

PROGRESS REPORT FROM THE OECD/NEA DATA BANK

For the NRDC meeting, Obninsk, Russia

22-25 September 2008

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General overview

The NEA will celebrate its 50th anniversary in October; the Secretary General of the OECD and the Director General of the IAEA will participate. The first issue of “Nuclear Energy Outlook” will be published for this occasion. The NEA, which is already the technical secretariat for Generation IV International Forum (GIF), will provide the same services to the Multinational Design Evaluation Programme (MDEP). MDEP aims at developing a common approach to safety criteria for future reactors and to streamline licensing worldwide. New staff members at the Data Bank include Roopa Chauhan (assistant to the head of the Data Bank) and Mireille Defranceschi (TDB project leader) replacing Federico Mompean.

Several staff members of the Data Bank are in 2009 coming to the end of their contracts, or reaching retirement, such as I. Kodeli, E. Sartori, H. Henriksson, Y. Rugama, P. Nagel and C. Morris.

Nuclear data services

Experimental (EXFOR) data compilations

The Data Bank is compiling and exchanging experimental neutron and charged particle induced data, as one of the nuclear data centres in the NRDC network coordinated by the IAEA.

In 2007, 82 new and 137 corrected neutron-induced data sets were entered into the EXFOR database. The number of new entries of charged-particle induced data was 114 new entries and 22 corrected data sets. The compilation effort in 2008 is well underway with several new and corrected experimental data sets. The emphasis has recently been on corrections, as this is strongly linked to recent activities in WPEC subgroup 30 on EXFOR's quality (see below).

Bibliographic (CINDA) data

The Data Bank has, together with the IAEA, revised the entire CINDA database covering bibliographic neutron, photonuclear and charged particle data. CINDA is mainly updated with information from EXFOR regarding experimental data, but bibliographic information on theoretical work and nuclear data evaluations are also included, mainly in the NEA member countries. Several formatting mistakes and incoherencies with the EXFOR database have been discovered and a process of correcting both CINDA and EXFOR is in progress.

Several references to theoretical work and nuclear evaluations in the Data Bank member countries are to be included in 2008. References to experimental data from all countries are taken from EXFOR.

Status of the JEFF project

A revised version of the Joint Evaluated Fission and Fusion (JEFF) radioactive decay data library, JEFF-3.1.1/RDD, was released in November 2007 and is available on the NEA website. A full report on the decay data library is planned for publication in 2008. A complete validation report of JEFF-3.1 is being prepared at the moment. The outline of the report covers: 1) thermal systems, 2) fast systems, 3) fuel cycle, storage and reprocessing, 4) fusion systems and 5) other applications.

The Data Bank also offers a set of processed libraries based on JEFF-3.1 to assist scientists wanting to use JEFF-3.1 in application calculations, such as group cross-section and Monte Carlo libraries. Experts from the JEFF project are investigating the possibility of developing new processing tools; the first phases are already underway and the progress made thus far is promising. An emphasis has been placed on updating the NJOY extensions required for JEFF processing. NJOY user meetings are regularly held in conjunction with the JEFF meetings. The last meeting was held in November 2007, and the next is planned to be held 21 November.

In 2007, feedback to the JEFF library (JEFF-3.1) was collected and several new evaluations are being considered for future releases. The feedback web pages make user comments available to evaluators. New and reviewed evaluations are also made available for JEFF working group members. Although the results from JEFF-3.1 results are encouraging, it has been noted that a number of key isotopes could be further improved. The objective is to develop and issue an updated and extended version, which will be called JEFF-3.2, in 2009-2010 along with the corresponding documentation.

Specific neutron evaluations that will be renewed and/or updated are given below:

- Revise and validate $^{235,238}\text{U}$ to solve remaining deficiencies, especially for fast reactor systems of highly-enriched uranium.
- A new evaluation for ^{239}Pu to improve the analysis of MOX systems. One has already been proposed and a preliminary file is available from the JEFF-3.2 β website for the JEFF working group.
- New evaluations of Cr, Mn, Ta and W isotopes are required for the European Fusion File (EFF) project. The tungsten evaluation has already been examined and compared to other new tungsten evaluations available.
- Revised evaluations of Pb, Bi and Am using recent measurements from IRMM, Geel, and the optical model code TALYS. Several Pb and Bi evaluations are already available from NRG for the JEFF working group.
- A new evaluation for ^{232}Th , ^{233}Pa based on TOF and IRMM measurements.
- New evaluations for ^2H , ^{16}O , ^{56}Fe , ^{151}Sm , ^{237}Np , Zr and Hf isotopes (many have already been prepared by the CEA).

Web services to nuclear data users

The main Web pages regarding Nuclear Data have evolved to better adapt to users' needs and be more accessible to both experts in the field and laymen (see Fig. 1), e.g. work related to the processing of nuclear data collected can be found on: www.nea.fr/html/dbdata/process. Other nuclear data services are provided through direct on-line access to the different databases (CINDA, EXFOR and EVA).

In 2007 and early 2008, the evaluated nuclear data libraries IRDF-2002, International Standards 2006, PADF-2007, UKHEDD-2.6, UKPADD-6.8 and JEFF-3.1.1/RDD were added to the EVA database. There has been a dramatic increase in the EVA-JEFF-JANIS area's access and traffic, see Table 1. The other online services are relatively stable.

The screenshot shows the NEA Nuclear Data Services web page. The header includes the NEA logo and the text 'Agence pour l'énergie nucléaire / Nuclear Energy Agency'. Below the header is a navigation bar with links for Home, About Us, Work Areas, Data Bank, Publications, Press Room, and Search. The main content area is titled 'Nuclear Data Services' and contains a paragraph about the NEA's goal, a bulleted list of activities, and a list of databases (EVA, EXFOR, CINDA). A right-hand sidebar contains three sections: 'Projects' (with links to Nuclear data, JEFF project, WPEC, HPR, and NRDC), 'Software' (with a 'Janis' logo and a link to JANIS-3.0), and 'Services and Resources' (with links to Databases - EVA, EXFOR, CINDA; Publications; and Processing data).

Fig. 1. The nuclear data web page of the NEA (www.nea.fr/html/dbdata/) with short links on the right-hand side to main activities (such as the JEFF project), software development (JANIS-3) and services and resources (databases related to nuclear data, publications and information on the processing of evaluated nuclear data libraries).

Table 1. Web retrievals (number of accesses) 2006 from the NEA Data Bank. (Note, JEFF documents are password protected)

Web page	2007	2006
EVA searches	7 410	8 017
EVA downloads	227 313	56 150
JEFF documents*	148 365	30 242
EXFOR searches	10 712	11 563
EXFOR downloads	22 761	18 698
JANIS	486 247	361 770
CINDA	1 852	1 388
Other web pages at the Data Bank	165 602	139 471

The JANIS software

The third version of JANIS was released in June 2007. Several improvements were included, for example, the inclusion of the EXFOR database in its original format, the customisation of plots and extended possibilities to access tabular data in EXFOR. Now, it is also possible to save plots in vectorial formats (e.g. EMF/WMF). An update, JANIS-3.0.1, was made available in February 2008 with a few corrections related to the handling of the ENDF and EXFOR formats and improvements, such as viewing calculation results as a table and using the nuclide chart browser with user's inputs. The popularity of the program has increased steadily and is now also being used in many university courses around the world as an easy introduction to nuclear data manipulation. The number of JANIS users is growing. They are now making over 35 000 accesses per month to the NEA on-line databases, see Fig. 2. The users are mainly requesting the databases JEFF-3.1 and ENDF/B-VII.0, followed by experimental data in EXFOR and ENDF/B-VI.8 as shown in Fig. 3. More than half of the requests are for neutron-induced data, and a third of the requests concern decay data. The requests for specific data types are shown in Fig.4. Users request JANIS mainly for fission applications, but also for basic research and educational purposes.

The work on a JANIS web application with minimum client side requirements (an Internet connection and a web browser) is under way, as well as the integration of JANIS as a tool for the NRDC in verifying and testing EXFOR and CINDA data. The next release will also place an emphasis on the ENDF format coverage by implementing views of covariance data and photon interaction data. The program is free of charge and can be downloaded or launched using 'JAVA Web Start' from the JANIS home page at <http://www.nea.fr/janis>, where the complete manual can be found as well. A DVD with JANIS and the most important nuclear data libraries can also be requested from the NEA.

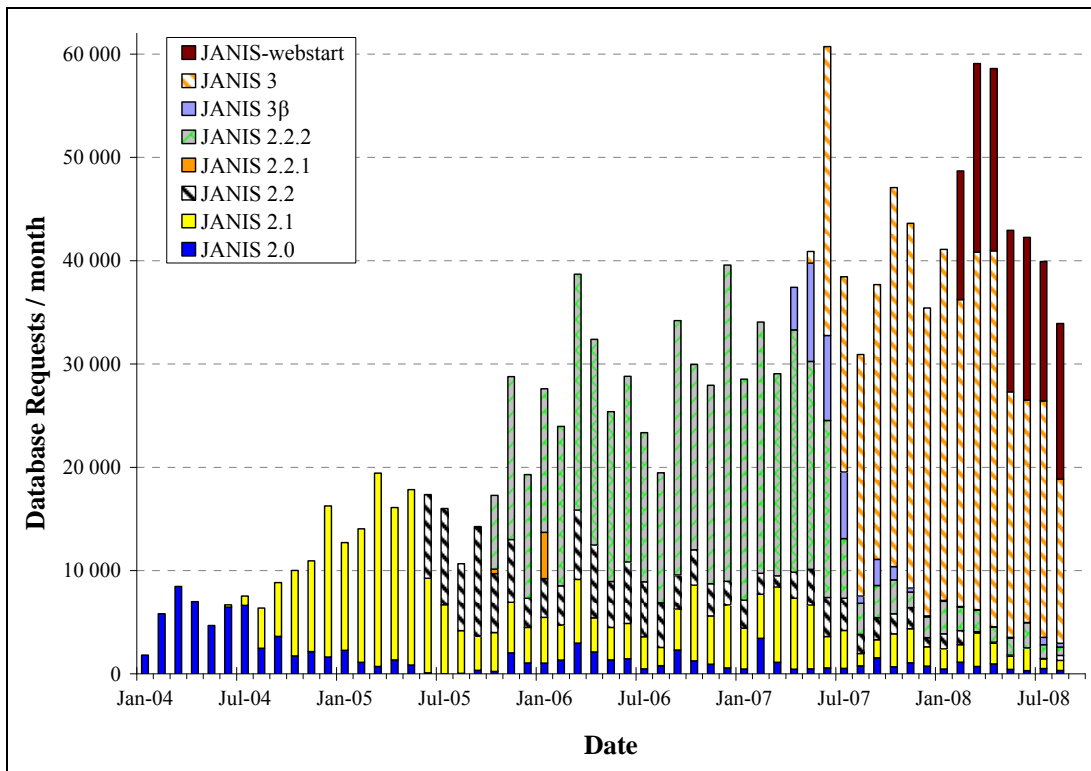


Fig. 2. Number of accesses to the JANIS database per month since the JANIS-2 release in 2004. Since February 2008, users launching JANIS from the web (webstart) will be directed to the latest version of the software automatically (not necessarily released on DVD).

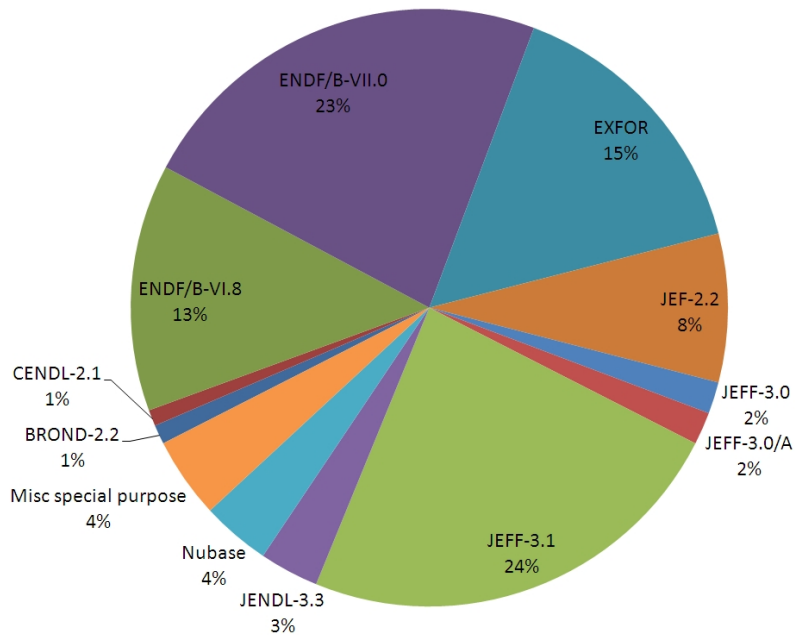


Fig. 3. Requested databases in JANIS for 2007-2008.

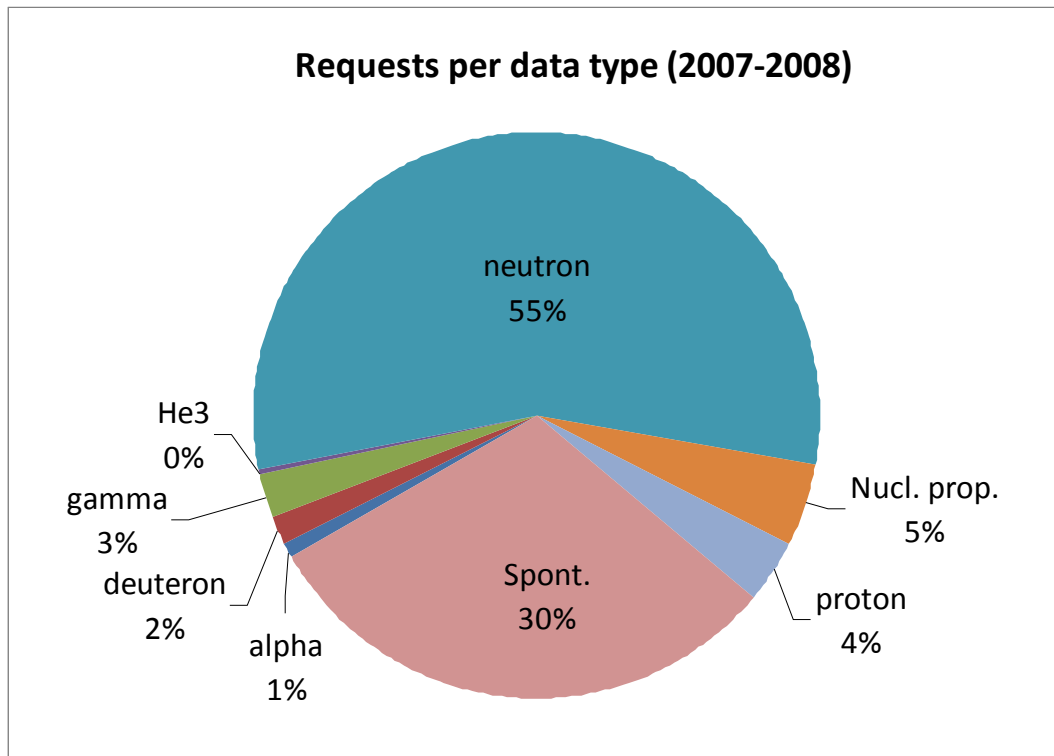


Fig. 4. Users' requests since 2007, divided by the various data types.

The Databank is closely linked to the activities in the NSC Working Party on International Nuclear Data Evaluation Co-operation (WPEC). One publication (Vol. 25) was issued in 2007 on the *Assessment of Fission Product Decay Data for Decay Heat Calculations*, and Vol. 26 on *Uncertainty and Target Accuracy Assessment for Innovative Systems Using Recent Covariance Data Evaluations* was recently published (Aug 2008). Two new WPEC activities were started in 2007, one on ^{235}U Capture Cross-Section in the keV to MeV Energy Region (subgroup 29), and the other on *Improvement of Accessibility and Quality of the EXFOR Database* (subgroup 30). Two more activities were proposed in 2008 and are about to start:

- WPEC Subgroup 31: *Meeting Nuclear Data Needs for Advanced Reactor Systems*, with the co-ordinator H. Harada,
- WPEC Subgroup 32: *Unresolved resonance treatment for cross section and covariance representation*, with the co-ordinator L. Leal.

A long-term activity within WPEC is the High Priority Request List (HPRL), containing specific nuclear data requests from data users. The content is reviewed on a regular basis by external referees. At the moment, HPRL contains ten general and 32 high priority requests, of which over twenty requests were proposed by the WPEC Subgroup 26.

Computer program services

During 2007, a total of 94 codes were acquired and 54 were tested, of which 25 originated from non-OECD countries. Also 19 new or revised compilations of integral measurements were included in the databases SINBAD (Shielding Integral Benchmark and Database), IFPE (International Fuel Performance Experiments) and IRPhE (International Reactor Physics Experiments). About 3,800 codes and benchmark experiments were distributed in 2007; about 50 % of these were integral experiment packages. In total, 360 packages were distributed to 26 non-OECD member states and the IAEA in 2007. Several training courses have been carried out, and are planned, concerning computer codes such as PENELOPE, TRIPOLI and MCNP5/MCNPX.

Several legacy books important in radiation transport and reactor physics for which publishers reverted the copyrights to the authors have been made available and distributed to over 1,000 audiences at 43 establishments, mainly to students. A collaboration with the International Nuclear Information System (INIS) of the IAEA has been reinforced to increase visibility of results from work carried out at NEA.

Thermochemical data (the TDB project)

There are now ten volumes in the series of reviews in the Thermochemical Database (TDB) project since the beginning. The book “*Chemical Thermodynamics of Solid Solutions of interest in Nuclear Waste Management*” was published in August 2007. The work in phase III of the TDB project, which was officially finalised in February 2008, will continue in phase IV with the publication of iron (stage 1), tin and thorium. Phase IV of the TDB project started in February 2008 and will carry on with a review on iron (stage 2) and auxiliary data.

Other database projects maintained by the Data Bank

SCAP: OECD Stress Corrosion Cracking (SCC) and Cable Aging Project

In support of the NEA Nuclear Safety Division, a third server-side database and web-based interface, SCAP, was developed and opened in October 2007. The first one was OPDE, developed in 2005, and the second one, FIRE, in 2006. The development of SCAP has been shortened by reusing the common parts defined by OPDE and FIRE applications.

DICE: Database for the International Handbook of Evaluated Criticality Safety Benchmark Experiments (Support to the Nuclear Science section). A new web interface for data entry has been developed. This new interface allows users to edit or view more data on the same screen (all cases of a given evaluation), speeding up data entry and allowing eye-checking of data consistency between cases.

ISOE: Information System on Occupational Exposure (Support to Radiation Protection)

The second phase of the project involving the development of a data entry web interface, was

carried out. The possibility of creating a Microsoft-Access database from the master Oracle database content was added. The testing phase initially planned in summer 2007 was postponed to spring 2008.

Below are some other projects listed, where the NEA Data Bank carries out the development of the services:

- *GIF Generation Four International Forum collaborative web server*
- *NEA Publications data base*
- *NEA Contacts database*
- *SFCOMPO Database of Spent Fuel Composition*
- *TDB Chemical Thermodynamics Database*
- *FIRE OECD Fire Incidents Records Exchange*
- *OPDE OECD Piping Failure Data Exchange*
- *STRESA Storage of Thermal Reactor Safety Analysis data: no change*
- *RBO Database for the Uranium resources (Red Book)*
- *BBO Database for the Nuclear Electricity statistics (Brown Book)*

LIST OF DATA BANK PUBLICATIONS

Publications in 2007

- International Handbook of Evaluated Reactor Physics Benchmark Experiments (IRPhE), Second Edition (DVD)
- Nuclear Program Abstracts (November 2007) (CD-ROM)
- CINDA 2006 The Comprehensive Index to Nuclear Reaction Data (Archive 1935-2006), seven volumes.
- International Evaluation Co-operation: Vol. 25: *Assessment of Fission Product Decay Data for Decay Heat Calculations*
- Chemical thermodynamics of solid solutions of interest in nuclear waste management

Publications in 2008 and planned for 2009

- International Evaluation Co-operation: Vol. 26: *Uncertainty and Target Accuracy Assessment for Innovative Systems Using Recent Covariance Data Evaluations*
- International Handbook of Evaluated Reactor Physics Benchmark Experiments (IRPhE) Third and Fourth Editions
- 2008 Editions of Computer Program Abstracts (CD-ROM)
- PENELOPE-2008 Report on electron-photon transport
- Documentation of the JEFF-3.1 Radioactive and Decay Data Library (JEFF Report 20)
- JEFF-3.1 Library Benchmarking and validation (JEFF Report 22)
- Radiation Transport Handbook
- Chemical Thermodynamics of Thorium
- Chemical Thermodynamics of Tin
- Chemical Thermodynamics of Iron (Stage I)
- New Editions of Computer Program Abstracts (CD-ROM))

- Proceedings of the 8th meeting on Shielding Aspects of Accelerators, Targets and Irradiation Facilities (SATIF-8)
- One edition of the nuclear program abstracts on CD-ROM was issued in November 2007 for distribution to 'liaison officers'.
- During 2007, four electronic newsletters were issued covering announcements of new computer codes, computer code specific and project oriented data libraries, integral experiments, training courses, workshops and meetings.
- In 2008, **The Data Bank e-newsletter**, with coverage of all Data Bank activities (including computer program services) was initiated. Two issues have been sent out to over 1200 recipients.

List of recently held training courses and workshops with participation of the Data Bank

- 26 November 2007, NJOY User Group Meeting, Issy-les-Moulineaux.
- 30 January - 1 February 2008, Course on Analytical Benchmarks (Case Studies in Neutron Transport Theory).
- 25-29 February 2008, Sensitivity and Uncertainty Analysis Training Course using SCALE TSUNAMI, Issy-les-Moulineaux.
- 7-11 April 2008, Training course on the Monte Carlo code TRIPOLI-4.
- 12-16 May 2008, Introductory/intermediate MCNP/MCNPX training course, Lisbon.
- 2-6 June 2008, REFIT-2007 Training course, EC-JRC-IRMM, Geel.
- 1-12 September 2008, Training course on EXperiment, Theory and Evaluation of Nuclear Data (EXTEND), Budapest.