# WORLD-WIDE EXCHANGE OF NUCLEAR DATA

Methods of assimilating, assessing and making available through widely scattered computer centres the great amounts of information on neutron physics are being worked out by the International Atomic Energy Agency in Vienna and were advanced by discussions held during a meeting of specialists while the Ninth General Conference in Tokyo was in progress.

This is a formidable task, but data on constants such as cross sections, neutron scattering, neutron capture and shielding are of vital importance to reactor constructors and physicists and are now forthcoming from all parts of the world in quantities which make it essential to devise means of making them readily accessible.

It is much more than the laborious business of standardizing references and preparing them for computer use, though even this is immense in view of the number of works involved and the difficulty of establishing ways of linking computers with differing characteristics, as with the Russian and American types. There is also the necessity of ensuring not only that the existence of information is known but that its validity can be assessed, and here is where another form of international collaboration is rapidly growing.

IAEA has set up a Nuclear Data Unit consisting at present of eight people, five of them physicists. It is they who are making the arrangements for exchanging the detailed information.

Several stages have to be gone through. One is the primary task of listing the existing measurement facilities, and this is being done in Vienna. The second is a bibliographical compilation, known as CINDA (Computer Index of Nuclear Data) with a division of labour between Columbia University, New York, for North America, Saclay, France, for Western Europe, and Vienna for the rest of the world. References arranged in order of element, isotope and reaction type, are stored in such a way that computers can give full information on request. For the purpose of ascertaining the information available a number of readers have been appointed – one is in Obninsk (URSS), another in Poland, and others will be appointed in many other countries to ensure coverage of all areas. The CINDA reference volume for 1965 edited recently by the West European Centre at Saclay contained 20 000 items collected in world-wide collaboration and developed within a few years from an initially private reference book maintained by Professor Goldstein of Columbia University. In Vienna an IBM 7040 computer of the Vienna Technische Hochschule has been made available by contract with IAEA under which the full 32 768 word memory was installed. An IBM 1401 is being installed in the IAEA headquarters building and will provide supporting facilities, including graphical plotting. The other data centres for which negotiations are in progress are in the USA, France and USSR, but they involve matters such as Government permission and finding methods of establishing comptability between IBM computers and those of USSR.

## EXCHANGE AND EVALUATION

The third stage is the storage and exchange of detailed numerical data, for which no international system with standard format and preparation of cards exists. Up to now the method known as SCISRS (Sigma Center Information Storage and Retrieval System) developed by Brookhaven National Laboratory (USA), which has more than 100 000 items stored, has been used. This is in a format which can be read (though with some difficulty) in Vienna, but does not meet all the requirements for international data exchange. For this purpose, a revision of programmes for numerical data compilation is being undertaken with the object of reconciling computer systems.

Fourth comes the evaluation of data by discussions and attempts to reconcile apparent discrepancies such as differing measurements of the same cross section. A review surveying the values of the 2200 m/sec constants for four fissile nuclides (uranium-233 and 235 and plutonium-239 and 241) was prepared by Dr. C.H. Westcott (Canada) in conjunction with workers in Vienna and elsewhere. Small panels of experts in specialized fields are engaged on considering measurements and making recommendations as to their acceptability or on the necessity for further measurements.

Distribution of papers emanating from different countries also has to be arranged. Some of these are original work by IAEA Nuclear Data Unit, others come in from and are distributed to a list of specialists all over the world and represent the nuclear physics activities of IAEA Member States. This is the work of the IAEA Nuclear Data Unit, which in all its activities is advised

*Processing nuclear data for reactors at Harwell, UK. (Photo : UKAEA)*

by the International Nuclear Data Scientific Working Group – a committee designed to advise and to help in establishing links with centres and laboratories in various countries. It meets once or twice a year on IAEA invitation and the Government nominated participants are usually the same people. The third of these meetings was held in Warsaw in late 1964, the fourth in Tokyo in 1965.

Head of the IAEA Nuclear Data Unit is Carl H. Westcott (Canada), and other physicist members are Piotr Otatavnov (USSR), Kim Ekberg (Sweden), Hans-Dietrich Lemmel (Germany) and Miss Ursula Schulze (Germany). Mrs. Pamela Attree (Canada) is the programmer, Mrs. Françoise Hirschbichler (France) is the staff member for technical work and preparation of punched cards, and Miss Eva Kiovsky (Austria) is the secretary of the Unit.

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# NUCLEAR MATERIALS MANAGEMENT FOR SAFETY AND EFFICIENCY

The use of nuclear materials in industrial processes presents management with some special problems which are peculiar to the atomic energy industry. The value of the materials is much greater than is normal in a full-scale industrial operation; for example, a 500 MW nuclear reactor may use 50 to 75 tons of uranium fuel at a degree of enrichment which costs $254 per kilogramme. This calls for close control to ensure that fuel is not delivered from the manufacturer before it is needed. No "dead" stocks must be allowed to accumulate in plants in which these materials are used or processed. If reactor fuel costs are to be kept low, too, each fuel element must yield the maximum economic "burn-up" before it is withdrawn from service, and this calls for reliable non-destructive methods of measurement of "burn-up" and appropriate records and fuel-changing schedules.

The special hazards of radioactive materials call for special precautions and appropriate systems of handling and storage. A further danger unique to atomic energy is that of criticality – the possibility that an excessive concentration of fissile material may result in a chain reaction. Every part of the processing plant must be surveyed and checked to ensure that there is no build-up of fissile residues; in storage or transit there must be no aggregation of small lots.

In the nuclear energy industry, too, the standards of purity required are much higher than in most other large-scale operation, so that stringent quality checks are needed.