



Status of the JEFF Project

June 1998

(1) Introduction

The Joint Evaluated File Project (JEF), supported by the NEA Data Bank member countries, has entered its third phase, the development of an evaluated nuclear data library for the next century.

The JEF project has traditionally worked in close co-operation with the European Fusion File (EFF) project, which is partly sponsored by the Fusion Programme of the European Union. It had been decided to further strengthen the ties through the release of the joint file. Hence the new library will be called JEFF-3 (Joint Evaluated Fission and Fusion File) indicating a combination of the former JEF and EFF projects.

(2) Status of the current JEF and EFF libraries

In parallel to the activities related to the preparation of the new JEFF-3 file, efforts are continuing to complete the final summary documentation for the current versions of the libraries, JEF-2.2 and EFF-2.4. Both files have been well received by the nuclear community in Europe. The JEF-2.2 file is used by the European Industry and by research establishments. The EFF-2.4 file is used by the NET / ITER team at Garching and at various European laboratories.

Extensive benchmarking documentation for all applications is ready or near completion. All benchmark reports will be ready by the end of 1998 or early 1999. Although the performance of the JEF/EFF files is quite good, meaning that for many applications adjustments are not needed, the benchmark results include useful indications on trends important for industry applications and further improvements.

All working documents from the JEF projects (JEF-DOC-xxx) have been scanned into electronic form (PDF), and are now available to members of the JEF/EFF working groups via the NEA web site. A similar digitisation has recently been completed for the EFF documents (EFF-Doc-xxx), which will become available on-line within one month.

Version 2.0 of the JEF-PC visualisation program has been released. This gives easy access to data cross-section data, radioactive decay data and fission yields data from the JEF-2.2 library. In addition to a range of new features, this new version permits comparison of JEF-2.2 cross sections with those from all the other major evaluated libraries, including EFF-2.4 and EAF-97, as well as experimental data from the EXFOR database. It is expected that work will commence on version 3.0 at the end of 1998, with release scheduled for the end of 1999.

(3) Why JEFF-3 ?

There are a number of applications for which further improvements are desirable. A number of examples are given:

For Pu-recycling in new thermal or fast reactors improved data on higher Pu isotopes and minor actinides are needed.

This is even more so for future ADS development. In that case, data for the thorium cycle (^{233}U , ^{232}Th , ^{231}Pa) and lead are also required. For lead, quite some work has already been made for the fusion file. For long-lived fission product transmutation better data on ^{99}Tc and ^{129}I are needed.

Improvements could be made on the resonance capture of ^{235}U , important for thermal reactors.

During the last few years important progress has been made in the evaluation of Fe cross sections important to shielding, fast reactors, fusion reactors and ADS. Similar improvements could be made for Ni and Cr.



A re-assessment of fission-product reactivity uncertainties has to be made by comparing recent data files and by making corrections to individual nuclides.

For fusion applications, ${}^7\text{Li}$ and ${}^9\text{Be}$ evaluations need further improvements.

The increased use of burnable poisons leads to high requirements on the absorber cross sections.

In general, improvements are required to enable better and more reliable calculation of the heat deposition (KERMA). Also, a requirement for future libraries will be the inclusion of reliable uncertainty information. Finally, not only cross section data are needed, but also improved yield and decay data libraries. Other special features required are extended activation libraries and intermediate energy data.

(4) Organisation of the JEFF-3 Project

The JEFF-3 project is structured as follows:

The JEF Scientific Co-ordination Group (SCG) has overall responsibility for all major project management decisions related to the JEF project. The members of this group are nominated by country representatives on the Executive Group of the Nuclear Science Committee, and also include representatives from the EFF Monitor Group. The SCG normally meets once per year to review progress and to plan future developments.

The NEA Data Bank secretariat provides services in assembly, QA, maintenance, and distribution of the library and associated documentation.

There are six working groups composed of scientists from member countries actively involved in contributing to the JEF and EFF projects. Feedback on evaluations and benchmark testing are provided at the biannual meetings of these working groups. The six groups are:

- Evaluation / benchmark testing
- Decay data and fission yield data
- Fusion data (EFF, including also structural materials)
- Fission product cross sections
- Intermediate energy data
- NJOY user group

The JEF working groups enjoy a close co-operation with the Working Party on Evaluation Co-operation and the Working Party on Measurements Activities. Experimental data are provided by IRMM Geel and other laboratories.

(5) Status of JEFF-3

In 1997, a detailed survey of candidate evaluations for the JEFF-3 starter file was carried out, and a list of recommendations was prepared. In general, adoption of new evaluations was only recommended in cases where a need for improvement had been clearly demonstrated. This conservative approach was chosen to ensure that, by retaining the best parts of the existing libraries, the large effort devoted to the validation of JEF-2.2 and EFF-2.4 was not wasted.

Quality Assurance procedures for the assembly and maintenance of the JEFF-3 library were developed and implemented at the NEA Data Bank. The decision was taken by the EFF project to offer the comprehensive activation file EAF-97 as a special-purpose annex of JEFF-3, and work continued to extend some evaluations to higher energies.

The UKFY-3.0 file has been offered as a JEFF-3 fission yields library, and some 20 nuclides important for fission and fusion applications have been evaluated for the radioactive decay data library, together with some evaluations for heavy element and actinide decay data schemes.



Compilation of the JEFF-3 General Purpose Library starter file, at the NEA Data Bank, is in progress. About 90% of the evaluations have been loaded into the database, and run through the standard ENDF checking codes. Work continues to load the remainder of the recommended evaluation, but in some cases these data have not yet become available (e.g. evaluations from the JENDL Fusion File). During the assembly and testing phase of the new library, other new evaluations may be completed and become available, thus yielding further changes and improvements: some of these will come from the EFF project, an important condition being the continued support of the Fusion Program of the EU. Also, final decisions have yet to be made on fission-products, absorbers, and Cm isotopes. For 24 fission products, detailed comparisons will be made between JEF-2.2 and other evaluations. It is therefore important to remember that significant changes are still expected in the contents of the starter file prior to any releases for testing.

Priority is now being given to the analysis of the output from the ENDF checking codes, in order to identify deficiencies in the file, and ascertain the overall state of the starter file. A status report on the starter file will then be presented at the next JEFF meeting in September.

(6) Planning

Assuming a release of the first version of the JEFF-3 General Purpose starter file in the final quarter of 1998, benchmark testing of the file may lead to feedback in early 1999. Further improvements and benchmarking should then take place in 1999/2000. Final benchmarking should follow, with an official release of the JEFF-3 General Purpose Library in 2001 or 2002. It is possible that selected individual evaluations could be released earlier for several applications.

Implementation of a Quality Management System for the JEFF-3 Radioactive Decay data library and the JEFF-3 Fission Yield data library, at the NEA Data Bank, is expected to commence at the end of 1998. Assembly of the starter files will then begin in early 1999.

(7) Manpower

There is some concern regarding the manpower situation at the NEA Data Bank, which is adversely affected by regular staff turnover. During this critical phase of the project, where the demands on the NEA secretariat are high, it is crucial that sufficient resources should be made available to complete the work in a timely manner. Likewise, concern has been expressed regarding the falling number of available experimentalists and evaluators in the European laboratories. Training opportunities and the creation of postdoctoral positions are needed to ensure that goals are achieved. New initiatives and support for industry are urgently required.

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