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22 July 2022

**NUCLEAR ENERGY AGENCY
MANAGEMENT BOARD FOR THE DEVELOPMENT, APPLICATION AND VALIDATION OF
NUCLEAR DATA AND CODES**

Joint Evaluation Fission and Fusion (JEFF) Co-ordination Group Meeting

Summary Record

29 April 2022
Hybrid Meeting
Chateau de La Muette, Paris / Zoom Videoconference

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Opening and introduction of participants

1. The Chair of the Co-ordination Group (CG), **Mr Arjan PLOMPEN**, opened the meeting and invited participants to introduce themselves. The list of participants is provided in **Appendix 1**.

Adoption of the agenda

2. The proposed agenda [[NEA/DB/DOC\(2022\)2](#)] was approved with one modification. As the outcome and recommendations from the JEFF dedicated sessions on Activation, Random Files and Big 3 were largely discussed on the previous Thursday, it seemed appropriate to remove them from the agenda (see **Appendix 2**). **Mr Arjan PLOMPEN** asked the participants to respect the time allocated in the agenda.

Approval of the summary record from the CG November 2021 meeting

3. The summary records from the November 2021 sessions [[NEA/MBDAV/DOC\(2021\)16](#)] were approved without comments from the CG members.
4. **Mr Arjan PLOMPEN** reviewed and announced the status of the actions listed in the summary record of the November 2021 CG meeting. He invited **Ms Daniela FOLIGNO**, Junior Scientist at the NEA Data Bank, to extract an action list from the summary, and provide it as an annex to this document. The annex should include the new actions defined during the April 2022 CG meeting.

Action (NEA): Extract an action list from the summary record of the November 2021 CG meeting, and provide it as annex to this document.

Feedback from NEA Steering Committee and ND2025 process outcome

5. **Mr Michael FLEMING**, Acting Head of the Data Bank, announced some changes at the NEA due to the invasion of Ukraine by the Russian Federation. The NEA Director General announced that the Russian Federation will be suspended from 11 May 2022. The decision was taken by the OECD Council on 11 April 2022 by consensus. The suspended member could be reintroduced in the future by a consensus decision of the Council. The Council decided on 25 February to formally terminate the Russian Federation accession process, which has been postponed since 2014 following the annexation of Crimea. At the same time, it decided to suspend Russian and Belorussian participation in all OECD bodies. The consequences for all NEA activities are being evaluated, including those that are subject to additional treaties or other agreements raised as part of the NEA's ability to create joint undertakings. Those will be evaluated on a case-by-case basis.
6. **Mr Michael FLEMING** reported that the Steering Committee, NEA's highest-level decision-making body, met the week before the JEFF Nuclear Data Week. During this meeting, held in person at the OECD Conference Centre on 21-22 April 2022, a proposal was made by the Polish delegation. The Steering Committee decided by consensus to issue a statement on the safety and security of operation of Ukraine's nuclear installations. The statement is public on the OECD NEA website. He invited the CG members to review it.
7. **Mr Michael FLEMING** mentioned that the legal aspects of these changes will be reviewed and should be available by 11 May 2022, when the suspension takes effect. They should include a concrete guidance on the Russian participation to Data Bank activities (such as JEFF), access to Data Bank services, and the consequences on any data stored at the agency having Russian origins. For questions and issues, please contact **Mr Michael FLEMING**.

8. **Mr Arjan PLOMPEN** invited the CG members to contact their MBDAV representative to support the Data Bank finances to face the increased pressure due to the Russian situation.
9. **Mr Michael FLEMING** expressed his delight in seeing the renewed energy in the JEFF meetings since hybrid meetings became possible. He apologised for not being there in person. The development with the technical sessions has been positive. He highlighted the productive and focused nature of the discussions that help the CG to make strategic decisions.
10. **Mr Michael FLEMING** announced that NEA launched a new GitLab in March 2022, which will allow more engagement with external participants. He expressed his eagerness to receive by the community the definition of more sophisticated pipelines. He also highlighted the importance of the prioritisation of technical sessions for the rest of the year, expected as output of this meeting.
11. **Mr Michael FLEMING** stressed that the engagement with the stakeholders is a major theme at the NEA. He mentioned that conversations between the Nuclear Science Committee (NSC) and the Data Bank have started for having a new stakeholder engagement meeting on JEFF nuclear data and its impact on a variety of systems. The input from CG members on the organisation of this meeting is welcome.
12. **Mr Michael FLEMING** announced that **Mr Andrew HOLCOMB** from Oak Ridge National Laboratory (ORNL) will join the NEA at the beginning of June. He is one of the main developers of the SCALE system and will complement the team with his competences in processing, verification, validation, and sensitivity analysis.

Presentation of the Spanish ND2025 proposal

13. **Mr Michael FLEMING** announced that, following the call for proposals to host the ND2025 conference, four excellent countries volunteered. Their proposals were reviewed using the criteria agreed at the last JEFF CG meeting and endorsed by the non-JEFF countries within WPEC.
14. **Mr Michael FLEMING** explained that the vote for the host of ND2025 included 12 participants. All 12 reviewers that represent member countries not making a bid responded within the time provided and their reviews are summarised in **Appendix 3** for transparency. In all three reviewed categories the second bid (Spain) scored on average highest, except on category 1, where one other proposal scored slightly higher.
15. **Mr Arjan PLOMPEN** explained that the opinion of the JEFF group will be delivered to the WPEC, which, in turn, will provide recommendations to the NEA on the next ND2025 Conference organiser.
16. **Mr Enrique Miguel GONZALES ROMERO** as lead proposer of the Spanish bid was invited to present the bid to the meeting by **Mr Arjan PLOMPEN**. **Mr Enrique Miguel GONZALES ROMERO** thanked the CG for the confidence. He explained that the proposal intended ND2025 to be held in Madrid. The conference would be organised by all Spanish institutions and organisations involved in nuclear data, EURATOM projects, and the n_TOF project. A large spectrum of topics was selected, from the most traditional to the ones arising from nuclear data needs (SMRs, new fuels). He stressed that the organising committee will do its best to optimise the schedule.

JEFF meeting structure and planning of dedicated sessions

17. **Ms Daniela FOLIGNO** suggested to start the planning of the dedicated sessions for the rest of the year. She listed the topics of interest and invited the CG members to propose, for each session, a

date, a Chair, and potential participants. The results of the discussion are summarised in the following table:

Topic	Chair, other participants	Date
Fission Yields: focus on Nd148 and Cs137	O. Serot	mid-June
REFIT-SAMMY-CONRAD comparison on the extraction of resonance parameters	L. Leal, S. Kopecky, T. Ware, H. Leeb	TBD
Validation	N. Leclaire	May-June
Covariances	C. De Saint Jean	September
Fe: inventory of available data and benchmarks	I. Kodeli	TBD, a series of meetings
Activation library: agreement on the list of benchmarks to validate the activation library	M. Gilbert	TBD
Processing pipeline for transport and activation libraries (codes, formats, parameters, input files)	M. Gilbert, O. Cabellos, D. Leichte, J-C. Sublet	First one before summer and second one in September

18. **Ms Daniela FOLIGNO** raised the need of having a discussion on how to use the JEFF-Lab consistently. The members of the group should agree on the content of the repository and its format (entire file, single section, reports, documentation). The CG members agreed that there is no need for a dedicated session on the topic. Instead, **Ms. Daniela FOLIGNO** will prepare, together with **Mr Gilles NOGUERE**, a proposal on the use of the JEFF-Lab. In this framework, a proposal on how to track the changes in the different versions of the library will be made.
19. Concerning the JEFF meeting structure, **Mr Arjan PLOMPEN** explained that the hybrid mode accommodates people who have limited travel capabilities. He pointed out that this mode might prevent people from being onsite for all their sessions of interest if these are not in a sequence. He asked the CG members if they have suggestions on how to minimize this inconvenience. **Mr Mark GILBERT** suggested to circulate a survey on participant's preferences well before the JEFF Nuclear Data Week. Statistics from the survey could help with the optimisation of the schedule.
20. **Mr Robert JACQMIN** greeted the organisation of dedicated sessions outside the regular JEFF meetings, as they provide more flexibility and more time for in-depth discussion with appropriate experts. He pointed out that, as a counterpart, the schedule of the JEFF Nuclear Data Week could be more compact. **Mr. Arjan PLOMPEN** agreed on the fact that dedicated sessions help the progression of the work on specific topic. At the same time, he stressed the importance of sharing the information with the community.

Rules about speakers from non-member countries

21. **Mr Arjan PLOMPEN** explained that rules about speakers from non-member countries have become more stringent. Until now, non-member speakers who received an invitation were allowed to attend the full meeting. He asked the NEA if this practice will continue to be possible towards Russian scientists. **Mr Michael FLEMING** commented that more guidance will be provided after 11 May 2022.

JEFF nuclear data needs for fission and fusion applications

22. **Mr Oscar CABELLOS** explained that communication between the fission and fusion communities is sometimes lacking. He suggested every new evaluation to be reviewed by both communities as soon as possible. He made the example of copper in JEFF-3.3. The issue was solved thanks to the collaboration of those parties. **Mr Arjan PLOMPEN** agreed on that, and suggested to tackle this problem in the “Discussion and progress on JEFF-4” part.
23. **Mr Dieter LEICHTLE** stressed that benchmarking should be comprehensive of fission and fusion applications, as the library’s performance is application-dependent. **Mr Alexey STANKOVSKIY** suggested to have a third party merging together both evaluations and performing benchmarking. **Mr Arjan PLOMPEN** concluded that it is in the interest of creating a general-purpose library that both parts are tested properly. He suggested that sensitivities – which are very different – could help identifying what aspects of the files need to be addressed. This point emphasises the need for a comprehensive set of benchmarks covering both applications against which JEFF-4 test versions and the final version are validated.

JEFF-SANDA collaboration and other EU projects

24. **Mr Arjan PLOMPEN** explained that in the current SANDA proposal there has been considerable emphasis on delivering for JEFF. He stressed that it is positive for the advancement of JEFF to have funded projects like SANDA, with a comprehensive set of activities on nuclear data, as JEFF is by tradition an unfunded project. **Mr Arjan PLOMPEN** proposed to invite SANDA participants to come to the JEFF meetings and deliver the main outcomes of their projects. Alternatively, he proposed to organise another joint JEFF-SANDA meeting in 2023.

JEFF education and training

25. **Mr Arjan PLOMPEN** mentioned that **Mr Oscar CABELLOS** is organising a course on nuclear data in Madrid in the fall with 20 students.
26. He also mentioned the NuDataPath web site, the “first international online school on nuclear data: the path from the detector to the reactor calculation”. The school was organised by CIEMAT in the framework of the H2020 ARIEL project. Finally, he concluded saying that there will be other events/schools organised by SANDA and ARIEL.
27. **Mr Oscar CABELLOS** stressed the importance of the NEA NEST project and asked to include nuclear data related activities into this framework. **Ms Daniela FOLIGNO** accepted to explore the possibilities by getting in contact with the NEA Nuclear Science and Education team. **Mr Michael FLEMING** explained that NEST is a joint undertaking, a framework with a management board that reviews proposals for the creation of the NEST fellowships. They have specific range of projects agreed. He mentioned that **Mr Andreas PAUTZ** (PSI) is the chair of this activity and that a

conversation with him could be arranged to explain the nature of NEST and provide more context. **Mr Arjan PLOMPEN** agreed in order to establish if there is sufficient interest for the CG to propose the inclusion of a nuclear data component in NEST.

Outcome and recommendations from the JEFF dedicated session

28. **Dedicated session on random files for uncertainties (8 March 2022, chaired by D. Rochman).** **Mr. Arjan PLOMPEN** proposed to formally adopt the recommendations as working principles for the JEFF-4 release. **Mr. D. Rochman** will continue to coordinate this activity for which the following actions were adopted:

- The random files will be delivered at each test release of JEFF, together with covariances. The following quantities will be considered: cross sections, nu-bar, PFNS, fission yields, TSL, decay data.
- G. Noguère (CEA), J. I. Marquez-Damian (ESS), D. Rochman (PSI), R. Ichou and J. Vaibhav (IRSN) will generate random files for TSL.
- L. Fiorito (SCK) will generate random files for cross sections using covariance-based sampling while D. Rochman (PSI) will use TMC.
- SCK can generate random decay data without taking into account any constraint.
- JEFF will provide: covariance matrices, a few hundred random files in ENDF format, and instructions to use SANDY on GitHub.
- Test cases must include verification of integral nuclear data quantities and real benchmarks to verify the integrity of the data.
- NEA should ensure that random files can be stored and made accessible. D. Foligno will discuss with D. Rochman (PSI) and A. Stankovskiy (SCK) to define what NEA should do to follow up on this activity (storage capabilities at NEA, second dedicated meeting).

The recommendations from the dedicated session on random files can be found in [NEA/MBDAV/DOC\(2022\)12](#)

29. **Dedicated session on special purpose libraries: activation (23 February 2022, chaired by M. Gilbert).** **Mr. Arjan PLOMPEN** proposed to formally adopt the recommendations as working principles for the JEFF-4 evaluation. **Mr. Mark Gilbert** will continue to lead the coordination of this activity for which the following actions were adopted:

- D. Foligno (NEA), J-C. Sublet (IAEA), M. Gilbert (UKAEA), O. Cabellos (UPM), D. Leichtle (KIT) must ensure the installation of the pipeline for producing the activation file at the NEA.
- As soon as the pipeline is ready, for every test library there should be an activation file (g-, n-, p-, d-, t-, h-, a- files). This must be a running action.
- For charged particles cross section libraries the evaluations will mostly come from TENDL. A. Konobeev (KIT) and A. Stankovskiy (SCK) will prepare a list of isotopes (targets) where other libraries have better versions than TENDL.
- A. Konobeev (KIT) and A. Stankovskiy (SCK) will prepare the list of benchmarks needed to validate the activation library.
- Another dedicated session on the validation of the activation library should be organised.

The recommendations from the dedicated session on activation can be found in

[\[NEA/MBDAV/DOC\(2022\)4\]](#).

30. **Dedicated session on the “Big 3” and JEFF-4 road-mapping (22 March 2022, chaired by G. Noguère). Mr. Arjan PLOMPEN** proposed to formally adopt the recommendations as working principles for the JEFF-4 evaluation. **Mr. G. Noguère** will continue to lead this activity for which the following actions were adopted:

- The Pu-239 file will be released in June 2022.
- U-235 and U-238 require more work and could be ready in September 2022.
- If possible, the RRR of U-235 and U-238, and the thermal part of U-238 will also be delivered in June 2022. In that case, a JEFF-4T2 version will be released for depletion testing.
- NEA will discuss with G. Noguère (CEA) the possibility to build a pipeline to merge the recommended part of each ENDF file to produce a final ENDF file. The procedure could be tested on the Pu-239 evaluation.
- NEA will investigate the possibility of using Overleaf to write the official JEFF-4 document in a collaborative way.

The recommendations from the dedicated session on the Big 3 can be found in [\[NEA/MBDAV/DOC\(2022\)5\]](#).

Discussion and progress on JEFF-4

31. **Fission Yields:** A dedicated session on fission yields will be organised and will be chaired by O. Serot (CEA). The thermal neutron-induced fission yields for U-235 will be delivered by the end of May 2022, while the thermal neutron-induced fission yields for Pu-239 should be ready by April 2023. The concerns for Nd-148 and Cs-137 should be the focus of this dedicated session. Covariances are already available but some work is still needed. **Mr Olivier SEROT** explained that CEA would like to test the impact of branching ratios uncertainties on the Q-matrix, which is used to derive the correlation matrix of fission yields.

32. **Structural Materials:** The following benchmarking issues have been identified:

- Fast benchmarks having Al, Ti, Ni, Mo as reflector. **Mr Dimitri ROCHMAN** proposed to check Al, Ti, Mo in T6. **Mr Gilles NOGUERE** commented on Al that T6 does not take into account experimentally-measured fluctuations stored in MF3 because it only reconstructs a flat cross section. If the problem persists after the inclusion of fluctuations, angular distributions should be investigated.
- Critical benchmarks with Pb do not compare well with the experiments. This problem already existed in JEFF-3.3. It is probably due to scattering, as Pb was used as reflector in those experiments. Nobody is currently working on this topic.
- A specific energy bin of Fe-56 (300 eV) underwent an important change, which now causes -2200 pcm in the hmi1-1 benchmark. This issue could be further investigated by the dedicated session on Fe which will be organized in the future and chaired by Mr. I. Kodeli (UKAEA)
- For W, **Mr. Nicolas LECLAIRE** showed that the agreement with some critical experiments sometimes improves going from JEFF-4T0 to JEFF-4T1 and sometimes it deteriorates. This phenomenon will be further investigated by KIT and UPM.

- There are new experiments, made by Kostal, with Fe, Cu, and Ni blocks measuring leakage by liquid scintillators stilbene detectors. JEFF-3.3, which has always been the library giving the best results on similar cases, behaves the worst in those benchmarks. This issue, at least for Fe, could be further investigated by the dedicated session on Fe which will be organised in the future and chaired by Mr. I. Kodeli.
- The hmf7 fast benchmark includes three cases (out of 43) containing F. For those three, the performance is very bad independently on the library. F requires further investigation to identify the origin of the large discrepancies. A sensitivity analysis could be helpful.

There is a new set of structural material evaluations at IAEA from the INDEN project: Cr (finalised), Fe-54,56,57 (finalised), Cu-63,65 (ongoing, probably ready in the fall). Mr. Arjan PLOMPEN suggested to take the final evaluations from INDEN into JEFF-4T2, except for Fe-56. This means Cr, Fe-45, and Fe-57.

33. **Processing issues:** A dedicated session on processing will be organised and will be chaired by M. Gilbert (UKAEA). There were some HEATR processing issues with Xe-128,129,133, and In-133,115.
30. **Thermal Scattering Law (TSL):** Mr José Ignacio MARQUEZ DAMIAN mentioned that ESS can provide a list of TSL files. Mr Arjan PLOMPEN clarified that JEFF is ready to adopt the recommendations made by Mr MARQUEZ DAMIAN, but that the consistency with the cross section evaluations should be addressed. He asked Mr MARQUEZ DAMIAN to provide a list of recommended files.
31. **Mass consistency:** Mr Cedric JOUANNE found that there are masses being used that are not consistent within a file nor with Nubase2020 (based on AME2020, the reference for masses). Mr Arjan PLOMPEN asked how to identify this kind of inconsistency, and encouraged the community to write a script for consistency checks to be used at NEA.
32. **Test release nomenclature:** Each change in the test release (bug fixes, new evaluations) should come as a new version of test release and should have its own nomenclature. Users should be able to identify which intermediate test release they are using.
33. **Consistency issues:** Mr Danila ROUBTSOV reported inconsistency in Be-10, Na-22 and Na-24 JEFF-3.3 transport evaluations. Mr Gilles NOGUERE reported issues in some fission products elastic cross section coming from TENDL, which are wrong by a factor of two. The discrepancy is due to the lack of constraints on the thermal value during the creation of some parts of the file. Mr Gilles NOGUERE also reported that sometimes the URR for fission products is missing.
34. **Carbon:** It was suggested to delete natural Carbon and only provide isotopic files: C-12,13,14. The concern that the TSL for graphite uses Cnat was expressed. CEA is planning to produce TSL files for the isotopes of Carbon. Mr José Ignacio MARQUEZ DAMIAN explained that even if the TSL file is created for a natural element, it is possible to assign it to the different isotopes in the ACER module of NJOY. The problems arise when using a compound that is pure C-13 (e.g. enriched graphite), because it behaves differently, from the TSL perspective, with respect to Cnat.

Announcement of future JEFF meeting dates

Ms Daniela FOLIGNO announced that the next JEFF Nuclear Data Weeks will take place at the following dates:

- 21-25 November 2022
- 24-28 April 2023

- 27-1 November 2023

The list of actions from the November 2022 NDW and from this CG can be found in [\[NEA/MBDAV/DOC\(2022\)11\]](#).

Action NEA: Publish these dates on the website of the JEFF project, so that participants can plan their participation and other events.

Appendix 1. List of participants

List of participants in surname alphabetical order:

Country	Name	Surname	Participation
ESP	Alejandro	ALGORA	Online
ITA	Maurizio	ANGELONE	Online
ESP	Oscar	CABELLOS	In person
FRA	Cyrille	DE SAINT JEAN	Online
NEA	Alice	DUFRESNE	In person
NEA	Michael	FLEMING	Online
NEA	Daniela	FOLIGNO	In person
GBR	Mark	GILBERT	In person
ESP	Enrique Miguel	GONZALEZ ROMERO	Online
FRA	Robert	JACQMIN	In person
FRA	Mark	KELLETT	Online
IAEA	Arjan	KONING	In person
FRA	Luiz	LEAL	Online
AUS	Helmut	LEEB	In person
DEU	Dieter	LEICHTLE	In person
NEA	Claude Annie	MANGA	In person
ARG	José Ignacio	MARQUEZ DAMIAN	Online
GBR	Robert	MILLS	Online
NEA	Hedvig	NAHON	In person
FRA	Gilles	NOGUERE	Online
EC	Arjan	PLOMPEN	In person
CHE	Dimitri	ROCHMAN	In person
FRA	Olivier	SEROT	Online

BEL	Alexey	STANKOVSKIY	In person
NDL	Steven	VAN DER MARCK	In person
GBR	Tim	WARE	In person
SVN	Gaspar	ZEROVNIK	In person

Appendix 2. Agenda

Duration	CEST	Speaker	Topic
00:05	9:00	A. Plompen	Opening and introduction of the participants
00:05	9:05	A. Plompen	Adoption of the agenda
00:05	9:10	A. Plompen	Approval of the summary record from the CG November 2021 meeting
00:20	9:15	M. Fleming	Feedback from NEA Steering Committee and ND2025 process outcome
00:15	9:35	E. Gonzalez	Presentation of the Spanish ND2025 proposal
00:15	9:50	D. Foligno, All	JEFF Meeting structure + rest of the year planning for dedicated sessions
00:05	10:05	D. Foligno, All	Rules about speakers from non-member countries
00:10	10:10	A. Plompen, All	JEFF Nuclear data needs for fission and fusion applications
00:10	10:20	A. Plompen, All	JEFF-SANDA collaboration and other EU projects
00:10	10:30	A. Plompen, All	JEFF Education & Training
30	10:40	Coffee Break	
00:05	11:10	M. Gilbert	Outcome and recommendations from the JEFF dedicated session on Activation
00:05	11:15	D. Rochman	Outcome and recommendations from the JEFF dedicated session on Random Files
00:05	11:20	G. Noguère	Outcome and recommendations from the JEFF dedicated session on the Big 3
01:20	11:25	A. Plompen, All	Discussion and progress on JEFF-4

00:05	12:45	A. Plompen, All	Any other business
00:10	12:50	A. Plompen	Wrap-up and actions + announcement of April 2023 JEFF Meeting dates
	13:00	Closing	

Appendix 3. Results for ND2022 organisers

	BID 1					
	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Sum 1-3	Sum
Review 1	4.5	3.7	4	3	12.2	15.2
Review 2	5	5	5	3	15	18
Review 3	4.3	3.9	4.2	3	12.4	15.4
Review 4	5	5	5	3	15	18
Review 5	5	3	3	3	11	14
Review 6	3	4	4	3	11	14
Review 7	4.5	4.5	5	3	14	17
Review 8	5	4	4	3	13	16
Review 9	5	4	5	3	14	17
Review 10	5	5	5	3	15	18
Review 11	4	5	4	3	13	16
Review 12	3	4	4	3	11	14
Sum	53.3	51.1	52.2	36	156.6	192.6
Average	4.441667	4.258333	4.35	3	13.05	16.05
STDEV	0.753728	0.643087	0.644558		1.565828	1.565828
Diff to 1st	0	-1.8	-5.3	-24	-7.1	-31.1
% diff to 1st	0%	-4%	-13%	-60%	-6%	-26%

	BID 2					
	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Sum 1-3	Sum
Review 1	4.5	4.7	5	5	14.2	19.2
Review 2	5	5	5	5	15	20
Review 3	4.3	3.7	4.5	5	12.5	17.5
Review 4	4	5	4	5	13	18
Review 5	5	4	4	5	13	18
Review 6	4	4	5	5	13	18
Review 7	4.5	4.5	5	5	14	19
Review 8	5	5	5	5	15	20
Review 9	5	4	5	5	14	19
Review 10	3	5	5	5	13	18
Review 11	5	4	5	5	14	19

Review 12	4	4	5	5	13	18
Sum	53.3	52.9	57.5	60	163.7	223.7
Average	4.441667	4.408333	4.791667	5	13.64167	18.64167
STDEV	0.621521	0.507146	0.396481		0.839327	0.839327
Diff to 1st	0	0	0	0	0	
% diff to 1st	0%	0%	0%	0%	0%	0%

BID 3						
	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Sum 1-3	Sum
Review 1	3.8	4.3	4	5	12.1	17.1
Review 2	4	5	5	5	14	19
Review 3	4.1	3.8	4.6	5	12.5	17.5
Review 4	3	5	4	5	12	17
Review 5	4	5	4	5	13	18
Review 6	4	4	5	5	13	18
Review 7	3.5	4.5	4	5	12	17
Review 8	5	4	4	5	13	18
Review 9	5	4	4	5	13	18
Review 10	3	4	4	5	11	16
Review 11	3	4	3	5	10	15
Review 12	3	4	4	5	11	16
Sum	45.4	51.6	49.6	60	146.6	206.6
Average	3.783333	4.3	4.133333	5	12.21667	17.21667
STDEV	0.72216	0.457265	0.534846		1.115864	1.115864
Diff to 1st	-7.9	-1.3	-7.9	0	-17.1	-17.1
% diff to 1st	-20%	-3%	-20%	0%	-14%	-14%

BID 4						
	Criteria 1	Criteria 2	Criteria 3	Criteria 4	Sum 1-3	Sum
Review 1	3.8	4.7	4.7	4	13.2	17.2
Review 2	5	4	4	4	13	17
Review 3	4.5	4	4.1	4	12.6	16.6
Review 4	4	5	5	4	14	18
Review 5	5	4	3	4	12	16
Review 6	4	4	3	4	11	15
Review 7	4	4	4	4	12	16
Review 8	5	4	4	4	13	17
Review 9	5	5	5	4	15	19
Review 10	5	4	4	4	13	17
Review 11	5	3	5	4	13	17
Review 12	5	4	5	4	14	18
Sum	55.3	49.7	50.8	48	155.8	203.8

Average	4.608333	4.141667	4.233333	4	12.98333	16.98333
STDEV	0.508935	0.543488	0.729051		1.05299	1.05299
Diff to 1st	2	-3.2	-6.7	-12	-7.9	-19.9
% diff to 1st	5%	-8%	-17%	-30%	-7%	-17%