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Nuclear and Radiological Data Available in the International Atomic Energy Agency (IAEA) Databases

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Review scientific paper

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Abstract

Having access to relevant data is essential for ensuring the quality and outreach of research work. In the context of the nuclear field, access to information and data facilitates competence building, long-term professional development, research, and information dissemination. Potential users of nuclear information resources come from different domains: scientists, experts, students, and the public. One of the main roles of the International Atomic Energy Agency (IAEA) is to ensure and promote peaceful uses of atomic energy worldwide. Through their activities, the IAEA strongly encourages the exchange of scientific and technical information. This paper presents an overview of different nuclear and radiological data available in several International Atomic Energy Agency databases. All data is available free of charge for educational and informational use. A summary of information is given for each database presented on the content, access options, copyright, acknowledgement, and dissemination of the available information. A concise summary of this various data might help in capacity building, as well as encourage research and information sharing between different stakeholders in the field.

Keywords:
IAEA; database; nuclear data; radiological data

1. Introduction

Data availability and accessibility is one of the main determinants of the contemporary world. However, the use of available and appropriate data in the proper format greatly influences the quality and outreach of different professional and scientific work in both the private and academic sectors. It is often not easy to distinguish appropriate data or have access to particular data and information from a specific domain. Perhaps this is even truer for the information related to the field of nuclear and radiological activities where data is complex, is in principle interdisciplinary and therefore overlaps and originates from various scientific areas, such as engineering, medicine, and natural sciences. On the other hand, the nuclear field is facing human resource challenges. Developing employee competencies, supporting, and maintaining a competent workforce is crucial for building a learning culture in the nuclear sector and ultimately ensuring safety and security. Having access to relevant data facilitates competence building, long-term professional development, implementing research, and information dissemination.

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One of the primary roles of the International Atomic Energy Agency (IAEA) is to ensure and promote atomic energy's contribution to peace, health, and prosperity worldwide. Additionally, through their activities, the IAEA encourages the exchange of scientific and technical information, which is available in the form of numerous publications, online training and learning materials, software and applications, and specialist databases. These resources are accessible to different users: scientists, experts, students, and the wider public. Essential publications include the IAEA Nuclear Energy Series which is focused on nuclear technologies supporting sustainable development, the advancement of nuclear technology, innovation, and expanding practical applications. The information in publications covers the implementation of activities involving the peaceful use of nuclear technology and its different aspects. The IAEA Safety Standards consist of fundamental principles, requirements and recommendations to ensure nuclear safety.

The main starting point for nuclear and radiological information is the IAEA's NUCLEUS information resource portal which hosts publications, online learning modules, and databases. One limitation of the resources available in the portal is that some are only intended for

different IAEA counterparts in the government, industry and scientific community, therefore, registration is required in order to access some of the data. All data is available free of charge for educational and informational use. The content is protected by copyright, but its use, reproduction, and dissemination are allowed. Adaptation, translation, printing and download are also allowed, but the IAEA must be acknowledged as the source. Additionally, the IAEA's endorsement of users' views cannot be stated or implied in any way.

Databases are a valuable format for organizing and structuring different complex data to make it more available and practical for various users. This paper aims to present available databases hosted by the IAEA, some of which may be less known, and summarize their information, practical context and accessibility. Hopefully, a concise overview of relevant nuclear and radiological data held therein might help in capacity building, encourage research, and information sharing between different stakeholders in the nuclear field.

2. Database overview

This paper presents an overview of several IAEA databases. A summary of information is given for each database, outlining the content, access options, copyright, acknowledgement, and dissemination of the available information. Additionally, a practical use of relevant data is described.

2.1. INIS - The International Nuclear Information System

The International Nuclear Information System (INIS) was established in 1970 and is maintained by the IAEA in collaboration with more than 130 countries. It covers the obligation stated in Article III, paragraph A.3 and Article VIII, paragraph C, of the Agency's Statute, which require the Agency "to foster the exchange of scientific and technical information on peaceful uses of atomic energy" (**IAEA, 2010**). Its main goal is to assist the Member States in developing their nuclear information capacities, whether by looking for nuclear information or looking for a way of preserving their nuclear information. Different countries and international organizations made INIS the world's major open access repository for nuclear science and technology literature by providing their national information.

In practical terms, INIS is a unique collection of published information on the peaceful uses of nuclear science and technology. The INIS repository consists of extensive bibliographic references and full-text documents, scientific and technical reports, conference proceedings, patents and theses with global coverage. The INIS repository content covers all of the IAEA's activities:

– Nuclear engineering and technology,
– Nuclear safety and radiation protection,
– Safeguards and non-proliferation,
– Applications of nuclear and isotope techniques,
– Nuclear and high energy physics,
– Nuclear and radiation chemistry,
– Nuclear applications in life sciences,
– Legal aspects, and environmental and economic aspects of nuclear and non-nuclear energy sources.

The INIS Repository Search (IRS) allows users to look up certain information through two basic search modes: standard search and advanced search. One of the less known but very useful features of INIS is the INIS Multilingual Thesaurus, where a translation of technical terms is available in Arabic, Chinese, English, French, German, Japanese, Russian and Spanish. This feature facilitates browsing the information collection at INIS but can also be used in other professional work with literary sources in foreign languages. Every literary entry reported to INIS needs to contain a title, an English language abstract, a subject category and a set of descriptors selected from the INIS Thesaurus (**IAEA, 2010**).

INIS also offers eLearning courses and training events related to input skills and the use of output products. These training events are organized by the IAEA and are aimed at Member States personnel in charge of data input and the use of output data. Training covers topics such as selection criteria for the literature to be reported, abstracting, descriptive cataloguing, indexing, retrieval, marketing and promotion (**IAEA, 2010**).

Another feature promoted at the INIS website is the IAEA Member States' Access to the OECD/NEA Data Bank. Based on IAEA membership, the Nuclear Energy Agency (NEA) of the Organisation for Economic Cooperation and Development (OECD) distributes nuclear computer codes and processed nuclear data libraries (NEA Data Bank codes) to the IAEA Member States. There are over 1400 different software packages available. The process of requesting NEA Data Bank codes, which is described in detail in the guidelines, needs to go through official channels, i.e. Liaison Officers of the entities in the respective IAEA Member States.

INIS is an excellent starting point for research on specific topics related to physics, radiation, climate change, and health. As a unique collection of data, INIS has specific value on several levels (**IAEA, 2010**). Its pragmatic value lies in the fact that it can be used as a tool by scientists, engineers, technical persons and managers in the nuclear industry in order to keep track of further developments in the subject areas covered by the database collection. At the political level, INIS shows that cooperation on information exchange between very diverse countries can result in a sophisticated information tool available to many. In a technical context, INIS covers the latest technologies and promotes advanced technologies in areas lacking particular infrastructure. From a knowledge preservation standpoint, INIS holds a cumulative scientific knowledge in the areas of the peaceful applications of nuclear science and technology.

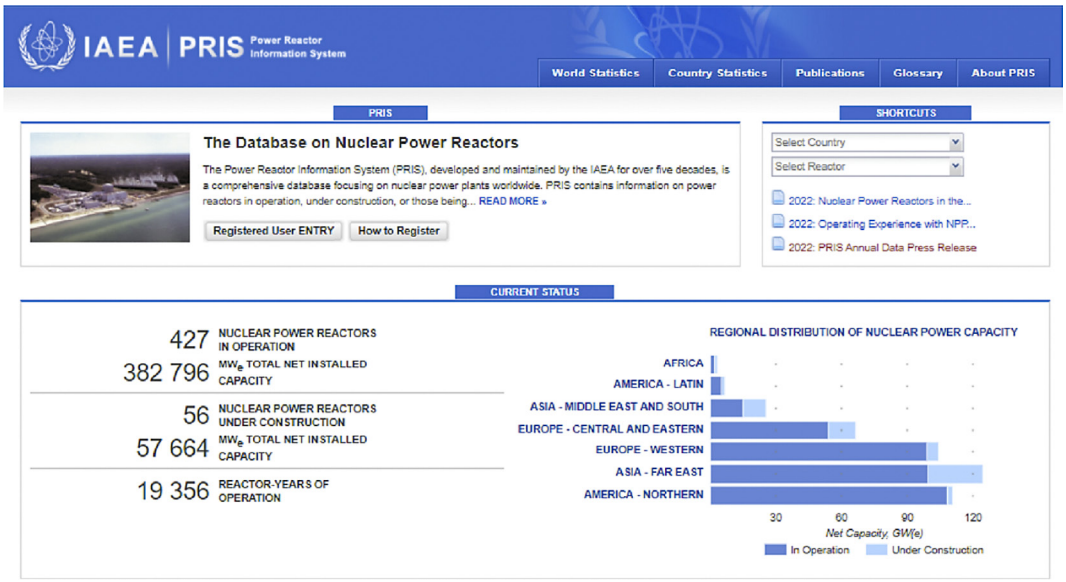

Figure 1: PRIS website with data layout (from **IAEA, 2022a**)

2.2. PRIS – Power Reactor Information System

The Power Reactor Information System (PRIS) contains comprehensive information on nuclear power reactors. It contains information on reactors in operation, under construction or in the decommissioning stage. PRIS users come from international organizations, governmental organizations, including regulators and NPP operators, technical support organizations, academia and research institutions, the private sector and the public.

Dating back to 1954, PRIS is the largest information source with nuclear power reactors' design information and statistical information on operating experience (**IAEA, 2022a**). Officially, nominated national liaison officers in the IAEA Member States submit information to PRIS, making the data in PRIS authorized and verified. In the beginning, PRIS was managed on paper with the database computerized in 1981 and the resulting PRIS reporting system, at the time, being a unique tool for nuclear data collection and validation. The Web Enabled Data Acquisition System (WEDAS) was developed by the IAEA to manage data acquisition and to assist the Member States with data entry. It is continuously being improved based on user feedback.

The PRIS public website includes over 30 types of statistical reports (**IAEA, 2022a**). These reports promote a better understanding of nuclear power and its development worldwide. Different information such as reactors status reports, energy availability, unit capability, unplanned capability loss and trend reports offer users options for complex analyses and benchmarking. Statistical reports offer the possibility of evaluation of nuclear power plant performance. Status and performance reports provide context for trends and strategic planning in the nuclear industry.

PRIS has several other outputs besides the WEDAS and PRIS public website: PRISTA, OPEX publication and RDS-2 publication. PRIS Statistics (PRISTA) is a web-based application, developed in 2009. It is only available to registered users and has four different levels of access: basic, non-nuclear organization, nuclear industry, governmental organizations and NPP owners and operators. PRISTA has a mapping system integrated and allows users to develop plant-specific reports and graphs. Based on the access rights, different statistical reports and details are available.

OPEX stands for Operating Experience with Nuclear Power Stations in the Member States; an annual publication first started in 1970. OPEX provides detailed information on nuclear power reactor performance, including statistical information on electricity production and the overall performance of operating nuclear power plants in a specific year. Additionally, summaries of the historical performance of individual reactors are available. Like OPEX, RDS-2 Nuclear Power Reactors in the World (RDS-2) is one of the IAEA's most popular annual publications (**IAEA, 2022b**). It summarizes specification, technical and performance data on IAEA Member States' nuclear reactors that are planned, under construction, operational, shut down or decommissioned. There are different examples of the practical use of PRIS data. **Volk et al. (2019)** mention using PRIS as a source of commercial data for determining decommissioning strategies and dismantling market analyses. **Carrara (2020)** included nuclear power generation data from PRIS in their analyses of reactor ageing and phase-out policies. **Escobar and Lévêque (2014)** used data on installed reactors from PRIS in the assessment of the probability of a nuclear accident. Other uses include using PRIS data for commercial statistics (**Hamon, 2021**), in nuclear insurance and nuclear liability (**Heffron et al., 2016**), and energy policy development and energy cost calculations (**Boccard, 2014**).

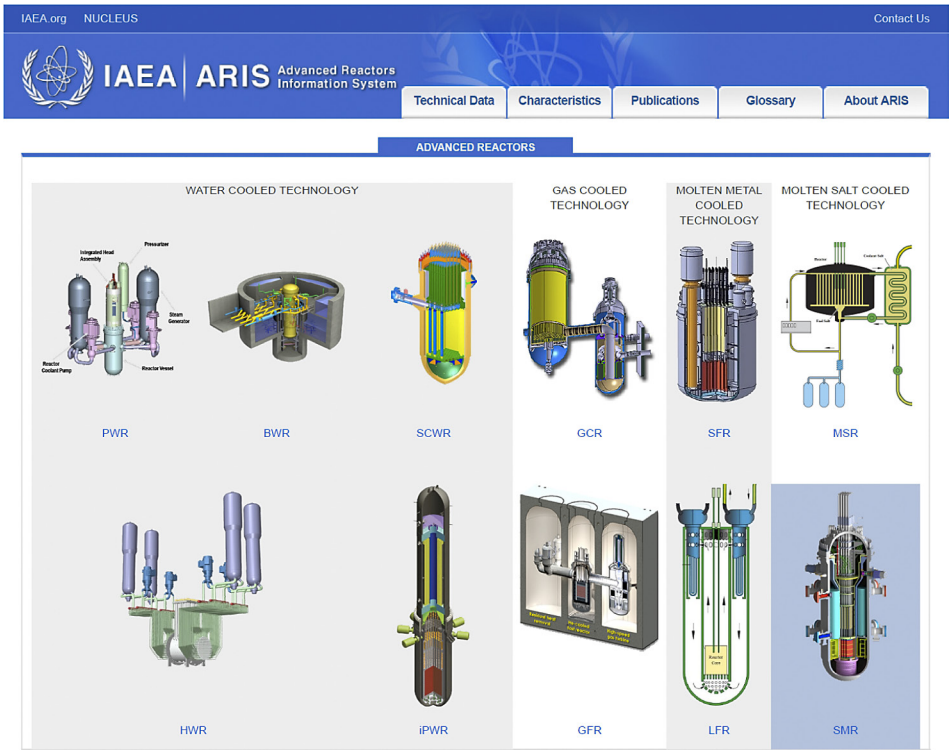

Figure 2: ARIS website data overview (from **IAEA, 2022c**)

2.3. ARIS – Advanced Reactor Information System

The Advanced Reactor Information System (ARIS) was developed to address the need of Member States who are considering their first nuclear power plant or have an existing nuclear power programme but are interested in having the most recent data on nuclear power plant designs and the latest development trends. The goal of ARIS is to assist the Member States in making an informed assessment of available reactor technologies, including advanced designs. The information and descriptions compiled in ARIS are meant to be unbiased and accessible. ARIS can be used with the IAEA's document "Nuclear Reactor Technology Assessment for Near Term Deployment" (NE Series NP-T-1.10) (**IAEA, 2022c**).

Responsible design organizations and reactor plant vendors provide the information contained in ARIS. Before upload, the IAEA reviews the design descriptions to ensure clarity and objectivity in case of an overly commercial presentation aimed at safety levels, costs, projected construction time and availability factors. Design Descriptions in ARIS include all reactor types and sizes and in reactors in different development phases, i.e. evolutionary and innovative reactor technologies (see **Figure 2**). Evolutionary reactor designs include minor or moderate modifications to existing designs while maintaining previously proven design features to minimize technological risk. On the other hand, innovative reactor designs are characterized by radical changes in the use of materials and fuels, operating environments and conditions, and system configurations (**IAEA, 2022c**). A database of advanced reactors can be explored based on the features such as nuclear steam supply system, reactor coolant system, reactor core, core materials and reactor pressure vessel. The reactors are classified as experimental, demonstration or prototype, and commercial in terms of purpose.

Depending on the level of development, the information in ARIS varies. For designs that are already certified or are being developed, there is substantial information available on nuclear steam supply systems, safety concepts, plant performance, proliferation resistance, and spent fuel and waste management, as well as a list of critical technical data (**IAEA, 2002c**). Information is updated in case of progress regarding the design itself, licensing and deployment.

2.4. RRDB – Research Reactor Database

Research reactors have an essential role in nuclear technology innovation by providing a multidisciplinary environment for countries' industrial, medical, and agricultural development. Additionally, research reactors play a key role in supporting nuclear power programmes by providing education and training for different scientists and technicians.

Many countries that are still developing their research reactor projects or building their first research reactor can benefit from having access to the technical information contained in the Research Reactor Database (RRDB). Information held therein is provided by facility

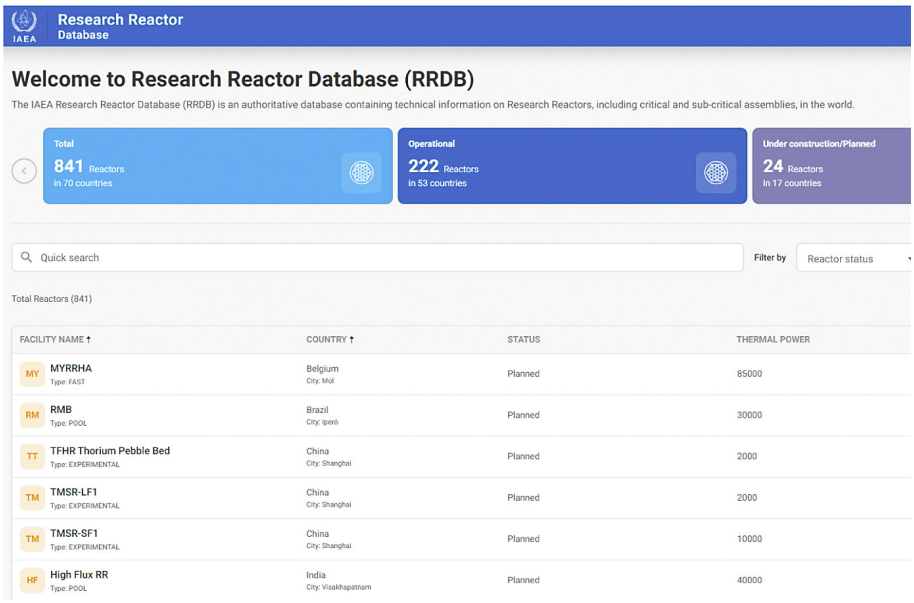

Figure 3: RRDB website layout (from **IAEA, 2022e**)

personnel nominated through official channels, making RRDB the largest authoritative database with technical, utilization and administrative data on 840 research reactors worldwide. The RRDB website offers filter options depending on the region or country, facility name and the reactor status (planned, under construction, operational, temporary shutdown, extended shutdown, permanent shutdown, under decommissioning, and decommissioned). Data in columns can be customized and exported for download (in PDF or Excel).

The IAEA also provides assistance in the format of the Research Reactor Material Properties Database (RRMPDB). The RRMPDB information is compiled from reports on the properties of structural and component materials used in research reactor cores. Information is provided to the IAEA by the Member States and intended for research reactor designers, operators and regulators to enable assessment of the structural components and refurbishment or replacement planning. The filter option allows for exploring the information according to material, property and component. The access is restricted only to NUCLEUS registered users.

Since many research reactors have been operating for longer than their initially planned design life, they are potentially negatively impacted by the ageing of systems, structures and components. The information collected in the IAEA's Research Reactor Ageing Database (RRADB) consists of Member States' reports in managing research reactor ageing issues. It is a repository of the worldwide good practices and lessons learned in maintaining long term reliability and availability of research reactors to ensure the safety and sustainability of reactor operation. It is also intended to be used by operating organizations and regulators for the implantation and improvement of research reactors' ageing management programmes. The access is restricted only to NUCLEUS site registered users.

2.5. NDS – Nuclear Data Services

The Nuclear Data Services (NDS) of the IAEA provides nuclear data for energy and non-energy applications, atomic data for fusion energy research, and basic research studies. These services aim to provide reliable data for dissemination and use in a wide range of applications, including the design and operation of nuclear power plants, nuclear waste management, medical dosimetry and diagnostics, fusion energy research, environmental monitoring, plasma processing, materials inspections, and nuclear safeguards (**Hubert et al., 2004**). An example of the use of different historical easily accessible nuclear data is presented in **Pritychenko et al. (2006, 2014)**.

Data development is related to the IAEA's Co-ordinated Research Projects and global data networks with participating experts from member States. All the data is available online free of cost. Atomic and nuclear data can be categorized into reaction data, decay data, and interactions between particles and surfaces. The information in all three groups can be bibliographic, experimental or evaluated data (**Hubert et al., 2004**). Bibliographic data contains descriptions but without numerical data. Experimental data is based on individual measurements reported by different authors. Evaluated data is derived from theoretical and experimental data, critical experimental data analysis and uncertainties, inter-and extrapolation, and nuclear model calculations. Due to its complexity, some data is difficult to measure, so calculated data is generated using modelling codes.

An additional source of general information and updates is the Nuclear Data Newsletter, first issued in 1994

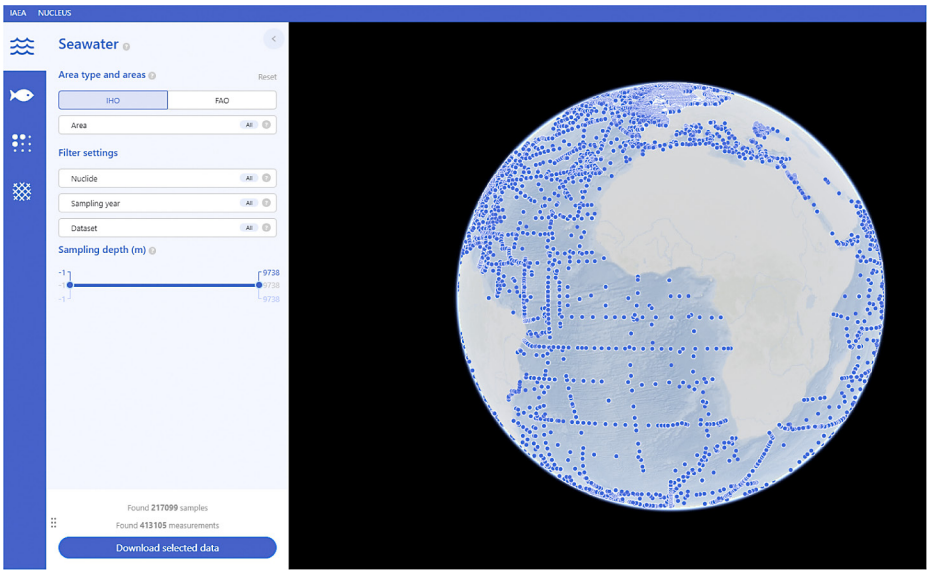

Figure 4: Data retrieval on MARIS website (from **IAEA, 2022f**)

and published twice a year. All issues are available online. In relation to scientific work, the importance of Nuclear Data Services is facilitating the improvement of technical studies with accessible data on nuclear reaction and nuclear structure (**Nichols et al., 2007**).

2.6. MARIS – Marine Radioactivity Information System

The IAEA Marine Radioactivity Information System (MARIS) is an online open-access database on marine radioactivity measurements results in seawater, biota, sediment, and suspended matter. MARIS is maintained and developed by the IAEA Environmental Laboratories in Monaco and contains the results of measurements of radionuclide levels in the marine environment from laboratories around the globe. MARIS has been available online since 2005 and it is an expanded database built upon the previous Global Marine Radioactivity Database (GLOMARD).

MARIS contains data and information on current and historical marine radioactivity levels dating back to 1957. Also, it offers general data and information on marine radioactivity to interested members of the public. MARIS contains data covering open ocean and coastal locations and results from different radiological surveys and research, including published scientific papers, technical reports and databases developed within institutes or scientific programmes in the Member States.

Users have free access to all the data and have a search or download option (according to the terms and conditions data must be appropriately acknowledged with the data source). The website also offers a user guide on MARIS. There is also an option of contributing data to MARIS. The reporting template, which outlines the necessary metadata and instructions, is available on their website. Users can search and retrieve measurements of radionuclides found in marine environment samples using the filter option, which updates the map in real-time (see **Figure 4**). There is also an option to export data and download it as a CSV file in table format. The table shows the number of measurements for each radionuclide for each of the four types of samples (seawater, biota, sediment, suspended matter).

MARIS data aims to support Member States in different environmental applications (**IAEA, 2022e**), such as quantification of contributions from sources of radionuclides to oceans and seas, validation of computational models used for the simulation of radionuclide transfer, the option to analyse inputs, levels and inventories by time and location, providing input data for radiological assessment studies, and data related to the use of radiotracer studies. In the future, MARIS could become a reference source on radionuclide levels in the marine environment so that input from current and legacy nuclear facilities might help identify the effects of potential nuclear and radiological incidents and emergencies.

2.7. DIRATA – IAEA Database on Discharges of Radionuclides to the Atmosphere and the Aquatic Environment

DIRATA is the IAEA's database on discharges of radionuclides to the atmosphere and the aquatic environment. It is an electronic repository of official reports submitted by the IAEA Member States, where each dataset includes annual discharge and detection limits. Additionally, regulatory limits are given if available, as well as information on the site's location (country, geographical coordinates, water body into which radioactivity is released, number, names and types of installations) (**IAEA, 2022f**). DIRATA's main purpose is to provide a technical means for the Member States reporting within the Joint Convention on the Safety of Spent Fuel Man-

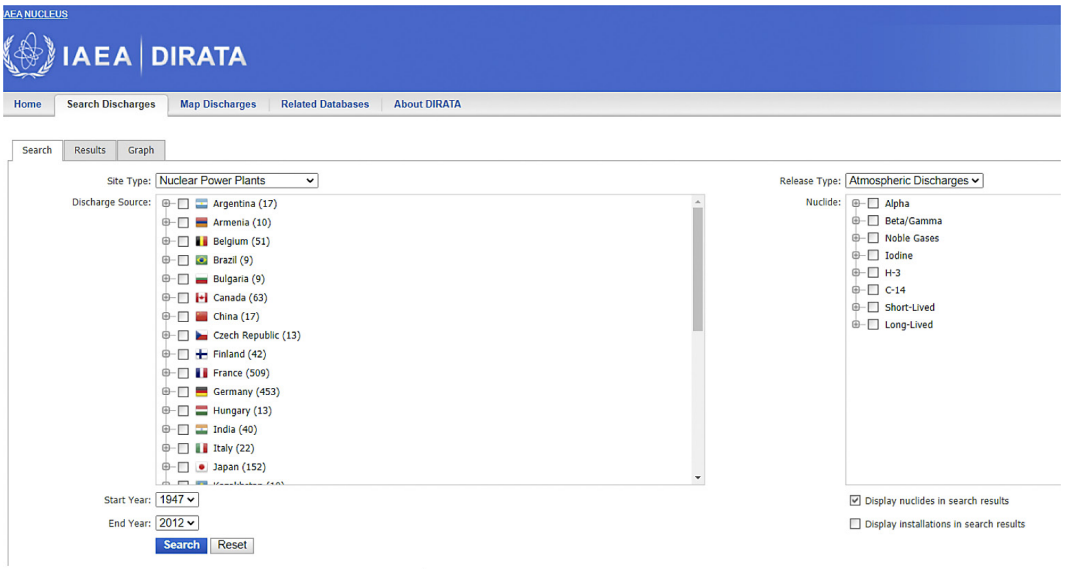

Figure 5: DIRATA search tool (from **IAEA, 2022g**)

agement and on the Safety of Radioactive Waste Management. The annual records are submitted on a voluntary basis.

The first online version of the DIRATA was released in 2006 as the pilot application intended for the Member States and the general public. It provided a format for primary information input by the IAEA Member States and international organizations. A Microsoft Excel template is provided on the DIRATA website for the batch input, online dataset access of the Member States and the public. Additionally, DIRATA contains the historical discharge records, which were collected by the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the European Commission and other international and national organizations. The source for each discharge record is acknowledged.

To access the database, registration is only needed in case of official designation for submitting information to DIRATA. Exploring the database is possible without registration. This includes browsing discharge records by country, facility and year and also plotting the data trends or browsing individual discharge records (see **Figure 5**). The location of nuclear facilities and the discharge data can be shown on Google Maps. Selecting the country, then site and installation is done from the drop-down list. The related discharge records are then shown in list format. The information is available for downloading in the CSV format and for interactive review. DIRATA is continuously updating atmospheric and liquid discharge data and improving data collection.

In a practical context, the DIRATA database has an important role in environmental radioactivity monitoring by providing a harmonised method of reporting effluent monitoring data which corresponds with several international and regional nuclear legal instruments, i.e. Basic Safety Standards (BSS) Directive and Euratom Treaty (**Janssens, 2004**).

2.8. ASTOR – Application of Safeguards to Geological Repositories (Restricted Access)

Since 1988, the International Atomic Energy Agency has been developing safeguards policy and approaches in cooperation with the several Member States through two IAEA Member State Support Programmes: The Development of Safeguards for Geological Repositories (SAGOR, 1994-2004) and Programme for the Application of Safeguards to Geological Repositories (ASTOR, 2005-2017) (**IAEA, 2018**). The ASTOR Programme aimed to assess the effective implementation of safeguard measures and propose recommendations in line with the applicable technology development. Both the SAGOR and ASTOR Programmes encouraged international cooperation in developing approaches to model safeguards, as well as safeguard-relevant information exchanges between the Member States.

In line with the IAEA's objective, the Group of Experts participating in the ASTOR programme focused on assuring that nuclear material and technology would not be diverted from peaceful nuclear uses. In the context of geological disposal activities, geological repositories and associated facilities, this should be fulfilled by providing technical expertise in developing safeguard procedures, measures and technologies. While the ASTOR site has restricted access, it is open to Member States participating in Support Programmes and requires the approval of a corresponding Point of Contact.

2.9. ISEMIR – Information System on Occupational Exposure in Medicine, Industry and Research (Restricted Access)

The Information System on Occupational Exposure in Medicine, Industry and Research (ISEMIR) development project started in 2009 and was coordinated by the

IAEA. The project builds on the experience from the Information System on Occupational Exposure (ISOE) of nuclear power plant operators around the world which showed the importance of having a database that contained detailed information on operational occupational doses which then enabled comparison and benchmarking of doses for specific occupations, functions and tasks (**IAEA, 2014a**). The project Advisory Group identified two specific areas in radiation-use related to non-trivial occupational exposures: interventional cardiology (IC) and industrial radiography (IR). Hence, ISEMIR contains two databases, ISEMIR-IC for interventional cardiology and ISEMIR-IR for industrial radiography. Both databases can be accessed via the IAEA website, but registration with an IAEA Nucleus account is required.

The goals of ISEMIR project were to improve occupational radiation protection in medical, research and industrial domain and to facilitate the implementation of ALARA practices and promote effective exposure management (**ARPANSA, 2022**). Additionally, good practices and gaps were identified through international benchmarking of specific task-related occupational exposures and their respective follow-up actions. All the lessons learned contribute to minimizing the likelihood of accidents.

ISEMIR-IC is a tool for radiation protection optimization intended for medical institutions practicing interventional cardiology. It is a web-based tool for data collection and analysis of the occupational doses for individuals working in interventional cardiology. A facility or organization in question requires one employee to be nominated as a registered facility coordinator. Usually this is either radiation protection officer, radiation safety officer or medical physicist. The effectiveness of the ISEMIR-IC database is dependent on the voluntary participation of IC facilities that register and share their occupational doses and other information on a yearly basis (**IAEA, 2014a**).

ISEMIR-IR is a tool for radiation protection optimization in non-destructive testing companies carrying out industrial radiography. It is also a web-based tool for regular data collection and analysis of occupational doses for individuals working in industrial radiography. Again, participation is free of charge and data entry is for the most part voluntary. Free participation enables the data to be accessible to all interested parties. Each participating company provides annual information on the sources used, company procedures, training related to radiation protection, and individual employees working as industrial radiographers. Facilities benefit from using ISEMIR-IR by identifying areas for improvement and corrective actions by benchmarking their own data (individual and company) with available global or regional data (**IAEA, 2014b**). **Izewska et al. (2018)** present the practical use of dosimetry data from audits and activities of dosimetry audit networks in radiotherapy.

As of June 2022, a new tool in the ISEMIR information system is available – ISEMIR-N, facilitating the assessment of occupational exposure for different workers in industries involving naturally occurring radioactive material (NORM). The tool allows users to benchmark their own radiation protection programmes, share their operational experience and compare information on dose assessment related to NORM industries (**IAEA, 2022g**). The database can be accessed via the IAEA website, and registration with an IAEA Nucleus account is necessary.

IAEA has also developed radiological databases related to the use of radioactive sources in medicine. Safety in Radiation Oncology (SAFRON) is a voluntary reporting and learning system associated with radiotherapy and radionuclide therapy. The main goal of SAFRON is the improvement in safe planning and delivery of radiotherapy and radionuclide therapy, focusing on reporting radiotherapy incidents and near misses. The tool promotes an overall safety culture in medical facilities and information sharing between users, thus improving patient safety and incident prevention (**IAEA, 2022h**). Another voluntary reporting system is Safety in Radiological procedures (SAFRAD), whose primary goal is education, where through participation, the users would improve the safety and quality of their services. The database focuses on data regarding patient dose-rates and other data related to patients undergoing various diagnostic and interventional procedures. A Nucleus account is also required to access SAFRAD. Given the nature of the data stored in SAFRAD, any identifiable data is not distributed to governmental authorities or third parties (**IAEA, 2022i**).

2.10. SRIS – Spent Fuel and Radioactive Waste Information System (Restricted Access)

The Spent Fuel and Radioactive Waste Information System (SRIS) is a restricted access database containing information on national spent fuel and radioactive waste management programmes, spent fuel and radioactive waste inventories, laws and regulations and spent fuel and radioactive waste management policies, plans and activities (**IAEA, 2022j**). The development of radioactive waste information started with the Agency's Waste Management Database (WMDB) in 1989. WMDB held the information provided by the Member States in response to questionnaires. An update was necessary to meet the users' needs, and the new version from 1999 was named the Net-Enabled WMDB (NEWMDB). SRIS replaced the NEWMDB. The first NEWMDB data collection cycle was conducted in 2002, and subsequent collections have been conducted annually since 2004. Currently, access to SRIS is limited to the Country Coordinator and regulatory authority officials.

The obligation of reporting through SRIS is based on the provisions of the Joint Convention on the Safety of

Spent Fuel Management and on the Safety of Radioactive Waste Management. It is a legally binding international instrument obligating individual countries to regularly provide their National Reports, including spent fuel and radioactive waste inventories.

Since there are different requirements in national and international reporting, the development of SRIS aims to provide a means of harmonization of reported data on national waste and spent fuel inventories. National requirements are based on legislation and vary significantly between the Member States. Also, in some instances, legal requirements might call for reporting to regional or intergovernmental organizations.

There are also other initiatives for collecting information on spent fuel and radioactive waste. These include the IAEA, European Commission (EC), and the OECD/NEA joint project: Status and Trends in Spent Fuel and Radioactive Waste Management. Several joint meetings have been organized by the IAEA, European Commission, and the OECD/NEA to promote the unified reporting of data on national waste and spent fuel inventories, simplifying the Member States' reporting procedure. A more consistent approach would enable data usage for other stakeholders as well, such as the interested public.

3. Conclusions

The core value of the International Atomic Energy Agency is facilitating information dissemination, exchange, and cooperation in the different areas of peaceful use of nuclear energy.

Various IAEA databases provide nuclear and radiological data ranging from basic technical information to very complex scientific information. Since the potential users vary significantly in their backgrounds, needs, and general knowledge, so do the possibilities for data use and its practical application. This paper provides a systematic summary of information on several databases and their key features. Additionally, the paper also presents examples of utilizing available data in the scientific context ranging from economic analyses and disposal market research, energy policy and safety science research, as well as general nuclear power overview, risk characterization in nuclear insurance and auditing.

Information compiled in this paper aimed to present new tools and data options for different nuclear technology stakeholders in order to generate new research ideas, long-term professional development, capacity building, and specific knowledge transfer. For stakeholders in governmental bodies and agencies, nuclear and radiological data may provide a means for assessing various national policies and reviewing proposals in a practical context.

Ultimately, the goal of information exchange and cooperation between all of the stakeholders in the nuclear field is to ensure the safety and security of radiation sources and provide effective protection of humans and the environment.

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SAŽETAK

Nuklearni i radiološki podatci dostupni u bazama podataka Međunarodne agencije za atomsku energiju (IAEA)

Pristup relevantnim podatcima ključan je za osiguravanje kvalitete i dosega istraživačkoga rada. U kontekstu nuklearnoga područja pristup informacijama i podatcima olakšava jačanje kompetencija, dugoročni profesionalni razvoj, istraživanje te širenje informacija. Potencijalni korisnici resursa s nuklearnim informacijama dolaze iz različitih domena: znanstvenici, stručnjaci, studenti i šira javnost. Jedna je od glavnih uloga Međunarodne agencije za atomsku energiju (IAEA) osigurati i promicati miroljubivo korištenje atomske energije diljem svijeta. Svojim aktivnostima IAEA snažno potiče razmjenu znanstvenih i tehničkih informacija. Ovaj rad predstavlja pregled različitih nuklearnih i radioloških podataka dostupnih u nekoliko baza podataka Međunarodne agencije za atomsku energiju. Svi podatci dostupni su besplatno za upotrebu u svrhu obrazovanja i informiranja. Za svaku predstavljenu bazu podataka dan je kraći pregled informacija o sadržaju, mogućnostima pristupa, autorskim pravima, referencijama i širenju dostupnih informacija. Sažeti pregled niza različitih podataka može pomoći u jačanju kapaciteta, poticanju istraživanja i razmjeni informacija između različitih dionika u području.

Ključne riječi:
IAEA, baza podataka, nuklearni podatci, radiološki podatci

Author's contribution

Ana Getaldić (MEng, PhD Candidate) proposed and defined the idea for the manuscript and provided information summaries on INIS, SRIS and ASTOR databases. **Marija Surić Mihić** (PhD, Senior Research Associate, Radiation Protection Expert) drafted a review of the ISEMIR and DIRATA databases. **Galla Uroić** (MEng, PhD Candidate) consulted open access databases related to the various reactor data (PRIS, ARIS and RRDB) and wrote the respective summaries. **Želimir Veinović** (PhD, Associate Professor, Radiation Protection Expert) performed the review of NDS and MARIS databases contributing with the information on the remaining open-access databases.