

NEA Data Bank Progress Report 2015-2016

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1. General

The Data Bank (DB) of the OECD Nuclear Energy Agency (NEA) provides scientists in member countries with reference materials in the field of nuclear energy applications. The services include the compilation, verification, and distribution of nuclear data, chemical thermodynamic data, integral benchmark experiments, as well as computer programs and associated application libraries. The Data Bank also develops and maintains databases and related administration/retrieval tools, including the JANIS display software. The Data Bank staffs work in close co-operation with the secretaries of the Nuclear Science (NS) Working Parties (WP), especially in the field of computer codes and libraries benchmarking, integral experiments, nuclear data evaluation, and knowledge preservation. These activities are in essence international and organised in close collaboration with other main national and international organisations.

More information on the NEA Data Bank can be found at www.oecd-nea.org/databank.

2. Organisation

The Data Bank's current membership consists of 25 countries in Europe, North America (Mexico), Russia and the Asia-Pacific region.

The **DB Task Force** (TF) was established to discuss future NEA DB activities and prepare the next NEA strategic plan 2017-2022. The TF review and discussion concluded in a set of recommendations for the Executive Group of the Nuclear Science Committee (June, 2015) to improve NEA/DB services and functioning. These recommendations could be summarized in the following four strategic initiatives: improvement of client services, adapting to new technical developments, enhancing scientific expertise, and enhancing governance.

Originating from the Recommendations of the Task Force on the Future Programme of the Data Bank, the NEA Steering Committee has approved the proposal to modify the name, reporting line, and mandate of the Executive Group of the NSC (Data Bank Management Committee). The EG-NSC has been renamed “Management Board on the Development, Application and Validation of Nuclear Data and Codes”, or “**MBDAV**”. The new MBDAV reports directly to the Steering Committee rather than to the Nuclear Science Committee. These changes, along with the new mandate, represent an important first step towards enhancing the Data Bank’s governance structure and visibility.

The Data Bank is composed of **14 staffs** working on both Data Bank and Nuclear Science related activities (plus additional NEA related activities when relevant). **One full-time equivalent man-year** is allocated to NRDC activities.

3. Nuclear Data Services

The Data Bank maintains large databases containing evaluated, experimental and bibliographic data and makes them available online to scientists and engineers in its member countries. Other important nuclear data related activities of the Data Bank are the coordination of the Joint Evaluated Fission and

Fusion (JEFF) file project and the development of the JANIS software, designed to facilitate the visualisation, comparison, and manipulation of nuclear data.

More information on Nuclear Data Services can be found at www.oecd-nea.org/dbdata.

3.1 Experimental data compilation

The Data Bank compilation of measured neutron and charged particle induced reaction data continues with the help of external consultants. Continuous efforts are made to check the content of the database and retransmit corrected entries.

Neutron induced data (Area 2)

In 2015, 24 new and 45 updated entries were compiled by the Data Bank for area 2. In the first months of 2016, the corresponding figures are 26 new and 83 revised entries.

Charged particle induced data (Area O)

In 2015, the Data Bank compiled 83 new entries and 33 updated entries for area O. The corresponding figures for the first months of 2016 are 9 new and 61 revised entries.

The following table shows more detailed statistics of recent NEA transmissions.

Year	Trans	Entry	
		New	Updated
2012	Total	133	238
2013	Total	104	224
2014	2237	8	4
	2238	11	150
	2239	19	7
	2240	3	36
	o051	48	23
	o052	1	66
	Total	90	286
2015	2241 (May 2015)	7	5
	2242 (Nov 2015)	2	21
	2243 (Feb 2016)	0	14
	2244 (Feb 2016)	15	5
	o053 (Feb 2015)	55	14
	o054 (Jul 2015)	28	19
	Total	107	78
2016 (1 st half)	2245 (May 2016)	0	13
	2246 (May 2016)	0	33
	2247 (May 2016)	4	20
	2248 (May 2016)	12	3
	2249 ¹	10	14
	o055 (May 2016)	7	6
	o056 (May 2016)	0	52
	o057 (May 2016)	2	3
	TOTAL	35	144

¹ Status = PRELIM

3.2 JEFF project

The **Joint Evaluated Fission and Fusion File** (JEFF) project is a collaboration between NEA Data Bank member countries to produce common sets of evaluated nuclear data, mainly for fission and fusion applications. The library contains a number of data types, including neutron and proton interaction data, radioactive decay data, fission yields and thermal scattering law data.

The latest version of the neutron cross-section JEFF library, JEFF-3.2, was released in March 2014. JEFF-3.2 is a major update of the general purpose neutron library which contains, in particular, new evaluations of neutron data for actinides, more complete gamma production data and has been revised and expanded to include neutron data for 472 nuclides or elements. JEFF-3.2 data are available on the NEA website at www.oecdnea.org/dbdata/jeff.

The current mandate of the JEFF project (2015-2018) is aimed at delivering JEFF-3.3. JEFF-3.3 will include a revision of all files in the library, which now includes neutron data in ENDF-6 format for over 560 nuclides or elements. In particular new evaluations of actinides are proposed. JEFF-3.3 will include updated Decay Data and Fission Yields libraries, new or revised Thermal Scattering Law data files for several compounds are also foreseen.

As part of enhanced Nuclear Data Services and, in particular under the scope of the JEFF Project, the Data Bank is continuing the development of the **Nuclear Data Evaluation Cycle** (NDEC) platform. NDEC is a systematized workflow for handling and diagnosing the quality of nuclear data under the different steps involved in the production of nuclear data libraries. These steps are the verification, processing, experimental differential validation and experimental integral benchmarking of evaluated nuclear data files.

The proposed NDEC aims at improving the transparency and visibility of the whole process of the production of a well-documented nuclear data library. The proposed NDEC/system would be developed, hosted, maintained and co-ordinated at the Data Bank by the DB Nuclear Data staff. It implies developing increased nuclear data services provided systematically by the data bank, built around already existing NEA tools (JANIS, ICSBEP/DICE, etc...) and implementing new ones, in a collaborative working environment. The proposed NDEC would also need to have a sub-versioning system to keep traceability of submitted files. Such an NDEC would greatly facilitate the implementation of a more project-managed approach for the production and final Q&A of nuclear data libraries in the case for the JEFF project.

3.3 JANIS software

The JANIS software allows the user to display and compare evaluated and experimental nuclear data from large international databases (e.g. JEFF, ENDF/B, JENDL, EAF, CENDL, BROND, TENDL for evaluated data, and EXFOR for experimental data). A new version of JANIS was released online and on DVD in September 2013. JANIS 4 introduces a Web interface, as well as major new features to display fission yields on 2D colour maps, to plot, tabulate and compare user's data in simple text format, as well as the possibility to save and restore JANIS state (plot, table, settings, etc.). More information on JANIS can be found at www.oecd-nea.org/janis.

- JANIS team will present in ND2016 recent developments rely on JANIS features to access nuclear data, for example the Nuclear Data Sensitivity Tool (NDaST) makes use of BOXER and COVERX formats support and the NEA central database to retrieve covariances. The features added in the latest version of the software, notably automated plots generation through scripting via the command line and improvement of covariance data support will be described, along with some examples of the use of JANIS.

The Data Bank also develops in-house codes to help check the correctness of EXFOR data. These codes are based on the JANIS software and use EXFOR dictionaries. They are used at the Data Bank to peer review EXFOR files submitted to NRDC as well as the EXFOR Master file shared among Data Centres. A standalone version of the JANIS Trans checker is integrated into the EXFOR-Editor developed at VNIIEF and a Web version is available for online use at www.oecd-nea.org/janisweb/trans-checker.

In line with recommendations from WPEC Subgroup 30, new methods have been developed and implemented in Data Bank tools to cross-check experimental data (EXFOR) and evaluated data (e.g. JEFF) with the objective to further improve the quality of both databases:

- NEA Data Bank is working to assess the quality of EXFOR data using a statistical approach. The methodology will be applied to the most of the EXFOR data including threshold reactions, isomeric transitions and data in the resonance region. The methodology will be extended to natural elements, angular distributions and integral resonances. This work will be presented in ND2016.
- In-depth review of all threshold reaction cross-sections: “Statistical Verification and Validation of the EXFOR database: (n,n') , $(n,2n)$, (n,p) , (n,α) and other neutron-induced threshold reaction cross-sections” by A.Koning, NEA/DB/DOC(2014)3. In 2016, the (n,γ) reaction cross-section will be included in this report.

3.4 Web services to nuclear data users

The online nuclear data services are now provided through direct access to the NEA databases taking advantage of the new Web interface of JANIS, which allows online browsing, searching and displaying nuclear data in a more user-friendly environment. The online services also include JANIS Books, comprehensive compilations of cross-section curves of experimental and evaluated data. JANIS Books are available for nuclear reactions induced by neutrons, photons and light-charged particles. Online Books are based on JANIS Web in order to allow the users to zoom in the plots, access complementary information and plot additional data. The statistics for online services are given in the following graph.

Find out more about NEA nuclear databases at www.oecd-nea.org/dbdata/databases.htm.

Figure 1. Number of requests per month to the remote JANIS database since 2003.

