

Summary Record of the Third Meeting of the
**WORKING GROUP ON INTERNATIONAL EVALUATION
COOPERATION**

ECN Petten, Holland, 21st and 22nd May 1991

Present:

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|---------------|------------------------|------------------|
| C. Dunford | (ENDF) | <u>Chairman</u> |
| A. Filip | (Subgroup 6) | |
| E. Fort | (NEANDC) | |
| C. Fu | (Subgroup 1) | |
| H. Gruppelaar | (EFF) | |
| A. Hasegawa | (JENDL) | |
| Y. Kanda | (JENDL and Subgroup 4) | |
| Y. Kikuchi | (JENDL) | |
| E. Menapace | (JEF) | |
| C. Nordborg | (NEA) | <u>Secretary</u> |
| M. Salvatores | (JEF) | |
| M. Sowerby | (JEF) | |
| H. Tellier | (Subgroup 3) | |
| H. Vonach | (Subgroup 2) | |
| J. White | (Subgroup 7) | |
| P. Young | (ENDF) | |
| T. Yoshida | (JENDL) | |

Observers:

- | | |
|--------------|------------|
| A. Hogenbirk | ECN Petten |
| J. Kopecky | ECN Petten |

H. Gruppelaar welcomed the participants and presented the Petten Research Establishment and its activities.

The chairman, C. Dunford, opened the meeting. Apologies for absence were received from G. Rudstam, coordinator of Subgroup 6. The proposed agenda was adopted. It was agreed to add a point on non-OECD participation in Working Group Meetings under "Other business".

REPORTS FROM THE COOPERATING EVALUATION PROJECTS.

JENDL

Y. Kikuchi presented two papers entitled "Present Status of JENDL Project" and "Japanese Evaluated Nuclear Data Library, Version-3".

The JENDL-3 General Purpose File had been tested and released in December 1989 and the summary document had been published as the JAERI report 1319. Revision 1 of the library, correcting some trivial errors, had been distributed in December 1990. The JENDL-3 Fission Product Nuclear Data Library, containing complete evaluations for 172 nuclei, had been released at the same time. The ENDF-5 format has been used for all released components of the JENDL-3 library.

Several kinds of JENDL special purpose files are under preparation in cooperation with working groups of the Japanese Nuclear Data Committee. The following major four file are expected to be completed in 1991:

- Dosimetry File, containing cross sections and covariance matrices of 61 reactions stored in a group-wise file,
- (α, n) Reaction Data File for 11 light elements, based on available experimental and theoretical calculations,
- Activation Cross Section File, comprising about 1000 reaction cross sections for important elements,
- Gas Production Cross Section File, including data of the p, d, t, ^3He and α production cross sections for 23 isotopes or elements.

Other special purpose file under preparation are: a decay data file, a KERMA factor and DPA cross section file, a file for fusion neutronics in ENDF-6 format, a high energy neutron data file, a charged particle data file, and an actinide cross section file.

JEF/EFF

The status of the JEF project was presented by M. Salvatores. There were at present three categories of users of the JEF data: Industry (ex. FRAMATOM in France), Utilities (ex. EDF in France and National Power in UK) and Bilateral Cooperations (such as the European Fast Reactor Programme).

A first version of the JEF-2 library had been sent out in February 1990 to laboratories involved in the testing of the file. Following processing of the data and first results from the benchmark calculations, minor problems had been identified and corrected, and it was envisaged that a JEF-2 General Purpose File should be ready for general distribution at the end of 1991. Of the Special Purpose files, the Fission Yield Data and Thermal Scattering Law Data had already been finalised, whereas the Radioactive Decay Data File would be ready in the autumn of 1991.

The status of the EFF and the closely linked EAF (European Activation File) projects were presented by H. Gruppelaar. The main tasks in the three year EFF programme from 1989 to 1991 were: the evaluation, compilation and testing of an EFF-2 library, taking specially into account the shielding of the inner coils of the proposed NET (Next European Torus) machine. Some processing problems have been encountered and it is envisaged that the benchmark testing will continue in the follow up programme, currently being defined. Future emphasis will also be given to better photon production data, improved particle emission spectra and updated covariance information.

The EAF-2 file had been released in the beginning of 1991. The file is recommended for fusion reactor activation and transmutation calculations. It contains about 11000 reactions on 667 target nuclides with half-lives longer than 0.5 days. The major future task will be to update the library with uncertainty information.

ENDF

C. Dunford informed the Working Group on recent progress in the ENDF project. The ENDF/B-VI neutron reaction, thermal scattering law and photon interaction sub-libraries had been completed and distributed worldwide in June 1990. Some errors have since then been detected in the files and it is foreseen to correct these errors and issue a partial release (ENDF/B-VI.1) in August 1991. A third version (ENDF/B-VI.2), containing new and revised evaluations, is planned for the autumn 1992. The Radioactive Decay Data library and a preliminary Fission Yield library will be released in September 1991. The final version of the Fission Yield library will not be ready until 1992.

The first results from the benchmark testing of the ENDF/B-VI library had been received. For ^{235}U fueled thermal reactor assemblies the performance had been comparable to that of the ENDF/B-V library, except that the trend of increasing eigenvalue as a function of epithermal leakage and epithermal fission fraction had been significantly reduced. Recent calculations of reactor vessel damage benchmark experiments have dramatically improved with the new isotopic Iron evaluations.

SUBGROUP ACTIVITIES

Subgroup 1: Inter-comparison of files for ^{52}Cr , ^{56}Fe and ^{58}Ni .

The group had recently met in December 1990 during the JEF-EFF meeting at the NEA Data Bank. A full report of the former and recent progress had been summarised in a contribution to the Jülich Conference the week before this meeting, and was presented by the coordinator, C.Y. Fu. The Group had concentrated the work on the high energy region and localised a number of problem areas, where the compared evaluated files were discrepant. Some of the problems, such as the $^{58}\text{Ni}(n,\alpha)$ cross section and the ^{58}Ni neutron energy distributions, were due to different nuclear model code parameters used, whereas other problems, such as $^{56}\text{Fe}(n,2n)$ and photon production cross sections were linked to discrepancies in the experimental data base.

It was felt that the group should concentrate on resolving the discrepant calculations of particle emission cross sections during the coming year, with the goal of developing a recommended methodology for performing such calculations in the future. It was decided that the comparison of the lower energy part, covering the resonance region, would be deferred to a new subgroup.

Subgroup 2: Generation of covariance files for ^{56}Fe and ^{nat}Fe .

The coordinator, H. Vonach, presented a status report. Covariances for the main isotopes of the structural materials, including ^{56}Fe had been generated by approximate methods both at Oak Ridge, for the ENDF/B-VI file, and at IRK, Vienna, for EFF-2. An evaluation at 14 MeV incident neutron energy of cross section measurements for ^{52}Cr , ^{56}Fe , ^{58}Ni , and ^{60}Ni performed at IRK would serve as a benchmark to check both the quality of the various evaluated data libraries and their uncertainties.

Future work would be devoted to the comparison of covariances derived from different approximate methods with those calculated from uncertainties of model parameters by Y. Kanda. The covariances for the most important resonances of ^{56}Fe by F. Fröhner would also be studied, as well as the processing of the covariance data in general. The sensitivity studies of neutron transport calculations to the uncertainties in angular and energy distributions performed at ECN Petten and CEN Cadarache would be reviewed.

It was hoped to terminate the work of the subgroup at the time of the BNL Evaluation Methodology Meeting and NEANDC Specialists' Meeting on Covariances in the autumn of 1992.

Subgroup 3: Actinide data in the thermal energy range.

The status of the thermal and epithermal data of the major actinides was presented by H. Tellier. The situation had greatly improved during recent years, and the results from calculations and evaluations using differential data were now in good agreement with values deduced from integral experiments. It was nevertheless noted that a few problem areas still remained:

- The recent ^{235}U η measurements by Harwell and Geel were discrepant and it was agreed to promote a continued discussion between the experimentalists involved.
- The parameters of the first resonance of ^{240}Pu had been measured at BNL and Oak Ridge, with different results. Spent fuel analysis supported the BNL measurement.
- A new measurement of η of ^{239}Pu would be needed.
- The ^{238}U Debye temperature problem would need new experiments to be solved. A measurement involving uranium metal, UO_2 and U_3O_8 samples was considered useful.

The subgroup had resolved almost all of the tasks it had been set up to investigate, and the coordinator agreed to write a final report of the achievements. It was nevertheless considered of importance to solve the outstanding problem of the η of ^{235}U . It was therefore

decided to modify the goal and composition of the subgroup. The future task would be to resolve the problem of " η " of ^{235}U and ^{239}Pu ". Proposed participants were J. Harvey, M. Moxon, and H. Weigmann. M. Sowerby would continue to serve as Monitor.

Subgroup 4: ^{238}U capture and inelastic scattering cross sections.

Y. Kanda informed the Working Group on recent developments within the subgroup. The ^{238}U capture cross section in the unresolved resonance region had been carefully studied and it was concluded that the lower values adopted by the recent major evaluated files, ENDF/B-VI, JEF-2 and JENDL-3, were to be preferred. This part of the exercise was therefore considered as terminated and the report presented at the Jülich Conference by Y. Kanda would be considered as the final report.

The investigation of the inelastic cross section would be started and both experimental and theoretical results would be taken into account. The situation would be reviewed at the next meeting of the Working Group.

Subgroup 5: ^{239}Pu 1 - 100 keV fission cross section.

E. Fort presented the status report. The work in trying to solve the discrepancy between the Weston & Todd experimental results and recent evaluated libraries had advanced along two lines:

1. The critical examination of the Weston & Todd data.
2. Examination of other sources of data, such as competitive cross section data, theoretical calculations, and integral data.

It is possible that there could be a normalisation problem in the Weston & Todd data and new experiments had been planned at Oak Ridge and Geel to verify this point.

New optical model parameters had been obtained by C. Lagrange, based on a recent transmission measurement by J. Harvey et. al. and total cross sections by W. Pönitz et. al.. Two test evaluations, one based on the ENDF/B-VI data and one on the Weston & Todd experimental data will be made and tested against clean integral data, such as JEZEBEL, JEZEBEL-Pu, FLATTOP-Pu, and a set of experiments from MASURCA, SNEAK and ZEBRA assemblies.

Subgroup 6: Delayed Neutron Data Benchmarking.

The work of the subgroup had been split up in two parts, one concerning differential data coordinated by G. Rudstam and one concerning integral data coordinated by A. Filip. The latter presented the status report.

A review on the Status of Delayed Neutron Data had recently been published by the NEA. The main discrepancies are identified in the document and an analysis of actions to be

taken is presented. One of the conclusions was that a new accurate measurement of ν_d for ^{238}U is highly desirable. Results from an experiment on delayed neutron branching ratios performed at the isotope separator on-line facility OSIRIS at Studsvik and an update to the evaluation of P_0 values from the same laboratory were presented. The JEF-2 fission yield data library had been finalised in January 1991 and the corresponding ENDF/B-VI library would soon be released.

The β_{eff} measurements planned at Cadarache will start in the beginning of 1992. In order to extract delayed neutron information from the experiment, a theoretical and calculational effort is being developed at Cadarache and Casaccia. A re-examination of a β_{eff} measurement at SNEAK is also under way.

Subgroup 7: Multigroup Cross Section Processing.

This subgroup had been set up at the last meeting of the Working Group in order to coordinate the processing of multigroup libraries based on the four major evaluated cross section libraries. J. White, substituting for the coordinator R.W. Roussin, presented the progress report.

The detailed specifications, including weighting spectrum, temperature grid, background cross sections etc., of the common VITAMIN-J structure had been discussed and agreed upon. Processing tasks have already begun on evaluations from the major evaluated libraries. The NJOY code would be used for the JEF and ENDF/B libraries whereas the PROF-GR system had been used for JENDL-3. At present, the major effort is being devoted to the checking and development of the NJOY code system, and it was planned to hold an NJOY workshop at the NEA Data Bank in early 1992.

NEW SUBGROUPS

The Working Group discussed proposals for new subgroups. Following the discussion of the status of the present subgroups and the possibility of terminating some of them already in 1992, it was felt timely to start several new subgroups.

Many different subjects were discussed and it was finally agreed to create four new subgroups as follows:

- **Subgroup 8: Minor Actinide Data. (Monitor: M. Sowerby)**
 - Initial phase will investigate ^{237}Np and ^{241}Am
 - Compare existing evaluations (graphs etc.)
 - Compare the validation data bases and find possible open experiments for benchmark testing (irradiated samples, irradiated fuel, radiation rate measurements in critical facilities etc.)
 - Compare the obtained C/E values for each separate data base.

- Make recommendations for future work (experimental and/or evaluation)
- Subgroup 9: High Priority Request List for Data Needs in Future/Advanced Reactors. (Monitor and Coordinator: M. Salvatores)
 - The scope will be to select a number of topics related to major national and international projects for advanced reactor developments, which can be relevant to their physics assessment (reactivity coefficients, critical balance etc.)
 - Indicate the data needs with high priority, based on sensitivity analysis and, when practical, with simple estimates of uncertainties.
 - Establish a priority list for new measurements (differential and integral) and evaluations.
- Subgroup 10: Fission Product Inelastic Scattering. (Monitor: H. Gruppelaar)
 - The subgroup will review the present data bases for the inelastic scattering cross section of the fission product nuclei, especially the even-even isotopes.
 - Theoretical tools for prediction of the inelastic cross sections will be investigated.
 - Make recommendations on the preferred data to be used or to suggest further experimental or theoretical work needed.
- Subgroup 11: Inter-Comparison of the Resonance Region of ^{52}Cr , ^{56}Fe , and ^{58}Ni . (Monitor: D. Larson)
 - The subgroup is a follow up to the existing subgroup 1, where the present work has been concentrated on the high energy region.

Another two subjects were discussed in detail, but it was agreed to defer the creation of subgroups until the next meeting of the Working Group. The two subject areas were: Photo-Nuclear Data and Medium Energy Data.

RE-ORIENTATION OF THE NEA SCIENCE PROGRAMME

C. Nordborg informed the Working Group on the plans to restructure the NEA Science programme by replacing the present NEANDC, NEACRP and Data Bank Committees with one Nuclear Science Committee (NSC). The Working Group felt it was of utmost importance that the work of the International Evaluation Cooperation continued, even if the mandates of the present sponsoring bodies were to be terminated and replaced by a new committee. The cooperative effort was very beneficial to the member countries and it was agreed that the chairman would write a letter to the chairmen of NEANDC and NEACRP, with a copy to the Director General of NEA, explaining the position of the Working Group.

MANPOWER

The situation concerning available manpower in the field of neutron data evaluation work, had not changed since the last meeting. H. Gruppelaar informed the Working Group of the decision by the European Communities to support for another three years, the work for the European Fusion File project.

OBSERVERS FROM NON-OECD COUNTRIES

Unofficial requests for the participation of non-OECD experts at Working Group meetings had been received. Following a discussion, it was decided to allow for observers to be present at Working Group meetings. The following procedure was decided: A maximum of three observers (at least one from the IAEA) would be allowed, nominated through the IAEA Nuclear Data Section, and subject to approval by the Working Group chairman. Nomination for observers should be sent to the Working Group chairman with a copy to the NEA Secretariat well in advance of a meeting.

OTHER BUSINESS

M. Salvatores proposed that the main documents presented at the Working Group meetings should be numbered by the NEA Secretariat for ease of reference. The proposal was agreed and a proposed numbering system is enclosed (Annex I).

COMMITTEE OFFICERS

The present chairman, C.L. Dunford, agreed to remain in office through the next meeting of the Working Group.

It was decided that a newly elected chairman should take up duty one month after the formal election.

NEXT MEETING

Following an invitation by Y. Kikuchi, it was decided to hold the next meeting in conjunction with the NEANDC Specialists' Meeting on "Fission Product Nuclear Data", to be held at JAERI, Tokai-Mura, Japan on 25th to 27th May 1992.

The next meeting of the Working Group will thus be held at JAERI, Tokai-Mura, Japan, on 28th and 29th May 1992.

Annex 1

Proposed numbering system for Documents presented at the meetings of the Working Group for International Evaluation Cooperation (IEC)

- IEC-1 Report of the NEACRP/NEANDC Task Force on Evaluation Cooperation; J. Rowlands and C. Nordborg, October 1989. (NEACRP-A-1011, NEANDC-A-257)
- IEC-2 Summary Record of the First Meeting of the Working Group on International Evaluation Cooperation, Oak Brook, USA, 9th October 1989.
- IEC-3 Status of the JEF-2 library, 20th March 1990; M. Salvatores, C. Nordborg
- IEC-4 Draft Status Report EFF and EAF Projects, April 1990; H. Gruppelaar (NFA-FUS-90-..).
- IEC-5 Japanese Evaluated Nuclear Data Library, Version-3, JENDL-3; Nuclear Data Center, JAERI
- IEC-6 CSEWG Progress report
- IEC-7 Letter from C.Y. Fu and D.C. Larson to members of Subgroup 1, 22nd May 1990.
- IEC-8 Report on the Initiation of SWG2 on the Generation of Covariance Files for Fe-56 and Natural Fe, April 1990; H. Gruppelaar (NFA-FUS-90-03).
- IEC-9 Letter from H. Tellier to M. Sowerby describing progress in SWG3, 12th June 1990.
- IEC-10 ^{238}U Capture and Inelastic Scattering Cross Sections, Progress report on the sub-group 1.4, 17th April 1990; Y. Kanda, Y. Kikuchi.
- IEC-11 Letter from E. Fort to members of subgroup 5 concerning proposals for actions, 27th February 1990.
- IEC-12 Status of International Evaluation Cooperation Subgroup 6, Memo from R.D. McKnight to C.L. Dunford, 23rd April 1990.
- IEC-13 Proposal from R.W. Roussin for setting up of a subgroup on "Multigroup Cross-Section Processing", 16th April 1990.
- IEC-14 Summary Record of the Second Meeting of the Working Group on International Evaluation Cooperation, Marseille, France, 30th April and 1st May 1990.

- IEC-15 Report on the Meeting of Subgroup 1 of the NEACRP/NEANDC Evaluation Cooperation: Intercomparison of cross sections for ^{52}Cr , ^{56}Fe , and ^{58}Ni in the JENDL-3, JEF-2/EFF-2, and ENDF/B-VI evaluations, held at the NEA Data Bank on December 3, 1990.
- IEC-16 Report from the subgroup 3 "Actinide data in the thermal energy range" meeting held on December 3, 1990 at the NEA Data Bank.
- IEC-17 Minutes of Meeting of sub-group 5: " ^{239}Pu Fission Cross Sections between 1 keV and 100 keV", December 4, 1990.
- IEC-18 Cooperation in Nuclear data Evaluation Among the OECD Countries; C.L. Dunford, Y. Kikuchi, M. Salvatores (Contribution to the Jülich Conference 13th-17th May 1991)
- IEC-19 Present Status of the JENDL Project; Y. Kikuchi
- IEC-20 Japanese Evaluated Nuclear Data Library, Version-3 -JENDL-3 -; Y. Kikuchi and members of JNDC (Contribution to the Jülich Conference 13th-17th May 1991)
- IEC-21 Status of the JEF and EFF Projects; C. Nordborg, H. Gruppelaar, M. Salvatores (Contribution to the Jülich Conference 13th-17th May 1991)
- IEC-22 European Activation File for Fusion; J. Kopecky, H. Gruppelaar, R.A. Forrest (Contribution to the Jülich Conference 13th-17th May 1991)
- IEC-23 CSEWG Progress Report to NEACRP/NEANDC Working Group on International Evaluation Cooperation, Petten, The Netherlands, 21-22 May, 1991
- IEC-24 International Evaluation Cooperation Task 1.1: Intercomparison of Evaluated Files for ^{52}Cr , ^{56}Fe , and ^{58}Ni ; C.Y. Fu et.al. (Contribution to the Jülich Conference 13th-17th May 1991)
- IEC-25 Report on the Activities of the Subgroup 2 (Covariance data for ^{56}Fe) of the NEACRP/NEANDC Working Group on Evaluation Cooperation; H. Vonach
- IEC-26 Thermal and Epithermal Data Assessment for Fission Reactors; H. Tellier (Contribution to the Jülich Conference 13th-17th May 1991)
- IEC-27 ^{238}U Capture and Inelastic Scattering Cross Sections, Progress Report of the sub-group 1.4 to the Third meeting of the NEACRP/NEANDC Working Group on International Evaluation Cooperation; Y. Kanda
- IEC-28 A Report on Evaluated $^{238}\text{U}(n,\gamma)$ Cross Section; Y. Kanda et.al. (Contribution to the Jülich Conference 13th-17th May 1991). (Final report for the first half of the work of subgroup 4)
- IEC-29 International Evaluation Cooperation Progress Report of the Subgroup on " ^{239}Pu Fission Cross Section between 1 keV and 100 keV"; E. Fort et.al. (Contribution to the Jülich Conference 13th-17th May 1991)

- IEC-30 Progress Report, Subgroup 6 (Delayed Neutrons (DN) data Evaluation & Benchmarking); A. Filip
- IEC-31 International Evaluation Cooperation Subgroup 7: Multigroup Cross Section Processing; R.W. Roussin et.al. (Contribution to the Jülich Conference 13th-17th May 1991)
- IEC-32 Summary Record of the Third Meeting of the Working Group on International Evaluation Cooperation, Petten, Holland, 21st and 22nd May 1991.