

## **Activities of the Japanese Nuclear Data Committee and the Japanese Evaluated Nuclear Data Library**

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### **Abstract**

The Japanese Nuclear Data Committee was established in 1963 and in its infancy the effort was concentrated on producing the neutron data for fast-reactor applications. Since then the application field has gradually been extended to include LWR design and safety, fuel cycles, accelerators, conceptual design of innovative reactors and other scientific fields. In accordance with this, JNDC has also extended its activities and now it consists of 14 Working Groups and 6 Standing Groups. The results of the evaluation effort have occasionally been compiled as the Japanese Evaluated Nuclear Data Library from JENDL-1 (1977) to JENDL-3.2 (1994). Evaluation and compilation for JENDL-3.3 and for some other Special Purpose Files have almost completed and their benchmarking is under way. JENDL-3.3 will be released in this fiscal year.

### **1. Introduction**

The nuclear data evaluation activity in Japan started in early 1960's to meet the requirement from the power reactor development which was its infancy around that time. Then a committee called the Japanese Nuclear Data Committee (JNDC) was organized in 1963 in order to consolidate the domestic activities related to nuclear data evaluation. Since then the effort to generate the nuclear data basis for peaceful uses of the atomic energy has ever been carried out within the framework of JNDC in close cooperation with the Nuclear Data Center in the Japan Atomic Energy Research Institute (NDC/JAERI).

### **2. Organization of the Japanese Nuclear Data Committee**

JNDC is a generic name given to an aggregation of 14 Working Groups (WG) and 6 Standing Groups with almost 120 participants (Status; early 2001). These participants are from the nuclear industries, the universities,

and the national laboratories. The committee belongs both to the Atomic Energy Society of Japan (JNDC/AESJ) and the Japan Atomic Energy Research Institute (JNDC/JAERI). The strategy of its activity is discussed and decided by the Steering Committee held several times a year. The committee is divided into three subcommittees. They are the Subcommittees on Nuclear Data, on Nuclear Fuel Cycle and on Reactor Constants (Fig. 1).

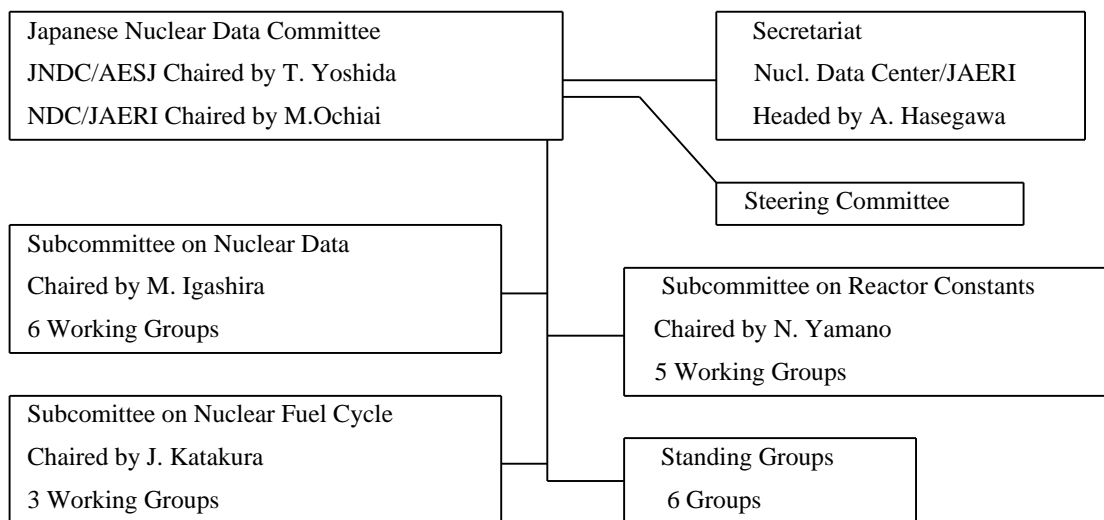


Figure 1 Organization of the Japanese Nuclear Data Committee (Status: early 2001)

Each subcommittee consists of a lot of Working-Groups as listed in Table I. Each Working Group has its own well-defined mission and the participants work together on the subject, though the work is carried out usually on part-time basis. Once the mission of a Working Group is completed, it is dissolved and a new Working Group is built with a new mission. The work as a whole is supposed to contribute to production, circulation and maintenance of the Japanese Evaluated Nuclear Data Library, JENDL, and the related data libraries described in the later part of this paper.

Table I Organization of the JNDC Subcommittees (Status: early 2001)

Subcommittee on Nuclear Data	
High Energy Nuclear data Evaluation WG	Delayed Neutron WG
Evaluation & Calculation Support System WG	Charged Particle Nuclear Data WG
Medium-Heavy Nuclide Data Evaluation WG	Heavy Nuclide Data Evaluation WG
Subcommittee on Reactor Constants	
Reactor Integral Test WG	Shielding Integral Test WG
Dosimetry Integral Test WG	Standard Group Constant WG
Medium and High Energy Nuclear Data Integral Test WG	
Subcommittee on Nuclear Fuel Cycle	
WG on Evaluation of Nuclide Generation	Decay Heat Evaluation WG
Fission Product Yield Evaluation WG	

### 3. JNDC and JENDL

In the early stage of the JNDC activity, they worked exclusively on production of the reactor constants for thermal and fast reactors. In 1974 it was decided to produce a comprehensive evaluated nuclear data library of the ENDF/B type. The years-long effort was first realized in 1977 with JENDL-1, or the Japanese Evaluated Nuclear Data Library Version 1<sup>[1]</sup>. It contained the neutron cross section data from  $10^{-5}$  eV to 15 MeV for 72 nuclide. The most urgent incentive for developing JENDL-1 came from the fast reactor project. In 1982 the second version of JENDL was released, which was followed by the completion of the FP cross section file including the data for 100 important fission product nuclides encountered in fast-reactor applications<sup>[2]</sup>. They constituted JENDL-2<sup>[3]</sup> and the total number of nuclides available therein was 181. The scope of the next version of JENDL, JENDL-3<sup>[4]</sup>, was widely extended to include various applications such as thermal, fast and fusion reactors, and related technologies. The latest version, JENDL-3.2, was completed in 1994, which consists of the data for 340 nuclides<sup>[5]</sup> including 172 FPs<sup>[6]</sup>. The next version, JENDL-3.3, is now on the final stage of development and it is envisaged to meet the requirements from much wider range of applications; not only the power application of the nuclear energy but the related fields ranging from nuclear medicine to astrophysics as is illustrated in Fig.2.

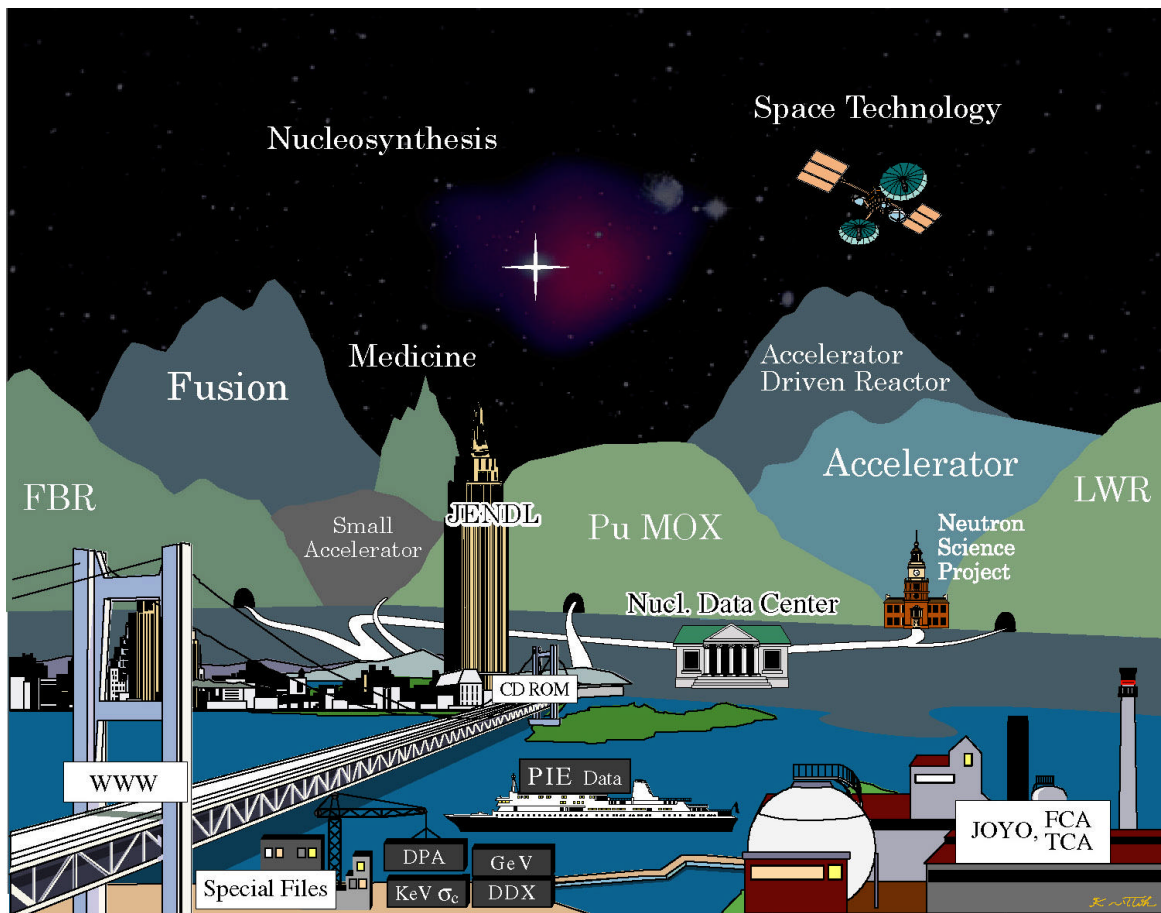


Figure 2 Imaginary Landscape around the Nuclear Data Activities in Japan

#### 4. General and Special Purpose Files of JENDL

The JENDL files described in the previous section are what is called the *General Purpose Files*, which are being developed for a wide range of applications in the general technical fields of nuclear power. Besides these, JNDC and the JAERI/NDC are also developing the *Special Purpose Files*. Each of these files has its own special but important application field.

- 1) Fusion File (JENDL/F-99): For fusion research and fusion reactor design. Double differential cross section data for 92 nuclides are inclusive therein.
- 2) Dosimetry File (JENDL/D-99): For evaluation of neutron flux in reactors. Cross sections and covariances for 67 important reactions are available.
- 3) Activation Cross Section File (JENDL/A-96): For estimation of radioactivities of reactor materials. 1246 reactions in 233 nuclides. Revision is foreseen in near future.
- 4) FP Decay Data File (JENDL/DD-2000): For decay heat summation calculation. This file is a descendant of the JNDC FP Decay Data Library<sup>[7]</sup> and contains the decay and the related data for 1229 fission product nuclides.
- 5) High Energy File (JENDL/HE, to be released): For applications in the accelerator shielding and the accelerator-based transmutation of long-lived nuclides. Proton and neutron cross sections up to 3 GeV will be stored.
- 6) Photonuclear Reaction Data File (to be released): For radiation shielding and for calculation of absorbed dose. Gamma-ray incident reaction data up to 140 MeV will be available in this file.
- 7) PKA/KERMA File (to be released): For evaluation of radiation damage of materials. Spectra of primary knock-on atoms and KERMA factors will be stored.
- 8) Actinide File (to be released): For applications in the nuclear fuel cycles and the transmutation studies of long-lived actinides. Cross section data in the energy range from  $10^{-5}$  eV to 20 MeV for almost 90 nuclides in the actinide region will be included.

In the above list, the digit after a hyphen stands for the year of the release of the file. The files without the year designation will be released in FY2000 or 2001 except the Actinide File, which will be made available by the year around 2003. JENDL is widely applied to various fields from nuclear technology to pure science as is shown in Fig. 3.

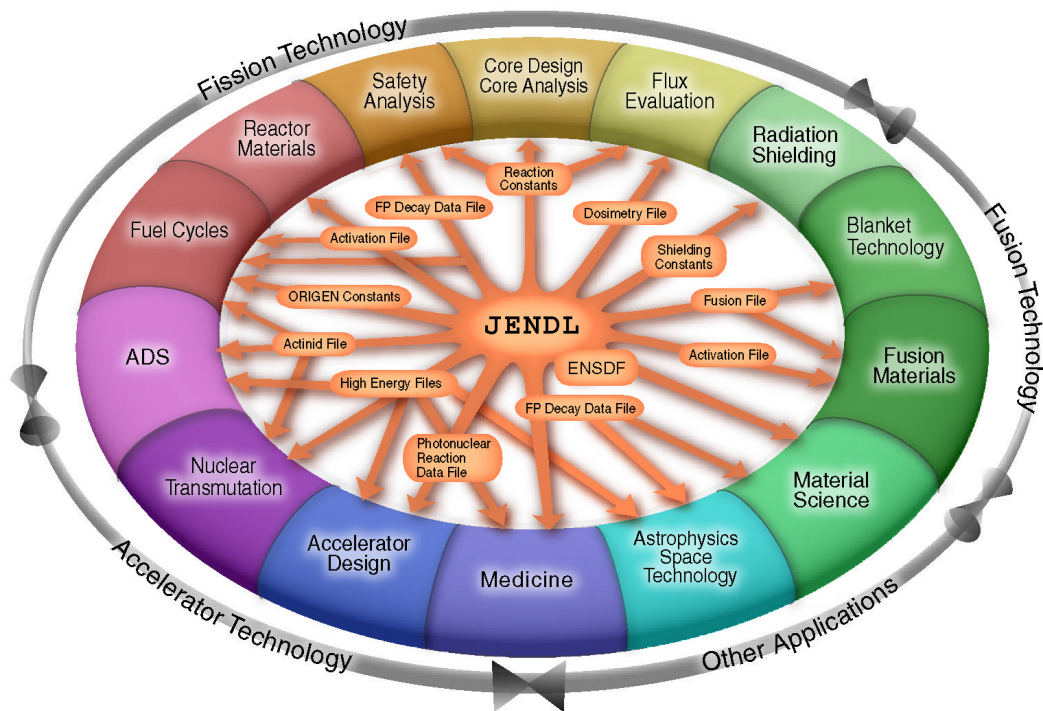


Figure 3 JENDL and its Applications

## 5. Concluding Remarks

The nuclear data measurements are widely carried out in the universities and the national laboratories throughout Japan. The Japanese Nuclear Data Committee consists of measurers, evaluators and users of the nuclear data, and is in charge of the production of the evaluated nuclear data libraries on the basis of the measured data and the theoretical calculations. Starting with the Japanese Evaluated Nuclear Data Library Version 1, JENDL-1, in 1977, JNDC has been making a continuous effort to produce the more advanced version of JENDL. The latest version, JENDL-3.2, was completed in 1994, which consists of the data for 340 nuclides including 172 FPs. Now the next version, JENDL-3.3, is now under development and it is envisaged to meet the requirements from much wider range of applications.

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