

PROGRESS REPORT FROM THE OECD/NEA DATA BANK

At the NRDC meeting at IAEA, Vienna, Austria

12 - 14 October 2005

NEA Web page: www.nea.fr

Contact: db@nea.fr

General

The Data Bank's primary role is to provide scientists in member countries with reliable nuclear data and computer programs for use in different nuclear applications. The services include also thermochemical data for radioactive waste management applications. The Data Bank organises seminars and workshops to present information on computer programs or groups of programs that are considered to be of special interest to users. Training courses on widely used computer programs are organised a few times a year to ensure a correct and effective use of these programs.

The Data Bank member countries are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Japan, Republic of Korea, Mexico, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, and United Kingdom. Users of the Data Bank services include governmental research institutes, industry and universities.

By arrangement with IAEA, the Data Bank computer program service covers both Data Bank countries and member states of IAEA, except USA and Canada where a separate agreement covers nuclear data and computer program exchanges.

The NEA Data Bank also maintains a close cooperation with the NEA Nuclear Science Section, which provides useful feedback on the performance of computer programs and nuclear data through a number of benchmark studies, especially in the areas of reactor and fuel cycle physics, criticality safety, and radiation shielding.

Organisation

Total number of full time staff in the NEA Data Bank is 19. This is divided into 9 professional staff and 10 support staff. However, only 8 professional and 7 support staff members work directly with the Data Bank services (see Fig. 1). The remaining staff is allocated to work in other parts of the NEA.

Thierry Dujardin is Director for **Science and Development** with Claes Nordborg below him as head of the **Nuclear Science** Section, while the post as head of the NEA **Data Bank** is presently vacant. Within the Data Bank, Enrico Sartori is responsible for the **Computer Codes and Benchmarks** together with Juan Galan and Ivo Kodeli (employed by the IAEA). Hans Henriksson and Yolanda Rugama are responsible for the **Nuclear Data Services**. The **in-house computer system** is taken care of by Pierre Nagel. Finally, Federico Mompean is responsible for the **thermochemical data project**. Both Byung-Chan Na and Enrico Sartori work part-time for the Nuclear Science Section, whereas Federico Mompean work full time on data for radioactive waste management applications.

The total annual budget of the Data Bank is about 3.5 million Euros. The Data Bank provides expertise to other parts of the NEA, for example to the Radioactive Waste Management Division and to the Nuclear Science Section. These services are paid by the NEA main budget, leaving an annual budget for the Data Bank scientific services of about 2.7 million Euros.

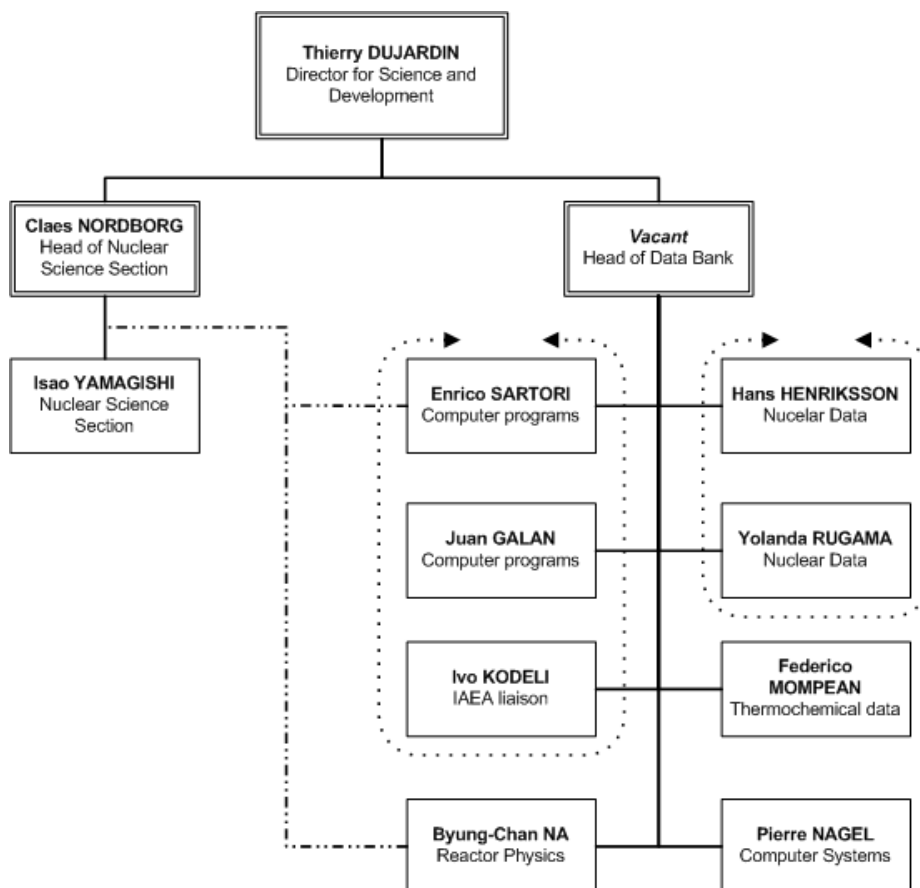


Figure 1 The NEA Data Bank organisation chart

Nuclear Data Services

The nuclear data services are mainly provided through direct on-line access to the CINDA, EXFOR and EVA databases containing bibliographic, experimental and evaluated nuclear data respectively. Access to all the databases is open. The number of retrievals from the NEA Web pages is between 700-1200 requests/month for EXFOR and CINDA, and about the same for evaluated data libraries in the EVA database. Lately, the display of data, directly from Web retrieval, has been upgraded and a test version is now accessible. This online plotting facility is linked to and performed in JANIS, the data display program that has been developed at the NEA.

In addition to these on-line services, the Data Bank also answers specific requests from customers. This concerns normally requests for very large datasets, which are too large for direct Internet download. The very large datasets are normally distributed on CD-ROM or DVD. Providing advice to nuclear data users is another important part of the nuclear data services.

EXFOR and CINDA

More than 100 new neutron reaction experiments and almost 500 charged particle experiments have been entered by the Data Bank into the EXFOR database since the beginning of 2004 (see Table 1). The database is updated continuously and the delay between article publication and inclusion in EXFOR has been reduced.

Table 1 EXFOR compilations from the NEA area 2 and area 0 during 2004-2005

| EXFOR works compiled for area 2 and area 0 | | | |
|--|--------------|-------------|-----|
| AREA 2 | Trans | No of works | |
| 2004 | 2163 | 13 | |
| | 2164 | 4 | |
| | 2165 | 20 | |
| | 2166 | 6 | |
| | 2167 | 14 | 57 |
| 2005 | 2168 | 7 | |
| | 2169 | 20 | |
| | 2170 | 8 | |
| | 2171 | 5 | |
| | 2172 | 8 | 48 |
| | Total | 105 | |
| AREA O | Trans | No of works | |
| 2004 | o015 | 68 | |
| | o016 | 99 | |
| | o017 | 106 | |
| | o018 | 12 | |
| | o019 | 101 | |
| | o020 | 4 | |
| | o021 | 25 | 415 |
| 2005 | o022 | 34 | |
| | o023 | 38 | 72 |
| | Total | 487 | |
| Grand total | | 592 | |

The CINDA database has been subject to a major extension thanks to a new format and the translation of the EXFOR database so that CINDA now also includes charged particle data. At the NEA, the new CINDA format, CINDA2001, has been adopted in a local database. The CINDA data from Area 2 has been converted and was sent to NDS in Vienna for the final CINDA master version. The new database contains over 150 000 lines of references separated into about 60 000 blocks, only for Area 2.

The CINDA database is available at the NEA both on DVD, together with JANIS, and on-line through the Web. Due to the extension of CINDA to include charged particle data, the NEA has decided to produce the CINDA Book. This archive version will be printed early 2006, pending decisions at the NRDC meeting 2005.

Data display tools: JANIS

The nuclear data display software, JANIS (Java Nuclear Information System), developed at the NEA Data Bank, has been available for all interested users free of charge since its first release in 2001. JANIS accesses locally stored data as well as remote data of most evaluated data libraries together with the

EXFOR and CINDA databases on the NEA server. JANIS was presented at the last two International Nuclear Data conferences (ND2001 in Tsukuba, Japan and ND2004 in Santa Fe, USA), as well as at various nuclear data workshops, such as the International Workshop on “Nuclear Data Needs for Generation IV Nuclear Energy Systems” in Antwerp, Belgium, April 5-7, 2005.

JANIS comprises a number of functionalities. The main browser window shows the nuclide chart where basic isotope data can be shown, from NUBASE or overall information of an isotope from evaluated data libraries. Data from the main evaluated libraries, ENDF/B, JEFF, JENDL, BROND etc. as well as the EXFOR database can be displayed and inter-compared. The CINDA database is also included and made searchable in JANIS. The formats supported are ENDF-6 (along with the linearised pointwise option PENDF and the group-wise option GENDF) and the computational format derived from EXFOR. An example is shown in Fig 2 on how JANIS displays data on the total cross section of ^{99}Tc from JEFF-3.1 and where the user has compared the results with JEFF-3.0 as well as with a set of data form EXFOR.

A variety of output formats exist in JANIS. For the graphical display, the PS/EPS and PNG formats are possible, and tabular data can be stored in CSV format (Comma Separated Values) for further use in other software (e.g. MS Excel).

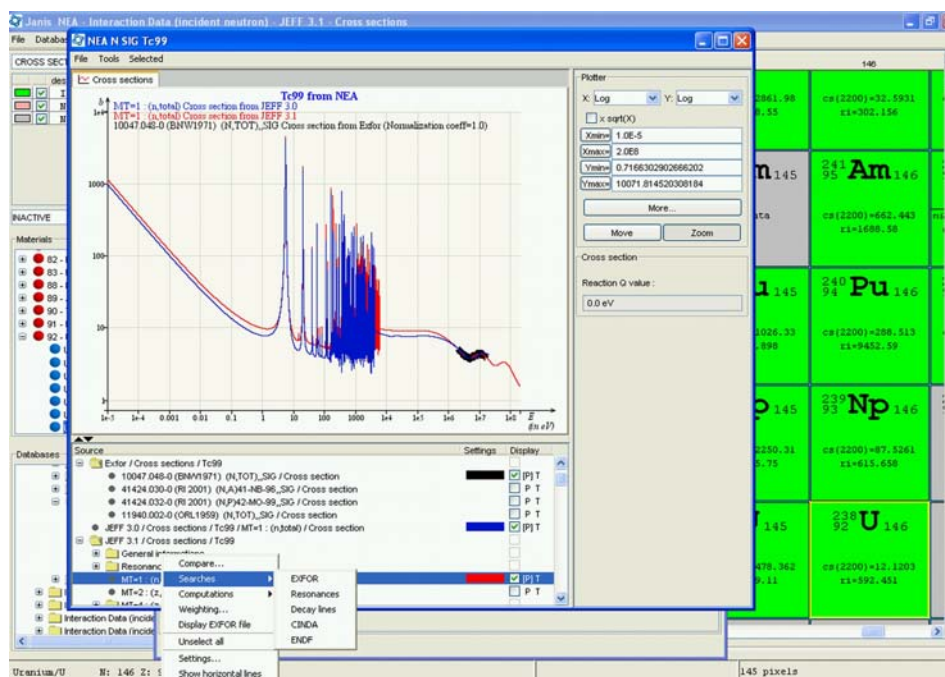


Figure 2. JANIS plot window with the 'Chart of Nuclides' window in the background. The total cross section of ^{99}Tc in JEFF-3.0 and JEFF-3.1 is plotted and compared with EXFOR data.

The latest version of JANIS (JANIS-2.2) was released in May 2005. The program is free of charge and can be downloaded or launched using 'JAVA Web Start' from the JANIS home page: <http://www.nea.fr/janis>, where the complete manual can be found as well. Recently, a test version of JANIS is launched when retrieving data from EXFOR or evaluated data libraries on the NEA Web page, see e.g. <http://www.nea.fr/html/dbdata/x4/x4retbeg-H2.html> for EXFOR retrievals. Feedback is appreciated and can be posted at janisinfo@nea.fr.

The Joint Evaluated Fission and Fusion (JEFF) Project and JEFF-3.1

The JEFF-3.1 Nuclear Data Library is the latest version of the Joint Evaluated Fission and Fusion Library. The full picture of the evolution of the JEFF project is presented in Fig. 3. The complete suite of data was released in May 2005, and contains general purpose nuclear data evaluations compiled at the OECD Nuclear Energy Agency (NEA) Data Bank in co-operation with several laboratories in the Data Bank member countries. Within the framework of the JEFF-3 project, the JEFF Working Group on Radioactive Data and Fission Yields decided to produce improved versions of the decay-data and fission-yield libraries with a release in conjunction with the JEFF library. Activation data has also been included in the latest version.

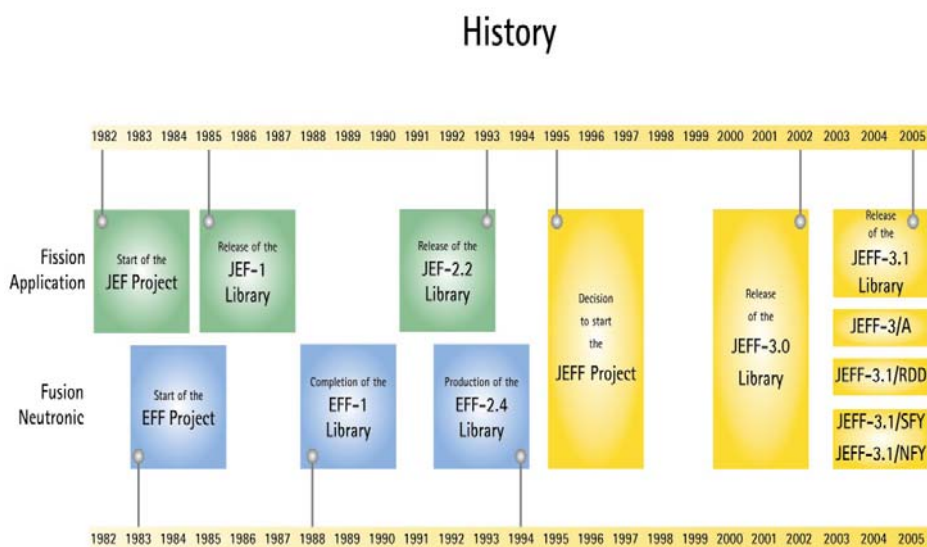


Figure 3. JEFF history from the start with the two fission and fusion projects JEF and EFF in the 1980s up to the release of JEFF-3.1 in May 2005.

JEFF-3.1 combines the efforts of the JEFF and EFF/EAF Working Groups who have contributed to this combined fission and fusion file. The neutron data library covers 381 isotopes or elements, which is an increase from 340 in JEFF-3.0. There are 26 isotopes in the proton data library, and 9 materials are covered in the thermal scattering law file. A great achievement was to include covariance data for many isotopes in the neutron data library. All actinides have now extended information on delayed neutron data in that they all are presented in eight-group formalism. The special purpose library on activation data contains 774 target nuclei with over 12600 neutron induced reactions. Included is also radioactive decay data with about 3852 isotopes and spontaneous and neutron induced fission yield data. Processed data for MC applications will be made available later on as well as full documentation of JEFF-3.1. The data can be downloaded from the NEA web site, www.nea.fr/html/dbdata/JEFF, and CDs are distributed on request.

The NEA High Priority Request List (HPRL)

The NEA Data Bank is responsible for the HPRL, which is a collection of requests to provide targets for the improvement of nuclear data, primarily for application in the nuclear industry through the evaluated data projects, and is a compilation of the highest priority nuclear data requirements. The purpose of the list is to provide a guide for those planning measurement, nuclear theory and evaluation programmes. The HPRL is a place where data users meet data producers.

The HPRL is in a stage of renewal. A totally new list is going to be presented in the autumn of 2005, and each year there will be a review of the requests by external referees coordinated by the subgroup C of the OECD NEA Nuclear Science Committee's Working Parties on International Evaluation Co-operation (WPEC). This group consists of both data users and producers from industry, representing Europe, Japan, Russia and USA.

The NEA is at the moment collecting new requests for experimental nuclear data. The requests are divided in high priority ones, where a quantitative justification is needed, and general requests where a more qualitative justification is sufficient. All requests need to be tied to a certain project including a project life span, that is to be stated. The list will be maintained by the NEA Data Bank and is presented on the NEA home page: <http://www.nea.fr/html/dbdata/hprl/>

Data from Integral Experiments

The Data Bank and the NEA Nuclear Science division work closely together on the preservation of data from integral experiments to assist users in having well documented data available for benchmark testing, especially in the context of the development of future nuclear energy systems. The Nuclear Science Committee (NSC) is responsible for the overall guidance of the project, whereas the Data Bank provides the infrastructure for the safeguarding of information in databases and for services to member countries.

In order to provide feedback to nuclear data evaluators, integral experimental data of benchmark quality has been compiled, evaluated, reviewed and published. The most relevant ones for nuclear data are:

- International Criticality Safety Benchmark Experiments (ICSBEP)
- Radiation Shielding and Dosimetry Benchmark Experiments (SINBAD)
- International Reactor Physics Experiments Evaluations (IRPhE).

Computer Program Services

The computer program services (CPS) group provides more than 2000 documented software packages and group cross-section data sets related to nuclear energy applications. The services include collection of programs, compilation and verification in an appropriate computer environment, and that the computer program package is complete and adequately documented. (see www.nea.fr/html/dbprog). The activities comprise acquisition of computer codes and experimental system data needed over a wide range of nuclear and radiation applications. Independent verification and validation of these is offered using quality assurance methods, adding value through international benchmark exercises, workshops and meetings and by issuing relevant reports with conclusions and recommendations. The CPS disseminates the different products to authorised establishments in member countries and integrates user feedback (more than 600 establishments are served in member countries and about 80 from other countries through agreement with the IAEA).

Of particular interest to the nuclear data community are a set of nuclear model codes and experimental data processing/unfolding codes. These have been contributed by member countries and then tested with the

aim of supporting work in nuclear data evaluations. Also computer codes for checking evaluated data files and/or processing them into application libraries (multi-group or continuous energy) have been gathered and made available within the CPS to authorised users. The list and abstract of these codes can be found in:

- Cross Section and Resonance Integral Calculations
<http://www.nea.fr/html/dbprog/categ-a.html>
- Spectrum Calculations, Generation of Group Constants and Cell Problems
http://www.nea.fr/html/dbprog/cpsabs_b.html
- Experimental Data Processing
http://www.nea.fr/html/dbprog/cpsabs_o.html

Workshops and seminars

The NEA Data Bank organises seminars and workshops to present information on computer programs or groups of programs that are considered to be of special interest to users, such as the NJOY workshop in May 2005 at the NEA. Training courses on widely used computer programs are organised a few times a year to ensure a correct and effective use of them.

The Thermochemical Database (TDB)

The Thermochemical Database (TDB) project is a co-operative effort between the NEA Data Bank and the NEA Radioactive Waste Management Committee to produce internationally recommended chemical thermodynamic data needed for the safety assessment of radioactive waste disposal systems. The Project is currently supported by 16 organisations from 12 OECD member countries.

An update to earlier reviews of thermochemical data for Uranium, Neptunium, Plutonium, Americium, and Technetium was published in 2003. Reviews of data for Zirconium, Selenium, Nickel and selected organic compounds have been published in 2005. A new phase of the project was started in 2003 covering evaluation of inorganic complexes and compounds of Thorium, Iron, Tin and Molybdenum.