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MEMO CP-N/62

DATE: 14 September 2007
TO: See distribution list below
FROM: A. Hasegawa, H. Henriksson
SUBJECT: NEA Progress Report, 2006-2007

Dear colleagues,

The NEA Progress report is attached in this memo to be presented at the NRDC meeting 8-10 October 2007.

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PROGRESS REPORT FROM THE OECD/NEA DATA BANK

At the NRDC meeting at IAEA, Vienna, Austria

8-10 October 2007

NEA Web page: www.nea.fr

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General overview

The Data Bank's primary role is to provide scientists in member countries with reliable differential and integral 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 computer programs or groups of programs that are 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.

The total number of full time staff in the NEA Data Bank is 15. This is divided into 8 professional staff and 7 support staff. However, only 5 professional and 6 support staff work with the Data Bank services. The remaining staff is allocated to work in other activities in the NEA.

The annual meeting of the Data Bank management committee (the NEA Nuclear Science Committee Executive Group) was held in June 2007. The main discussion concerned future directions of the NEA Data Bank and general views on how to maintain high quality services to member countries. A secretary for the head of the Data Bank, Roopa Chauhan, has been appointed, while Federico Mompean has left the TDB project and the NEA.

The compilation of experimental data into the EXFOR database has progressed as planned with 58 new neutron induced data sets and 67 new charged-particle induced data sets entered since the last NRDC meeting. The CINDA database, containing bibliographic information, has been updated and was published in 7 volumes (in total 5400 pages) as an archival book in September 2007. It was distributed worldwide to about 250 libraries, research facilities and nuclear data centres.

The JANIS nuclear data display software has been upgraded and a beta version was released in April 2007. The official version of JANIS-3 was released in June 2007 after further checking of the software. It is now a much appreciated tool for nuclear data users, with over 25 000 accesses per month to the NEA databases containing nuclear data.

The high priority request list for nuclear data, within the Working Party on international nuclear data Evaluation Cooperation (WPEC), has been updated and contains now 5 high priority requests and 6 general requests. The requests are divided into 'general' and 'high priority', and the rules for 'general' requests to be accepted have been relaxed so as to admit more of this type. A new WPEC subgroup (number 30 in the series) was formed to deal with the "Quality assessment and improvement of usability of the experimental database EXFOR" in collaboration with the NRDC.

A validation report of JEFF-3.1, JEFF Report 22, is being prepared and the structure of the report has been decided. The plan for the next nuclear data library, JEFF-3.2, was outlined, with new evaluations being prepared on $^{235,238}\text{U}$, ^{239}Pu , Cr, Mn, Ta and W, as well as a new activation data library. The new library is planned to include more covariance data as well as photonuclear data. A revision of the decay data library, JEFF-3.1.1, was also agreed for release in autumn 2007.

The current phase of the Thermochemical Database (TDB) project has been prolonged until 31 January 2008, and a fourth phase, TDB IV, will start on February 1, 2008. Ten volumes have so far been published in the series of reviews and the work in present phase of the TDB project is concentrating on finalising the three reviews on Thorium, Tin and Iron. The first of these reviews is planned for publication in 2007, the latter two in 2008.

The collaboration with the US-DOE on computer code exchange was recently restarted with 20 codes received and 62 codes distributed. Several training courses have been carried out and recently, courses on MCNPX and SCALE-5 (TRITON) were organised at the NEA.

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 and free of charge. See Table 1 for the numbers of retrievals of some services from the web pages during 2006. Figure 1 shows what kind of reaction data users are requesting. Data in the figure is based on the use of the display tool JANIS.

In addition to these on-line services, the Data Bank also answers specific requests from customers. Normally, this concerns 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.

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

Web page	2006
EVA searches	8 017
EVA downloads	56 150
JEFF documents*	30 242
EXFOR searches	11 563
EXFOR downloads	18 698
JANIS	361 770
CINDA	1 388
Other web pages at the Data Bank	139 471

EXFOR and CINDA compilation

More than 100 new neutron reaction experiments and about 160 charged particle experiments have been entered by the Data Bank into the EXFOR database since the beginning of 2006 (see Table 2). The database is updated continuously and the delay between article publication and inclusion in EXFOR has been reduced.

Table 2 EXFOR compilations from the NEA (area 2 and O) during 2006 and Jan-Aug 2007

AREA 2	Trans	No of works	AREA O	Trans	No of works	
2006	2174	17	2006	o024	9	
	2175	18		o025	17	
	2176	11		o026	69	
	2177	10		o027	13	
	2178	6		2007	o028	19
	2179	6			o029	15
	2180	11			o030	20
2007	2181	11	Total		162	
	2182	12				
	2183	3				
	2184	6				
	2185	3				
Total		114				

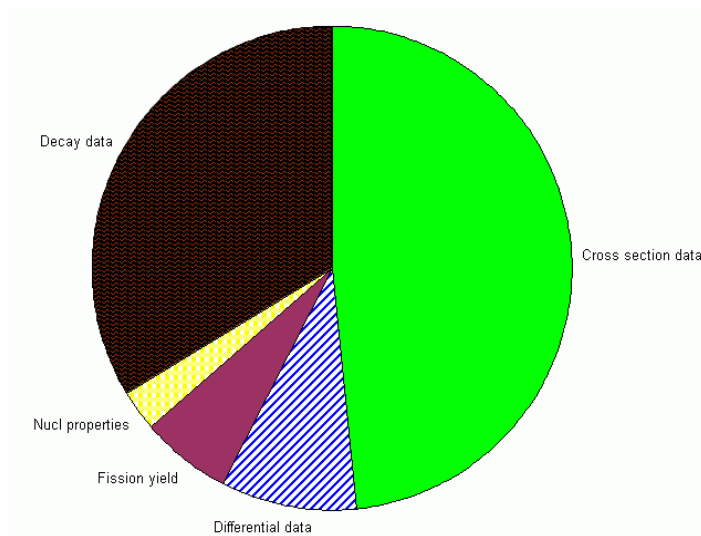


Fig 1. Requested data categories in JANIS. Cross section data is for example total cross sections and ENDF, MF=3 data, differential data is angular or energy distributions, and nuclear properties are data from Nubase.

The CINDA database has been subject to a major extension due to the new format, including the insertion of charged particle references from the EXFOR database. The new CINDA database has been tested and adopted at the NEA.

The CINDA database is available on DVD as part of the JANIS package, and also on-line through the Web. Due to a certain demand and the extension of CINDA to include charged particle data, the NEA has decided to produce an archive version of the CINDA Book, last issued in 1990. The new CINDA 2006 archive version was printed in September 2007.

The data display tool 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, as well as remote, ENDF formatted evaluated data and experimental data from the EXFOR database. A new version of JANIS (JANIS-3.0) was released in June 2007. That version incorporates the full CINDA database as well as the complete EXFOR database read in the original EXFOR format. Many features related to the plotting of data have also been added and ameliorated since the previous version, such as the possibility to use dotted lines or different line thickness in the graphs. The plots and nuclide charts can easily be exported as image files (or Windows Meta-files).

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. Over 25 000 JANIS requests per month for data from the NEA databases are registered in the log files. One such request can cover one EXFOR subentry, or a full evaluated library. See Fig. 2 for the evolution of JANIS retrievals over time since January 2004.

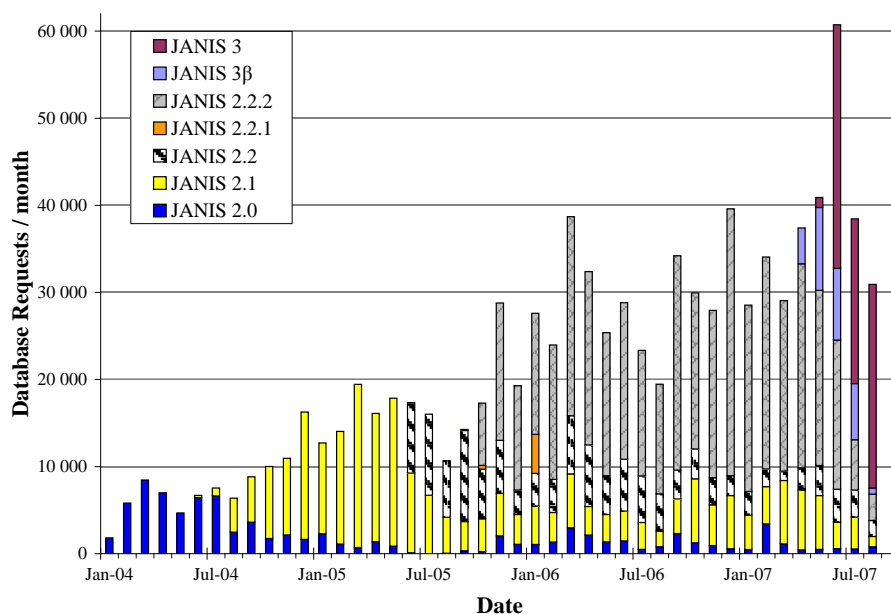


Figure 2 JANIS statistics, January 2004 – April 2007, with the different versions indicated as well. From version 2.2.1 JANIS includes the Web retrieval plotting facility. JANIS-3 β was a test version released for the nuclear data conference ND-2007 in Nice, France in April 2007.

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 complete suite of data was released in May 2005, and contains general purpose nuclear data evaluations compiled at the NEA Data Bank in co-operation with several laboratories in the Data Bank member countries. Processed data for Monte Carlo code applications was made available in spring 2006, and the full documentation of JEFF-3.1, JEFF Report 21, was published in November 2006.

The NEA High Priority Request List (HPRL)

The NEA Data Bank is assisting the Nuclear Science section Working Party on international nuclear data Evaluation Cooperation (WPEC) to manage the High Priority Request List (HPRL), which is a compilation of the highest priority nuclear data requirements, primarily for application in the nuclear industry. The purpose of the list is to provide a guide for those planning measurements, exploring nuclear theory, and requesting high precision evaluated data for the projects. The HPRL is a place where data users meet data producers. Five high priority requests have been accepted after peer review by the HPRL reviewing procedure, and six general requests were also accepted. All requests need to be tied to a certain project. The list is maintained by the NEA Data Bank and is presented at: <http://www.nea.fr/html/dbdata/hprl/>

Computer Program Services

A large set of computer programs shared by member countries has been acquired, It covers a wide scope from basic nuclear cross section calculations to full nuclear power plant analysis. Every year about 60 new or revised versions of computer codes are added. The computer

program services distributes more than 2000 documented software packages and group cross-section data sets per year. The activity includes collection of programs, compilation and verification, using quality assurance methods, in an appropriate computer environment, and the verification that the computer program package is complete and adequately documented (see www.nea.fr/html/dbprog).

Data from Integral Experiments

Under the guidance of the NEA Nuclear Science Committee (NSC), the Data Bank preserves data from integral experiments to assist users in having well documented information available for benchmark testing, especially in the context of the development of future nuclear energy systems. Integral experimental data with benchmark quality have been compiled, 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).

A large number of these evaluated experiments were distributed in recent years in support of nuclear data and computer code validation.

NEA Data Bank workshops, training courses & tutorials 2006-2007

The NEA Data Bank organises and participates in 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 them. Training courses are organised in the context of the Data Bank knowledge transfer and preservation effort. Each course is attended by between 15 and 30 participants and is financially self-supporting through the fees paid by them. The classes are taught by the authors of the computer codes. Participants gain hands on-experience and acquire competence in the use of the codes for problem solving. Such classes can be at three different levels: introductory, intermediate and advanced. The training courses and workshops held recently are listed below.

September 2006, PHYSOR-2006-Topical Meeting on Advances in Nuclear Analysis and Simulation, Hyatt Regency Vancouver

September 2006, Workshop on Use of Monte Carlo Techniques for Design and Analysis of Radiation Detectors, University of Coimbra, Coimbra, Portugal

September 2006, 9th Information Exchange Meeting on Actinide and Fission Product Partitioning and Transmutation (co-organised NSC/NDC), Nîmes, France

October 2006, Training Course on MCNP5 Coupled Neutron, Electron Gamma 3-D Time-Dependent Monte Carlo Transport Calculations, ITN Sacavém, Lisbon, Portugal

November 2006, Journées "codes de calcul en radioprotection, radiophysique et dosimétrie", INSTN, Saclay, France

November 2006, NJOY users group meeting, NEA Headquarters, Issy-les-Moulineaux, France

November 2006, Training Course on Monte Carlo Simulation, Universidad Internacional de Andalucía, Baeza (Jaén), Spain

March 2007, MCNP5 Introductory Class, with additional topics in advanced geometry & criticality, University of Pisa, Italy,

September 2007, MCNPX Intermediate Class, OECD NEA Data Bank, Issy-les-Moulineaux, France

September 2007, SCALE / TRITON - Multidimensional Transport and Depletion Course, OECD NEA Data Bank, Issy-les-Moulineaux, France

Data Bank Publications

Some of the publications produced by the Data Bank relate to the Nuclear Science Programme, and are presented in the progress report for that committee. Only those related to the Data Bank programme of work are listed below. Periodic news bulletins are also sent monthly by e-mail, or can be retrieved via the Web.

Recent publications from the NEA Data Bank

- JEFF-3.1 Nuclear Data Library (The) :JEFF Report 21
- International Handbook of Evaluated Reactor Physics Benchmark Experiments (IRPhE)
- Radiation Shielding and Dosimetry Database (SINBAD) (CD-ROM)
- International Fuel Performance Database (IFPE) (CD-ROM)
- New Editions of Computer Program Abstracts (CD-ROM))
- International Evaluation Co-operation:
 - Vol. 7: Nuclear Data Standards
 - Vol. 20: Covariance Matrix Evaluation and Processing in the Resolved/Unresolved Resonance Regions
 - Vol. 22: Nuclear Data for Improved LEU-LWR Reactivity Predictions
- Chemical Thermodynamics of Solid Solutions of Interest in Nuclear Waste Management - Volume 10 A State-of-the-art Report (2007)

Data Bank cooperation with other NEA divisions

Nuclear Science

The collaboration between the NEA Nuclear Science section and Data Bank is mainly in the areas of:

- Reactor and fuel cycle physics, including reactor stability and transient calculations, utilisation of MOX fuel and reactor-based disposition disposal of weapon-grade Pu, nuclear criticality safety, nuclear waste transmutation studies and radiation shielding.

- Fuel cycle chemistry covering chemical partitioning, fuel cycle flowsheet studies and separation criteria

The Data Bank has also developed a database, called DICE, for the International Handbook of Evaluated Criticality Safety Experiments. The most recent version of DICE was released in September 2007.

RTFDB: Research and Test Facilities Data Base

This project is in support of the NEA Nuclear Science Section and development by a Japanese software engineering company is essentially completed. The content of the database describes the various R&D projects in member countries. Additional authentication according to end-user category is being implemented.

Radioactive Waste Management

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 17 organisations from 12 OECD member countries. The TDB project focuses on the need to meet the specialised modelling requirements for safety assessments of radioactive waste disposal sites. Chemical thermodynamic data are collected and critically evaluated by review teams of experts. In 2006, work continued on the reviews of thorium, tin and iron. The thorium report is under peer review and is scheduled for publication in 2007. The tin and iron reports are scheduled for peer review during 2007. A state-of-the-art report on chemical thermodynamics of solid solutions was recently published.

During the meeting held on 26-27 October 2006 at OECD Headquarters in Paris, France, the TDB III Management Board approved a one-year extension (from 1 February 2007 to 31 January 2008) of the current agreement and for planning to begin during 2007 for a new phase of the TDB project and organised an ad-hoc group to study possible follow-up activities. A new agreement for a new phase of the TDB project (TDB-IV) has now been prepared by the NEA Secretariat, incorporating the conclusions of the ad-hoc group, and, following discussion with potential participants in member countries, was presented and endorsed by the NSC Executive Group, prior to the endorsement by the NEA Steering Committee in Autumn 2007. On 16 March 2007, the RWMC endorsed the proposed programme of work for TDB IV. The tentative start date for the new phase of the project is 1 February 2008.

Radiation Protection

The Information System on Occupational Exposure (ISOE) is a database managed at the NEA jointly with the IAEA. ISOE provides the world's largest database on occupational exposure at 478 commercial reactor units in 29 countries, covering some 91% of the world's operating commercial power reactors. Occupational exposure data collected annually from participants is made available to ISOE members through the database. In addition to the detailed data provided directly by participating utilities, participating authorities also contribute official national data in cases where some of their licensees may not yet be ISOE members. The NEA Data Bank is developing a new Internet-based system for ISOE.

Nuclear Safety

The Data Bank is safeguarding information from a number of projects within the NEA Nuclear Safety division, such as the OECD Piping Failure Data Exchange (OPDE) Project. The goal of this project is to collect and analyse piping failure event data to promote a better understanding of underlying causes, the impact on operations and safety, as well as to generate qualitative insights into the root causes of piping failure events. The OPDE project also aims at establishing a mechanism for efficient feedback of experience gained in connection with piping failure phenomena, including the development of defence against their occurrence.

Changes to the NEA computer system

Upgrade to Oracle version 10g is completed. The new installation was done with Unicode settings, allowing storage of multinational character sets required by the ISOE project. The general structure was kept: one primary instance serving clients and one instance in standby for failover; but the failover configuration is now provided by Oracle Dataguard. The new installation takes also advantage of Oracle Enterprise Manager for monitoring, controlling database instances and Dataguard operations.

Upgrades were carried out on the dual internet server system. This included both a hardware replacement of the Dell units and the migration to the open source CENTOS which is the publicly available version of the equivalent Red Hat Enterprise Linux operating system.

The equipment used to backup the user and system files was replaced in February 2007. The new system is composed of a cassette based backup robot for the monthly full backups and a disk based system for the daily incremental backups. Both are managed by the same software (EMC Networker) and Linux server as before.

The main Network Attached Storage (NetApp NAS) was replaced in May 2007 and consolidation of the user and application files were subsequently consolidated on this single file store. It is operated with a second identical system for the NEA's office automation file services and they both mutually act as failover backups for one another. The current size of the storage is 1.3 TB. A further increase in storage was done in June 2007 in order to accommodate the present and future computer programme master file storage requirements.

The Data Bank as well as the rest of the NEA uses an open source software called 'Soupermail' which helps set up web forms for a variety of applications. It is used for submitting papers to conferences, soliciting feedback, ordering products (such as JANIS), etc... Because of the lack of robustness of this tool and the need to integrate the application into the Data Bank's other administrative databases, a replacement for the current software is being developed. The new tool will enable NEA users to make up their own customized forms and collect information as needed from external users for all the situations envisaged.