

# ANNUAL REPORT TO THE GENERAL CONFERENCE

There has been "a notable growth" during the past year in the provision by the International Atomic Energy Agency of experts and equipment to its Member States. This is noted in the third annual report of the Agency's Board of Governors to its General Conference, covering the period 1 July 1959 - 30 June 1960, a period which is characterized as "in most domains... the first full year of normal operation" for the Agency.

The report gives an account of the work done during this period to further progress in the two main technologies of interest to the Agency, nuclear power and the use of radioisotopes and radiation, and in the quest for means to employ these technologies without hazard to health, safety or peace.

The Agency has undertaken various programs of work in these subject fields. For example, it renders assistance to Member States by providing equipment and making available the services of experts as well as by arranging the training of technical personnel. It also supports and, to a limited extent, conducts scientific research in its fields of interest. Further, it facilitates the widest possible dissemination and exchange of technical information on the peaceful uses of the atom. The report by the Board of Governors covers all these programs, the main points of which are summarized below.

## Technical Assistance

Technical assistance to Member States which are at an early stage in the development of programs for the peaceful uses of atomic energy has in many cases been rendered first of all through the dispatch of preliminary missions. Such missions have established close contacts with national authorities, collected technical information, advised on the development of atomic energy programs, and given guidance about making specific requests for technical assistance from the Agency. Missions sent during the report period brought the number of countries assisted in this way since the Agency's establishment to 36. Smaller missions were sent during the year to eight Member States for preliminary discussions of specific technical questions.

Requests for technical assistance have often come about as a consequence of the information exchanged during the visits of preliminary assistance missions. In some cases these requests are for the services of field experts to provide advice on the initiation or carrying out of specific undertakings. During 1959, requests involving the services of 32 such experts for a total period of 357 man-months were approved. For 1960 approval has been given to requests for 24 experts for 202 man-months, as well as to implementation of a

program under the United Nations Expanded Program of Technical Assistance (EPTA) involving the services of 16 experts for 180 man-months.

Countries just embarking on atomic energy programs are often in need of specialized equipment and supplies which they find it difficult to secure through their own resources. In 1959 requests for equipment totalling about \$125 000 in value were approved for eight Member States. Under the 1960 program requests for equipment and supplies worth about \$500 000 have been received.

## Training

The 1957 Report of IAEA's Preparatory Commission, which laid the foundation for the Agency's programs in its early years, explains the training function as follows:

"Assistance to Member States in respect of exchange and training should be a major activity of the Agency in its initial years because of the acute shortage of persons with specialized training and qualifications in nuclear technology for peaceful purposes, particularly in under-developed areas of the world..."

"The Agency should assist Member States, in accordance with their needs, to make arrangements whereby scientific and technical personnel and students of one Member State would have access to instruction and facilities available in other Member States."

The annual report shows a notable expansion during the past year in the Agency's programs to accomplish this objective.

A first approach, which involves bringing the students to the instructors, is through the granting of fellowships which Member States make available to the Agency. The growing interest in this program is shown by the fact that both the number of candidates offered for fellowships and the number of fellowship awards are greater in 1960 than in 1959. Applications numbered 626 for 1960 from 42 governments, as against 577 for 1959 from 45 countries. As to awards, 378 were made in the first half of 1960, as compared to 377 for all of 1959. In addition, the report comments that both the qualifications of candidates and the procedures for their selection were improved in 1960.

Another Agency program to overcome the shortage of trained personnel involves bringing the teacher to the student. It provides for the exchange of visiting professors, scientists, engineers and other specialists to give courses or lectures, or to teach the techniques required for undertaking specific types of research. This program received a certain impetus

during the year ended 30 June this year, 15 visiting lectureships having been arranged for periods varying from several weeks to one year. This compares with only two such arrangements made prior to the report period. A number of additional requests are under consideration and are expected to be met in the near future.

The establishment of regional training centers is yet another device which the Agency has considered in its efforts to foster the training of scientific and technical personnel. The progress made toward this end is described by the report as follows:

"As a result of the request of the Board to the Director General, a survey mission was despatched to the Belgian Congo, Greece, Israel, the Federation of Rhodesia and Nyasaland, Tunisia, Turkey, the Union of South Africa and the United Arab Republic, to make a further study of the problems involved in establishing one or more radioisotope training centers in the area of Africa and the Middle East. At its meetings in June 1960 the Board considered the report of the mission and decided to endorse the request of the Government of the United Arab Republic for the establishment in Cairo of a Middle Eastern regional radioisotope training center for the Arab countries subject to the provisions that the Director General arrange a series of training courses in Cairo and report to the Board on a draft project agreement in the light of the results of these courses. The Board decided to defer until September requests from Belgium (on behalf of the Congo), Greece and Turkey for the establishment of such centers and an offer by Israel to act as host for such a center if the Board so wished."

As a further part of its training and exchange program, the Agency gives assistance to Member States in organizing training courses, refresher courses and seminars. Three training courses on radioisotope applications were organized with Agency help during the report period, the host countries being the United States of America, Argentina and India. Additional training courses are planned for the succeeding year.



The mobile radioisotope laboratory in Korea

Training courses in the applications of radioisotopes are also being assisted by use of two mobile units donated by the US Government. During the year ended 30 June, one of these units was used successively in Austria, the Federal Republic of Germany, and the Republic of Korea, while the other was used for courses in Mexico and Argentina.

## Research

A principal means employed by IAEA to promote advances in its major fields of interest is the support of research undertaken by institutions in Member States, and there has been a very substantial increase in the number of requests for such support. During the period under review the Agency placed 57 research contracts with institutions in 24 countries. The contracts fall into six main subject areas, as the following table taken from the annual report shows:

<u>Subject Matter of Research</u>	<u>Number of Contracts Placed</u>	<u>Agency con- tribution in dollars</u>
Safe disposal of radioactive waste	13	96 620
Health physics and radiation protection	11	116 859
Radiobiology	20	148 275
Safeguards	3	31 000
Small and medium power reactors	1	9 410
Research assistance in medicine and agriculture	9	56 310
Total	57	458 474
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The report explains that "the Agency has concentrated its efforts on supporting research on a limited number of subjects in which it has a major interest and where the results can frequently be expected to have an immediate bearing on the Agency's own activities."

A particularly important research experiment was the one carried out at Vinca, Yugoslavia in April 1960 to measure the radiation exposure received by persons involved in a brief uncontrolled run of the zero power reactor there in October 1958.\*

In addition to supporting research work in Member States, the Agency furthered its research objectives by conducting research in its own facilities, organizing panels of scientific investigators and having staff members present at important international scientific conferences.

IAEA has begun to perform a limited amount of research work in its own laboratory facilities which have so far been located in the headquarters building in Vienna. During the report year this work expanded, both in amount and variety. New equipment, including valuable donations from the Governments of France,

\* See Bulletin for July 1960.

the Netherlands and Yugoslavia, was received. The laboratory's work centered largely on the measurement and analysis of materials contaminated by radioactivity, and on the development of standards, apparatus and methods for such work.

The foundations of the Agency's main functional laboratory at Seibersdorf, near Vienna, were laid in October 1959. Construction of the outer structure was completed in March 1960. It is hoped to have the laboratory in operation early in 1961.



The Agency's laboratory under construction at Seibersdorf, near Vienna

The first panel of scientific investigators working under IAEA contracts, convened in March 1960, brought together 26 scientists in the field of radiobiology.

During the report period, Members of the Agency's staff attended, and in some cases took active part in, scientific conferences dealing with radiology, high energy physics, radioisotopes, radiation effects and nuclear medicine.

## Exchange of Information

The Agency's Statute authorizes it to "foster the exchange of scientific and technical information on peaceful uses of atomic energy". This function, which the Agency pursues in the main through the organization of scientific meetings, the publication of books, brochures, journals and pamphlets, the circulation of various kinds of information material and the extension of library services, has gained marked impetus.

During the year the Agency convened two major scientific conferences, one in Warsaw, on the Application of Large Radiation Sources in Industry and especially to Chemical Processes, and the other in Monaco, on the Disposal of Radioactive Waste. It also acted as co-sponsor of a conference at the Massachusetts Institute of Technology on the Preservation of



Scientists from 12 Member States met in Vienna to discuss selected topics in radiobiology in the context of the Agency's program of research contracts

Foods by Ionizing Radiations. In addition, it convened two seminars, three symposia and 18 panels of expert advisers.

An even fuller schedule of meetings has been planned for the remainder of 1960, with Denmark, Czechoslovakia, the Federal Republic of Germany, India, Italy, Thailand and Brazil acting as hosts for the meetings.

The increase in the volume of the IAEA's publications is noted in the report as follows:

"Whereas in 1959 approximately 4 000 pages of manuscript, totalling 11 books and 35 brochures were published, and another 4 000 pages were edited and prepared for printing, it is estimated that in 1960 up to 6 000 pages of manuscript will be devoted to conference proceedings alone. In addition, approximately 6 700 manuscript pages will be published as further volumes of the Directory of Nuclear Reactors, and the International Directory of Radioisotopes, further issues of the Safety, Legal, Review, and Bibliographical Series, reports of preliminary assistance missions, conference lists, world lists, publications catalogues and various other miscellaneous brochures and leaflets. In addition, the Journal on Plasma Physics and Thermonuclear Fusion will be produced as a quarterly."

Besides publishing this large volume of original material, IAEA is being increasingly called upon for scientific documentation. During the report period 16 bibliographies and lists of references were prepared, and discussions were started with other organizations on a uniform system of classification for atomic energy information.

## Materials Supply and Nuclear Power

When the Agency was established there was wide expectation that one of its early and principal roles

would be that of a world broker through which fissionable, source and other nuclear materials would be supplied by producing nations to other users. During the year under review a beginning was made in this direction with the delivery to Japan in November 1959 of three tons of uranium metal. In addition, negotiations were begun with Finland for the procurement of enriched uranium for a training reactor and for a critical assembly. From the experience gained the Agency can now make much more detailed information available about conditions of supply of enriched fuel.

Notwithstanding these transactions, there can be no denying that the materials supply role of the Agency has been slow in developing. The reasons for this are explained in the report in these words:

"The cost of generating electricity from nuclear power plants, although steadily declining, is still substantially higher than that of conventional power except possibly in a few cases in which special factors enhance the price of conventional fuel or permit the operation of nuclear plants in such a way as to offset their higher capital costs. Technological progress has moreover also tended to bring down the cost of conventional power and there have been notable improvements in some parts of the world in the supply of conventional fuels.

"For these and other reasons the earlier nuclear power plans of a number of countries have been revised and construction of plants is not yet proceeding at the rate foreseen some years ago. The slow growth of demand for uranium for peaceful purposes has contributed to the fact that the world's production of uranium is now beginning substantially to exceed consumption and this has encouraged a trend towards a freer market and declining prices. These factors have also retarded the emergence of the Agency's role as a major supplier of uranium."

The report goes on to say:

"In a longer perspective, however, the expectation remains that research and technical progress on many fronts will substantially reduce the cost of nuclear power and that reserves of conventional fuel will, at least in some regions, eventually be insufficient to meet the steadily increasing demand. Looking to the future certain technically advanced countries are going ahead with impressive nuclear power programs and there has been good progress in the construction of nuclear power plants. There are, moreover, indications that nuclear power will shortly be introduced into other parts of the world."

In order to assist Member States in assessing the economic merits of nuclear power, IAEA is undertaking studies both on an individual country basis and on a general basis. Following an invitation from the Government of Finland, the Agency is participating in a study of nuclear power needs in that country. A similar request from the Government of the Philippines has been received and preliminary studies will begin this year. The approach being followed initially in a general study of nuclear power costs is to review current methods of presenting the costs of nuclear

power plants, with particular emphasis on questions relevant to less developed areas.

In the field of reactor engineering, the report points out that "the Agency is taking steps to make effective use of the offer made by the Government of the United States of America that the Agency should participate in the design, construction and operation of a 20 MW pressurized water reactor to be built in that country."

## Use of Radioisotopes and Radiation Sources

If progress seems slow in the field of nuclear power, this is not the case in the other main technology with which IAEA is concerned: the use of radioisotopes and radiation sources. About the latter, the report comments:

"The growing availability of large sources of radiation now promises... to make possible new applications of nuclear science. Thus for instance, radiation may play an important role in the chemical industry by improving existing processes for the manufacture of synthetics, and by enabling industry to carry out chemical transformations at lower temperatures and pressures than had previously been needed."

As indicated earlier, an important amount of the research which the Agency supports or performs concerns subjects in the field of radioisotopes and radiation sources. This is true as well of the training activities which it supports and the technical assistance which it renders.

The Agency has also undertaken a variety of studies dealing with radioisotope and radiation applications. One, dealing with the use of large radiation sources in radiotherapy, led to the publication of an International Directory of Teletherapy Equipment.

Considerable work has centered round the isotope calcium 47, which is useful in radiobiological studies and clinical research. The Agency completed a market survey of requirements for this isotope. It also continued its support of research to find cheaper methods of producing it and its assistance to Member States in developing practical applications for it.

A study on economics of import, distribution and eventual production of radioisotopes in the less developed countries was begun. Several further studies were initiated in co-operation with the Food and Agriculture Organization of the United Nations, dealing with the use of radioisotopes to investigate fertilizers, with the use of radiation to improve plant species, and with the potentialities of radioisotope tracer techniques in hydrology.

The second volume of the Agency's comprehensive International Directory of Radioisotopes was published. The first volume contains complete tables of isotope preparations, including physical data, sources of supply, procedures for obtaining isotopes, and

prices. The second volume contains similar information on chemical compounds labelled with carbon 14, tritium, iodine 131, phosphorus 43 and sulphur 35.

## Health, Safety and Safeguards

Widespread international concern over the possible dangers to health and safety inherent in the peaceful uses of atomic energy has led the Agency to take an increasingly active role in the efforts to minimize these dangers. For example, as indicated earlier, research contracts supported by the Agency have been largely concentrated in this field. In addition, the Agency continued its work in the drafting of regulations, the issue of guides and the evaluation of specific hazards. During the period under review the Agency drafted regulations on the safe transport of radioactive materials and circulated them to Member States for comment.

In October 1959, the Agency completed its first evaluation for a Member State of the safety of an individual reactor, this being the Swiss research reactor, DIORIT. Several further requests and enquiries for such evaluations were received. Work began during the report period on a manual on the safe operation of critical assemblies and research reactors.

The legal problems presented by radiation hazards also received attention. With the aid of a panel of expert advisers, the Agency drafted and submitted to Member States for comment a Draft Convention on Minimum International Standards regarding Civil Liability for Nuclear Damage. A related panel, dealing

with liability for nuclear propelled ships, began its work in March.

On the subject of safeguards to prevent diversion of nuclear materials from peaceful to military uses, the report says:

"Some of the questions of an administrative and political character with which the Agency has to deal in this part of its work are as novel as nuclear technology itself and involve long-standing concepts of international relations and sovereignty. Progress is therefore inevitably slow and uncertain. Although divergencies of opinion persist, the Board has been able to give provisional approval to a set of principles and procedures for safeguards to be applied in connection with the Agency's own operations, and also to projects it assists and those to which it is invited by Member States to apply safeguards. The Board is submitting these principles and procedures to the General Conference for its consideration at its fourth regular session."

## A Look Ahead

The Board of Governors' report has this comment about the direction of IAEA activities:

"The Board expects that the Agency's operations in the coming year will continue in the main along the lines now established, with some expansion particularly in the domain of technical assistance and scientific information and support. This expansion will however depend partly on the willingness of Member States voluntarily to make available greater resources for the Agency's programs of direct assistance."

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# SAFE OPERATION OF CRITICAL ASSEMBLIES AND RESEARCH REACTORS

Some 150 research reactors are at present operating in approximately 25 countries and many more are being constructed and planned for operation in the near future. In addition, there are many critical assemblies or zero power reactors in various parts of the world.

Some countries have accumulated considerable experience in the operation of these reactors and have in the process developed safe practices. On the other hand, other countries which have recently acquired, or will soon acquire, such reactors do not have sufficient background of experience with them to have developed full knowledge regarding their safe operation.

In this situation, the International Atomic Energy Agency has considered that it would be useful to make available to all its Member States a set of recommendations on the safe operation of these reactors, based on the accumulated experience and best practices.

The Director General accordingly nominated a Panel on Safe Operation of Critical Assemblies and Research Reactors to assist the Agency's Secretariat in drafting such recommendations. The group, which held its first meeting at IAEA's Vienna headquarters last February and a second meeting in July, was composed of the following experts:

D. W. Jefferson-Loveday, United Kingdom,  
Chairman  
J. Aleksandrowicz, Poland  
R. Mello Cabrita, Portugal (first meeting only)  
Dr. R. P. de Figueiredo, Portugal (second meeting only)  
S. G. Kaufmann, USA  
N. Lakshmanachar, India (second meeting only)  
N. B. Prasad, India (first meeting only)  
E. O. Rexin, Argentina  
S. Suguri, Japan  
J. F. Tcherniline, USSR