Progress Report of the IAEA Nuclear Data Section

(Note: This report is an extract taken from the 1999 report to the INDC (INDC(NDS)-414))

1. Staff and Budget

Organization chart of the Nuclear Data Section as in May 2000 is given below.

Nuclear Data Centre Unit	Nuclear Data Development Unit	Computer Operations Unit	Atomic & Molecular Data Unit
V.G. Pronyaev (Head) Nuclear Data Physicist (04950-33-P4) (21717)	**A. Trkov** * (Head) Nuclear Data Physicist (04923-33-P5) (21712)	**D.W. Muir** (Head) Section Head (04914-33-P5) (21709)	**R. Clark** (Head) Atomic Physicist (04932-33-P4) (21731)
P.K. McLaughlin Programmer Analyst (06619-33-P3) (21723)	**M. Herman** Nuclear Physicist (04969-33-P4) (21713)	**W. Costello** Systems Analyst (04941-33-P3) (21724)	**J.A. Stephens** Atomic Physicist/ Programmer (04987-33-P3) (21729)
V. Zerkin Nuclear Physicist/ Programmer (05069-33-P2) (21714)	**R. Paviotti de Corcuera** Nuclear Data Information Physicist (05023-33-P3) (21708)	**M. O'Connell** Applications Progr. (05124-33-G5) (21722)	**K. Sheikh** Database Clerk (06499-33-G5) (21730)
M. Lammer Asst. Nucl. Data Phys. (05078-33-G7) (21727)	**A. Scherbaum** Secretary (05115-33-G4) (21711)	**E. Baumgartner** Secretary (05087-33-G4) (21710)	
O. Schwerer Asst. Nucl. Data Phys. (05133-33-G7) (21715)			
G. Bush Production Progr. (05106-33-G5) (21725)			
M. Wirtz Secretary (05050-33-G4) (21716)			

* Andrej Trkov will take up his duties in the Nuclear Data Section on 11 May 2000.

The budget and staffing level of the Nuclear Data Section has been relatively stable during the current reporting period. The authorized staff level for 1999-2000 is 18, consisting of 10 professionals (P-staff) and 8 support staff (G-staff). Of these 18 staff members, 3 (2 P-staff and 1 G-staff) are assigned to the Atomic and Molecular Data Unit.

The previous Deputy Section Head, Pavel Oblozinsky, resigned his position effective 31 March 2000, in order to accept employment with the National Nuclear Data Center, Brookhaven. His

successor, Dr. Andrej Trkov, will take up his duties in the Section on 11 May 2000. The Head of the Atomic and Molecular Data Unit Ratko Janev retired after 11-plus years of outstanding service. His successor, Dr. Robert Clark, arrived in August 1999.

As shown in Table 1, the draft budget for 2001 is nearly unchanged in dollars. There has been some shift of emphasis in the programme of the Section, with more resources devoted to workshops and other user training initiatives than in the past, and there has been increased staff activity in the development of Technical Cooperation projects. The increased dissemination of online documents via direct download from Web has reduced the hard-copy printing expenditures.

TABLE 1. BUDGET AND STAFF SUMMARY 1998-2001

	1998	**1999**	**2000**	**2001**
Authorized Staff Level	18	18	18	18
Actual Staff Level	19	18.1	18	18
Staff Cost Budget	1,600,000	1,600,000	1,550,000	1,643,000
Programmatic Budget	602,000	570,000	636,000	573,000
Total Budget US$	**2,202,000**	**2,170,000**	**2,186,000**	**2,216,000**

In support of the PPAS of the Department of Nuclear Sciences and Applications, the Nuclear Data Section produced briefing materials on several topics of interest to the review panel, including (a) the special role of the Department of Nuclear Sciences and Applications in developing scientific databases which support the development of nuclear technology in Member States, (b) the close working relationship between the nuclear data programs of the IAEA and the OECD Nuclear Energy Agency, (c) an explanation of the important role of the International Nuclear Data Committee in providing programmatic guidance to Agency activities, and (d) the creation of a unified Web site for our parent Division, the Division of Physical and Chemical Sciences (NAPC), on the Agency's central Web server; see http://www.iaea.org/programmes/ripx/nd/. The NDS portion of this site containing programme overviews, staff contact information, details of meetings, project, publications, etc. provides a useful supplement to the Section's nuclear and atomic data dissemination sites, which continue to be developed separately.

2. Data Center Activities

The main objectives of the NDS Nuclear Data Center activity in 1999 were:

- to collect, assess, recommend and disseminate nuclear data required in the application of nuclear technology,
- to promote the international exchange of nuclear data for applications,
- to coordinate worldwide networks of national and regional nuclear reaction and nuclear structure and decay data centers,

- to maintain manuals and software for internationally agreed database formats and exchange procedures, and

- to improve the means by which the data center provides information to its users.

2.1 Nuclear Data Compilation

Nuclear reaction data compilation includes the collection of bibliographic information and primarily experimental numerical data mainly from the NDS Nuclear Data Center's area of responsibility, and their compilation in the computerized formats CINDA and EXFOR.

The general purpose evaluated nuclear reaction data libraries are created under the national or regional programs. After international release, they are placed in the ENDF database by NNDC, Brookhaven. Special purpose nuclear databases, data libraries and files are prepared in the framework of the IAEA Coordinated Research Projects or national and regional programs. They are documented by the IAEA NDS and, after checking and testing, are disseminated via online access or off-line on diskettes and CD-ROM upon requests.

2.1.1 CINDA

There were no activities in the NDS toward the development of the new CINDA format and the new file "CINDA2001". Presently all CINDA operations (compilation, storage, data exchange and retrievals/transmission to customers) continue to be performed using the old CINDA format.

During 1999, the NDS has prepared and transmitted about 900 CINDA entries either as direct input to the CINDA file (work in laboratories belonging to the responsibility of NDS) or for further processing by the responsible data centres.

CD-CINDA, the CD-ROM version of CINDA including a search software developed by the NEA Data Bank was completed in 1999. This was thoroughly tested by M. Lammer. Many suggestion for improvements to the search software were communicated by Lammer to M. Kellett of the Data Bank. Thus the NDS has made a considerable contribution towards the development of the CD-CINDA. The CD-CINDA could be an alternative or a supplement of the hardcopy CINDA book.

CINDA 99 was published again as a supplement to CINDA 97 and superseded CINDA 98. Plans were developed in November 1999 together with M. Kellett (NEA Data Bank) for a joint distribution of CINDA 2000 as a hardcopy book and a CD-ROM.

2.1.2 EXFOR

Since January 1999, two neutron-EXFOR transmissions were distributed containing new works from China (13), Ukraine (4), Argentina (4), Brazil (1) and Australia (1). These included

5 entries compiled at the China Nuclear Data Center which were checked and processed at NDS, and data received from Ukraine and Argentina in a "raw EXFOR" format which were finalized at NDS. In addition, 3 photonuclear entries were received in " raw EXFOR" format from Brazil. These were finalized (with help from CDFE Moscow) and transmitted on a separate EXFOR transmission file.

Considerable time was spent in updating the common CINDA/EXFOR dictionaries and related software originating from NNDC, and in quality control checking of EXFOR transmissions from all participating compilation centers.

2.1.3 Evaluated Data Libraries, Files and Programs

The following Evaluated Data Libraries, Files and Programs have been updated or added to the IAEA NDS collection (listed in chronological order of their inclusion):

- JENDL-3.2 Library. Pointwise data reconstructed by JAERI at 300 K.

- ENDF/B-VI Library, Release 6. It includes revisions up to September 1999. Basic and pointwise data are available online and on CD-ROM. The following materials were added, replaced or updated: 1-H-1, 1-H-2, 6-C-0, 7-N-14, 8-O-16, 13-Al-27, 14-Si Isotopes, 15-P-31, 20-Ca-40, 24-Cr Isotopes, 26-Fe Isotopes, 28-Ni Isotopes, 29-Cu-63, 29-Cu-65, 41-Nb-93, 74-W Isotopes, 82-Pb Isotopes.

- ENDF/B-VI Charged-Particle Sublibraries, Version: September 1999. The 1998 and 1999 updates includes complete presentation of the nuclear data for H-1, H-2, He-3, C-12, N-14, O-16, Al-27, P-31, Ca-40, Nb-93 and isotopes of Si, Cr, Fe, Ni, Cu, W, Pb, needed for transport, damage, heating, radioactivity and shielding applications over the incident proton energy range from 1 to 150 MeV.

- Table of Nuclear Root-Mean-Square Charge Radii, by I. Angely (June 1999), contains bibliographic information, data selection, evaluation procedures and tables with experimental and evaluated data .

- TLAPrfl: Package for Calculation of Depth Profile for Thin Layer Activation, by G. Wallace.

- PCNuDat: a PC Nuclear Data Program, by R.R. Kinsey (Release 2.7, October 1998).

- EXFOR+ENDF retrieval + interactive plotting software by ZVVIEW. A tool for retrieval of integral reaction cross sections from experimental database EXFOR and major evaluated data libraries and their graphical comparison using ZVVIEW (a package specially designed for interactive plotting of nuclear reaction cross sections).

- PHYSCO - Nuclear Structure Calculation Tools – HSICC and LOGFIT. Tools for calculations of internal conversion coefficients and Log-ft values for beta and electron capture decay, average beta energies, and capture fractions.

- JENDL Dosimetry File 99 (JENDL/D-99) on CD-ROM, by JAERI. Data for 67 dosimetry reactions in pointwise and 641-group structure form and figures of comparison between JENDL/D-99 and IRDF-90 are given.

- NMF-90. Neutron Metrology File is an integrated database for performing neutron spectrum adjustment (unfolding) calculations. It contains four different adjustment codes, the group structure version of the dosimetry reaction cross section library IRDF-90/NMF-G with covariance files, six input data sets for reactor benchmark neutron fields and a number of utility codes for processing and plotting of the input and output data.

- DROSG-2000: Neutron Source Reactions. Data files with computer codes for 56 monoenergetic neutron source reactions.

- SaBa: The Library of Evaluated and Experimental Data on Charged Particles for Fusion Applications. Evaluated and experimental data for 52 reactions with a set of data processing procedures which provide a user-friendly interface for presentation and evaluation of cross sections.

All these files, libraries and codes are documented either in the IAEA-NDS Report series (available online) or in INDC Reports.

2.2 Nuclear Data Services: Improvement and Development

The main innovations, development and improvements in the user services in the last year are:

- About 50% of all new INDC reports have been made available on the Internet. This lowered the printing cost by reducing the distribution of hardcopies of these reports. More than 1200 reports were downloaded by users in 1999.

- A new EL series of INDC reports, published and distributed in electronic form only, was introduced. The hardcopies of these reports are available only on special request by the user. Users are informed of the publication of these reports through an announcement in the Nuclear Data Newsletter.

- A new Web statistics system based on the Alpha Web server was developed. The system provides online monitoring and statistics reports of the retrievals from nuclear databases and accesses to data files, programs and documents. The access rate is tabulated for various categories such as data topics, countries and regions and is given in daily, monthly and year time frames. The system provides information on client activity with respect to country, data base accessed, etc. The system is available through the Web from any computer and at any time.

- A new multi platform software package ZVView, designed for interactive graphical display of nuclear reaction cross sections retrieved from experimental and evaluated nuclear reaction cross sections was released to the user community. This software and its documentation are available from the NDS Web page.

- A new Web-based service was developed in collaboration with NNDC, BNL. This combines the EXFOR and ENDF cross section retrievals on Alpha VMS with interactive plotting by ZVView on a client's local computer. This service is now available from the NDS Web page.

- A new NDS Web site content-navigation tool was developed. This provides "explorer" type access to the most important pages, databases, libraries, files and documents. In addition, the NDS pages were enhanced with hyper-links to other sites containing important information on nuclear data and related topics. The tool provides fast overview of NDS Web site, allows to view information and services from various viewpoints depending on the client's interests.

- A new EXFOR CD-ROM retrieval system was developed. This is based on ACCESS-97 and is designed as a relational database. It allows flexible SQL search of information from EXFOR dictionaries. The system is integrated with ZVView interactive plotting program. Test version of the system was sent to the network of Nuclear Reaction Data Centers.

2.3 Nuclear Data Services: Statistics

Due to the variety of requirements from users, different media are used for user services. These include ordinary mail for hardcopies of documents, PC diskettes and CD-ROMs, e-mails with attached retrieved data or electronic documents, and online transfer of data retrieved by the users themselves through the Telnet or Web interfaces.

The general statistics of user services in 1995 - 1999 is shown in Table 2. Figures are given for three different categories. Ordinary mail includes retrievals prepared by the NDS staff upon user requests and sent to them via ordinary mail. Online retrievals from NDS major databases are made directly by users themselves through Telnet or Web access to the databases, libraries, files and reports. One retrieval usually contains one homogenous piece of information. This can represent one report, or a set of different data retrieved from one library or database, or a computer code or codes when they are distributed as a package. Online retrieval corresponds to one user creating output either on hard disk or in screen mode. The number of Web accesses to other important databases, libraries programs and reports is also listed in Table 2.

Fig. 2.1 presents summary report of Web based Nuclear Data Services and includes statistics of accesses to the NDS data and information sources for the last four years starting from 1997. Statistics for year 2000 is given for first three months of the year.

The following trends in the user services can be seen during the last year:

- The total number of offline retrievals shows a slight increase with a wider use of CD-ROM media for distribution.

- In 1999 the number of retrievals by hardcopy decreased by 30% probably due to downloading of online documents by users themselves instead of requesting hardcopy from NDS.

- Most of the users prefer to use Web access because of ease of use compared to Telnet. However the number of retrievals through Telnet is stable at around 2000 per year.

- The number of Web accesses increased by about 30% in 1999 compared to 1998. The geographic breakdown of the increase is, developing countries 14.8%, FSU countries 18.4%, East European region 6.7% and European Union 34.6%.

Table 2. NDS nuclear data retrieval and access [a] statistics by year

Type of Medium					**Year**
	1995	**1996**	**1997**	**1998**	**1999**
Offline retrievals [b] prepared upon request, including:	**1556**	**786**	**1846**	**1995**	**2290**
Documents (hardcopies)	1155	554	1547	1533	1060
Data (diskettes)	373	219	286	115	105
Data (CD-ROM)		-	-	205	420
Online retrievals (Telnet)	**4462**	**5688**	**7350**	**2700**	**2180**
Online retrievals (Web)		-	**40**	**4964**	**9071**
Including retrievals from:					
ENDF		-	-	2618	4820
EXFOR		-	32	784	568
CINDA		-	3	470	498
NUDAT		-	5	1092	3185
Web pages accessed		-	**3690**	**6953**	**7319**
NGAtlas		-	286	613	1074
MIRD		-	257	453	493
Thermal Neutron Capture		-	353	714	514
IRDF90-NMF90		-	259	322	263
Masses		-	337	479	428
Programs		-	1109	1695	1769
FENDL		-	279	580	440
RIPL	-	-	23	841	962
Newsletters and Reports	-	-	787	1256	1376

[a] Data given in Table for Web accesses in 1997 – 1998 differ from what was given in previous reviews because a new statistics program and database for IP addresses of 'real users' was used in the analysis.

[b] Data for total offline retrievals in 1998 and for number of documents distributed are corrected. Number of physical media used for distribution (hardcopies, diskettes and CD-ROMs) may not coincide with the number retrievals.

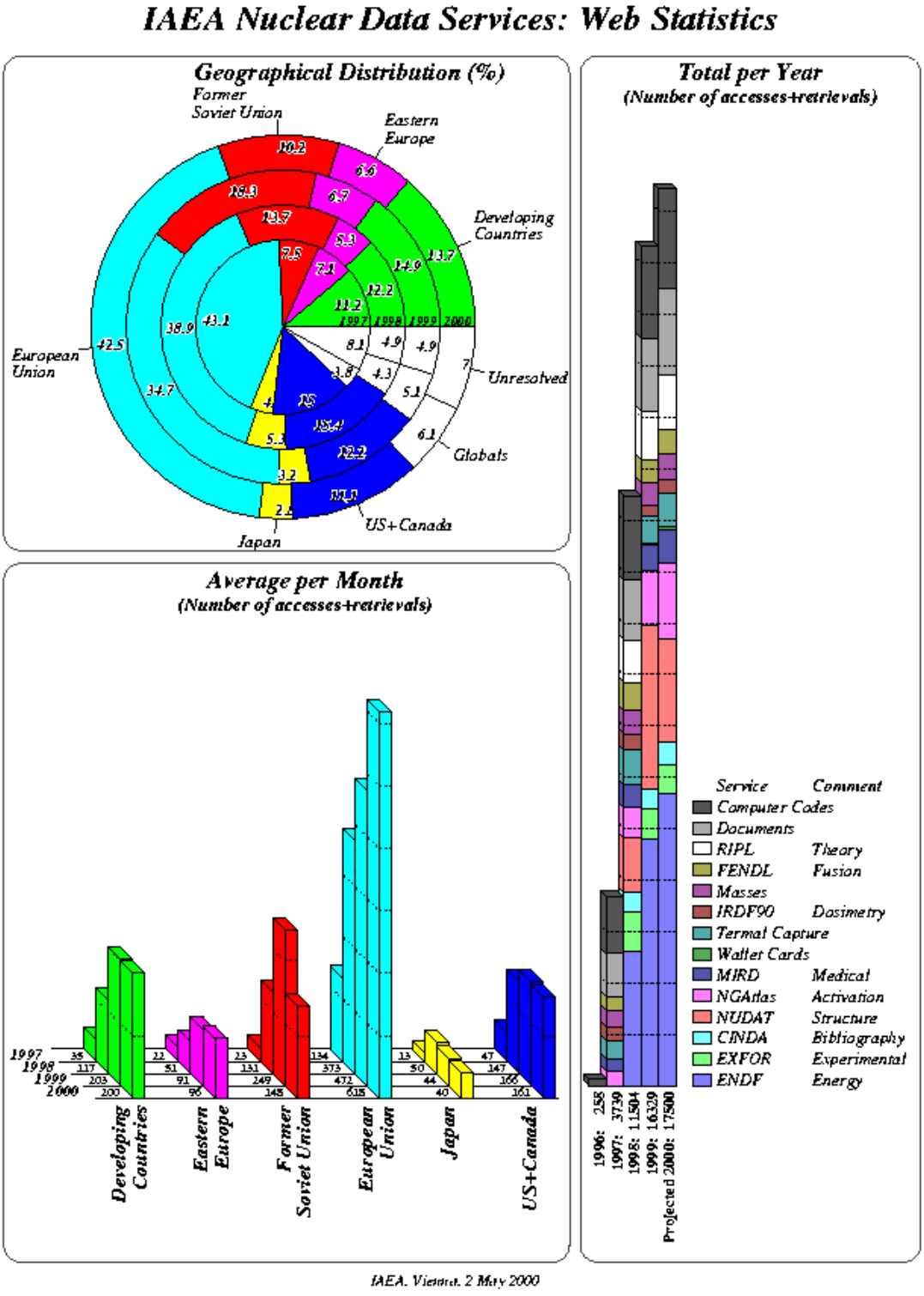

Fig. 2.1 Summary statistics of the user accesses at the NDS Web server.