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**NUCLEAR ENERGY AGENCY  
NUCLEAR SCIENCE COMMITTEE**

## **Working Party on International Evaluation Co-operation**

**Twenty-Fourth Meeting of the Working Party on  
International Nuclear Data Evaluation Co-operation**

### **SUMMARY RECORD**

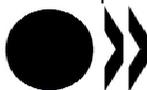
**24-25 May 2012  
NEA Headquarters  
92130 Issy-les-Moulineaux, France**

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ORGANISATION FOR CO-OPERATION AND DEVELOPMENT  
OECD/NEA Nuclear Science Committee

**Twenty-Fourth Meeting of the Working Party on  
International Nuclear Data Evaluation Co-operation**

**24-25 May 2012**

NEA Headquarters  
12 boulevard des Iles, 92130 Issy-les-Moulineaux, France

**SUMMARY RECORD**

**Introduction**

1. The WPEC chair, **R. Jacqmin**, opened the meeting and welcomed all participants (a list is given in Annex 1).

**Adoption of the Agenda**

[\(NEA/SEN/NSC/WPEC\(2012\)1\)](#)

2. The proposed agenda was adopted with addition of a presentation of the TENDL project under item 5 (Brief progress report from the evaluation projects and discussion of future plans).

**Approval of the Summary Record of the 23<sup>rd</sup> WPEC meeting**

[\(NEA/SEN/NSC/WPEC\(2011\)2\)](#)

3. The summary record of the twenty-third meeting was approved without modification.

**Membership and observers**

4. **E. Dupont** informed participants that the Russian Federation will formally join the NEA and its Data Bank on January 1<sup>st</sup>, 2013. The list of current WPEC members is given in Annex 1. Apologies for absence were received from M. Igashira (JENDL), A. Koning (JEFF) and M. Chadwick (ENDF). A live video feed of the meeting as well as slides of the presentations were available from the NEA web conference services in order to allow absent delegates to follow the meeting. An audio-visual conference with M. Chadwick was organised under item 9 of the agenda to discuss the opportunity to create a Worldwide Evaluated Nuclear Data Library.

**Reports on experimental activities**

5. Experimental nuclear data activities of relevance to the evaluation projects were reviewed. Detailed information about the experimental activities is given in the reports and viewgraphs presented at the meeting (see Annex 2).

- *NEA Data Bank member countries*

**A. Plompen** reported on experimental activities in Europe, covering about 30 measurements performed at different facilities from EC-JRC-IRMM (Belgium), CERN/n\_TOF (Switzerland), JYU (Finland), ILL, GANIL, CEA/DAM (France), HZDR, GSI (Germany), IKI (Hungary). The presentation summarized results presented at the Nuclear Data Weeks held at the NEA in November 2011 and April 2012, and reflects progress in the French GEDEPEON project, as well as the European ANDES, ERINDA and EUFRAT projects, amongst others.

**Y.-S. Cho** (on behalf of T.-Y. Song) reported on measurements performed with existing Korean facilities at PAL (white neutron and gamma sources using electron Linacs), KIGAM (mono-energetic neutron source using a Tandem accelerator) and KIRAMS (mono-energetic light-charged-particle source using a Cyclotron accelerator). He also presented planned facilities and associated experimental programme: KAERI-TOF (High frequency super-conducting electron linac for neutron production), PEFP (20/100 MeV proton linear accelerator), IBS (heavy-ion accelerator).

- *Japan*

**H. Harada** reported on Japanese activities in nuclear data measurements. He highlighted results obtained at Tohoku university (fission cross-section of minor actinides using a lead slowing-down spectrometer), at J-PARC/MLF/ANNRI (neutron capture cross-sections of minor actinides and long-lived fission products), at KEK (p-induced DDX data for neutron, gamma and fragment production), at Tokyo Tech (neutron capture cross-section and  $\gamma$ -ray spectra), at Kyoto university (neutron capture cross-section), at Osaka university (integral benchmark of scattering cross-sections at large angles), at Konan university (photo-neutron measurements and determination of neutron capture cross-sections) and at Kyushu university (DDX data from proton-, deuteron- and heavy-ion-induced reactions).

- *USA*

**Y. Danon** reported on experimental activities in the USA covering about 30 experiments carried out at different facilities. The report emphasized neutron reaction data measurements performed at LANL, LLNL, ORNL, RPI, ANL, LBNL, NIST. More details about these activities are also available on the CSEWG web page.

- *China*

**Zhigang Ge** reported on Chinese experimental activities. He highlighted results obtained at CIAE on fission yields measurements and recent data measured with the HI-13 Tandem (neutron emission DDX for  $n+{}^9\text{Be}$  and  $n+D$ ) and the 600 kV Cockcroft-Walton accelerators ( ${}^{69}\text{Ga}(n,2n)$  cross-section). The CIAE HI-13 Tandem was equipped with Accelerated Mass Spectrometry (AMS) system to analyse samples irradiated by DT neutrons at the 600 keV Cockcroft-Walton accelerator and deduce  $(n,xn)$  cross-sections. Other experimental activities are ongoing at Peking university ( $(n,\alpha)$  cross-sections measured at the 4.5 MV Van de Graaff) and Lanzhou university (activation cross-sections using the 300 kV Cockcroft-Walton accelerator). The importance of increased international co-operation was highlighted to compensate for the lack of experimental facilities in China, as well as the need to educate and train a new generation of physicists.

- *Russian Federation*

**A. Ignatyuk** reported on Russian experimental activities, which unfortunately suffer from a lack of funding. Partial  $(n,\alpha)$  cross-sections on  ${}^{19}\text{F}$  targets were measured at IPPE by the Khryachkov group. The INR Lead Slowing Down Spectrometer was used in recent years to measure the

fission cross-sections of americium and curium isotopes in the resonance region. New measurements at higher energy are in preparation.

### **Brief progress reports from the evaluation projects and discussion of future plans**

6. Progress in the major nuclear data evaluation projects was presented. Detailed information about the status of the evaluated nuclear data libraries is given in the reports and viewgraphs presented at the meeting (see Annex 2).

- *ENDF*

**M. Herman** reported on the release of ENDF/B-VII.1 and associated publication in December 2011. The following four sub-libraries were updated: general purpose (neutron), thermal scattering law, radioactive decay data and fission yields. One of the most important changes was addition of covariance data for 190 general purpose evaluations. More information on ENDF/B-VII.1 evaluation and validation work is available in a special issue of Nuclear Data Sheets 112 (2011) 2887-3152.

- *JEFF*

**R. Jacqmin** presented the status of the JEFF project, which includes contributions from both the fission and fusion communities. The JEFF-3.1.2 update of the General Purpose file was released in February 2012 with new hafnium isotopes, adoption of 47 fission products from ENDF/B-VII.0 (SG23) library and addition of capture prompt gamma-ray emission to 89 fission products (SG27). The next major release, JEFF-3.2, is under preparation and release is now expected in 2013.

- *JENDL*

**T. Fukahori** presented the status of the JENDL project. Benchmarking and evaluation activities are still going on after the release of JENDL-4.0 in May 2010. A working group on the use of covariance data was launched in 2011 to promote the interaction between nuclear data users and evaluators. Improved JENDL-4.0 Updated (u) and Plus (+) files will be made available on the JNDC web site to correct/update (u) and complement (+) the initial JENDL-4.0 release. A new radioactive decay data file (JENDL/FPD-2011) was released early 2012 together with a new fission yields file (JENDL/FPY-2011) for consistency.

- *TENDL*

**D. Rochman** presented the TENDL evaluation project, which started at NRG a few years ago and has already released a series of consistent and complete libraries for neutron and light-charged-particle-induced reactions. The project is based on the TALYS and Total Monte Carlo (TMC) systems to produce, reproduce, improve and validate a complete set of nuclear data evaluations, including covariance data for neutron cross-sections and resonance parameters.

- *BROND*

**A. Ignatyuk** reported on the status of the BROND and RUSFOND libraries. The BROND-3 library was updated with revised evaluations for minor actinides, lead isotopes, bismuth and Prompt Fission Neutron Spectra (PFNS). Moreover, covariance data were added for the 38 most important reactor materials, including minor actinides. The ROSFOND-2012 library will be updated accordingly and revised evaluations from the BROND-3A activation library will be added. Additional evaluation work was also performed to improve the (d,p) reactions in the FENDL-3A library.

- *CENDL*

**Zhigang Ge** presented the status of the CENDL project and related activities at CNDC. The evaluation work continues according to new experimental information and feedback from the validation. The next version of CENDL will be released by 2015 and will include 300 nuclei, covariance data (for 30 important materials) and special purpose files. The CNDC also contributes to the international effort to improve radioactive decay data (DDEP) and to evaluate nuclear structure data (ENSDF). In support to these evaluation and validation efforts, the CNDC develops the APRML code based on the R-Matrix theory, as well as models and codes related to covariance data and S/U analysis.

- *IAEA*

**R. Forrest** presented the activities of the IAEA Nuclear Data Section (NDS), including the international networks of nuclear reaction experiments and nuclear structure/decay data evaluation, as well as contributions to the JEFF project. The IAEA-NDS organizes Coordinated Research Projects (CRP), Data Development Projects (DDP) and training activities. Eight CRPs have recently been completed, and another six are ongoing or planned. The project on Minor Actinide Neutron Reaction Data (MANREAD) is completed and the report is in preparation. The ongoing projects on FENDL-3 and on Prompt Fission Neutron Spectra for Actinides should be completed in 2012 and 2013 respectively. A new CRP on Charged Particle Monitor Reactions and Nuclear Data for Medical Isotope Production is going to start in September 2012. Two other CRPs on the validation of the International Dosimetry Library IRDFF and on the evaluation of beta-delayed neutron emission should start in 2013.

### Review of final or near-final subgroup reports

7. Results and conclusions of completed or near-completed subgroups were discussed. A summary table of all subgroup status is given in Annex 3.

- *Subgroup 27 (Prompt photon production from fission products)*

This subgroup is closed. **R. Jacqmin** proposed to circulate the draft report by the end of September. The final report would be issued by the end of 2012.

- *Subgroup 28 (Processing of covariance data)*

This subgroup is closed. **M. Dunn** proposed to circulate the draft report by the end of August. The final report would be issued by the end of 2012.

- *Subgroup 29 (U-235 capture cross-section in the keV to MeV energy region)*

This subgroup is closed. The final report was published in October 2011.

- *Subgroup 31 (Meeting nuclear data needs for advanced reactor systems)*

**H. Harada** reported on progress made to review the nuclear data needs identified by SG26 and on the outcomes from the final SG31 meeting held two days ago on May 22, 2012. The target accuracy of the  $^{241}\text{Am}(n,\gamma)$  cross-section will be difficult to meet, but other requirements seem achievable pending confirmation by double check experiments. The WPEC decided to close the subgroup. The final report will be issued by the end of 2012.

### Status of ongoing subgroups

8. Activities of ongoing subgroups were presented. A summary table of all subgroup status is given in Annex 3.

- *Subgroup C (High priority request list for nuclear data)*

**A. Plompen** presented a summary of SG-C status. There have been considerable efforts in recent years to respond to the High Priority requests and time has come to review and update the HPRL entries. Members of SG31 will do this review from an experimental point of view and a questionnaire will be prepared and circulated among evaluation projects. The WPEC welcomed this proposal to review HPRL entries and recommended to continue this kind of activity in the framework of this long-term subgroup.

- *Subgroup 33 (Methods and issues for the combined use of integral experiments and covariance)*

**G. Palmiotti** reminded participants that the preliminary stage of reviewing the different adjustment methodologies and assessing their merits has been completed and published in April 2011 as an intermediate report. The first phases of the adjustment benchmark have already been completed by some participants and analysis of the results is ongoing. A draft report will be available by March 2013. *The subgroup was given a one-year extension to organise the benchmark results and finalise the report, which will be issued in 2013.*

**R. Jacqmin** complimented the subgroup for the excellent progress made and thanked the coordinators for their efficient role.

- *Subgroup 34 (Coordinated evaluation of  $^{239}\text{Pu}$  in the resonance region)*

**C. de Saint Jean** reported on the co-ordinated evaluation of the  $^{239}\text{Pu}$  resolved resonance region. The ORNL/CEA collaboration produced a new resonance parameter evaluation including both microscopic and integral data. The work on covariance data is ongoing. Various prompt fission neutron spectra (PFNS) have been tested, but the integral validation does not provide a definitive answer and conclusions from the IAEA CRP on PFNS will be helpful. *The subgroup was given a one-year extension to complete the work and prepare the report, which will be issued in 2013.*

- *Subgroup 35 (Scattering angular distribution in the fast energy range)*

**T. Kawano** reported on progress made to improve the evaluation of scattering angular distributions and identify integral benchmarks in which the scattering data play important role. He presented a summary of the SG35 meeting held just prior to this meeting, where ongoing evaluation and validation work for neutron scattering data on D, Na, Al, Fe, Zr was discussed. *Subgroup activities will continue in 2013 with the objective to complete the work by the next WPEC meeting.*

- *Subgroup 36 (Reporting and usage of experimental data for evaluation in the resolved resonance region)*

**P. Schillebeeckx** reported on methods and best practices to produce accurate cross-section data together with reliable covariance information in the resonance region. Members of SG36 have reviewed the uncertainty components of experimental data, the available evaluation models and prepared test cases. They also recommended a list of key information to report and store in an international database. *Subgroup activities will continue in 2013 with the objective to complete the work by the next WPEC meeting.*

### Proposals for new subgroups

9. The following subgroup proposals were reviewed by WPEC. Detailed information about these proposals is given in the documents and viewgraphs presented at the meeting (see Annex 2).

**R. Mills**, on behalf of the JEFF project, proposed a new subgroup with the objective to improve fission product yield evaluation methodology. The goal is for the experts in this field to develop improved methodologies for future evaluations that are consistent with the new theoretical knowledge and experimental measurements, and include common covariance methods that will allow calculations with both improved accuracy and the generation of uncertainties on calculated engineering parameters. This proposal is supported by the ENDF project and M. Chadwick accepted the role of subgroup monitor. *The proposed subgroup would start in January 2013. The WPEC approved the proposal and established the subgroup as number 37.*

**9. D. McNabb**, on behalf of the ENDF project, presented a proposal to define a modern nuclear database structure beyond the ENDF format. The proposed subgroup would define a common data model/organisation, agree on best practices for evaluations and how to implement them in the format and in QA tools, as well as defining a process to publish and update the format. I. Kodeli is proposed as subgroup monitor. *The WPEC approved the proposal and established the subgroup as number 38.*

### Discussions on the opportunity to create a World Wide Evaluated Nuclear Data File/Library

10. **M. Chadwick** (via audio-visual conferencing) invited participants to think about the opportunity to establish a worldwide collaboration between evaluation projects with the objective to produce a common international evaluated file. **M. Chadwick** proposed to develop this international library in parallel with existing files during the next 5-10 years. Beyond this initial period regional projects will probably have to make a choice. This presentation was followed by many comments and discussions on the merits and drawbacks of such a file. **U. Fischer** wondered if this new library could be assembled on the basis of existing libraries such as in the FENDL project. **T. Fukahori** commented that the FENDL approach is not appropriate for fission applications, which are sensitive to small (< 1%) nuclear data variation. **M. Herman** commented that local modifications of this international file would always be possible. **R. Jacqmin** observed that such an idea had been suggested by the JEFF project more than 10 years ago, but was then rejected by the other projects for various reasons, after due consideration. He stressed the fact that the file projects were not “competing” against each other but collaborating, that there would be no “savings” to expect today from a move to a joint file, noting that JEFF was already a hybrid library in many ways. He emphasized the importance of first defining a common set of objectives for such a joint file, as well as a management system (selection of “best” evaluations, updating rules, etc.) and operational practices. **T. Fukahori** added that there would be a serious risk of losing national funding and expertise, as a move to a joint file would convey the erroneous perception that “equivalent work can be done with less manpower”. **M Chadwick** proposed to test the approach on 10-15 critical nuclides. **R. Forrest** agreed but added that critical materials for fusion applications should be included in this initial list.

11. After much discussion, no general agreement on the idea of starting now the development of a common international file could be reached. However, the suggestion was made to initiate without delay a two-step process to consolidate current knowledge and to investigate the reasons for the present discrepancies between evaluated files and propose actions to try to reconcile these discrepancies.

- Short-term (one-year). Establish a review group to:
  - Develop a list of key isotopes for which a better consensus between current evaluated files would be highly desirable;
  - Document “facts” related to the present files, in a general way: source of experimental data, models, evaluation method, validation, for all these important nuclides;
  - Develop a list of desirable upgrades for these files.
- Mid-term. On the basis of the conclusion of the review group, consider specific WPEC subgroups and IAEA CRPs or DDPs working on these important nuclides:
  - Review the latest nuclide evaluations in detail and identify the reasons (data, models, validation information...) for agreements and disagreements between the files, as well as the lessons learned from past evaluation activities;
  - Document these expert views, and put them in a shared “knowledge database”. This high-value information would be accessible to the contributing projects and would be an essential input to any subsequent joint evaluation effort;
  - Suggest actions to be taken to reconcile the differences (link with HPRL subgroup) and to produce improved evaluations.

12. The purpose of these groups would therefore not be to develop a worldwide library at this stage, but to create the proper conditions to help international experts and evaluators come to a consensus and agree on the actions to take (and the resources to contribute) to produce the “best” joint evaluated files progressively.

13. All evaluation projects agreed to participate in this first step. **M. Chadwick** volunteered to coordinate a first draft review. It was decided to limit the scope of the review to 10-15 nuclides among major actinides, structural materials and coolant. The NEA will collect and circulate all contributions.

#### **Conferences and meetings of interest to the nuclear data community**

14. **M. Herman** presented the status of the next Nuclear Data conference (ND2013) that will take place on 4-8 March, 2013 at the Sheraton Hotel & Towers in Manhattan, New York, USA. The second circular was distributed in April 2012 and both registration and abstract submission are now open. The conference proceedings will be published in the Nuclear Data Sheets journal. The aggregation of contributions into bigger but coherent papers is encouraged. More information is available on the conference web site ([www.bnl.gov/nd2013](http://www.bnl.gov/nd2013)).

15. **E. Dupont** informed the participants that JRC-IRMM expressed interest in organizing the 2016 Nuclear Data conference (ND2016) in Belgium at a location to be determined. This candidacy is supported by Data Bank member countries represented in the JEFF project. The WPEC agreed with this proposal.

16. **E. Dupont** briefly reviewed the forthcoming meetings of interest to the nuclear data community. This information is available on the NEA web page at [www.oecd-nea.org/science/wpec/calendar.html](http://www.oecd-nea.org/science/wpec/calendar.html).

#### **Any other business**

17. No other questions or issues were raised. Before closing the meeting **R. Jacqmin** said a few words in the memory of John Rowlands, Christopher Dean, Vicki McLane and Alan B. Smith who have recently passed away.

**Time and place of next meeting**

18. The dates initially proposed were in conflict with the preparations for some US NDP meetings in early June 2013 and discussions continued by email after the meeting. Finally, it was agreed that the next WPEC meeting will be held at the NEA Headquarters, France, on 23-24 May 2013. Subgroup coordinators will have the opportunity to hold short technical meetings the same week on 21-22 May 2013 (20<sup>th</sup> May is a public holiday in France).

*ANNEX I*

**Participation at the twenty-fourth WPEC meeting**  
**NEA Headquarters, Issy-les-Moulineaux, France, 24-25 May 2012**

*Representatives from evaluation projects*

Yaron DANON	ENDF	
Mike DUNN	ENDF / SG28	
Mike HERMAN	ENDF	
Albert (Skip) KAHLER	ENDF	
Ulrich FISCHER	JEFF	
Robert JACQMIN	JEFF / SG27 / WPEC Chair	
Arjan KONING	JEFF	(excused)
Arjan PLOMPEN	JEFF / SG-C	
Tokio FUKAHORI	JENDL	
Hideo HARADA	JENDL / SG31	
Masayuki IGASHIRA	JENDL	(excused)
Makoto ISHIKAWA	JENDL	
Robin FORREST	IAEA/FENDL	
Anatoly IGNATYUK	IAEA/BROND	
Zhigang GE	IAEA/CENDL	

*Subgroup coordinators*

Giuseppe PALMIOTTI	SG33 / ENDF
Cyrille DE SAINT JEAN	SG34 / JEFF
Toshihiko KAWANO	SG35 / ENDF
Peter SCHILLEBEECKX	SG36 / JEFF

*Observers and scientific advisers*

Mark CHADWICK	ENDF	(excused)
Young-Sik CHO	JEFF/KAERI	
Luiz LEAL	ENDF	
Dennis MCNABB	ENDF	
Richard MCKNIGHT	ENDF	
Robert MILLS	JEFF	
Dimitri ROCHMAN	JEFF	
Xichao RUAN	CENDL	
Haicheng WU	CENDL	

*Secretariat*

Emmeric DUPONT	NEA
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*ANNEX 2***Documents presented at the twenty-fourth WPEC meeting  
NEA Headquarters, Issy-les-Moulineaux, France, 24-25 May 2012**

The following reports, presented at this meeting, can be found on the WPEC webpage ([www.oecd-nea.org/science/wpec](http://www.oecd-nea.org/science/wpec)) and the subsequent link to the “List of Working Documents”. The documents will have the identification NEA/NSC/WPEC/DOC(2012)XXX, where XXX correspond to the number below. The viewgraphs presented at the meeting have not been given an official number; they can be found on the webpage [www.oecd-nea.org/science/wpec/meeting2012](http://www.oecd-nea.org/science/wpec/meeting2012).

- 434 Progress of nuclear data measurement in China during 2010-2011; Ge Zhigang, Ruan Xichao
- 435 Present status of the JENDL project (May, 2012); T. Fukahori
- 436 Progress of CENDL and related activities during 2010-2011; Ge Zhigang, Wu Haicheng
- 437 Improved Fission product yield evaluation methodologies; R.W. Mills
- 438 Beyond the ENDF format: A modern nuclear database structure; D. McNabb

*ANNEX 3***Subgroups Status****Short-term subgroups**

	<b>Topic</b>	<b>Co-ordinator</b>	<b>Status in May 2012</b>
27	Prompt Photon Production from Fission Products	R. Jacqmin, JEFF	Closed; final report to be issued by the end of 2012
28	Processing of Covariance Data	M. Dunn, ENDF	Closed; final report to be issued by the end of 2012
31	Meeting Nuclear Data Needs for Advanced Reactor Systems	H. Harada, JENDL	Closed; final report to be issued by the next meeting
33	Methods and issues for the combined use of integral experiments and covariance data	M. Salvatores, JEFF G. Palmiotti, ENDF	Ongoing (extended)
34	Coordinated evaluation of <sup>239</sup> Pu in the resonance region	C. de Saint-Jean, JEFF	Ongoing (extended)
35	Scattering Angular Distribution in the Fast Energy Range	T. Kawano, ENDF	Ongoing; established in 2010
36	Reporting and usage of experimental data for evaluation in the resolved resonance region	P. Schillebeeckx, JEFF	Ongoing; established in 2010
37	Improved Fission product yield evaluation methodologies	R.W. Mills, JEFF	Approved with effective start delayed to 2013
38	Beyond the ENDF format: A modern nuclear database structure	D. McNabb, ENDF	Approved with effective start by the end of 2012

**Long-term subgroups**

C	High Priority Request List	A. Plompen, JEFF	Ongoing
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