Fusion Engineering and Design 83 (2008) 1801–1806

Contents lists available at ScienceDirect

Fusion Engineering and Design

journal homepage: www.elsevier.com/locate/fusengdes

Fusion-related work at the OECD Nuclear Energy Agency

H. Henriksson*, I. Kodeli, F.J. Mompean

OECD Nuclear Energy Agency, Le Seine St Germain, 12 Blvd des Iles, 92130 Issy-les-Moulineaux, France

ARTICLE INFO

Article history:
Available online 21 July 2008

Keywords:
Nuclear Energy Agency
Evaluated data
WPEC
JEFF
EFF
SINBAD

ABSTRACT

The Nuclear Energy Agency (NEA) is a specialised agency within the Organisation for Economic Co-operation and Development (OECD) focusing on the use of nuclear energy for peaceful purposes. Through its activities in the reaction data field, the NEA participates in the preparation of data for the modelling of future nuclear facility concepts and the development of reactor installations. A Working Party at the NEA on International Nuclear Data Evaluation Co-operation is established to promote the exchange of nuclear data evaluations, measurements, nuclear model calculations and validation. Activities on evaluated data in the European Fusion and Activation File projects are monitored through the Joint Evaluated Fission and Fusion (JEFF) collaboration as they play an important role for new fusion applications. The NEA provides also data from integral experiments collected in benchmark databases. Materials research is a field of key relevance for innovative nuclear systems, such as Generation IV reactors, critical and sub-critical transmutation systems and fusion devices. Recently, a new Working Party on Multi-Scale Modelling of Fuels and Structural Materials for Nuclear Systems has been created within the NEA.

1. Introduction

The Nuclear Energy Agency (NEA) is an intergovernmental organisation of industrialised countries, based in Paris, France with 28 member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom and the United States of America.

The work areas of the NEA cover nuclear safety and regulation with support to nuclear installation safety and regulation, nuclear energy development focusing on nuclear technology, economics, strategies and resources, radioactive waste management, radiation protection, nuclear law and liability, nuclear science and the Data Bank providing reliable data and computer programs for use in nuclear applications. These parts are governed by several committees, such as the Radioactive Waste Management Committee (RWMC) and the Nuclear Science Committee (NSC).

The Data Bank is a part of the NEA, but has its own membership and a separate budget. Its primary role is to provide scientists in member countries with reliable nuclear data and computer programs for use in different nuclear applications. One of the responsibilities covers the administration of the Joint Evaluated Fission and Fusion (JEFF) nuclear data library [1], where the fusion relevant data are embraced within the European Fusion File (EFF) project [2]. The NEA provides also integral experiments collected in for example the Shielding Integral Benchmark Archive Database (SINBAD) database [3].

In this paper an overview will be given of the fusion-related projects within the NEA, with examples of nuclear data services offered, such as the SINBAD database and validation of data with fusion neutronics shielding experiments, and the collection of experimental and evaluated data. Recent evaluation efforts among the EFF collaborators are mentioned as well as activities on important structural materials for nuclear systems.

2. NEA and the Data Bank services

2.1. The NEA structure and working parties

The NEA activities in the two committees on Radioactive Waste and on Nuclear Science (RWMC and NSC, respectively) are closely linked to the NEA Data Bank activities, such as the NEA activity in the Working Party on international nuclear data Evaluation Co-operation (WPEC) [4]. The main evaluation activities in the world are there discussed, involving projects in for example Japan (JENDL), the United States (ENDF) and Europe (EFF and JEFF). One of the subgroups in the WPEC is maintaining the High Priority Request List (HPRL) where nuclear data needs for future nuclear applications (e.g. IFMIF or ITER) are presented [5]. The list provides a guide for those planning new measurements, nuclear calculations and evaluation programmes. The HPRL is presented on the web

* Corresponding author. Tel.: +33 1 45 24 10 84; fax: +33 1 45 24 11 28.
E-mail address: henriksson@nea.fr (H. Henriksson).

0920-3796/$ – see front matter © 2008 Elsevier B.V. All rights reserved.
doi:10.1016/j.fusengdes.2008.06.007

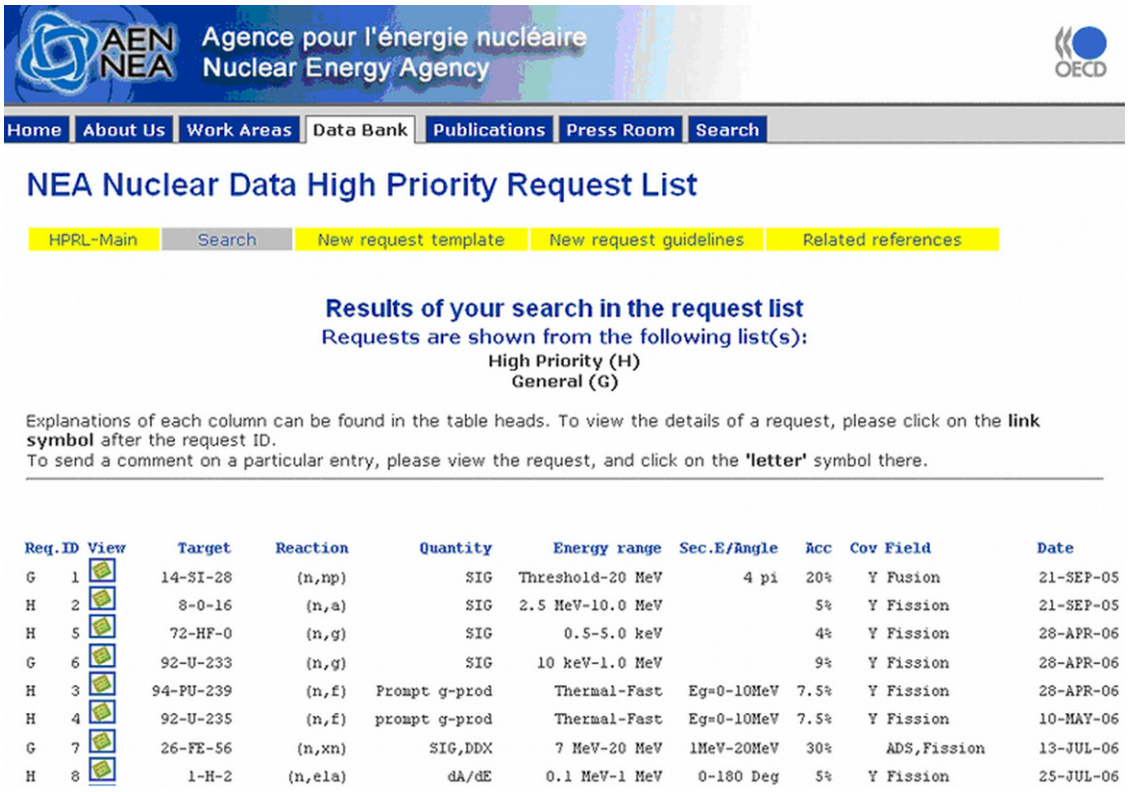

Fig. 1. The web site of the NEA Nuclear Data High Priority Request List.

page: www.nea.fr/html/dbdata/hprl/, where there are 11 requests at present (see Fig. 1).

The NEA services include also chemical thermodynamic data for radioactive waste management applications. Following the organisation of a workshop on Structural Materials for Innovative Nuclear Systems (SMINS) aiming at stimulating an exchange of information on current material research programmes, a Working Party on Multi-Scale Modelling of Fuels and Structural Materials for Nuclear Systems (WPMM) has been created within the NEA.

2.2. The NEA Data Bank

The Data Bank is part of an international network of nuclear reaction data centres (NRDC) [6]. The present aim of the NRDC is to encompass all types of nuclear reaction data, including neutron- and charged-particle-induced data, as well as photonuclear data, considering the requirements of many other nuclear applications, such as accelerator driven systems, fusion reactors, nuclear medicine, materials analysis, environmental monitoring and basic research. The NRDC network is an important collaboration for the coverage of all performed research in the area of nuclear physics and related issues, and the NEA has provided expertise and manpower for decades to the development of databases for experimental nuclear data and the collection of bibliographic data.

The organisation of seminars and workshops gives an opportunity to present information on computer programs or groups of programs that are considered to be of special interest to users. Training courses on widely used computer programs, such as MCNP, are organised a few times a year to ensure a correct and effective use of them. Users come from governmental research institutes, industry and universities.

3. Experimental and evaluated nuclear reaction data

3.1. Experimental data collection

The experimental database EXFOR [6] contains a comprehensive set of neutron, charged particle and photonuclear data from published reports and conference contributions from all over the world; EXFOR contains at present about 16,000 experiments divided in 124,000 different data sets. Some statistics of the database contents as a function of incident particle are shown in Fig. 2; the total number of data sets for each incident particle is compared with the number of data sets in the MeV-range and with data sets only covering cross-section data in the MeV-range. In addi-

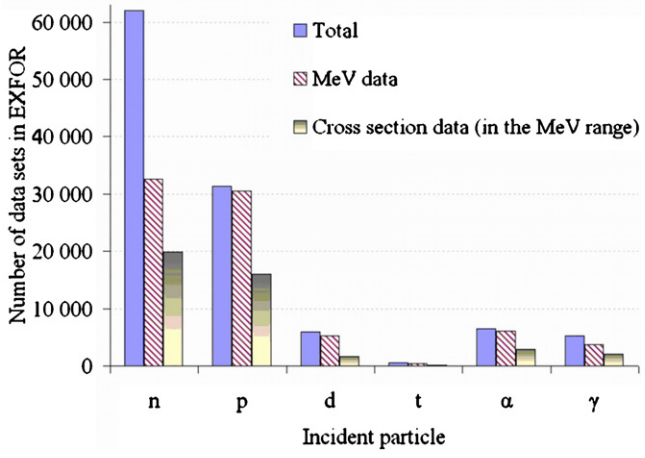

Fig. 2. EXFOR statistics as a function of incident particle. See main text for details.