty is probably negligible, there should be a discussion regarding this. Room return effects? Removal of cart wheels, other detectors, etc. Cart simplification (what about the powder coating?) Removal of impurities Tape
101	Bess	3.1	39	Description of the SNAP and HPGe detectors are not provided anywhere in this report. They are in the detailed input deck. There should be more information in Section 1 and Section 3. Biases and uncertainties need addressed or their negligibility proven and addressed.
102	Bess	3.1	39	Bias information should be provided in Section 3.1. Biases should be addressed individually and overall to demonstrate which simplifications are negligible and which are significant.

103	Bess	3.1	39	The reference provided for the NPOD and SNAP detectors is incomplete. This information should be provided in the benchmark report.
104	Bess	3.1.2	39	It is not clear what is meant by the phrase "optionally with geometrical simplifications".
105	Bess	3.2	40	An overview figure with distances, dimensions, and labels needs provided in Section 3 for both Simple and Detailed models.
106	Bess	3.2.2	41-46	Please provide higher quality figures for Figure 26-30. Their detail is insufficient for clear depiction of the benchmark model. Typically figures taken from MCNP are not of sufficient resolution for benchmark model descriptions.
107	Bess	3.2.2	46	Renumber section numbering. Check throughout report.
108	Bess	3.2.2	47	Is the detail shown in Figures 31 and 32 implemented in both benchmark models?
109	Bess	3.2.4	49	Figure 34, Same comment as before regarding actual dimension of cart wheels. Also, the thickness of the wheels isn't mentioned anywhere in the report. Based on the drawings, they could be rollers, not wheels.
110	Bess	3.3	50	A lot of the discussion provided in Section 3.3 for calculating material densities should have been provided in Section 2 instead. Section 3.3 should just provide the material and atom densities for the components.
111	Bess	3.3	51	Not clear what is meant by the statement "…impurities have a greater relative importance, and their removal is balanced uniformly by the other components."
112	Bess	3.3	51	Table 22, The mass density of the steel is incorrect.
113	Bess	3.3	51	Table 2.2, The nickel sleeve is missing.
114	Bess	3.3	51	The atom density tables should be reported by element except for actinides and strong absorbers. All atom densities should be reported in scientific notation with 4 significant figures after the decimal point.
115	Bess	3.3.1.1	54	When the earlier experiments were evaluated there was a concern that the Np-237 content was too high because a branching factor in the decay of Pu-241 was probably missed. An uncertainty analysis was not performed to address the decay of the Pu sphere. Also, current atom densities do not match very well with earlier compositions for the Pu sphere. Decay would be different but non-decaying isotopes should not have changed significantly. Please verify calculations of the atom densities.
116	Bess	3.3.1.5	58	Official handbook data would be more appropriate than the MCNP primer for calculations of material compositions.
117	Bess	3.3.1.5	58	The wheels were polyurethane, not silicon rubber.
118	Bess	3.3.1.6	59	More details regarding the specific reference and type of concrete assumed should be provided (when this assessment of concrete assumptions is moved to Section 2).
119	Bess	3.3	61	Missing Compositions: Air NPODs Other Detectors Al, He, Cd, steel, silicium, lexan, poly, Teflon…
120	Mennerdahl	3.3.1	51-59	The detailed model contains material discussions that appear more representative for the experiment itself and thus belong in Section 2.
121	Zerkle			Move bias information in §3.5 to §3.1.2.
122	Percher	3.2.2.1	45	Figure 29, address the seams being lined up vs. not being lined up.
123	Percher			Discuss where the gaps may be thicker.
124	Briggs	3.0		INL will redraw figures as appropriate.
125	Lell	3.3	31	Table 22, also provide atom densities for each isotope.
126	Zerkle	3.3	52 59	Tables 23 and 30, clarify how hafnium was treated between the two tables. Verify if all hafnium isotopes are included in the tables.
127	Snoj	3.0		Discussion on materials should be moved or repeated in §2.0
128	Snoj	3.3.1.1	51	Reference 'MISC module'.
129	Snoj	3.3.1.5	58	Table 27, mention the company name and that the data can not be shared by them.
130	Zerkle	3.3		Verify and address decay effects.
131	Bess	3.4	61	Temperature is not at room temperature for experiment. If assumed room

				temperature for the benchmark, then bias and uncertainty estimates need to be provided.
132	Bess	3.5	62	While R1, R2, and ML can be benchmark experiment data, a derived benchmark experiment measurement of k_sub needs provided as well.
133	Bess	3.5	62	Bias calculations need moved to Section 3.1 and a breakdown of individual biases provided (not just the overall calculated bias). Also, both detailed and simple models will have biases, not just the bias going from the detailed model to the simple model.
134	Bess	3.5	63	It is not clear how I would obtain R1, R2, and ML using the benchmark model.
135	Bess	3.5	63	"Relative uncertainties for M1 are included in a range defined between 2% and 4%. Therefore, all configurations are considered as acceptable for a benchmark." It is not clear why these sentences are meaningful and how the conclusion can therefore be applied.
136	Bess	4.0	64	What are "punctual" cross section libraries?
137	Bess	4.0	64	Calculation of R1, R2, and ML are code dependent. It isn't clear how one would obtain them without using the special MCNP Patch. Additional information regarding the patch and how to use it should be summarized here in Section 4. Then a more detailed explanation should be provided in an Appendix.
138	Bess	4.0	64	Because the "bottom line" should be k_eff/k_sub values that are code/method independent, two sets of k_calcs should be provided. The calculated R1, R2, and ML values using your MCNP Patch along with the derived k_sub values. Basic MCNP/KENO/whatever kcode calculations of k_sub This would provide a comparison of eigenvalue calculations using the two codes and provide sample calculations using codes that most users would also use. Therefore biases in methods could be seen and addressed by the users.
139	Mennerdahl	4.0	64	Some note about the results? Are they good?
140	Briggs	4.0	64	Provide C/E values.
141	Zerkle			Correct simplified model. Replace impurities with void, rather than normalizing.
142	Marshall	4.0	64	Expand discussion of the results also in terms of the calculated bias and other relevant information.
143	Bess	5.0	64	Reference section should exist. References supporting this experiment should be provided. Some of the footnotes to LANL reports regarding the detection systems and evaluation of measurements might be more appropriately considered as references.
144	Bess	App. A	65	The detailed model input has a lot more detail than what is provided in Section 3. A user should be able to independently model the benchmark models (Simple and Detailed) purely using Section 3 without referring to Sections 1, 2, or 4, the Appendices, or any external documentation.
145	Bess	App. A	65	The input deck for the Simple model is missing.
146	Bess	App	65	Other appendices in the original report are missing: BERP ball report, Ni measurement reports, carbon steel cart specs.
147	Bess	App. A	66	Mass densities and mass fractions are not used in input decks. The input decks should use the atom densities specified in Section 3.3.
148	Bess	App. A	66	Mass density for SS304 shell is incorrect.
149				STATUS: Evaluation approved if all actions are resolved and approved in time for publication. Resolve and complete ALL reviewer comments. Resolution will be verified by internal and independent reviewer(s) and subgroup (Bess, Garcia, Heinrichs, IRSN, Keffer, Marshall, Percher, Rozhikhin, Snoj, Zerkle). EVALUATION DUE DATE: DUE TO SUBGROUP: JULY 18, 2014. ACTIONS RESOLVED, EVALUATION APPROVED BY REVIEWER(S) AND SUBGROUP (if applicable) AND FINAL VERSION SUBMITTED BY AUGUST 8, 2014.

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INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT TECHNICAL REVIEW GROUP MEETING

FINAL AGENDA
15 – 16 MAY 2014

Le Seine Saint Germain, 12, bd des Iles, 92130 Issy-les-Moulineaux, Paris France
Ground Floor, Room D

Upon arrival Please report to the Reception Desk on the ground floor with a photo ID. A badge will be issued that will allow you to enter the premises at all times during the meeting.

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http://www.oecd-nea.org/general/practical/

Thursday, 15 May 2014

09:30 - 10:00	**SESSION 1:**	**WELCOME AND INTRODUCTION**	
		Welcome and Introduction	Jim Gulliford Blair Briggs
		Administrative Items: Sign-In, Future Evaluation, Format Issues	Lori Scott
10:00 - 10:30	**SESSION 2:**	**DISCUSSION OF MINOR REVISIONS, STATUS OF UNPUBLISHED EVALUATIONS, AND APPROVED IRPhEP EVALUATIONS**	
	HEU-MET-FAST-100	ORSphere: Critical, Bare, HEU(93.2)-Metal Sphere (Increased Uncertainty of β_{eff})	Margaret Marshall
	HEU-COMP-FAST-001 IRPhEP ID: (SCCA-SPACE-EXP-001) HEU-COMP-FAST-002 IRPhEP ID: (SCCA-SPACE-EXP-002) HEU-COMP-FAST-004 IRPhEP ID: (SCCA-SPACE-EXP-003)	Critical Configuration and Physics Measurements for Graphite or Beryllium Reflected Assemblies of U(93.15)O2 Fuel Rods (Revision to Fuel Rod End Caps and the Addition of Reactor Physics Measurements)	Margaret Marshall
	HEU-MET-FAST-051 HEU-MET-FAST-071	Unreflected Uranium (93.2) Metal Cylinders, Interacting Uranium (93.2) Metal Cylinders, and Graphite Reflected Uranium Metal Annuli (Revised Room Return Correction)	John Bess
	HEU-MET-THERM-033	2 X 2 Polyethylene Reflected and Moderated Highly Enriched Uranium System with Rhenium (Small Correction to Rhenium Atomic Densities and Minor Editorial Corrections)	John Bess For Nichole Ellis
	MIX-MISC-THERM-006	Arrays of UO_2-PuO_2 PHENIX Pins Containing 26% of Plutonium ($^{240}Pu/Pu_t$=16%) in a Mixed Uranium-Plutonium ($Pu/(U+Pu_t)$ =29.6%, $^{240}Pu/Pu_t$=19%) Nitrate Solution (Revised Treatment of Uncertainty in Plutonium Isotopic Data and Temperature)	Nicolas Leclaire For Gilles Poullot

INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT TECHNICAL REVIEW GROUP MEETING

Thursday, 15 May 2014 (Continued)

10:00 - 10:30	**SESSION 2 (Continued):**	**DISCUSSION OF MINOR REVISIONS, STATUS OF UNPUBLISHED EVALUATIONS, AND APPROVED IRPhEP EVALUATIONS (Continued)**	
	MIX-COMP-FAST-001	ZPR-6 ASSEMBLY 7: A Cylindrical Assembly with Mixed (PU,U)-Oxide Fuel and Sodium with A Thick Depleted-Uranium Reflector (Typing Error to Figure of Model)	Rich Lell
	IEU-COMP-INTER-003	Unreflected UF_4-CF_2 Blocks with 37.5% ^{235}U (Minor Editorial Corrections)	Evgeni Rozhikhin
	IEU-COMP-INTER-004	Unreflected UF_4-CF_2 Blocks with Uranium of 30, 25, 18.8, and 12.5% ^{235}U (Propagate Previous Revisions to ICT-002, where appropriate)	Evgeni Rozhikhin
	U233-COMP-THERM-004	D_2O Moderated Lattice of $^{233}UO_2$-$^{232}ThO_2$ (Revision To Uncertainty Analysis to Correct Error in Driver Fuel Rod Pitch Uncertainty Component.)	Michael Zerkle For Emily Flora
	PU-COMP-FAST-004	PURNIMA-I: A Plutonium Oxide Fast Reactor with Axial Molybdenum and Radial Copper and Mild Steel Reflectors (Add Plutonium Isotopic Data for the Pu-Be Source)	Blair Briggs For The Authors
	HEU-MET-FAST-086	GODIVA-IV Delayed-Critical and Static Prompt Supercritical Experiments (Possible Error – Update Status)	Dave Heinrichs
	HEU-MET-THERM-035 HEU-MET-FAST-077	Highly Enriched Uranium Metal Foils Moderated By Graphite: 'SNOOPY 134' and Unmoderated Spherical Shells of Highly Enriched Uranium Metal Reflected by Beryllium (Update Status)	Dave Heinrichs
10:30 - 10:45	**BREAK**		
10:45 - 12:30	**SESSION 3:**	**APPROVAL OF EVALUATIONS**	
	MIX-MISC-THERM-007	Arrays of UO_2-PuO_2 PHENIX Pins Containing 26 wt% of Plutonium ($^{240}Pu/Pu$=16 wt%) in a Plutonium ($^{240}Pu/Pu$=19 wt%) Nitrate Solution	Nicolas Leclaire Gilles Poullot
12:30 - 13:45	**LUNCH**		
13:45 - 15:30	**SESSION 4:**	**APPROVAL OF EVALUATIONS (Continued)**	
	PU-MET-FAST-046	ZPR-3 Assembly 58: A Cylindrical Assembly of Plutonium Metal and Graphite with a Thick Depleted Uranium Reflector	Rich Lell
15:30 - 15:45	**BREAK**		
15:45 - 17:45	**SESSION 5:**	**APPROVAL OF EVALUATIONS (Continued)**	
	PU-MET-INTER-003	ZPR-3 Assembly 59: A Cylindrical Assembly of Plutonium Metal and Graphite with a Thick Lead Reflector	Rich Lell

INTERNATIONAL CRITICALITY SAFETY BENCHMARK EVALUATION PROJECT TECHNICAL REVIEW GROUP MEETING

Friday, 16 May 2013			
09:30 - 11:00	**SESSION 6:**	**APPROVAL OF EVALUATIONS**	
	SUB-LEU-COMP-THERM-002	Subcritical configurations of the IPEN/MB-01 Reactor	Adimir dos Santos
11:00 - 11:15	**BREAK**		
11:15 - 12:30	**SESSION 7:**	**APPROVAL OF EVALUATIONS**	
	SUB-PU-MET-FAST-003	Nickel-Reflected Plutonium Metal Sphere Subcritical Noise Measurements	Jesson Hutchinson
12:30 - 13:45	**LUNCH**		
13:45 - 15:30	**SESSION 8:**	**DISCUSSION**	
		Future Benchmarks	All
		ICSBEP Database (DICE)	Ian Hill Manuel Bossant Nicolas Soppera
		Comparing DICE SDF Sensitivity Data to Section 2 Data, for Older ICSBEP Evaluations	Ian Hill
		Next ICSBEP Meeting (13– 15 May 2015)	All
		Chairman of the ICSBEP	Jim Gulliford
		Adjourn	