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English - Or. English

NUCLEAR ENERGY AGENCY
NUCLEAR SCIENCE COMMITTEE

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Executive Group

DATA BANK MANAGEMENT COMMITTEE

PROGRESS REPORT FOR 2007
WORK IN HAND IN 2008
PROGRAMME OF WORK FOR 2009 and 2010

24 (PM) - 25 (AM) June 2008
NEA Headquarters, Issy-les-Moulineaux, France

Akira HASEGAWA
Akira.HASEGAWA@oecd.org
+ 33 1 45 24 10 80

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INTRODUCTION

1. Regarding nuclear data services, EXFOR compilations are moving forward as planned for NEA assigned regions. The IAEA/NDS has automised the inclusion of references to the CINDA data base. The references are imported from EXFOR. However, references to theoretical work and evaluated data are still compiled for Data Bank member countries; Japan has contributed several important references. With respect to the JEFF project, the Radioactive Decay Data library JEFF-3.1.1/RDD was released in November 2007. An NEA expert group was established to improve the accessibility and quality of the EXFOR database within the framework of the NSC Working Party on International Nuclear Data Evaluation Co-operation (WPEC) and in conjunction with the IAEA Nuclear Reaction Data Centres (NRDC) network. An updated version of JANIS, the nuclear data plotting and manipulation display programme, was released in February 2008 and can be found on the NEA website. A workshop on processing tools for evaluated data was organised in November 2007 and will, henceforth, be held on an annual basis.

2. In Computer Program Services, the exchange and distribution of codes and integral data to member countries as well as to non-member countries have continued. The work load, however, has become heavy in terms of user-verification, which is required by the newly incorporated export control clause stipulated by the new contracts between the US and NEA, signed in 2006.

3. The training courses are carried out as part of the knowledge preservation and transfer activities of the NEA. They are held in order to ensure the competent use of computer codes distributed by the Data Bank, and to transfer the knowledge they contain. Requests by Data Bank customers (from academia, research institutions, industry and safety organisations) are increasing because these courses involve hands-on use of computer codes for simulation and modelling in the nuclear energy field. In 2007, a total of 250 people attended and this year more than 120 people have already participated. This activity is financially self-supporting.

4. The third edition of the International Handbook of Evaluated Reactor Physics Benchmark Experiments was published on DVD in March 2008. It provides an extensive, peer-reviewed set of integral data related to reactor physics that can be used by reactor designers and safety analysts to validate the analytical tools used to design next-generation reactors and to establish safety guidelines for operating these reactors. Fourteen countries contributed, including the Russian Federation. It contains a 25-experiment series performed at 17 reactor facilities, including gas-cooled reactors, heavy water reactors, liquid metal fast reactors and light water reactors (BWR, PWR and VVER).

5. A new phase of the Thermochemical Database project (TDB-IV) began in February 2008 after endorsement by the RWMC and the Executive Group of the NSC. Fifteen organisations from 13 member countries are currently participating in this endeavour. Four subjects will be covered during the new phase: inorganic species and compounds of iron (stage II), auxiliary data, updates to the selected value database accrued during previous phases of the project, and inorganic species and compounds of molybdenum. In accordance with this new phase, two project posts for the TDB projects (as A1 grade junior scientists) have been opened recently, to replace the yearly consultancies previously funded by the TDB project. The positions will be filled in September.

6. This March, the Data Bank launched its first electronic newsletter that can be found at the following site: (http://www.nea.fr/html/databank/newsletter/index.html). It will be issued every two or

three months. The aim is to communicate more effectively with Data Bank users. The first newsletter was sent out to nearly 1 300 correspondents.

7. Recently, new staff members have joined the Data Bank. In July 2007, the reactivated secretary/assistant position to the Data Bank Head was filled by Roopa Chauhan (USA). The position of chemist and TDB project manager, previously held by Federico Mompean, was filled by Mireille Defranceschi (France) in January 2008.

8. In the secretariat, there will be several changes in staff from now until mid-2009: Ivo Kodeli, an official on loan from the IAEA, has given the Data Bank seven years of service in facilitating computer code distribution to non-NEA member countries and Carol Morris, who has provided the Data Bank with highly skilled administrative support for over 30 years. Finally, Enrico Sartori, a physicist who has been responsible for the NEA Data Bank Computer Program Services and served as secretary of the WPRS, will be retiring in May 2009. He has initiated database projects like SINBAD, IFPE, ICSBEP, IRPhE. They will be replaced in due course.

COMPUTER PROGRAM SERVICES

9. The following sections describe activities related to the acquisition, verification, testing, maintenance and distribution of computer codes to establishments with authorised access. Information on trends and specific actions aimed at adjusting the service to arising needs and evolving technologies will also be provided. Information on services provided to each of the member countries will be delivered to Executive Group members individually. Work of specific interest to Nuclear Science, Safety of Installation, Radioactive Waste Management and others, or carried out in co-ordination and co-operation with them, will be presented in a separate chapter.

Acquisition

10. During 2007, a total of 94 new or revised versions of computer codes were acquired and 54 were verified, tested and master-filed, of which 25 were contributed from the non-OECD area. Nineteen new or revised compilations of integral experiments (SINBAD, IFPE) were acquired during the same period.

11. From 1 January 2008 to 30 April 2008 a total of 17 new or revised versions of computer codes were acquired and 13 were verified, tested and master-filed. Six of these were contributed from the non-OECD area. Eight new or revised compilations of integral experiments (IFPE, IRPhE and STEX) were acquired during the same period.

12. A list of computer codes and application-oriented data libraries acquired during the last 12 months is provided as Annex I. The trend in acquisition of packages from member countries and others participating in the computer program service is shown below in Figure 1.

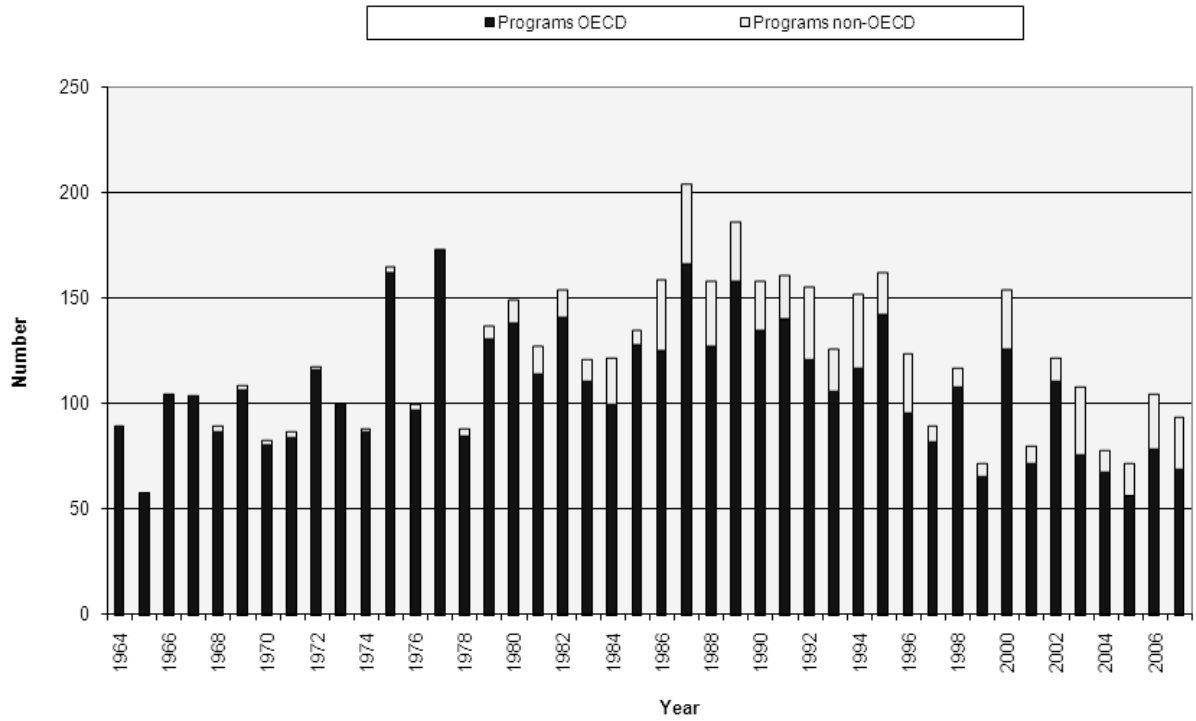

Fig. 1 – Program Acquisitions 1964-2007: an overall total of 5 338

13. Figure 2 shows new acquisitions by topic of interest for computer codes and for integral experiments:

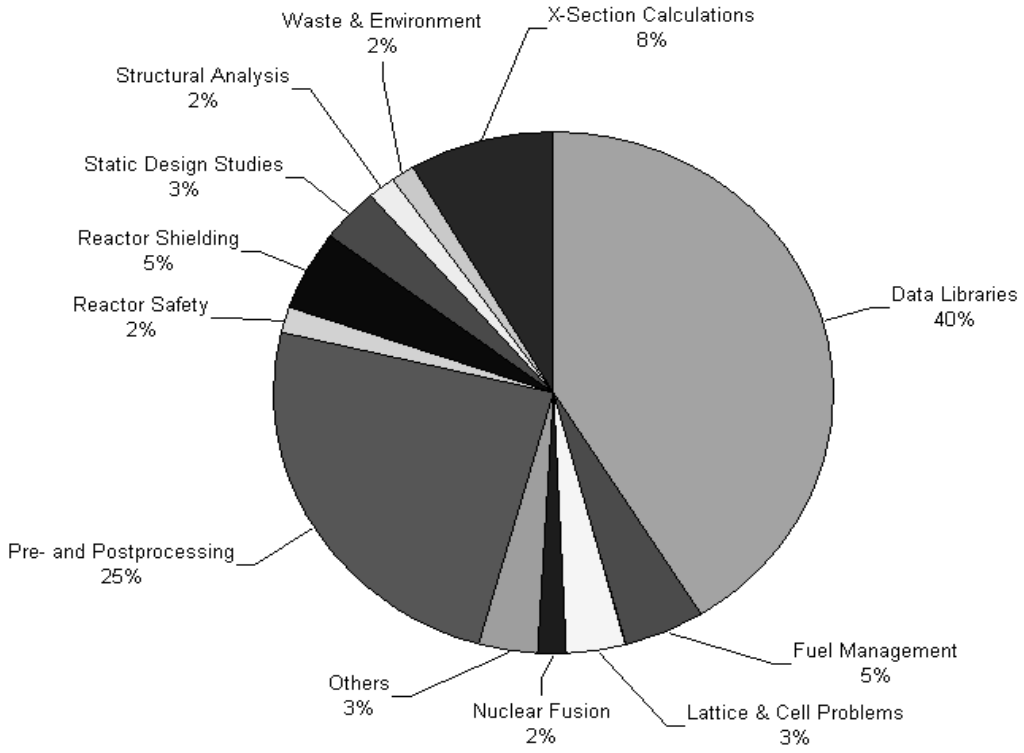

Fig. 2 – Computer Codes Acquired in 2007: a total of 94

Dispatches

14. The dispatches concern computer programs, associated data libraries and sets of integral experimental data used for code and data validation. The trends starting in 2003 are shown in the following table:

Year	Programs	Integral Experiments	Total	% Integral Experiments
2003	1 917	2 524	4 441	57
2004	1 846	3 472	5 318	65
2005	1 836	2 212	4 048	55
2006	1 776	3 801	5 577	68
2007	1 843	1 958	3 801	52

15. During 2007, 1 843 computer program packages were distributed, a figure that falls within the last five-year average. With regard to integral data experiments, 1 958 sets were distributed, which shows a decrease from last year. The dispatches made to authorised non-OECD establishments or International Organisations (within the framework of a co-operative agreement with the IAEA), amounted to 390 (10%): 103 computer codes and 257 sets of integral experiments. Specific details are provided in Annex IV. About 9% of the distributed packages were made available directly on-line to liaison officers using a password-

protected protocol. The remaining 91% were distributed on CD-ROM (33%) or DVD (58%) in accordance with users' requests. The evolution of dispatches by year is shown below in Figure 3.

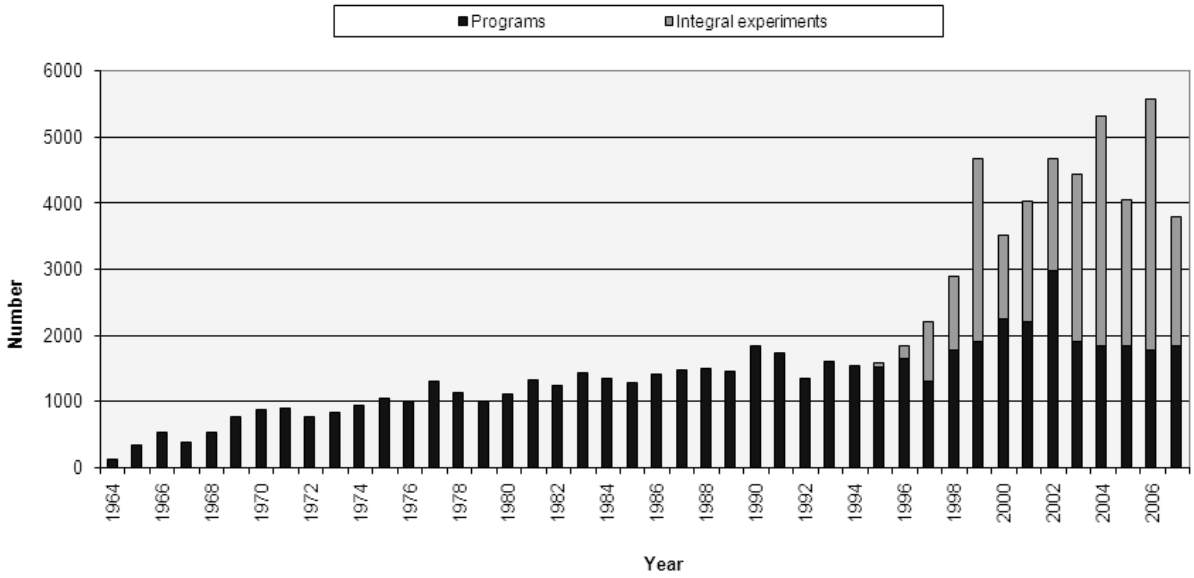

Fig. 3 – Dispatches of Computer Codes and Integral Experiments 1964-2007: a total of 83 368

16. The number of computer codes distributed has remained stable over the last five years averaging around 1 850/year. The number of series of integral experiments distributed has fluctuated between 2 000 and 3 500/year over the same period. The fluctuation is related to the release and publication of new data that becomes available each year. Following the re-instatement of computer code exchanges with US centres in spring 2007, MCNP/MCNPX was the most requested code, with about 340 individual licenses issued and copies dispatched. Dispatches of the 1 958 integral experiments by application are shown below in Figure 4. The CCVM data are distributed on behalf of the NEA Nuclear Safety Division.

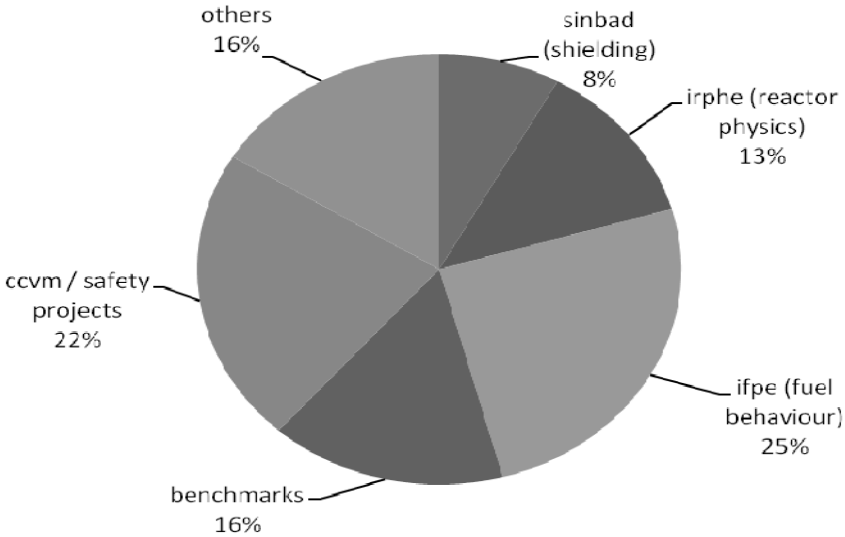

Fig. 4 – Dispatches of Integral Experiments by type: a total of 1 958

17. Dispatches of computer codes by topic for 2007 are shown in Figure 5.

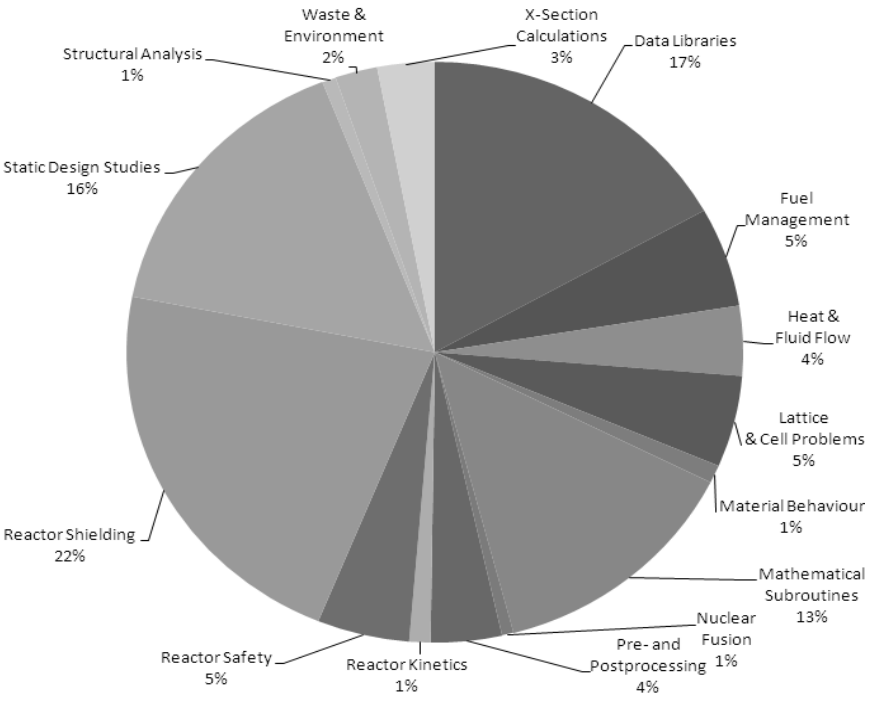

Fig. 5 – Distribution of Computer Codes by Topic: a total of 1 843

18. The profile by subject field of all codes available from the Data Bank is shown in Fig 6.

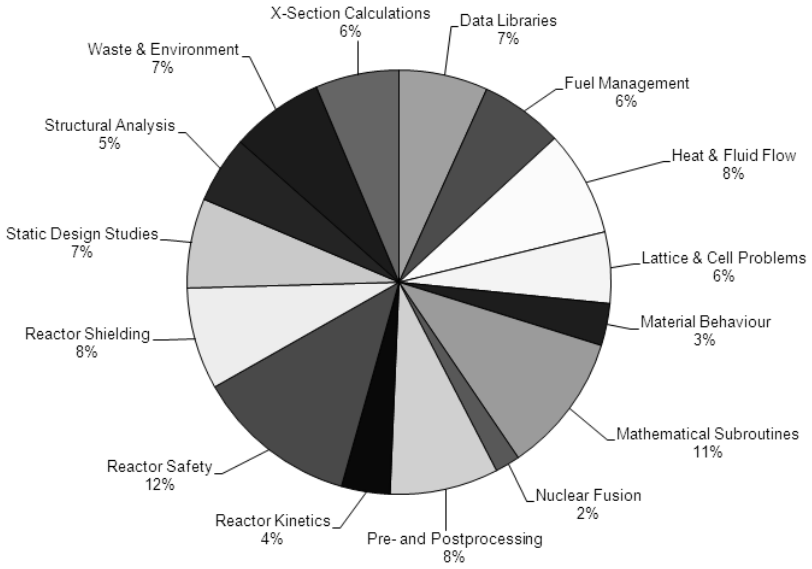

Fig.6 – Profile of the full-set of computer codes available (~2 200)

19. The distribution in 2007 by type of customer is shown in Figure 7.

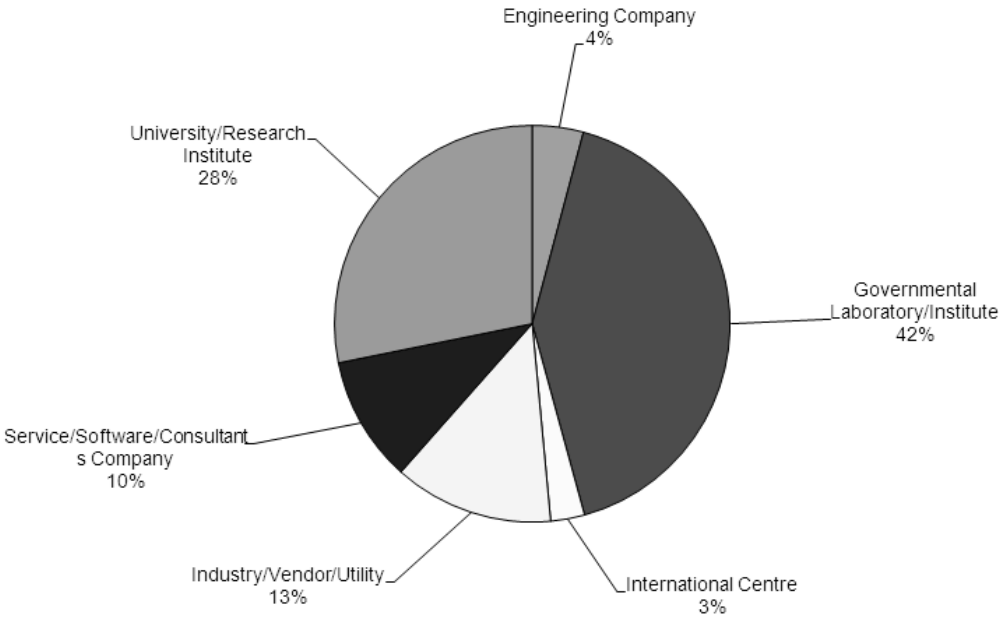

Fig. 7 – Distribution of Packages by Requester Profile: a total of 3 801

20. The requests are ranked by user category research (laboratories or institutes funded by national governments, universities, industry, etc.).

21. During the period of 1 January - 30 April 2008, 934 computer codes and 928 integral experiments were distributed. In the three weeks following the release of the third edition of the IRPhE Handbook (2008 version) on DVD, about 200 copies were sent to researchers on request.

22. The current number of establishments in NEA Data Bank member countries officially nominated to co-operate with the Data Bank is 758. Through the co-operative agreement with the IAEA, 84 non-OECD establishments also have access to part of the computer codes and data after screening by the respective national authorities and the IAEA.

Forty years of co-operation with the IAEA and INIS

23. The International Nuclear Information System and Nuclear Knowledge Management (INIS & NKM) Section of the International Atomic Energy Agency (IAEA) is responsible for implementing programmes on nuclear knowledge management and on nuclear information for their member states. The objectives are: to increase awareness and understanding worldwide of the need to sustain knowledge and expertise in nuclear science and technology. Ms. Taghrid Atieh, one of the Group leaders in that section visited the NEA in early October 2007. She gave a presentation with an update to NEA staff on INIS and its main products and services. The NEA staff recognised the relevance of these products for their work, and the importance of strengthening and further developing co-operation with INIS. More specifically, it was agreed that NEA committee reports with an unrestricted status should be entered into the INIS bibliographic database. So far, only publications with an ISBN number have been entered. The objective is to make the work of NEA committees more visible to the international community. This action supports the NEA's knowledge preservation effort.

24. As mentioned in the Introduction, the service to non-OECD countries has existed for 40 years through a co-operative arrangement with the IAEA, approved by the Steering Committee for Nuclear Energy of OECD and the Board of Governors of the IAEA. Over this period, 11 350 computer program packages were distributed to authorised centres in the non-OECD area, 6 000 copies of packages

originating from non-OECD were distributed through this service. Non-member countries contributed 600 new or revised versions of computer codes to the Data Bank. So far, this co-operation has been balanced and mutually beneficial to all parties involved (see also Annex IV). Several institutions have expressed how important this service is to them. The Data Bank distributes computer programs on behalf of the IAEA, they in turn take care of advertising and disseminating open reports from the NEA through the INIS system. In addition, the IAEA provides the Data Bank with one staff member to support this service. The table in Annex V summarises statements of support for this service received recently from some major research centres in non-OECD countries that use these services. The IAEA recently confirmed that they will continue to support this endeavour and arrangement.

Master-file and dispatching system

25. The updates carried out to the Master-File system in 2007, which enable the handling of dispatches subject to the export control procedures introduced with the activation of the co-operative arrangement with the US centres, are working correctly. Summary information on licenses accorded and other details such as the specified end-use of the codes and data can be produced and delivered according to the arrangement in place.

26. An end-use statement is requested systematically now. This information provides additional insights, besides classification by topic, as to the application fields and problem areas the service is useful for.

27. With the evolution of optical storage for information in electronic form, the Master-File and robotised dispatching system will be upgraded to allow double layer DVDs to be produced. Most databases can then be distributed as one item, thus facilitating the use of the information.

28. The consequence of DVDs' increased capacity is that no file-compressing will be required. Therefore, the "Master-File" system used will further evolve during 2008 to allow for this additional change and simplification.

Three-dimensional sensitivity/uncertainty

29. Last year, in the area of dosimetry, the Data Bank also actively contributed to computational problems addressed within the framework of the EC sponsored CONRAD activity, which is devoted to studying the use of complex computer codes in dosimetry calculations and to assessing uncertainties associated with the numerical results. The criteria the various laboratories adopt in expressing the uncertainties both in their measurement procedures and in their computations were investigated. The EC project successfully came to an end in October 2007 and its final workshop was held in Bologna. About 80 participants attended the meeting to discuss various outcomes to the inter-comparison exercises.

30. The SNEAK-7A & 7B experiment was compiled and a draft evaluation published in the IRPhE Handbook. A sensitivity and uncertainty benchmark based on the SNEAK experiments is being finalised in co-ordination with WPRS-UAM and IRPhE to compare the performances of the different computer tools available.

31. Revisions to the following cross-section sensitivity and uncertainty codes and data were recently acquired by the Data Bank:

- SUSD3D (1D, 2D, 3D SN uncertainty including SED/SAD);
- TSUNAMI (SCALE-5): 1D SN, 3D M/C (KENO5)
- JAEA Sensitivity Analysis Codes (SAGEP, SAGEP-BURN, PSAGEP, ABLE, ACCEPT) deterministic diffusion 1D/2D

An updated version of the SUSD3D package for the calculation of cross-section sensitivity coefficients and the corresponding standard deviations in the calculated detector responses or design parameters of interest was prepared and released by NEA DB. Main modifications apply to the treatment of the sensitivities and uncertainties in the secondary angular distributions (SAD), such as fission spectra uncertainties, and several updates for user-friendly input preparation. Further extensions of the system to be compatible with recently received transport codes are planned, e.g. PARTISN.

32. Sensitivity-Based Global Assessment of Nuclear Data Requirements (GANDR Project) is a Computerised Planning Tool for Nuclear Data Development and for assessing the impact of new experimental information on evaluated cross-sections and integral parameters. The GANDR methodology was extended to self-shielded cross-sections, namely to the development of methods for the calculation of the sensitivity of 'pseudo-composition-independent' self-shielded multi-group cross-sections to the pointwise parameters of the GANDR evaluation system. Such self-shielded cross-sections are parameterised by particular values of the 'background' cross-section sigma-zero. In defining these cross-sections, the Bondarenko flux model is employed.

33. The extension of the computer codes for the extrapolation and mathematical verification of the cross-section covariance matrices' capacity to handle the 44-group covariances available in the SCALE-5.1 package was terminated. Both the computer codes and the covariance matrix library extracted from SCALE-5.1 were prepared.

34. Results from this work are used within the benchmark work carried out by the Expert Group on Uncertainty Analysis in Modelling (UAM) of the WPRS (see NEA/ NSC/DOC(2008)6).

Knowledge preservation and 'legacy books'

35. The effort to preserve legacy books as a main area of interest to Data Bank users has continued. The area of Reactor/Radiation Shielding, in particular, has received special attention for the 50th anniversary of the first shielding conference. The Data Bank recently rendered the following books electronic :

- Theodore Rockwell III: Reactor Shielding Design Manual "Water Has No Cracks", 1956, copyright removed.
- Proceedings of the First Radiation Shielding Symposium (ICRS1), Cambridge, UK 1958 prepared by NEADB with the help of FZK.
- N. M. Schaeffer, Editor: Reactor Shielding for Nuclear Engineers, TID-25951, 1973(1981) released by the author for the 50th anniversary of the first radiations shielding symposium.

36. Prof. J.D. Lewins has now released the following three of his legacy books for free distribution:

- Importance: The Adjoint Function, North-Holland Publishing Company - Amsterdam, 1966 (ready).
- Nuclear Reactor Kinetics and Control, Pergamon Press, London, 1978 (ready).
- Thermodynamics: Frontiers and Foundations, New ook 2008, electronic publishing (being finalised).

37. The three legacy books made available by Prof. M.M.R. Williams are often requested by the broad Data Bank user community and are used for teaching. In all, over 1 000 copies of his electronic books were requested and distributed to 43 countries. The books requested include:

- The Slowing Down and Thermalization of Neutrons, North-Holland Publishing Company, Amsterdam, 1966.
- Mathematical Methods in Particle Transport Theory, Butterworths, London, 1971.
- Random Processes in Nuclear Reactors, Pergamon Press Oxford, 1974.

Radiation Transport Handbook

38. The "Analytical Benchmark Library for Nuclear Engineering Application" - Case Studies in Neutron Transport Theory, with enclosed computer codes have been developed under the aegis of the Data Bank. It is in fact a Handbook produced by B.D. Ganapol from the Department of Aerospace and Mechanical Engineering at the University of Arizona. This book was used to teach one of the training courses.

39. The Handbook has been reviewed by several experts. Students and researches use this book and its computer codes as a reference guide. The systems considered as benchmarks are not all from real applications. The purpose of the handbook is to deal primarily with analytical methods, and such methods have a high educational value. Final formatting is being carried out and it will be printed in summer 2008.

Courses and workshops held in 2007

40. 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/ workshops held during 2007 were:

- MCNP5 Introductory Class, with additional topics in advanced geometry & criticality, University of Pisa, Italy, March 2007.
- MCNPX Intermediate Class, OECD NEA, Issy-les-Moulineaux, France, 3-7 September 2007.
- SCALE TRITON – Multi-dimensional Transport and Depletion Course, OECD, Issy-les-Moulineaux, France. 10-13 September 2007.

Courses in 2008/09

- Course on DIREKT - A computer program for the time-dependent, two-dimensional simulation of thermal-hydraulic transients in gas-cooled reactors and in particular for pebble bed reactors, OECD/NEA Issy-les-Moulineaux, France, 21-23 January 2008.
- Course on "Analytical Benchmarks: Case Studies in Neutron Transport Theory" using the Handbook on "Analytical Benchmarks for Nuclear Engineering Applications (Case Studies in Neutron Transport Theory)", OECD/NEA Issy-les-Moulineaux, France, 30 January - 1 February 2008.
- Sensitivity and Uncertainty Analysis Training Course using SCALE TSUNAMI Syllabus, OECD/NEA Issy-les-Moulineaux, France, 25-29 February 2008.
- A training course on the Monte Carlo computer code TRIPOLI-4 held at OECD/NEA Headquarters. OECD/NEA Issy-les-Moulineaux, France, 7-11 April 2008.
- Joint introductory/intermediate MCNP/MCNPX training course, ITN, Sacavem, Lisbon Portugal, 12-16 May 2008.
- REFIT-2007 Training course on Multi-level Resonance Parameter Least Square Fit of Neutron Transmission and Capture Data, EC-JRC-IRMM, Geel, Belgium, 2-6 June 2008.
- Training course on PENELOPE-2008 - a Code System for Monte Carlo Simulation of Electron and Photon Transport, Barcelona, Spain, 30 June - 3 July 2008.
- Training Course on FLUKA, a fully integrated particle physics Monte Carlo simulation package, OECD/NEA Data Bank, Issy-les-Moulineaux, France, 29 September - 3 October 2008.

- Sensitivity and Uncertainty Analysis Training Course using SCALE TSUNAMI, KFKI Budapest, Hungary, 13 -17 October 2008.
- Joint introductory/intermediate MCNP/MCNPX training course, GRS, Garching near Munich, Germany, 27-31 October 2008.
- Course on "Analytical Benchmarks: Case Studies in Neutron Transport Theory" using the Handbook on "Analytical Benchmarks for Nuclear Engineering Applications (Case Studies in Neutron Transport Theory)", OECD/NEA Issy-les-Moulineaux, France, 16-20 March 2009.
- MCNP6 Training course, OECD/NEA, Issy-les-Moulineaux, France, 23-27 March 2009.

COMPUTER PROGRAM SERVICES DELIVERABLES

2007	*Deliverables*	*Status end of 2007*
	Acquire about 60 new packages.	94 packages acquired.
	Testing and master-filing of 60 packages.	54 packages tested.
	Dispatch about 1 500 programs, and 1 500 integral experiments (user driven).	1 843 programs and 1 958 integral experiments dispatched.
	Add data consistency and security options in the TRADE (transaction registration) system.	Complete.
	Inquiry about the use made of integral experiments and prepare report.	Done for IFPE, planned for the others.
	Implement in DBAIS and TRADE export control features required by the new DOE-NEA co-operative arrangement.	Implemented, tested, operational.
	Integrate more radiation transport codes into the generalised environment for radiation transport tools GERALD and include user-developed tools in support of legacy and knowledge management.	Demonstration phase completed.
	Contribute SUSD-3D to the GANDR project on generalisation of sensitivity/uncertainty tools, SUSD-3-D compatibility with PARTISN.	In progress.
	Five electronic newsletters.	Four issued.
	Training courses.	Three courses held.
	One abstract issued on CD-ROM.	One issue in November.
	On-line publication of NJOY User-group meeting proceedings.	Completed.
2008	*Deliverables*	*Status 30 April 2008*
	Acquire about 60 new packages.	17 packages acquired.
	Testing and master-filing of 60 packages.	13 packages tested.
	Dispatch about 1 500 programs, and 1 500 integral experiments (user driven).	933 programs and 928 integral experiments dispatched.
	Workshop on Next Generation Start phase II of the GERALD project for expanding comprehensiveness of functions for additional applications.	In depth discussion at DB meeting prepared, workshop planned for 2009.
	Inquiry about the use made of integral experiments and prepare report.	Systematic request of end-use of data introduced.
	Extension of cross-section covariance interpolation / handling to accept COVERX files.	Completed.
	Integration of benchmark experiments and corresponding sensitivities in GANDR - validation is based on cases that are representative.	In progress.
	Generalise Master-file system for handling integral experiments database.	In progress.
	Four - five electronic newsletters (DB newsletter).	One issued, three planned.
	Four Training courses.	Five held, five planned.
	One abstract issued on CD-ROM.	Planned for October.
	Publication of Radiation Transport Handbook.	Summer 2008.
	Publish PENELOPE-2008 report.	Summer 2008.

2009/2010	***Deliverables***
	Acquire about 60 new packages.
	Testing and master-filing of 60 packages.
	Dispatch about 15 00 programs, and 1 500 integral experiments (user driven).
	Organise workshop on "New generation of computer codes in nuclear engineering" and publish proceedings.
	Introduce the use of double layer DVDs (in accordance with users' request).
	Contributing to four-five electronic newsletters.
	4 Training Courses.
	1 Abstract issue on CD-ROM.
	Contribute to 'knowledge preservation" through the issue of electronic legacy books (2 or 3).

NUCLEAR DATA ACTIVITIES

41. The Data Bank maintains large databases containing bibliographic (CINDA), experimental (EXFOR) and evaluated (EVA) nuclear data and makes these databases available online to scientists and engineers in member countries. These databases are maintained in close co-operation with other nuclear data centres and cover most types of data needed in nuclear energy applications.

42. Another important activity is the development of useful software. A new version of the nuclear data display program, JANIS-3, was released in June to respond to users' feedback and needs. The main improvements include complete coverage of the EXFOR database, the EXFOR and CINDA search panels and the plotting features.

International nuclear data evaluation co-operation

43. The Databank is closely linked to the activities in the NSC Working Party on International Nuclear Data Evaluation Co-operation (WPEC). In 2007, one publication (Vol. 25) was issued on the *Assessment of Fission Product Decay Data for Decay Heat Calculations*, and in 2008 Vol. 26 on *Nuclear Data Needs for Advanced Reactor Systems* has already been prepared and will be published soon.

44. Two new activities have also been launched, 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). 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 eight general and six high priority requests, but over twenty new requests were already proposed in early 2008.

Experimental (EXFOR) data compilations

45. The Data Bank is compiling and exchanging experimental neutron and charged particle induced data, as one of the main partners of an old and well-established international nuclear data network, coordinated by the IAEA.

46. In 2007, 82 new and 137 corrected neutron-induced data sets were entered into the EXFOR database. This exceeded expectations set out in the objectives (50 new entries). The compilation of new charged particle induced data was also better than expected (114 new entries and 22 corrected data sets versus 100 new entries in the objectives).

47. The compilation effort in 2008 is well underway with 18 new and 92 corrected compilations. It is expected that the goal in 2008 of compiling 80 data sets on neutron-induced reactions and 100 on charged particle-induced data will be reached. The emphasis will mainly be on corrections, as this is strongly linked to recent activities in the new WPEC subgroup on EXFOR's quality (see above).

Bibliographic (CINDA) data

48. 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.

49. In 2007, the Data Bank published a complete version of the CINDA database that includes over 55 000 references to neutron- and charged-particle data including references to EXFOR. The publication was printed in seven volumes and distributed to approximately 300 libraries and research facilities around the world. Several references to theoretical work and nuclear evaluations in the Data Bank member countries are to be included in 2008. At present, references to experimental data from all countries are taken from EXFOR.

Status of the JEFF project

50. A revised version of the Joint Evaluated Fission and Fusion (JEFF) radioactive decay data library, JEFF-3.1.1/RDD, was released in November 2007and 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.

51. 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 one was in November 2007.

52. In 2007, feedback to the JEFF library (JEFF-3.1) was collected and several new evaluations are being considered for future release as JEFF-3.2. The feedback web pages make user comments available to evaluators. New and reviewed evaluations are also made available for JEFF working group members.

53. 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}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 beta 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 ^{2}H, ^{16}O, ^{56}Fe, ^{151}Sm, ^{237}Np, Zr and Hf isotopes (many have already been prepared by the CEA).

Services to nuclear data users

54. 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. 8). For example, 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). For statistics regarding the usage of the web services see the section on "*Computing Infrastructure and*

Development" in this report. 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.

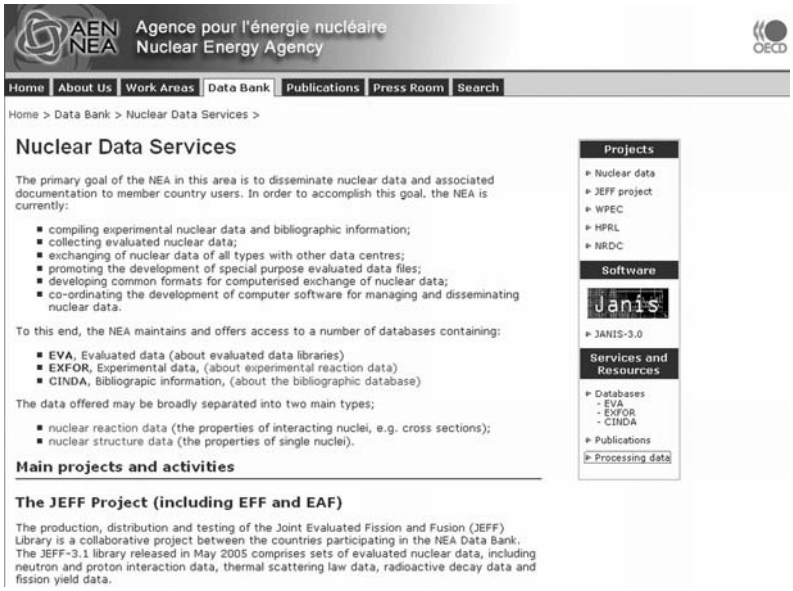

Fig. 8 – The nuclear data web page of the NEA (www.nea.fr/html/dbdata/) with short links on the right-hand side to main activities (such as the JEFF project), software development (JANIS-3) and services and resources (databases related to nuclear data, publications and information on the processing of evaluated nuclear data libraries).

55. The third version of JANIS was released in June 2007 after extensive testing with a beta-release in April that year, during the International Conference on Nuclear Data for Science and Technology in Nice, France. The JANIS-3 DVD was published and sent out to 260 people in August 2007 and several requests for this edition have been received and handled since. 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 (EMF/WMF).

56. 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.

57. 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. 9 below. Almost 50 % of the requests are for cross-section data, and a third of the requests concern decay data. The variation of requests for specific categories of data is shown in Fig.10 below. 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.X3. Users request the program mainly for fission applications, but also for basic research and educational purposes.

58. The work on a JANIS website 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.

59. 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.

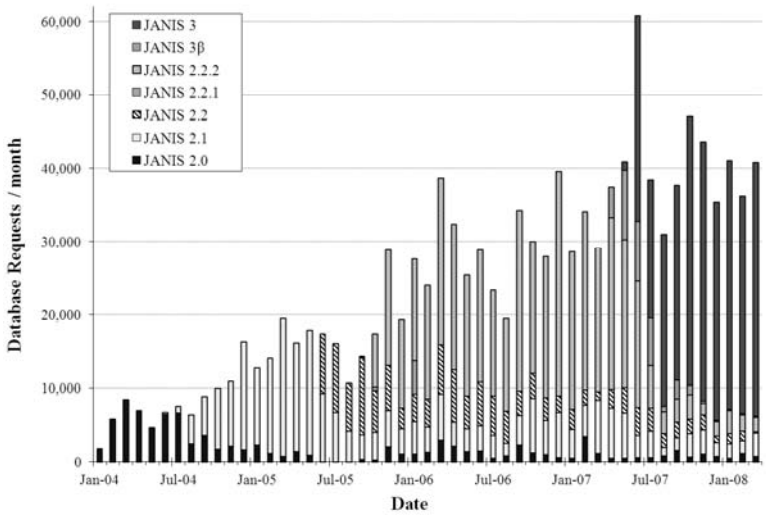

Fig. 9 – Number of accesses to the JANIS database per month since JANIS-2 in 2004. The peak in June 2007 (of over 60 000 database access requests) is related to the release of JANIS-3.0.

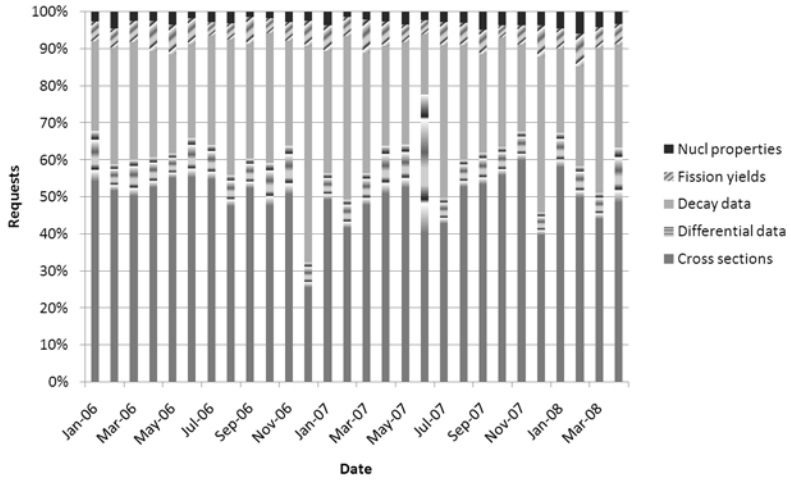

Fig. 10 – Requested data categories in JANIS per month since January 2006. Cross-section data includes, for example, ENDF, MF=3 data or EXFOR data codes with the quantity 'SIG', and Nubase houses data related to nuclear properties.

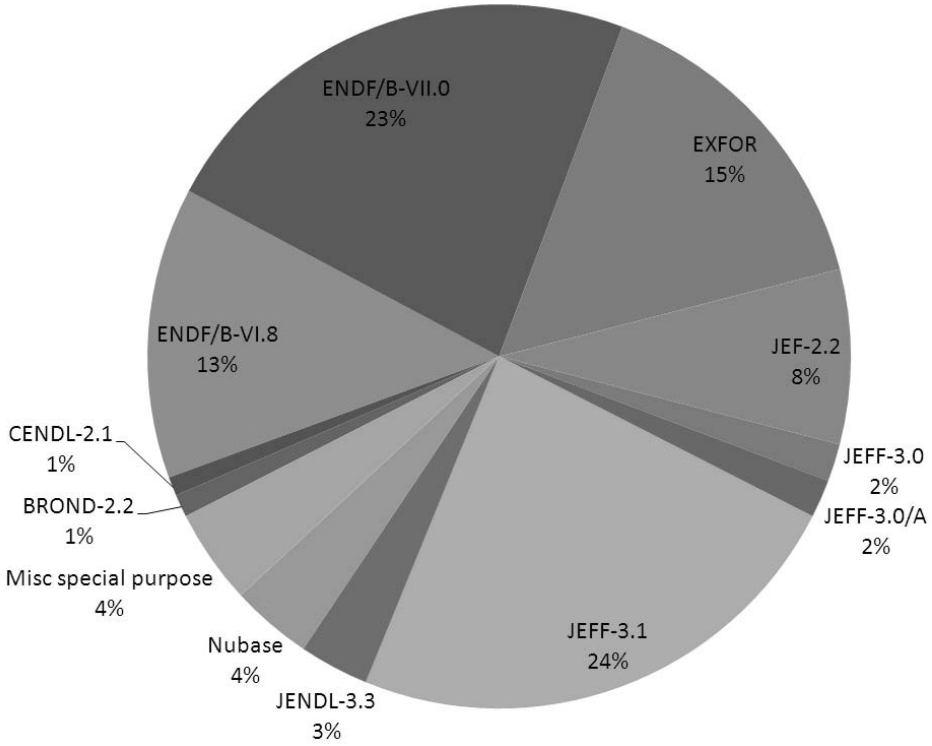

Fig. 11 – Users' requests since 2007, divided by the various databases JANIS makes available.

NUCLEAR DATA DELIVERABLES

2007	***Objectives***	***Achievements***
	Compile 500 CINDA entries.	Several entries have been prepared for inclusion. A correction of the database has delayed the final inclusion, but data is constantly being added from EXFOR.
	Compile 50 new neutron induced experiments in EXFOR.	82 new experiments from member countries of the Data Bank and 137 retransmissions were included in EXFOR.
	Compile 100 new charged particle induced experiments in EXFOR	114 new compilations were included and 22 datasets were corrected and retransmitted.
	Complete the harmonisation of the EXFOR databases at the different Data Centres by solving any discrepancies.	The introduction of the master EXFOR database, kept at the IAEA, has been done with an archive version of the old EXFOR database at the NEA. A few datasets were retransmitted into EXFOR after comparing the two versions. JANIS-3 has been fully upgraded to read the original EXFOR format, and is now used to checking EXFOR for formatting errors and data discrepancies.
	Document the JEFF-3.1 benchmarking and validation effort.	Draft in preparation. Several sections are ready and a final draft is expected in 2008.
2008	***Actions / Deliverables***	***Status in May 2008***
	Compile 500 CINDA entries	New compilations have been received and will be incorporated in the database.
	Compile 80 new neutron induced experiments in EXFOR	18 new and 92 corrected datasets have already been compiled and included in EXFOR.
	Compile 100 new charged particle induced experiments in EXFOR	50 new and 6 corrected datasets have already been finalised.
	Publish the JEFF-3.1 benchmarking and validation effort.	A final draft is expected from the JEFF working group in connection to the next JEFF meeting.
	Publish the JEFF-3.1 Radioactive Decay Data report and issue a new release of the library, JEFF-3.1.1/RDD.	The final draft of the report will be printed in the summer after the May meeting of JEFF.
	Continued improvement the Quality Assurance system for nuclear data, involving both evaluated (JEFF) and experimental data in EXFOR.	The quality assurance system for CINDA and EXFOR incorporates now JANIS-3. Regarding the quality efforts on JEFF, two dedicated feedback pages on the Web collects all known deficiencies and new proposals for solving these.
2009 2010	***Objectives***	
	Compile CINDA entries on bibliographical information of theoretical works performed in Data Bank member countries.	
	Develop CINDA to incorporate better links to EXFOR as well as other bibliographical databases. Verify if other bibliographical databases are of interest to Data Bank activities.	
	Compile 80 new neutron induced experiments in EXFOR.	
	Compile 100 new charged particle induced experiments in EXFOR.	
	Prepare the EXFOR database in a “computational” format with the help of JANIS for usage in various codes, such as TALYS and EASY.	
	Improve accessibility to experimental and evaluated nuclear data from the Web via the program JANIS.	
	Publish the JEFF-3.1 Radioactive Decay Data report and issue a new release of the library, JEFF-3.1.1/RDD.	
	Publish the JEFF-3.1 benchmarking and validation effort.	

DATA BANK WORK IN CO-OPERATION WITH AND EXPERTISE PROVIDED TO OTHER OTHER DIVISIONS OF THE NEA

60. The Data Bank carries out work in cooperation with and provides some expertise to all of the technical NEA Standing Committees, namely, Nuclear Science, Safety of Nuclear Installations, Radioactive Waste Management, Radiation Protection and Public Health, and Nuclear Development. A large part of the work is devoted to integral experiments data and to Handbooks. The work consists of acquiring the data, verifying its content, structuring where necessary, maintaining it and distributing it according to certain rules. Another part of the work consists in providing computing infrastructure and expertise for handling databases.

61. The items contained in several such databases and Handbooks are subject to a number of rules and restrictions concerning their distribution, which are recorded in the DBAIS system. These rules are established by the management of the different projects or their Executive Groups and the Data Bank applies them accordingly.

Nuclear Science

IRPhE (International Reactor Physics Experiment Evaluations) Project

62. The archives of primary documents were enriched with new a series of reports. In 2008, an effort will be made to enlarge the primary documents for HTR experiments, following the requests received and made.

63. The second edition, containing data from 21 different experimental series that were performed at 13 different reactor facilities, issued in March 2007 was distributed to 195 authorised requesters from 16 countries. The third edition, issued in March 2008, was distributed to 203 requesters from 23 countries in April 2008. The third edition of the handbook includes evaluated data from the following reactor types:

- Seven liquid metal fast reactors (JOYO, BFS-1, BFS-2, ZPPR, ZEBRA, ZPR, and SNEAK)
- Two gas-cooled reactors (HTR-10 and ASTRA)
- One heavy-water reactor (DCA)
- Three light-water reactors (DIMPLE, CROCUS, and IPEN/MB-01)
- Two pressurised water reactors (VENUS and CREOLE)
- Two VVER reactors (ZR6 and PFACILITY)
- Four fundamental physics evaluations of non-fast-reactor measurements performed on BFS-1 and BFS-2 are also included

64. Fourteen countries have so far contributed their technical expertise and/or experimental data to the IRPhE Project. The 2009 Edition of the *IRPhE Handbook* is expected to contain completed benchmarks of VENUS 3. ZPPR 10A, and SNEAK Cores 7A and 7B, are currently all in draft form. Additional data are expected from the IPEN/MB01 Reactor and ZPR-6 Assembly 7 (high ^{240}Pu). Evaluations of several other reactor/experimental assemblies are planned or are in progress, some of which may be completed for the 2009 Edition of the *IRPhE Handbook*. Included on the list of "in-progress" or "planned" evaluations are the PROTEUS reactor (GCR); FFTF (LMFR); ZPPR Assemblies 9, 13, and 17 (LMFR); VENUS Configurations 1, 7, 9, and 17 (PWR); VHTCR (GCR); HTTR (GCR); KRITZ (LWR); and TCA (LWR).

65. Annex II provides a more detailed view of the Status of IRPhE Evaluations, Published, New or Revised in the Third Edition, Currently in Progress or Planned, and/or Archived and Potentially Available for Evaluation. See also the Web pages www.nea.fr/html/dbprog/IRPhE-latest.htm.

66. The IRPhE Project is financed in part by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) of Japan in the form of a voluntary contribution. Other countries give financial support to research groups in their countries, which, in turn provide input to the project.

IFPE - Fuel performance experiments

67. Work on expanding the comprehensiveness of the International Fuel Performance Experiments (IFPE) database has continued in cooperation with the IAEA. Some sets of data were updated with complementary or missing data or corrections obtained from user feedback and several new ones were added. At present, the database contains data of about 1 436 rods or samples. The following cases have been added during 2007 and early 2008:

1. Studsvik DEFEX BWR fuel secondary defect formation as a consequence of primary defects
2. Studsvik DEFEX-II DEMO BWR fuel primary defect and conditions leading to secondary failure of the cladding by hybriding
3. Studsvik ROPE-I (1986-93), BWR, 4 rods, Ringhals, investigates clad creep-out.
4. Studsvik ROPE-II PWR rod over pressure experiment
5. Studsvik STEED-I Stored Energy / Enthalpy Determination
6. HRP IFA-585, In-Reactor Creep Behaviour of Zircaloy-2 and Zircaloy-4 under Variable Loading Conditions
7. AEKI Experimental Database of E110 Claddings under Accident Conditions
8. Belgonucléaire and SCK-CEN PRIMO Ramped MOX Fuel Rod BD8
9. JAEA Power Ramp Tests of MOX Fuel Rods IFA-591
10. CANDU IRDMR experiments FIO-118 and FIO-119 CANDU Fuel Behaviour under LOCA Conditions
11. CANDU experiment FIO-131 Fuel Behaviour under LOCA Conditions
12. Belgonucléaire Beznau-1 PWR irradiated MOX Fuel Rod M109/D3
13. DOE WG-MOX Fuel Irradiation Experiment Irradiated at the Advanced Test Reactor (ATR)
14. Novovoronezh-5 VVER1000 fuel behaviour data (cycles 7-9, Bu ~47MWd/kg) (updated)

68. The following set of experimental data is undergoing review:

- LWR MOX Fuel Irradiation Tests - HBWR Irradiation with the Instrument Rig, IFA-514/565 (JAEA)

69. The following archives have been added:

- Babcock & Wilcox Extended-Burn-up Gadolinia Lead Test Assembly (Mark Gdb) Irradiation Programme
- AREVA-ANP/Erlangen - Grain Bubble Gas Interlinkage
- IFA-508 and IFA-515 conducted by JAERI at HRP - PCMI behaviour data on different cladding thickness by means of diameter rig

70. Since IFPE was designed and set up 13 years ago, 13 editions have been issued and requested by 117 establishments in 33 countries. The full set now occupies four full DVDs.

71. Recently, the FUMEX-III exercise organised by the IAEA Technical Working Group was approved. This project is carried out in cooperation with the NEA that provides the datasets used for the exercises through its IFPE database. A kick-off meeting was held on 30 April 2008 defining the themes to be covered and datasets to be used. Through this exercise, additional data will be made available to the IFPE database. In particular, a series of important experiments carried out at the Halden Reactor are candidates for release.

72. For more information, please visit: www.nea.fr/html/science/fuel/ifpelst.html

SINBAD – Radiation Shielding and Dosimetry experiments

73. The SINBAD database currently contains compilations and evaluations of experiments for 42 reactor shielding problems, 27 for Fusion Neutronics Shielding and 15 for Accelerator Shielding cases. Several new experiments were compiled and need final review. They include:

Reactor Shielding

- RFNC-PHOTONS2. Measurement of Photon Leakage Spectra from Spherical and Hemispherical Samples of H2O, SiOe and NaCl compounds with a Central 14-MeV Neutron Source

Fusion Neutronics Shielding

- IPPE Bi spheres (Cf-252 and T(d,n) sources)
- FNS-SKYSHINE. FNS/JAERI Measurement of Radiation Skyshine with D-T Neutron Source

Accelerator Shielding

- AVF (Osaka University) neutron transmission through concrete shields
- INS (Tokyo University)Neutron Production from Thick Targets of Carbon, Iron, Copper, and Lead by 30- and 52-MeV Protons(1982)
- ITEP/Moscow Experimental determination of the threshold activation reaction rates inside and outside the 0.8 GeV proton-irradiated W-Na target
- Transmission of Medium Energy Neutrons Through Concrete Shields (1991)
- CERF shielding experiment at CERN (2004)
- CERF Radionuclide Production (2003)
- CERF Residual Dose Rates (2003)

74. Other valuable data from shielding experiments are on the waiting list for compilation and acquisition, for the three types of applications. These will be added at a pace compatible with available resources at the Data Bank and external expertise. Several evaluations from the ICSBEP alarm system benchmark chapter are within the scope of SINBAD.

75. Since the experimental data presently available in SINBAD are of varying quality, a revision and classification of the benchmark experiments according to the completeness and reliability of information will be done to provide users with easier choices and help them make better use of the experimental information. In particular, all the Time-of-Flight benchmark experiments will be revisited according to the outcomes of the EC CONRAD inter-comparison exercise.

76. The full list of SINBAD experiments is provided in Annex III. Further information can be found at: http://www.nea.fr/html/science/shielding/sinbad/sinbadis.htm.

Nuclear Safety

77. "Enhanced Co-operation and Co-ordination of Activities between the CSNI, and the NSC and the Data Bank" has continued relative to experimental data and corresponding primary reports released from the different projects carried out by the Committee on Safety of Nuclear Installations (CSNI). This information is maintained and disseminated by the Data Bank.

78. Data and reports from joint CSNI projects maintained or being acquired by the Data Bank:

- PKL test programme is investigating pressurised water reactor (PWR) safety issues
- CABRI LWR Fuel Performance (ALPS-CIP-LS-1 tests)

- CCVM: CSNI Code Validation Matrix Integral Test Data and Validation Matrix Separate Effects Test Data
- IRSN Cabri Water Loop Project: High burn-up fuel behaviour in RIA conditions
- MASCA Project: In-vessel phenomena during severe accidents
- MCCI Project: Melt Coolability and Concrete Interaction (MCCI) Project
- PAKS fuel behaviour in accident conditions
- PSB-VVER Project: Experiments for transient analysis of VVER-1000 reactors project
- RASPLAV Project: Physical and thermal behaviour of the corium in large-scale tests
- ROSA/LSTF facility large scale experiments - complex phenomena that may occur during design basis events (DBE) and beyond-DBE transients
- SETH - PANDA experiments on large-scale mixing and stratification relevant for accidents management
- SETH - PKL Project (small-break LOCA with boron dilution and residual heat removal system at shutdown)

79. A special effort was devoted to the STEX database in 2008. The STEX database is a compilation of the experimental work conducted to investigate the phenomenon of "***STeam EXplosion***", an extensively studied problem in the area of nuclear safety. Steam explosion (also known as vapour explosion) is a physical phenomenon in which the internal energy of a hot liquid is rapidly transferred to a colder and more volatile liquid, which, as a result vaporises at high pressure and expands against the inertial constraint of the surrounding structure as well as the mixture. In the context of nuclear safety, the hot liquid is the molten *'fuel'* and the colder more volatile liquid is the *'coolant'*. A steam explosion is, therefore, a class of fuel-coolant interactions in which the timescale for heat transfer between the liquids is smaller than the timescale for pressure wave propagation and expansion in a local region of the fuel-coolant mixture.

80. Steam explosion experiments are numerous and can be categorised in different ways depending on the scale or the conditions of the experiment:

- In-pile vs. out-of-pile experiments,
- Small, intermediate or large scale experiments,
- Pouring, injection, or stratified contact mode.

81. Currently, the STEX database is exclusively focused on out-of-pile, intermediate to large-scale experiments in which the pouring mode has been employed to cause direct contact between the molten fuel and the coolant. Due to the large number of experiments that fit into this category, STEX focuses on experiments performed at six facilities: **FARO**, **KROTOS**, **TROI**, **WFCI**, **ZREX**, and **FITS.**

82. The STEX database has been compiled by the University of Wisconsin-Madison on behalf of the Nuclear Energy Agency. The information provided is available in structured HTML files with suitable hyperlinks to pictures and graphs (>700), tables (>120) and reference reports (21). The complete database consists of approximately 1 000 files (135 Mbytes).

83. Experts recommend that other experiments carried out in the USA (EXO-FITS, Efficiency Scaling Tests, Argonne Lab R22 Tests), UK (MFTF, MIXA, Winfrith), FRG (QUEOS) and Japan (ALPHA) be integrated in STEX in the short term in order to fill in gaps and expand comprehensiveness.

Nuclear Waste Management

84. The thermochemical database (TDB) project helps 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.

85. A state-of-the-art report on chemical thermodynamics of solid solutions was published in 2007.

86. In 2007, work continued on the reviews of thorium, tin and iron. The thorium report is scheduled for publication in 2008. The iron report is scheduled for peer review in 2008. The tin report is scheduled for peer review in 2009.

87. A new fourth phase of the TDB project (TDB-IV) began on 1 February 2008. The management boards of Phase III and Phase IV of the TDB project met at NEA headquarters on 19 and 20 February 2008, respectively. It was agreed to close the third phase of the project and to transfer the remaining tasks and budget to the fourth phase of the project. The remaining tasks are completing and publishing the reviews on chemical thermodynamic data for inorganic compounds and complexes of thorium (Th), iron (Fe), and tin (Sn). The fourth phase of the project will comprise:

- complementary studies of inorganic species and compounds of iron (Fe),
- a review of auxiliary data,
- an update of the selected value database accrued during the first three phases of the project,
- a review of inorganic species and compounds of molybdenum (Mo).

Radiation Protection and Public Health

88. The Data Bank will provide support to the Information System on Occupational Exposure (ISOE) operated by the Radiation Protection and Public Health Section. A data entry web application is being implemented and tested for Phase 2 of this project.

Central Secretariat

One man-month will be allocated to assist the NEA Central Secretariat in maintaining and operating the infrastructure for the NEA's Web site and other Internet activities.

DATA BANK WORK IN CO-OPERATION WITH AND EXPERTISE PROVIDED TO OTHER DIVISIONS OF NEA

2007	***Actions / Deliverables***	***Achievement 2007***
	TDB: Publish Review on Solid Solutions.	Published in Summer 2007.
	Issue of ICSBEP.	Published in September 2007.
	Add new compilations / evaluations to IRPhE in accordance with set priorities, issue second edition of IRPhE Publication on CD-ROM in March 2007.	2nd Edition published in March 2007.
	Archive data, reports and computer codes from separately funded OECD/NEA projects on behalf of the Nuclear Safety Division, distribution upon specific authorisation.	Archived MASCA and MCCI, CABRI-ALPS-CIP-LS, SETH Panda.
	Release of IFPE with new compilations.	Five new series of experiments included in 2007.
	Issue new edition of SINBAD.	Continuous updating during 2007.
2008	***Actions / Deliverables***	***Achievement 2007***
	TDB: Reviw on Thorium.	Scheduled for publication in Fall 2008.
	Issue of ICSBEP.	Dur out in September 2008.
	Release IFPE in a continuous way with new compilations.	Seven new series of experiments included in 2008.
	Release SINBAD in a continuous way with new compilations.	Ten compiled experiments are currently undergoing a review process.
	Add new compilations / evaluations to IRPhE in accordance with set priorities, issue second edition of IRPhE Publication on CD-ROM in March 2008.	3rd Edition issued in March 2008.
	Archive data, reports and computer codes from separately funded OECD/NEA projects on behalf of the Nuclear Safety Division, distribution upon specific authorisation.	STEX database Version 1 released, PAKS, PKL, ROSA/LSF added, continuous updating during 2008.
2009/ 2010	***Objectives***	
	TDB: Review on Iron Step 1 (2009) and Review on Tin (2010).	
	Issue of ICSBEP.	
	Release IFPE in a continuous way with new compilations.	
	Release SINBAD in a continuous way with new compilations.	
	Add new compilations / evaluations to IRPhE in accordance with set priorities; issue second edition of IRPhE Publication on CD-ROM in March 2009.	
	Archive data, reports and computer codes from separately funded OECD/NEA projects on behalf of the Nuclear Safety Division, distribution upon specific authorisation.	

COMPUTING INFRASTRUCTURE AND DEVELOPMENT

89. The last two years can be characterised by a basic consolidation of the computing infrastructure and a shift in software development and management procedures. An IDE (Integrated Development Environment) for the maintenance and development of software projects has been introduced and is proving a reliable tool for collaborative work on JANIS and CONFDB as detailed below.

Achievements in 2007

JANIS: CD/DVD nuclear data viewer

90. A new version was released in June 2007, version 3.0, and an update (3.0.1) in February 2008. The latest version provides:

- A complete implementation of EXFOR format, the previous version used NEA computational format.
- Plots are now vectorial instead of rasterised. They can now be exported as Windows Metafiles (WMF/EMF), the quality of printing and PS/EPS export has been improved and now line style and width can be set.
- More data can be viewed as tables: previous versions were limited to data with only one variable (e.g. incident projectile energy), version 3.0 can display table data with more than one variable (e.g. incident projectile energy and angle of outgoing particle).

91. Other changes and new functionalities include:

- Use of FreeHEP library for saving pictures into rasterised and vectorial formats.
- RTF based text views have now been replaced by HTML; this allows integration of tables and prepares the integration into NEA website.
- INTER format : support of version 7.0 and 7.01.
- Java relational database used for DVDs : the discontinued Mckoi product has been replaced by H2, which offers better performance and more compatibility with Oracle (used on server-side)?
- Display of ENDF MF1 MT455 (delayed neutrons decay constants).
- Translation of EXFOR database into computational format C4, defined by IAEA NDS. A tool has been written to compare C4 file and help debug JANIS EXFOR implementation and check EXFOR database content.
- Saving of nuclide charts as picture files combined with the possibility of displaying customised charts.
- A part of source code has been extracted and shared between JANIS and all other Java based projects (DICE, OPDE, FIRE…).

CINDA: Bibliographical Index to Nuclear Data

92. The full archival book was produced and distributed in August 2007, as well as the DVD distribution, which is now a part of Version 3. A special set of software modules were developed to produce the Latex output in order to print the 5 400 pages from the CINDA database.

RTFDB: Research and Test Facilities Data Base

93. The contents of the database describe the various R&D facilities in member countries. This project supports the NEA Nuclear Science Section and development by a Japanese software engineering company is now complete. Additional authentication according to end-user category has been implemented. Code has been optimised to improve speed.

CONFDB and REVIEWDB

94. The Data Bank, as well as the rest of the Agency, 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…

95. 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 has been developed. The new tool will enable NEA users to make up their own customised forms and collect information as needed from external users for all the situations envisaged. The software system has been tested and is currently being used for some meetings.

96. An extension to the core Conference Management System is one that manages the review process of the paper selection for a conference. A prototype had been developed for ND2001, but has been tweaked since then for various conferences. We are now integrating these functions into a module for the overall CONFDB environment. The testing phase is planned for summer 2008.

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

97. 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)*

98. 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. The new interface is Java based and makes use of the Spring framework. This new interface was used for 2007 data entry. The end-user application was refactored:

- Search panes: allow searching of combinations of codes, the Boolean AND operation in addition to the default OR operation.
- Result panes: the new edition always retrieves all results in a single relational database query, in case of NEA remote database access, multiple queries triggered multiple network roundtrips between the client and the server, so the speed gain is consequent in this case.
- Result panes: unification of the two result panes into a single one, which is more flexible and provides all the previously available functionalities.
- Plotting panes: this part was re-engineered to improve the look of the plots, to be more intuitive and to add the possibility of plotting new sensitivity data. This was achieved by using an external library named JFreeChart, also used by ISOE project.
- DICE can now display Tsunami sensitivity files (1D and 3D).
- 2008 edition displays correlation matrices.

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

99. The second phase of the project involving the development of a data entry web interface, was carried out. The development was based on the Spring framework, also used for the DICE project. The graphical design was taken from a Korean national implementation of a similar system, provided by KINS. The module developed during the first phase, MADRAS, was incorporated into the new web interface. To accommodate the actual complexity and future changes in user rights management, a flexible system was

developed which allows access rights from the web interface to be changed, without intervention of developers. 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.

Other database projects maintained by the Data Bank

General:

EXFOR *Database of experimental nuclear data*
EVA *Database of evaluated nuclear data*
HPRL *High Priority Nuclear Data Request List*

In support of the NEA Radioactive Waste Division:

TDB *Chemical Thermodynamics Database*

In support of the NEA Nuclear Safety Division:

FIRE *OECD Fire Incidents Records Exchange*
OPDE *OECD Piping Failure Data Exchange*
STRESA *Storage of Thermal Reactor Safety Analysis data: no change*

In support of the NEA Nuclear Development Division:

RBO *Database for the Uranium resources (Red Book)*
BBO *Database for the Nuclear Electricity statistics (Brown Book)*

In support of the Generation-IV forum:

GIF *Generation Four International Forum collaborative web server*

In support of the NEA central Secretariat and general users:

PUB *Publications data base*
ADD *Contacts database*

In support of the NEA Nuclear Sciences Division:

SFCOMPO *Database of Spent Fuel Composition*

Use of the Data Bank Services

100. There has been a dramatic increase in the EVA-JEFF-JANIS area's access and traffic. The other online services are relatively stable.

Table 1. Number of accesses

	2007	2006	2005	2004	2003	2002
Computer Program Abstracts	1 272 558	905 814	708 622	592 296	479 926	225 299
Program retrievals	417*	503*	527*	616*	576*	489*
CINDA	1 852	1 388	897	873	975	2 733
EVA searches	7 410	8 017	13 843	8 481	9 796	4 400
EVA downloads	227 313	56 150	54 956	15 354	7754	2 915
JEF documents	148 365*	30 242*	19 772*	14 515*	11 775*	12 783*
EXFOR searches	10 712	11 563	13 368	13 105	12 777	9 063
EXFOR downloads	22 761	18 698	436 055	13 694	12 449	8 872
JANIS	486 247	361 770	216 520	218 811	277 046	25 068^
Web pages – CPS	261 773	234 171	186 443	166 649	158 915	107 491
Web pages – DB	43 897	38 743	34 166	33 107	34 321	27 738
Web pages – Data	121 705	100 728	86 894	83 437	77 672	57 138
Web pages – TDB	46 860	43 090	38 649	30 189	24 711	16 997
Total accesses	**2 651 870**	**1 810 877**	**1 810 712**	**1 191 127**	**1 108 693**	**48 7714**

* password protected

^ password protected until July 2002 (In July 2002, at the request of the Executive Group, password protection was removed from the nuclear data areas. As a result there was a rapid increase in the number of accesses to those pages.)

Table 2. Number of Gigabytes

	2007	2006	2005	2004	2003	2002
Computer Program Abstracts	25.5	21.7	16.5	13.2	10.3	3.9
Program retrievals	8.7	7.1	6.3	6.2	4.7	9.1
EVA downloads	290.2	75.5	25.2	23.4	17.6	13.3
Exfor downloads	0.6	0.5	1.9	0.5	0.24	0.24
JEF documents	123.9	38.6	12.0	8.1	11.0	10.3
JANIS	52.7	17.8				
Web pages – CPS	33.2	30.9	18.4	14.0	9.1	5.7
Web pages – Data	38.8	12.6	4.0	3.8	3.3	2.3
Total traffic	**573.6**	**204.7**	**84.3**	**69.2**	**56.2**	**44.8**

101. Standard Web statistics software can account for visits rather than just hits to give a slightly different view of usage as shown in Fig. 11.

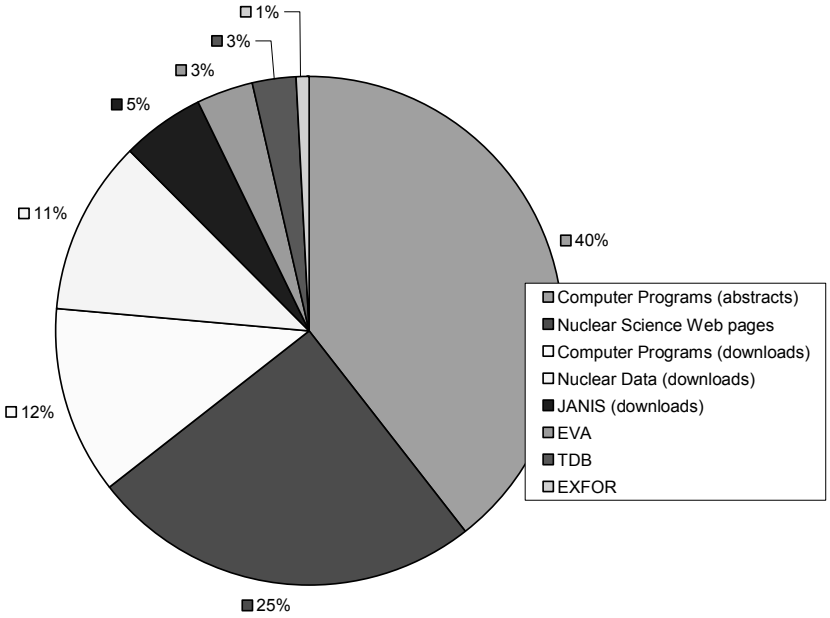

Fig. 12: Visits of Data Bank Web pages

102. Note that visits are not directly comparable to number of accesses in Table 2.

Changes to the Hardware and Systems

File storage

103. Following the upgrade in 2006 of the main Network Attached Storage (NetApp NAS), an increase in storage of one TeraByte was carried out in June 2007 in order to accommodate the present and future computer programme master file storage requirements. They were housed on a separate older NAS system.

Intranet servers

104. The intranet services relying on Linux system have been migrated to a fully high-availability system (HA). The two main servers were upgraded with new Dell units, and the older Dell units were used as service directors and load-balancers. Open source CentOS, a publicly available version of the equivalent Red Hat Enterprise Linux operation system, was used here. Most of the Linux NEA systems now run a CentOS operation system.

Oracle

105. A new installation of Oracle Enterprise Manager (OEM) took place during the hardware upgrade. OEM is the system which manages and controls the two instances (the one serving requests and the one in standby for failover). The new installation was done to ensure that during normal operations it does not report any warning.

SVN and Trac: In-house software source code management

106. All new NEA in-house software development is now stored in a version control system named Subversion (SVN). Its purpose is to help track work, history of changes and version management. Around this version control system, a web application named TRAC is used to browse software codes, write documentation and keep track of bugs. TRAC is an open source, web-based project management and issue tracking tool, including a wiki, source code browsing. TRAC uses a minimalist approach to web-based software project management.

KVM (Keyboard-Video-Mouse)

107. To reduce the number of screens in the computer rooms, a new KVM system has been installed. It allows users to reach any server and network equipment from one of the three screens and keyboards located in the computer room and the telecom room. A dedicated appliance still needs to be set up (access rights, for example) to reach those same servers from any PC of the network that can run JAVA software. A dedicated cable needs to be installed to allow remote access from the telecom room to the computer room, and vice-versa. This cannot be done until the computer room has been moved.

Backup

108. The backup system has been replaced. It allows shorter restoration time by first backing-up data on dedicated hard-drives. The data are then backed-up on tapes. The StorageTek hardware has been replaced by Quantum hardware, but the software is still EMC2 Legato Networker. A specialised company was hired for the destruction and recycling of the out-of-date tapes from the previous two generations of back-up systems.

Current and recent work in 2008 and plans for 2009 and 2010

JANIS

109. Plotting of "Beta decay ray shapes", a functionality which was available in JEF-PC and not yet implemented into JANIS was developed. Some tools and some checking routines have been developed in order to enhance the quality of EXFOR and CINDA databases. WPEC subgroup 30 will benefit from work done on EXFOR. Future work will concentrate on:

- NEA website integration: The final objective being to provide all JANIS functionalities through a Web interface; the first phase being to split the current source code into two parts: source code of the DVD software graphical interface, and source code of nuclear data file

reading and displaying, which will be shared by the DVD application and the Web application.
- Completion of coverage of ENDF libraries: photon interaction data, covariance matrices.
- Comparison of user own data with data contained in ENDF and EXFOR databases.

OPDE, FIRE and SCAP

110. The FIRE project is currently investigating the possibility of incorporating a query and/or a statistical module into the data input web application.

Monitoring, Reporting and Testing

111. It is important to find a way to automate log file checking and statistics generation for each application to enhance the quality of service. Tests developed for applications like JANIS could be launched automatically to provide an instantaneous view of the global state of the source code during development, in order to avoid malfunctions on the production version.

Infrastructure plans

Oracle

112. Investigation will begin on moving the Oracle system and databases to a NAS based operation using the existing NetApp file server. This should lead to further improvements of the management of the failovers.

Internet bandwidth increase

113. Last year's efforts to increase the bandwidth of the main Internet link with the world Research network failed because our local French operator is pulling out from that service. We have identified another operator (RAP: Reseau Academique Parisien), which is exceptionally willing to provide the link, although we are not properly within the Paris limits.

Firewall structure

114. Some improvements in security will be expected from the reorganisation of the subnets into specialised firewall managed 'DMZs'. The main 'Internet DMZ' will be split into a Windows OS and a Linux OS subnet. In this way, potential weaknesses in the Windows OS (in case of attacks) will not affect the Linux servers and vice versa. The link to the OECD network will also be routed through the firewall instead of just a routing link on the Office Automation subnet. Upgrading the firewall equipment is foreseen for 2009.

MOVE from 9th floor computer room

115. The computer room was not moved from the 9th floor in 2007. It is still highly probable that the premises will be available towards the end of 2008. There is an advantage to relinquishing this part of the building, currently housing the computer room, but there is no critical deadline. By pre-installing the cabling, power supply, a core switch and some new racks, the transfer of the equipment can be carried out at leisure over a few weeks without any disruption to the services.

COMPUTING INFRASTRUCTURE AND DEVELOPMENT DELIVERABLES

2007		***Achievements***
	Upgrade Oracle	Done
	SCAP web application	Done
	ISOE Web application	Done
	Internet bandwidth increase	Delayed
	JANIS software	Done
	DICE software	Done
	Various database application improvements	Done
2008	***Objectives***	***Status in June 2008***
	Complete Confdb with review part	In progress
	Internet bandwidth increase	In progress
	Oracle NAS environment study	
	Network core equipment upgrade	
2009/ 2010	***Objectives***	
	Firewall equipment upgrade	
	Move computer room	

MANPOWER ALLOCATION IN THE DATA BANK (man-months/year)

116. The table below shows the foreseen resource allocation (in months/year) of professional staff in the Data Bank for 2008 and 2010. The allocation below corresponds to the actual Data Bank professional staff of 15.4, minus 3 professional staff working in the Management Support Unit and in the Central Secretariat.

Project area	*2008*	*2009*	*2010*
Nuclear data co-ordination and services	41	41	41
Software validation and services	40	40	40
Databases of integral experiments	13	13	13
Calculation methods for fission reactors and radiation shielding	19	19	19
Expertise to other parts of NEA			
To Nuclear Science	20	20	20
To other NEA divisions	16	16	16
TOTAL DATA BANK MANPOWER	149	149	149

LIST OF DATA BANK PUBLICATIONS

117. 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.

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 planned in 2008 and 2009

- 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 electronic newsletter was renamed from Computer Program Service (CPS) E-Newsletter to OECD/NEA Data Bank e-newsletter. Coverage was expanded to include all aspects of Data Bank activities. It has also been distributed to a larger community.

ANNEX I: List of some codes and data released during the last 12 months

Name	Function
ACTIVATE2007	Activation Cross-Section by Combining Cross Section and Multiplier
ADEFTA 4.0	Atomic Densities for Transport Analysis
ANGELO-LAMBDA	Covariance matrix interpolation and mathematical verification
CAFDATS	Converter of Angular Fluxes of DORT, ANISN and TORT Systems
CARL 2.3	Radiotoxicity, activity, dose and decay power calculations for spent fuel
DWBA07/DWBB07	Elastic scattering with nucleon-nucleon potential and DWBA for inelastic
EASY-2005.1	European Neutron Activation System
ECIS-06	Coupled Channel, Statistical Model, Schrödinger and Dirac Equation, Dispersion Relation
ENDF-UTILITY-CODES	Codes to check and standardise data in the Evaluated Nuclear Data File (ENDF)
ERANOS 2.0	Modular code and data system for fast reactor neutronics analyses
GENII-1.485	GENII-LIN, Multi-purpose Health Physics Code
KENO2MCNP	ACTIVATE2007
KENO3D	Visualisation Tool for KENO V.A and KENO-VI Geometry Models
MARLOWE 15b	Computer Simulation of Atomic Collisions in Crystalline Solids
MCNP-POLIMI v1.0	Monte Carlo N-Particle Transport Code System To Simulate Time-Analysis Quantities
MCSLTT	Monte Carlo Simulation of Light Transport in Tissue
MONTEBURNS 2.0	An Automated, Multi-Step Monte Carlo Burn-up Code System
NLCGCS_MPV3.0	Inversion of electromagnetic fields for subsurface electrical properties
NRCDose 2.3.10	Evaluation of Routine Radioactive Effluents from Nuclear Power Plants
P-CARES 2.0.0	Probabilistic Computer Analysis for Rapid Evaluation of Structures
PGAA-IAEA	Database for Prompt Gamma-ray Neutron Activation Analysis
PMK2-VVER440-RESULTS	Results of the Experiments Performed in the PMK-2 Facility for VVER Safety Studies
PREPRO2007	Data Preparation and Management, Subsidiary Calculations (ENDF Format)
RASCAL 3.0.5	Radiological Doses from Accidental Release to Atmosphere
REFIT	Multi-level Resonance Parameter Least Square Fit of Neutron Transmission and Capture Data
REMIT5.1	Radiation exposure monitoring and information transmittal system
RSAC-6	Gamma-, inhalation and ingestion doses, fission products inventory after release
SAMMY	Multi-level R-Matrix Fits to Neutron and Charged-Particle Cross-Section Data
SCALE 5.1/ORIGEN-ARP5.1	Modular system for criticality, shielding, source term, fuel depletion/decay, reactor physics
SCAMPI	Problem Dependent Library Preprocessing in AMPX Format
SCIP	Radioactive Surface Contamination Investigation Program
SERA-1C0	Simulation environnent for radiotherapy applications
SQUIRT 1.1	Predicts leakage rate and crack area for cracked pipes in nuclear power plants
SUSD3D	1-, 2-, 3-Dimensional Cross-Section Sensitivity and Uncertainty Code
SWAT	Step-Wise Burn-up Analysis Code to Combine SRAC-95 Cell Code and ORIGEN2
TALYS-1.0	Nuclear reactions cross-sections, yields & spectra via a comprehensive set of nuclear models
TRIPOLI-4.3.3 & 4.4	Coupled Neutron, Photon, Electron, Positron 3-D, Time Dependent Monte-Carlo
VARSKIN-3	Dose Calculation for Skin Contamination, with Sadde Input Generator
ZZ ADS-LIB/V1.0	Test library for Accelerator Driven Systems
ZZ ALBEDO-DATA	Data for Albedos from Concrete, Iron, Lead and Water for Photons and Neutrons
ZZ COV-15GROUP-2006	15-group cross-section covariance matrix library
ZZ HATCHES-18	Database for radiochemical modelling
ZZ IRDF-2002-ACE	Cross-Section Library and Spectra for Dosimetry Calculation in ACE Format
ZZ VITJEFF31.BOLIB	JEFF-3.1 Coupled (199n + 42gamma) X-Section Library for Nuclear Fission Applications
ZZ-SCALE5.1/COVA-44G	44-group cross-section covariance matrix library extracted from SCALE5.1

ANNEX II: Status of IRPhE Evaluations

Evaluations for Third Edition (in green: new evaluations)

Approved Evaluations	TITLE
FUND	
BFS1-FUND-EXP-001 CRIT-SPEC-COEF-RRATE	Experimental Program Performed at the BFS-97, -99, -101 Assemblies - Critical Experiments with Heterogeneous Compositions of Plutonium, Depleted Uranium Dioxide and Polyethylene
BFS1-FUND-EXP-002 CRIT-SPEC-REAC-RRATE (MIX-MISC-FAST-001)	Experimental Program Performed at the BFS-42 Assembly - k-infinity Experiments for ^{238}U in Fast Neutron Spectra: Measurements with Plutonium Mixed with Depleted Uranium Dioxide and Polyethylene
BFS1-FUND-EXP-003 CRIT-SPEC-COEF-RRATE	Experimental Program Performed at the BFS-57and -59 Assemblies - Critical Experiments with Heterogeneous Compositions of Enriched Uranium or Plutonium, Depleted Uranium Dioxide and Polyethylene
BFS2-FUND-EXP-001 CRIT-SPEC-REAC	Experimental Program Performed at the BFS-31 Assemblies - k-infinity Experiments for ^{238}U in Fast Neutron Spectra: Measurements with Plutonium Mixed with Depleted Uranium Dioxide
GCR	
ASTRA-GCR-EXP-001 CRIT	Graphite Annular Core Assemblies with Fuel Elements Containing UO_2 Coated Fuel Particles
HTR10-GCR-RESR-001 CRIT	Evaluation of the Initial Critical Configuration of the HTR-10 Pebble-Bed Reactor
HWR	
DCA-HWR-RESR-001 CRIT-SPEC-RRATE	Deuterium Critical Assembly with 1.2% Enriched Uranium Varying Coolant Void Fraction and Lattice Pitch
LMFR	
BFS1-LMFR-EXP-001 CRIT-SPEC-COEF-KIN-RRATE	BFS-73-1 Assembly: Experimental Model of Sodium-Cooled Fast Reactor with Core of Metal Uranium Fuel of 18.5% Enrichment and Depleted Uranium Dioxide Blanket
BFS2-LMFR-EXP-002 CRIT-SPEC-RRATE	BFS-62-3A Experiment: Fast Reactor Core with U and U-Pu fuel of 17% Enrichment and Partial Stainless Steel Reflector
JOYO-LMFR-RESR-001 CRIT-REAC-COEF	Japan's Experimental Fast Reactor JOYO MK-I core: Sodium-Cooled Uranium=Plutonium Mixed Oxide Fueled Fast Core Surrounded by UO_2 Blanket
ZEBRA-LMFR-EXP-001 CRIT-SPEC-REAC-RRATE	Fast Critical Experiments in Plate and Pin Geometry Form. The ZEBRA CADENZA Cores, Assemblies 22, 23, 24 and 25
ZEBRA-LMFR-EXP-002 CRIT-SPEC-REAC-RRATE	The ZEBRA MOZART Programme Part 1. MZA and MZB, ZEBRA Assemblies 11 and 12
ZEBRA-LMFR-EXP-003 CRIT-REAC-RRATE	The ZEBRA MOZART Programme Part 2. MZC and the Control Rod Studies ZEBRA Assembly 12
ZPR-LMFR-EXP-001 CRIT-SPEC-REAC-RRATE	ZPR-6 Assembly 7: A Cylindrical Assembly with Mixed (Pu,U)-Oxide Fuel and Sodium with a Thick Depleted-Uranium Reflector
LWR	
CROCUS-LWR-RESR-001 CRIT-REAC-KIN	Kinetic Parameters and Reactivity Effect Experiments in CROCUS
DIMPLE-LWR-RESR-001 CRIT-BUCK-SPEC-REAC-COEF-RRATE	Light Water Moderated and Reflected Low Enriched Uranium (3 wt.% ^{235}U) Dioxide Rod Lattices DIMPLE S01

IPEN/MB01-LWR-RESR-001 CRIT-COEF-KIN	Isothermal Experiment of the IPEN/MB-01 Reactor
PWR	
CREOLE-PWR-EXP-001 CRIT-COEF-RRATE-MISC	CREOLE PWR Reactivity Temperature Coefficient Experiment - UOX and MOX up to 300C in EOLE
VVER	
PFACILITY-VVER-EXP-001 CRIT-RRATE	VVER Physics Experiments: Hexagonal (1.27-vm Pitch) Lattices of U(4.4 wt.% ^{235}U)O_2 Fuel Rods In Light Water, Perturbed by Boron, Hafnium, or Dysprosium Absorber Rods, or by Water Gap With/Without Aluminium Tubes
ZR6-VVER-EXP-001 CRIT-BUCK-SPEC-REAC-COEF-RRATE	The VVER Experiments: Regular and Perturbed Hexagonal Lattices of Low-Enriched UO_2 Fuel Rods in Light Water
Evaluations published as drafts	
SNEAK-LMFR-EXP-001 CRIT-SPEC-REAC-RRATE	SNEAK-7A&SNEAK 7B Pu-Fueled Fast Critical Assembly Experiments in the Karlsruhe Fast Critical Facility
VENUS-PWR-RESR-001 RRATE-POWDIS	VENUS-1 PWR Core -- 2-Dimensional Benchmark Experiment
VENUS-PWR-RESR-003 RRATE-POWDIS	VENUS-3 PWR UO_2 Core 3-Dimensional Benchmark Experiment
ZPPR-LMFR-RESR-001 CRIT-REAC-RRATE	JNC Large fast reactor experiment ZPPR-10A in JUPITER

Evaluations being evaluated for inclusion in fourth Edition

- TCA-LWR-EXP-001 CRIT-COEF - TER-2 in LWR UO2 with Soluble Poisons
- VENUS-PWR-EXP-004 CRIT-BUCK-REAC-KIN-RRATE - Experimental Study of the VENUS Configuration No. 7
- VENUS-PWR-EXP-005 CRIT-SPEC-POWDIS - Experimental Study of the VENUS Configuration No. 9
- VHTRC-GCR-EXP-001 CRIT-COEF - VHTRC Temperature Coefficient Benchmark
- KRITZ-BWR-RESR-002-CRIT-BUCK-RRATE: KRITZ-2:1 Experiment on Regular H2O/Fuel Pin Lattices with Low Enriched Uranium Fuel at Temperatures up to 248.5 °C
- KRITZ-BWR-RESR-003-CRIT-BUCK-RRATE: KRITZ 2:13 Experiment on Regular H2O/Fuel Pin Lattices with Low Enriched Uranium Fuel at Temperatures up to 243 °C
- KRITZ-PWR-RESR-001 CRIT-BUCK-REAC-COEF-RRATE - Kritz-2:19 Experiment on Regular H2O/Fuel Pin Lattices With Mixed Oxide Fuel at Temperatures up to 245 °C
- PROTEUS-GCR-EXP-001 CRIT-SPEC-REAC-RRATE - Shut-down Rod Worths in LEU-HTR Configurations
- IPEN - Effective kinetic parameters (βeff,βeff/Λ, Λ)
- ZPPR-9 experiment: 600 MWe class, two-region homogeneous clean core: one feature is the measurement of the sample Doppler reactivity in JUPITER
- ZPPR-13A: 650 MWe class, radially-heterogeneous clean core in JUPITER: very weak core-coupling - difficult from the reactor physics viewpoint
- ZPPR-17A: 650 MWe class, axially-heterogeneous clean core in JUPITER: medium characteristics between homogeneous and radially-heterogeneous core from core-coupling

Evaluations requiring considerable more work before approval

- HTTR-GCR-RESR-001 CRIT-REAC-COEF-POWDIS - Initial Criticality, Control Rod Position at Criticality, Excess Reactivity, Scram Reactivity of HTTR reactor

- SNEAK-LMFR-EXP-002 CRIT-SPEC-REAC-RRATE - SNEAK 9C Experimental Series of SNR 300 Specific Criticals
- STEK-LMFR-EXP-001 CRIT-SPEC-REAC-RRATE - Reactivity Worth Measurements and Other Experiments in the Critical Facility STEK
- VENUS-PWR-EXP-001 BUCK-RRATE-POWDIS - VENUS-1 PWR UO2 Core 2-Dimensional Benchmark Experiment
- VENUS-PWR-EXP-002 BUCK-RRATE-POWDIS - VENUS-2 PWR UO2-MOX Core 3-Dimensional Benchmark Experiment
- VENUS-PWR-EXP-006 CRIT-BUCK-SPEC-REAC-POWDIS - Experimental Study of the VENUS Configuration No. 17
- ZEBRA-RESR-EXP-001-CRIT-SPEC-RRATE - K-Infinity Experiments In Fast/Intermediate Neutron Spectra for Various Fissile Materials - ZEBRA Core 8

Experiments proposed for inclusion in IRPhE

- AVR HTR Melt-wire Experiment
- B&WSSCR-PWR-EXP-001 CRIT-SPEC-REAC B&W-SSCR, Spectral Shift Reactor Lattice Experiments
- BERENICE - Investigations of the delayed neutron fraction in MASURCA
- IPEN - Power and fission density distributions, and Buckling and extrapolation length
- IPEN - Spectral Indices (28ρ, 25δ, and 28δ), etc.
- Indian experimental PHWR thorium-PIE high burnup benchmark
- JAEA - Burn-up reactivity measured in 50MWth power ascension test, 50MWth 1st and 2nd cycles, and 75MWth 1st-4th cycles (Measured in 1978-1981. Several assemblies were replaced between cycles.)
- MONJU Experiments
- OECD/DRAGON GCR Experiments
- PBF Facility Fast Kinetics Experiments (INL)
- RACINE - Fast reactor experiments in support of Phenix
- RRR/SEG-LMFR-EXP-001- CRIT-SPEC-REAC-RRATE Sample Reactivity Measurements in the Rossendorf SEG Configurations
- ZPPR-19B: 1000 MWe class, two-region homogeneous core with enriched uranium in the outer core region in JUPITER: the largest FBR mock-up core in the history

Primary Documentation Archives

- IRPHE/AVR, High Temperature Reactor Experience, Archival Documentation
- IRPHE/B&W-SS-LATTICE, Spectral Shift Reactor Lattice Experiments
- IRPhE/BERENICE, effective delayed neutron fraction measurements
- IRPHE/JOYO MK-II, JOYO MK-II core management and characteristics database
- IRPhE/RRR-SEG, Reactor Physics Experiments from Fast-Thermal Coupled Facility
- IRPhE/STEK, Reactor Physics Experiments from Fast-Thermal Coupled Facility
- IRPHE-ARCH-01, Archive of HTR Primary Documents
- IRPHE-DRAGON-DPR, OECD High Temperature Reactor Dragon Project, Primary Documents
- IRPHE-JAPAN, Reactor Physics Experiments carried out in Japan
- IRPHE-KNK-II-ARCHIVE, KNK-II fast reactor documents, power history and measured parameters
- IRPHE-SNEAK, KFK SNEAK Fast Reactor Experiments, Primary Documentation
- IRPhE-TAPIRO-ARCHIVE, Fast neutron source reactor primary documents reactor physics experiments

- IRPHE-ZEBRA, AEEW Fast Reactor Experiments, Primary Documentation
- Archive of Critical experiments in VENUS Experimental results - Plutonium Recycling Physics Project
- Archive with NEACRP-U-190 Light Water Lattice Data and EACRP-L-42 with D2O Lattice Data for the IRPhE International Reactor Physics Experiments Project

ANNEX III: SINBAD Evaluations

List of available Radiation Shielding and Dosimetry Compilations / Evaluations in SINBAD (May 2008)

Reactor Shielding (42)

- Averaged X-ray Production Cross-Sections from Fast Neutron Capture in 14 elements & SS
- Baikal-1 Skyshine Benchmark Experiment
- Balakovo-3 VVER-1000 Ex-vessel Neutron Dosimetry Benchmark
- Cadarache Sodium (HARMONIE)
- Gamma-ray Production Cross-Sections from Thermal Neutron Capture in 14 elements and SS
- H.B. Robinson-2 Pressure Vessel
- IPPE Th shell with 14 MeV and Cf-252 source neutrons
- Ispra Iron Benchmark (EURACOS)
- Ispra Sodium Benchmark (EURACOS)
- JANUS Phase I (Neutron Transport Through Mild and Stainless Steel)
- JANUS Phase VIII (Neutron Transport Through Mild Steel)
- JASPER Advanced Reactor Axial Shield Measurements
- JASPER Advanced Reactor Intermediate Heat Exchanger Measurements
- JASPER Advanced Reactor Radial Shield Measurements
- Karlsruhe Iron Sphere
- NAÏADE 1 Graphite Benchmark (60cm)
- NAÏADE 1 Iron Benchmark (60cm)
- NAÏADE 1 Light Water Benchmark (60cm)
- NESDIP-2 Benchmark (ASPIS)
- NESDIP-3 Benchmark (ASPIS)
- Neutron Leakage from Water Spheres (NIST)
- ORNL Neutron Transport in Thick Sodium
- ORNL Neutron Transport Through Iron and SS - Part I
- ORNL TSF Iron Broomstick
- ORNL TSF Nitrogen Broomstick
- ORNL TSF Oxygen Broomstick
- ORNL TSF Sodium Broomstick
- ORNL TSF Stainless Steel Broomstick
- Photon Leakage Spectra from Al, Ti, Fe, Cu, Zr, Pb, 238U Spheres
- Photon Spectra from H2O, SiO2 and NaCl
- Pool Critical Assembly-Pressure Vessel Facility Benchmark
- Streaming Through Ducts (IRI-TUB)
- University of Illinois Iron Sphere (252Cf)
- University of Tokyo-YAYOI Iron Slab
- VENUS-3 LWR-PVS Benchmark
- Winfrith Graphite Benchmark (ASPIS)
- Winfrith Iron 88 Benchmark (ASPIS)
- Winfrith Iron Benchmark (ASPIS)
- Winfrith Neutron-Gamma Ray Transport through Water/Steel Arrays (ASPIS)
- Winfrith Water Benchmark
- Winfrith Water/Iron Benchmark (ASPIS-PCA REPLICA)
- Wuerenlingen Iron Benchmark (PROTEUS)

Fusion Neutronics Shielding (27)

- FNG Silicon Carbide (integral)
- FNG Tungsten (integral)
- FNG/TUD ITER Blanket Bulk Shield (spectra measurements)
- FNG/TUD Silicon Carbide (spectra measurements)
- FNG/TUD Tungsten (spectra measurements)
- FNG-ITER Blanket Bulk Shield (integral)
- FNG-ITER Dose Rate Experiment
- FNG-ITER Neutron Streaming (integral)
- FNG-SS Shield (integral)
- FNS Dogleg Duct Streaming
- FNS Integral Experiment on Graphite Cylindrical Assembly
- FNS Liquid Oxygen
- FNS Skyshine
- FNS Tungsten
- FNS Vanadium Cube
- IPPE Iron Shells
- IPPE Vanadium Shells
- KANT Spherical Beryllium Shells
- MEPhI empty slits streaming experiment
- OKTAVIAN Iron Sphere (OKTAVIAN)
- OKTAVIAN Nickel Sphere (OKTAVIAN)
- OKTAVIAN Silicon Sphere (OKTAVIAN)
- OKTAVIAN Tungsten Sphere (OKTAVIAN)
- OKTAVIAN Aluminium Sphere (OKTAVIAN)
- ORNL 14-MeV Neutron SS/Borated Poly Slab
- TUD Iron Slab Experiment
- University of Illinois Iron Sphere (D-T)

Accelerator Shielding (15)

- BEVALAC Experiment with Nb Ions on Nb & Al Targets
- CERF Bonner Sphere Spectrometer Response to Charged Hadrons
- HIMAC experiments with He, C, Ne, Ar, Fe, Xe and Si ions on C, Al, Cu & Pb targets
- HIMAC High energy Neutron (<800 MeV) Measurements in Concrete
- HIMAC High energy Neutron (<800 MeV) Measurements in Iron
- ISIS Deep-Penetration Neutrons through Concrete and Iron Shields using p-800 MeV
- KENS p-500 MeV shielding experiment using 4m Concrete at KEK
- MSU experiment with He & C ions on Al target
- Neutron Spectra Generated by 590-MeV Protons on a Thick Pb Target
- RIKEN Quasi-monoenergetic Neutron Field in 70-210 MeV Energy Range
- ROESTI I, II and III (CERN)
- Simulation of the lineal energy distribution of the energy deposition in biological cells, TEPC-FLUKA Comparison
- TIARA 40 and 65 MeV Neutron Transmission Through Iron, Concrete and Polyethylene
- Transmission Through Shielding Materials of Neutrons and Photons Generated by 52 MeV Protons
- Transmission Through Shielding Materials of Neutrons and Photons Generated by 65 MeV Protons

ANNEX IV: Service to non-OECD areas

OECD/NEA Data Bank's Computer Program Service to non-OECD Members through IAEA: Report for 2007

IV.1 Introduction

As part of the co-operative arrangement between IAEA and OECD/NEA, the NEA provides its computer programs to IAEA Member States that are not Members of OECD. The liaison function between OECD/NEA, IAEA and Member States is vested in the INIS Secretariat.

The agreement takes the following forms: assisting new organisations to participate in the Computer Program Service; publicising OECD/NEA benchmarks, conferences and seminars to these and other organisations; nominating their scientists to attend and channelling the participation forms to OECD/NEA. Based at Issy-les-Moulineaux (France), the Computer Program Service serves scientific users authorised by Member States and belongs to over 500 organisations: national laboratories, universities, and safety authorities.

NEA Data Bank services are financed by contributions from the Data Bank's Member States, and no direct service charge is made to users.

In general 10 - 20 % of the total activity can be attributed to non-OECD countries.

IV.2 Acquisition of New Programs

Twenty-five new or updated computer packages out of a total of 113 were received from non-OECD Members in the year 2007. This is similar than in 2006, when 26 programs had been received out of 105. The contributing countries are shown in Table 1, and the evolution in time on Figure IV.1.

Contributor (non-OECD Member)	Number of programs
Russian Federation	3
Serbia	1
Slovenia	1
South Africa	1
IAEA	19
Total	**25**

Table IV.1: Non-OECD Members contributing Computer Programs in 2007

IV.3 Distribution

In all, 360 packages out of a total of 3 801 were distributed to 26 non-OECD Member States and the IAEA. This is less than the 2006 year figures of 726 packages out of 5 566.

Table IV.2 shows the number of programs sent to each non-OECD Member State that submitted requests in 2007. They were distributed only after having received authorisation from the originating countries.

The number of programs distributed originating in non-OECD members during 2007 was 249, representing a small increase compared to the 210 programs distributed during 2006. Table IV.3 shows the details. Figure IV.2 shows the evolution over time of program distribution.

Requester (non-OECD Member)	**Number of programs**
Algeria	7
Argentina	7
Bahrain	1
Belarus	1
Brazil	22
Bulgaria	74
Costa Rica	1
Croatia	3
India	9
Indonesia	2
Israel	5
Lithuania	1
Morocco	11
Peru	1
Poland	70
P.R. of China	4
Qatar	1
Romania	1
Russian Federation	80
Serbia-Montenegro	3
Singapore	2
Slovenia	23
South Africa	27
Ukraine	1
Viet Nam	1
IAEA	2
Total	**360**

Table IV.2: Computer Programs dispatched to non-OECD Members in 2007

Originator (non-OECD Member)	Number of Programs
Algeria	1
Argentina	2
Belarus	2
Brazil	2
Bulgaria	1
Croatia	1
Ex East Germany	1
India	1
Israel	2
Pakistan	1
Poland	3
P.R. of China	3
Romania	2
Russian Federation	32
Serbia-Montenegro	9
Slovenia	28
South Africa	93
Syria	3
Ukraine	6
IAEA	56
Total	**249**

Table IV.3: Computer Programs originating in non-OECD Members distributed in 2007

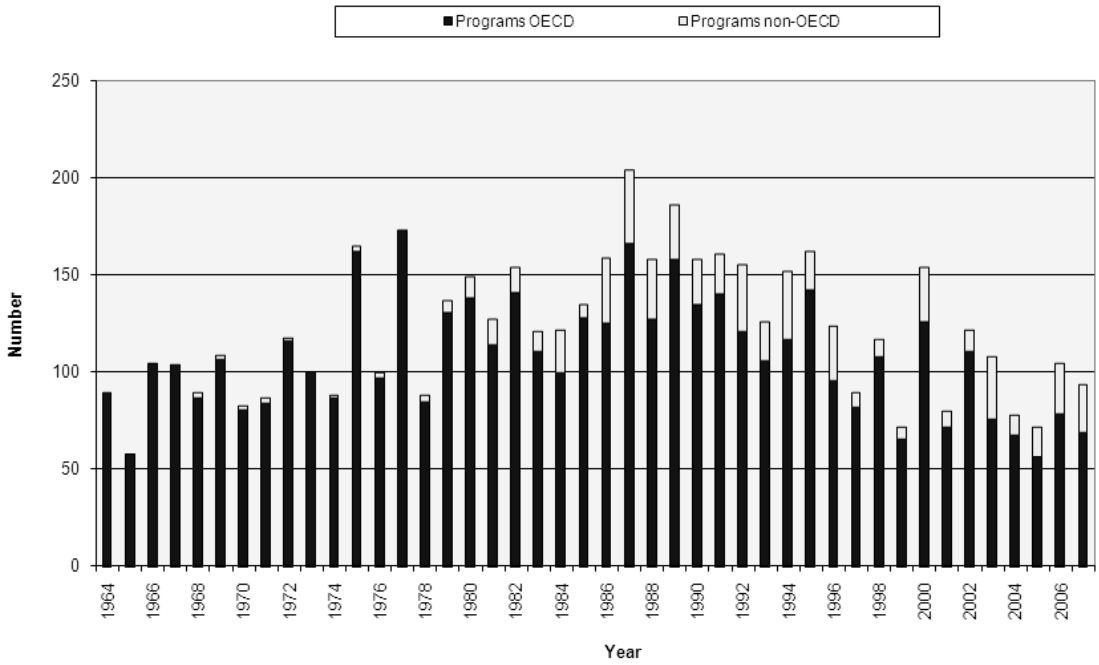

Figure IV.1: Evolution in time of program acquisition

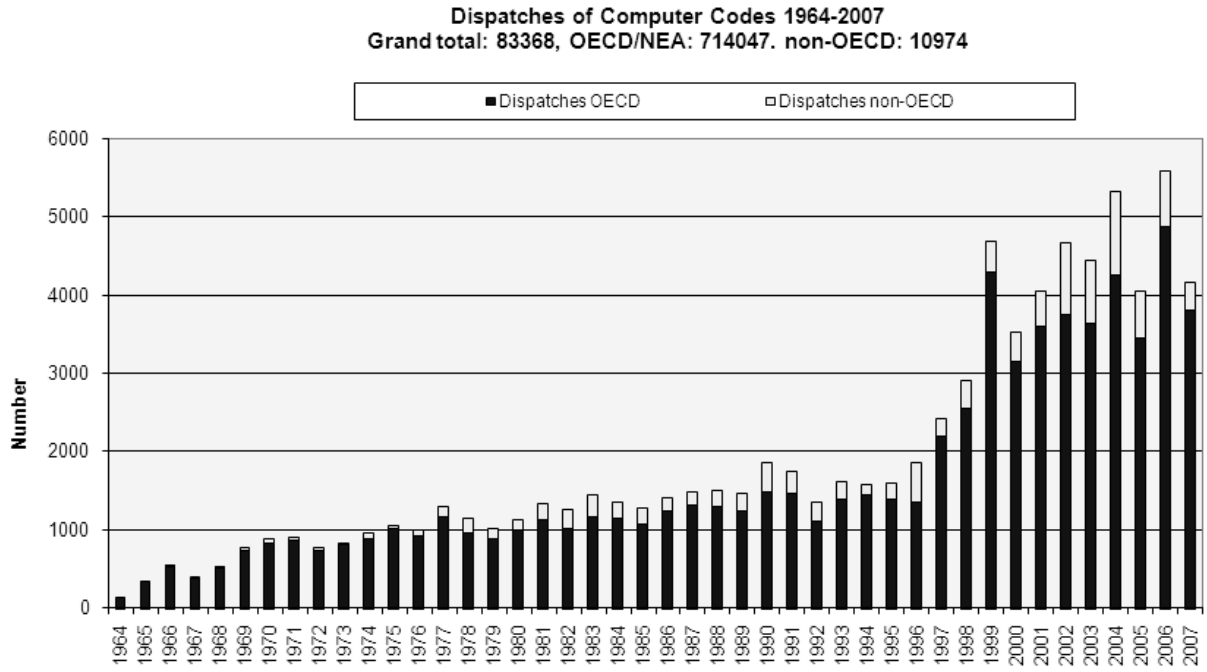

Figure IV.2: Evolution in time of program distribution

Annex V: Letters received in support of service to non-OECD area

Country	Organisation	Town	Area of research
Argentina	Autoridad Regulatoria Nuclear	Buenos Aires	Different nuclear energy areas
Belarus	Academy of Sciences JINER	Minsk	Reactor physics, nuclear data
Brazil	Instituto de Estudos Avancados-IEAV	Sao Jose dos Campos	Fields of radiation physics, reactor physics and design, reactor safety, radiation dosimetry and radiation shielding
Bulgaria	Institute of Nuclear Research and Nuclear Energy	Sofia	Radiation physics, reactor physics and design, reactor safety, impact of radiation on the environment, radiation dosimetry, criticality safety, radiation shielding, fuel behavior
China	China Institute of Atomic Energy	Beijing	Nuclear data evaluation, nuclear reaction study, reactor physics and design, reactor safety and related research
Croatia	Faculty of Electrical Engineering and Computing	Zagreb	Radiation physics, reactor physics and design, reactor safety, impact of radiation on the environment, radiation dosimetry, criticality safety, radiation shielding, fuel behavior, and heat transfer
Morocco	Université Mohamed V-Agdal	Rabat	Fields of radiation physics, reactor physics and design, reactor safety, radiation dosimetry and radiation shielding
Romania	Institute for Nuclear Research	Mioveni	Radiation physics, reactor physics and design, reactor safety, impact of radiation on the environment, radiation dosimetry, criticality safety, radiation shielding, fuel behavior
	Bucharest University	Bucharest	Nuclear data evaluation, radiation physics, reactor physics and design, reactor safety, impact of radiation on the environment, radiation dosimetry, criticality safety, radiation shielding, fuel behavior
	National Institute for Physics and Engineering	Bucharest Magurele	Radiation physics, reactor safety, impact of radiation on the environment, radiation dosimetry, and radiation shielding
Russia	RFNC- VNIITF	Snezhinsk	Radiation physics, criticality safety, radiation shielding, fuel behaviour, impact of radiation on the environment

	Institute of Physics and Power Engineering (IPPE)	Obninsk	Radiation physics, reactor physics, reactor safety, criticality safety, radiation shielding, processing of nuclear data
Serbia	Vinca Institute of Nuclear Sciences	Belgrad	Radiation physics, reactor physics and design, reactor safety, impact of radiation on the environment, radiation dosimetry, criticality safety, radiation shielding, fuel behavior
Slovenia	Institut "Josef Stefan"	Ljubljana	Radiation physics, reactor physics and design, reactor safety, impact of radiation on the environment, radiation dosimetry, criticality safety, radiation shielding, fuel behavior
South Africa	NECSA	Pretoria	Radiation physics, reactor physics and design, reactor safety, criticality safety, radiation shielding
Ukraine	National Academy of Sciences	Kyiv	Radiation physics, reactor physics and design, reactor safety, impact of radiation on the environment, radiation dosimetry, criticality safety, radiation shielding