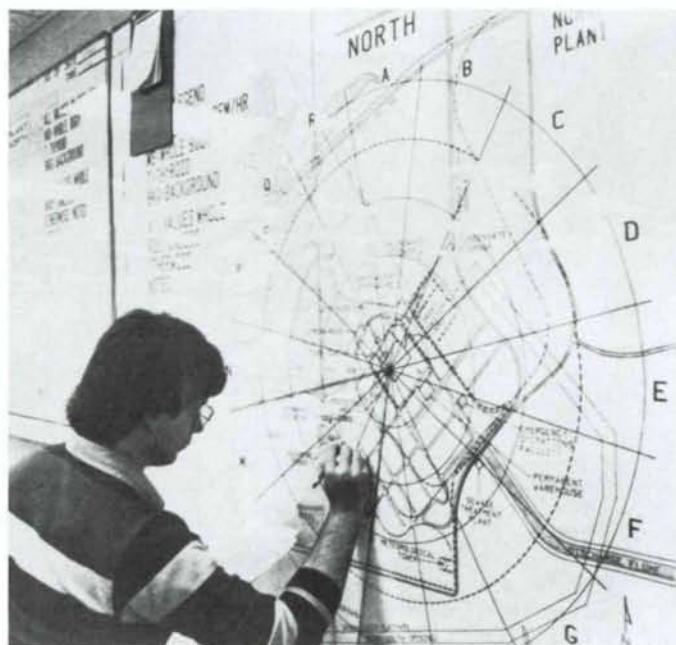


As tools for management and development, information systems serve multiple needs. From top left: checking data inside Japan's Tokai reprocessing plant; studying a computer printout in the USA to help analyse reactor operations; supporting application of nuclear techniques in agriculture research at the IAEA Seibersdorf laboratory in Austria; and tracking a simulated airborne release of radioactive materials during an emergency preparedness drill in Illinois, USA. (Credits: JCG, INPO, Katholitzky-IAEA)



Nuclear information: An overview of IAEA's activities

*Recent developments have re-enforced
the need to define future directions*

by Ivano H. Marchesi
and Leonard V. Konstantinov

Two undeniable by-products of recent international developments have been the heightened interest in the availability and exchange of information in nuclear energy and its development around the world, and the recognition of the IAEA as a major focal point for those activities.

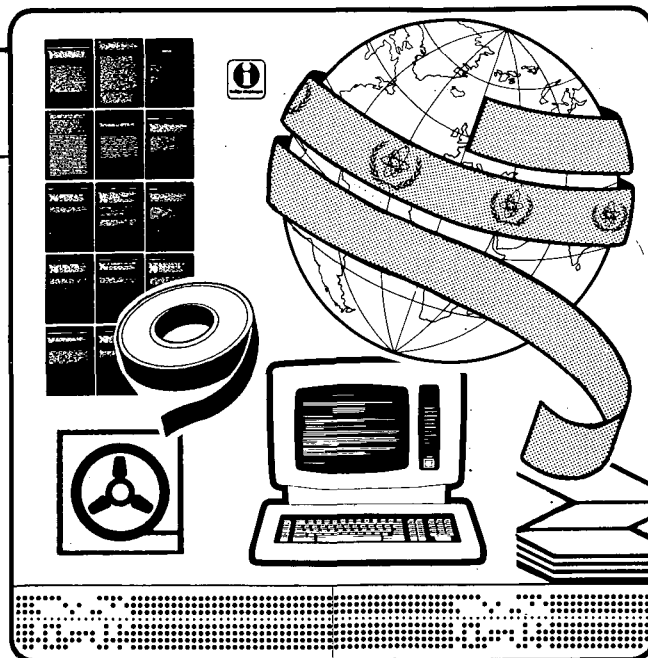
A long tradition of work in this field has allowed the Agency to accumulate significant resources that are of use to the entire IAEA community. Such resources have been designed, developed, and operated by single divisions as tools for specific programmes. A recent review of the utility of existing nuclear information systems at the Agency has found them quite satisfactory for the programmes for which they were designed.

Today, the Agency's extensive bibliographic, numerical, and factual databases provide statistics and references answering specific needs on specialized topics in nuclear energy and related fields. As important, the systems help process and manage the mass of information that is available and being generated daily to facilitate analyses and promote effective use. In some cases, these systems are a primary resource for the Agency's publishing programme, one of the world's most comprehensive for nuclear energy subjects.

Multi-faceted information services

Overall, the Agency's role in information services is rapidly evolving and multi-faceted. It includes, for example, serving Member States as an international nuclear data bank, information clearing house, and publishing centre. The scope of services today is primarily aimed at fostering information exchange and at supporting scientific and technical development worldwide, in keeping with the IAEA Statute. However, the rapid expansion in technology possibilities and the evolution of the Agency's role itself has brought the need to look at and define future directions for information systems.

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Improving current systems

The Agency is now at a point where it needs to consider upcoming information systems development. The databases developed for the various programmes have become sufficiently rich to be of interest to a wider user community. As they begin to be more widely used, they will require more management. This will help ensure that they can be efficiently used by those outside of their particular programmes and that they may be used in conjunction with other Agency databases.

Further, the success of current systems is providing an impetus for other programmes to request even more systems and databases that will need to be integrated. Some areas are receiving special attention in those future directions — for example, nuclear safety, where the emphasis will be on improving systems for the collection and exchange of information related to nuclear plant incidents.

This edition of the *IAEA Bulletin* looks at some of the Agency's principal nuclear information systems, how they are developing, what services they provide, and how they may be directed in the future. By necessity, not all IAEA information systems and resources can be covered in articles here, nor are all widely accessible. Some contain restricted information pertaining to safeguards implementation, for instance. Others are programme tools not intended for information dissemination on a broad scale.

Altogether, the Agency maintains more than 200 computerized files of information. Some 60 of these are part of systems directly related to nuclear activities. Among them are the:

- *International Nuclear Information System (INIS)*
- *Power Reactor Information System (PRIS)*
- *Incident Reporting System (IRS) (nuclear power plants)*
- *Research Reactor Database (RRDB)*
- *Nuclear Fuel Cycle Information System (NFCIS)*
- *Nuclear Data System (NDS)*
- *International Uranium Geology Information System (INTURGEO)*

- *Energy and Economic Databank (EEDB)*
- *Transportation Certificates Database (radioactive materials)*
- *Isotope Hydrology Database*

Some of these are briefly profiled here or covered in more detail in following articles.

Nuclear information and bibliographies

In the field of bibliographic databases, the IAEA has developed and maintained the International Nuclear Information System (INIS) system for over 15 years. This system processes the available nuclear science and technology literature that has been collected worldwide from 74 Member States and 14 international organizations. Over one million items are included in the database, operated by the IAEA Division of Scientific and Technical Information. It is updated and increased by around 80 000 new items each year. This information — covering topics from nuclear plant safety to isotopes in agriculture — is directly available to all scientific and technical users in participating Member States through officially appointed liaison officers in each country.

The system's three main products are: *INIS Atomindex*, an abstract journal containing bibliographic citations to all included items; magnetic tapes with approximately the same information; and a collection of microfiches containing literature referenced in the database which is not commercially available.

Nuclear and atomic data

For scientists and engineers, numerical data for the solution of complex problems are indispensable. The IAEA Nuclear Data Programme serves as the only worldwide centre of its kind, helping to ensure efficient dissemination of reliable data worldwide. It assesses the needs for nuclear data in various fields; compiles, validates, and exchanges data with more than 30 national and regional centres; offers extensive data services to more than 70 Member States; publishes two major bibliographic data indexes; and assists in the transfer of nuclear methods and techniques to developing countries. Nuclear data applications extend to nearly all IAEA programme areas as well, from nuclear safety to safeguards to nuclear medicine.

Nuclear safety databases

The IAEA Incident Reporting System (IRS) was initiated in 1983 to collect, assess, and distribute information on safety-significant events in nuclear power plants. The main portion of each incident report is stored in concise form serving as a bibliographic-textual database. The system is operated and updated by the IAEA to assist participating countries in sharing safety-related operating experiences, with special emphasis on aspects of safety assessment, corrective actions, and lessons learned. All Member States with nuclear power plants are encouraged to exchange information on incidents as freely as possible for their mutual benefit. IRS data are considered as restricted information, and their distribu-

tion is effected through designated national coordinators to regulatory bodies only in participating countries. The system is operated by the IAEA Division of Nuclear Safety, in close harmony with the analogous IRS of the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development.

In the field of radioactive material transport, the Agency has developed an extensive database of approval certificates for packages, shipments, and other special arrangements and forms. The database was established to facilitate the transfer of information to competent authorities and others involved in transporting radioactive material. It maintains a current file of those certificates that apply to international shipment activities or to the use of packages outside the country of origin. The availability of this database enhances safety and the proper implementation of the transport regulations worldwide.

Energy economics and trends

The IAEA Energy and Economic Databank (EEDB) is a collection of data gathered from throughout the world on energy consumption, national production, and economic and demographic statistics. It contains both historical data and forecasts. The Agency uses this information for forecasting future nuclear power potential by country and region through systematic analysis and the use of computer models. Major sources for this database are the United Nations statistical office in New York, the World Bank, and the International Monetary Fund. The database also supports the annual IAEA reference booklet *Energy, electricity and nuclear power estimates for the period up to 2000* (Reference Data Series No. 1). EEDB is available to Member States on request directly to the Division of Nuclear Power, which operates the system.

Nuclear reactors

The IAEA Power Reactor Information System (PRIS) collects data pertaining to reactors in operation, under construction, in planning, shut down, or in various stages of decommissioning. The file thus represents the latest status of nuclear power reactor programmes in Member States and the operational performance of the world's nuclear power plants. Data is analysed, coded and used to support work directed at continually improving the performance and economy of reactors. PRIS is also used as a source for the EEDB and for the preparation of the reference booklet *Nuclear Power Reactors in the World* (Reference Data Series No. 2). Like EEDB, PRIS is available to Member States on request to the Division of Nuclear Power. (See the article "PRIS: A multi-purpose information tool" in the *IAEA Bulletin*, Vol. 28, No. 3, Autumn 1986.)

The IAEA Research Reactor Database (RRDB) collects and provides information covering research reactors in operation, under construction, planned, and shut down. Reported data include training reactors, test reactors, prototype reactors, and critical assemblies.

The system is capable of producing special data sets on request. Among its uses is the preparation of the reference booklet *Nuclear Research Reactors in the World* (Reference Data Series No. 3).

Nuclear fuel cycle facilities

The Nuclear Fuel Cycle Information System (NFCIS) includes the latest information identifying existing and planned nuclear fuel cycle facilities throughout the world and indicating their main parameters, thus providing an overview of activities in this field. NFCIS includes information on facilities for uranium ore processing, refining, conversion and enrichment, fuel fabrication, away-from-reactor storage of spent fuel, reprocessing, heavy-water production, and zirconium and zircaloy tubing. It does not include information on nuclear power reactors, facilities for at-reactor storage of spent fuel, waste management, or prices and marketing. The system is useful to Member States desiring current information on the status of nuclear fuel cycle facilities worldwide. It helps them assess availability of services and formulate future plans. IAEA plans to publish a technical document on NFCIS in the near future.

Uranium information

The International Uranium Geology Information System (INTURGEO) is a comprehensive database on the location and characteristics of world uranium deposits and occurrences. It is designed to allow rapid access and analysis of data for the development studies on the nature of deposits and geologic settings. A well-established database, INTURGEO is being used to prepare an atlas of world uranium deposits. Co-operative data gathering and exchange arrangements are in place with a number of Member States, some of which are installing similar systems. INTURGEO also supports other Agency activities on uranium raw materials, including technical assistance projects.

Future directions

IAEA's information resources now consist of a number of databases that aim to satisfy very specific information needs of scientists in Member States. They are used satisfactorily by experts working in different retrieval languages and database structures; however, they cannot be used in conjunction with one another in an interactive search strategy. It is expected that additional databases will enrich the existing resources as a consequence of recent international developments in the nuclear field.

Member States should be able to view the Agency as a single, though not sole, information resource in the nuclear field. If the Agency has information on a certain subject, that information should be available from the single IAEA information system. Specialists should not have to understand the Agency's organization in order to find the appropriate place to locate information on a par-

ticular subject. Subjects of interest are not necessarily confined to one division within the Agency, and users should not have to use multiple retrieval languages.

Ways to upgrade systems

In looking ahead, we can visualize several measures directed towards an overall upgrading of the system. Some are general enhancements to the overall system in support of the IAEA information system community as a whole; others require new or enhanced programmes throughout the Agency. These can be thought of in four major categories, in generally increasing order of difficulty:

- Creation of new databases or enhancement of existing ones in support of new or improved programmes, and provision of larger information resource at the IAEA. This is especially expected in the area of nuclear safety. This work is fairly straightforward, similar to the programme support provided in the past. As we have seen in the past, the most serious component necessary for success is a commitment by data suppliers for complete and timely data input.

- Integration of the various databases at the Agency into a single information system with multiple but fewer databases on more general topics; and, perhaps, multiple user interfaces for the needs of specific programmes or levels of user. Very recently, one working group at the Agency took up a proposal to integrate PRIS, RRDB, NFCIS, and IRS into a single database on the more general topic of nuclear reactors. Further investigation of such a project will demonstrate both the utility of such an endeavour and the difficulties in converting existing databases into a single one with a common data structure and common vocabulary. This is a level of difficulty beyond that of simply building a new database.

- Development of a communication network for emergency situations. This is one possible outcome of the plans for an enhanced programme for nuclear safety. Should an automated information system be selected, that system would have to be available at all times; that is, uninterrupted operation 24 hours a day, 7 days a week. This would be a major change in the IAEA automated system position and require a significant increase in resources. It is not clear whether this is required or desirable, but we must look at the question and decide on the direction.

- Artificial intelligence systems. In the long term, we need to look at artificial intelligence, expert systems, and "knowledge" databases to provide the international level of support to Member States expected of the IAEA.

It is now clear that the IAEA still must pursue a challenging and long avenue to cope with its attribution of being a major focal point for information exchange and dissemination at appropriate levels. Which of the above-mentioned, or other, possibilities will become reality to supplement the present situation is a matter of resources, definition of Member States' expectations and needs, and, of course, extensive management and development work by the Agency's Secretariat.