

# IAEA Nuclear Data Section Report to WPEC

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## 1. Evaluated Neutron Data Libraries

The following work packages represent NDS contributions to FENDL during 2001/02:

- With assistance from Dr. John White (ORNL, invited Consultant), some deficiencies in the FENDL-2 files have been identified and removed in updates to the library that have still to be loaded.
- The FENDL-2 Ace library is being verified through an on-going research contract. This research contract will also produce software tools to generate data at an arbitrary temperature using mainly standard NDS Pre-processing codes and a few additional small utility codes. Due to the modest investment into code development and verification this option is preferable to generating and archiving voluminous libraries at different temperatures.
- Future plans include extensions of Ace and group libraries for nuclides that are not included in the current list for fusion applications (i.e., fissile and fertile nuclei, and fission products).

## 2. Evaluated Charged-Particle and Photonuclear Data Libraries

Both of these nuclear data libraries were formulated in 2000, and are products of specific IAEA Co-ordinated Research Projects: Photonuclear Data Decay, and Charged-Particle Cross Section Database for Medical Radioisotope Production. Both databases have required some follow up activities, particularly data checking and verification. Format corrections were also made to the Photonuclear Library, while some of the evaluated cross sections in the first release of the Medical Radioisotope Production Database are currently being revised.

Future plans include conversion of the evaluated charged particle data into ENDF format.

## 3. On-going Co-ordinated Research Projects and Other Activities for Data Evaluation and Verification

- Fission Product Yield Data Required for Transmutation of Minor Actinide Nuclear Waste up to 150 MeV.
- Update of X- and Gamma-ray Standards for Detector Calibration.
- Nuclear Model Parameter Testing for Nuclear Data Evaluation, Reference Input Parameter Library: RIPL-Phase II.
- Development of Database for Prompt Gamma-ray Neutron Activation Analysis.

## 4. Activities Proposed for Future Programmes

### 4.1 Improvement of the Standard Cross Sections for Light Elements

The most recent evaluations of light element standards were completed in 1987, and there are plans to prepare new versions of the national evaluated data libraries in the USA, Russia, China, Japan and Europe. This work should begin with a re-evaluation of the international reaction cross section standards. The NEA/OECD Nuclear Data Standards Sub-Group of the Working Party on International Evaluation Cooperation as well as the Cross Section Evaluation Working Group in the USA have expressed strong interest in the IAEA contributing to the re-evaluation of the light element cross section standards through this CRP mechanism. The objectives are:

- Improve the methodology for the evaluation of the covariance matrix of uncertainty in the R-matrix model fits.
- Produce R-matrix evaluations of important light element standards.

### 4.2 Evaluated Nuclear Data for the Thorium-Uranium Fuel Cycle

A number of programmes of the IAEA Nuclear Energy Department are aimed at investigating the operational parameters of systems based on Th-U fuel cycle. A Consultants' Meeting held in 1999 concluded that a significant fraction of the uncertainties in the prediction of such parameters is related to uncertainties in the nuclear data. The objectives are:

- Update the nuclear data relevant to systems utilizing the Th-U fuel cycle.
- Identify in more detail the variances in nuclear data that are responsible for the discrepancies observed in the calculated parameters of Th-U fuel cycle systems.

### 4.3 Update of Decay Data for Actinides

Actinide nuclides and their decay chains need to be well characterised and their decay parameters quantified with high confidence. A previous CRP from 1978 to 1986 addressed this issue directly, and provided the catalyst for a series of new measurements that continued well into the 1990s. All of this new work and earlier data need to be compiled and evaluated to produce an updated set of recommended decay data to replace the current IAEA data base (of 1985/86). The objectives are:

- Evaluate decay data for specific actinides and major decay chain nuclides.
- Prepare a library of direct use throughout the nuclear industry and for a number of non-nuclear applications.

### 4.4 Development of nuclear data libraries for the design of advanced fission systems

Recent worldwide initiative to address innovative designs of nuclear power systems requires extensive and accurate nuclear data for materials, to which little attention has been devoted in the past. With new, evaluated nuclear data files becoming available, the need arises to process these data into libraries compatible with designers' computational tools. The objectives are:

- Compile a library of selected evaluated nuclear data files and to generate application libraries for most commonly used code systems.

## **5. Topics Proposed for Future WPEC Subgroup Activities**

### **5.1 Intercomparison and benchmarking of selected materials from newly released libraries:**

With the last release of ENDF/B-VI Rev.8 frozen and with announced releases of JENDL-3.3 and CENDL-3 shortly, the next US library ENDF/B-VII will not be released before 2005. National projects will be responsible for benchmarking their own libraries. Co-ordination of such activities would be desirable to ensure that analysis methods are comparable. Thus, intercomparison of results would be simplified and duplication of work avoided. It would also provide feedback to the evaluators and stimulate communication to resolve problems with a consensus that is acceptable to all national projects, consequently leading to the convergence of evaluations.

### **5.2 Formats for the archival of PENDF and GENDF files:**

Basic evaluated nuclear data files are stored in compact format allowed by ENDF format rules and are not directly usable in applications. Partly processed files were well received by the users (e.g. POINT200 libraries). The interest justifies the suggestion to formalise adopted conventions for storing data at different temperatures, group-averaged data and self-shielded cross sections with minimal changes to existing format rules. The extensions could be limited to derived files, but they should have formally "reserved" format specifications to avoid any future conflicts. The advantage of the "minimum change" approach is to retain compatibility with existing ENDF retrieval and display software.

