A LONG-TERM PROGRAMME FOR IAEA

At its fifth regular session in 1961, the IAEA General Conference adopted a resolution calling for the preparation of a long-term programme for the Agency's activities. The programme, which was prepared after extensive consultations with experts from many Member States and is intended to serve as a guide in planning and carrying out the Agency's work from 1965, has been presented to the seventh session of the General Conference by the Board of Governors and the Director General. It envisages that the Agency's main role during the next few years will be, on the one hand, to assist in preparing Member States for the introduction of atomic energy in its various peaceful uses, especially in the production of power, and, on the other, to stimulate and co-ordinate scientific and technological development with a view to making the advantages of peaceful atomic applications available to the maximum number of countries in the shortest possible time.

The long-term programme is based on the conviction that promotion of nuclear power will be the Agency's most important contribution to economy and general welfare. At the same time, early tangible results are expected from the applications of isotopes and radiation sources in medicine, agriculture, hydrology and industry. Activities regarding health, safety and radioactive waste management are regarded essentially as ancillary functions, but attention is drawn to their bearing on the economic use of nuclear power and the application of radioisotopes on a wider scale. Close collaboration with the United Nations and related agencies will continue; the Agency, it is stated, could serve as an operational organ for atomic energy activities under certain programmes of the United Nations or of a related organization.

The United Nations and related agencies are relying more and more on a regional approach in meeting common problems of countries in a particular area. So far the Agency has met these problems on an ad hoc basis either by appointing regional experts or by organizing regional centres. In the future some systematic regionalization may be expected in the Agency's work.

The programme is divided into two broad sections, one dealing with substantive aspects of the work and the other with functional aspects. Two monographs on the Agency's activites in relation to the development of nuclear power and in relation to the application of isotopes and radiation sources are appended to the main document.

Some of the main points of the programme are given below.

SUBSTANTIVE ASPECTS

Nuclear Power

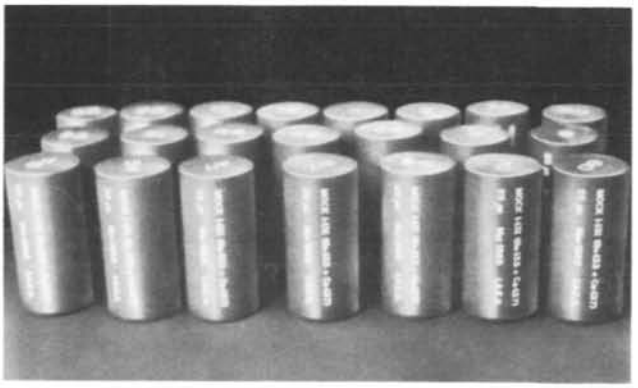
It is expected that nuclear power will become economically competitive with conventional power in the latter half of this decade, particularly in certain areas of the advanced countries. This may also be true in respect of small and medium-sized nuclear power stations in developing countries where conventional fuel costs are especially high. This should increase the demands on the Agency for advice on national nuclear power programmes, particularly in regard to the economic feasibility of specific projects. The Agency should also be prepared to give technical advice on reactor siting, reactor type selection and safety evaluation, and if necessary to help in securing nuclear fuel or facilitating the financial arrangements. In order to be able to give sound advice, it must continue technical and economic studies; besides, it should be in a position to base its advice on an impartial evaluation of all existing alternatives of power generation.

The Agency cannot itself lend much active support to research and development work on nuclear power, but it should keep abreast of progress made in national institutions and continue to disseminate the results. It should encourage Member States in launching joint research projects and assist such projects by expert advice, the grant of fellowships and research contracts, or the supply of materials and equipment. While a shortage of nuclear fuel is not likely to occur in the near future, the expected growth in nuclear power installations may change the present market outlook. The Agency should therefore continue to assist Member States with their programmes of prospection for nuclear raw materials, fuel production and fuel element fabrication.

Isotopes and Radiation Sources

At present the most widespread application of isotopes is in medicine. They are now less widely used in agriculture and there is considerable scope for development. Applications in hydrology, where relatively little is being done at present, can also have great economic significance. Although it may take some time for industrial isotope techniques to make their full impact in countries with few or small industries, it may be economically advantageous to introduce these techniques at an early stage.

Isotope applications entail comparatively simple and inexpensive equipment. Moreover, as more research reactors come into operation, many countries



As part of its efforts to develop the medical uses of radioisotopes, the Agency has undertaken a programme for the calibration and standardization of measurements of radioiodine uptake by the thyroid gland. "Mock" radioiodine sources (a substance with radiation characteristics nearly identical to those of iodine-131 but with a much longer half-life) are used as standards in this work. Picture shows these sources (containing barium-133 and caesium-137) ready for despatch

will start producing radioisotopes on a scale that will meet domestic or regional requirements and make short-lived radioisotopes available to many areas for the first time.

The main aim of the Agency's activities concerning isotopes and radiation sources should be to enable the maximum number of countries to acquire the relevant knowledge and skills, and also to provide the supporting facilities as far as possible. Steps should be taken to encourage research for the development of new techniques, or for the adaptation of existing techniques to the particular conditions of developing countries, as well as for the dissemination of the results of such research.

The need for research contracts to promote isotope uses will increase; it will also be necessary for the Agency to sponsor two or three large research projects using isotope techniques. The isotope work done in the Agency's laboratory will have to be expanded.

Health, Safety and Waste Management

Continuing health and safety guidance from the Agency will be required either in the form of safety standards and technical manuals or in the form of technical advice on particular projects.

The Agency should continue to collect and digest information on development and research undertaken in the advanced countries; it may also try to stimulate and co-ordinate the work done by national institutions. It should continue to provide guidance on the safety aspects of the simple uses of atomic energy, such as the application of radioisotopes, and on problems common to all atomic energy uses, such as monitoring practices. Attention should also be given to more advanced activities, such as mining and milling of nuclear ores, land-based or mobile power reactors and chemical processing. As the number of nuclear research centres grows, there will be a corresponding increase in requests for siting and safety evaluations. Accidents which might occasionally occur in nuclear establishments will be studied.

The problem of high-level wastes from fuel reprocessing plants will be faced in the next few years mainly in the advanced countries. It will, however, be important for even small nuclear laboratories to concern themselves with the problems of treating radioactive solutions and storing relatively concentrated liquid as well as solid wastes. For intermediate-level waste, more experience with treatment processes will be gained in various nuclear establishments and it would be very useful if this experience could be collected and made generally available. With low-level waste, the main problem is to establish methods for determining levels of activity which could be dispersed into the environment without hazard.

The formulation of systematic methods for establishing codes and standards should be the ultimate goal. The Agency should collect and disseminate information, and stimulate research and development work on wastes from small centres as well as on problems that may have an international bearing. The tasks deserving special attention in the coming years will include (a) development of high-level waste treatment methods; (b) technical and chemical evaluations; (c) compilation of data and publication of an international registry of sea disposals; and (d) studies of dispersal mechanisms in fluid environments. The scope of research and development conducted by the Agency itself must be rather limited, but it should be in a favourable position to identify important gaps in the existing research programmes. It may also influence research trends in national institutions and stimulate new research by the award of research contracts.

Physical and Life Sciences

The Agency must maintain a lively interest in the development of fundamental disciplines, especially physics, chemistry and the life sciences insofar as they are related to nuclear energy. It has already organized meetings and issued publications on work done in solid state physics, theoretical physics, plasma physics and thermodynamics. New topics which may profitably be taken up in the future include direct conversion of heat into electricity, physics common to space and nuclear research, interaction between radiation and matter, and radioactivity and radioresistance.

The Agency could do much in encouraging the best possible use of research reactors, in co-ordinating national research programmes and in

facilitating exchange of information on the results obtained. Whenever practicable, the Agency should support joint research ventures involving the use of research reactors. The award of research contracts will also be useful. Besides, simplified administrative procedures should be devised in order to speed up the provision of small amounts of special materials and equipment needed in such research projects. Where experts are requested, the standard practice of sending one expert for a long period should not necessarily be continued; it may often be more useful to send a scientist for short periods at longer intervals, as progress reaches the stage of independent work.

An agreement for the establishment of subcritical assemblies at the Institute of Technology at Otaniemi, near Helsinki, Finland, was signed at IAEA headquarters on 30 July 1963. The enriched uranium needed for these assemblies will be supplied by the Soviet Union through the intermediary of the Agency. At the signing ceremony, left to right, Dr. Cestmir Simone, Director of IAEA's Division of Technical Supplies; Mr. Peter Danoewinata, of the Agency's Protocol Office; Ambassador Otso Wartiovaara of Finland, signing on behalf of his Government; Dr. Henry Seligman, signing on behalf of IAEA as acting Director General; and Mr. Alexander I. Alexandrov, Counsellor of the USSR Mission to IAEA

FUNCTIONAL ASPECTS

Activities Initiated by the Agency

The Agency should keep a balance between the following three main methods of encouraging research and, whenever appropriate, combine all three in integrated programmes: (a) stimulation and coordination of research in Member States without cost to the Agency; (b) support of research by the grant of research contracts; and (c) direct research activities conducted in the Agency's laboratories.

Research contracts have been used in the past for the financial support of research projects either of general value to Member States or of specific interest to the developing countries. The latter type of research contracts, which often serve the incidental but important purpose of assisting scientific institutions or individual scientists in the developing countries, should in the future be given higher priority. Research contracts in support of other projects should as a rule be part of an integrated research programme of general scientific or technological value. Research in the Agency's laboratories should be devoted primarily to problems of an international character.

In disseminating scientific and technical information, the Agency's work must reflect the enormous expansion of scientific work, the proliferation of research centres and the transformation of research from an essentially academic endeavour into an undertaking actively sponsored and supported by governments and industry. In general the Agency's role in this field is to foster the international exchange of information and supplement it by its own activities, with particular attention to the needs of the developing countries.

The Agency's library serves the needs of both Member States and its own staff. In the long run, the Agency may have to seek a satisfactory solution to the growing problem of information storage and retrieval in the use of special equipment and computers. It should also be prepared to assist Member States in organizing their libraries and documentation centres on nuclear energy.

In the programme of scientific meetings, emphasis should be given to certain topics of continuing interest on which it would be advisable to convene meetings at regular intervals. It is important to arrange the programme of meetings in such a way as to ensure maximum co-operation with scientific meetings held by other organizations. The number of meetings should be kept at the present level of about ten to twelve per year. In its publications programme the Agency should continue to give priority to the proceedings of the scientific meetings in addition to panel reports, directories and scientific journals.

As regards regulatory activities, it is proposed to supplement and complete the standards already established for application to the simplest and commonest uses of atomic energy. It is also proposed to develop the general outlines of standards relating to more elaborate and less widespread types of operations.

The revision of the Agency's basic safety standards adopted in 1962 will be a task for the immediate future. The study should be supplemented by standards concerning the permissible emergency doses to the public. Codes of practice should be developed for radiation protection services in small nuclear establishments and for the safe disposal of radioactive wastes by users of radioisotopes. Work should also be pursued on standards for the safe management of high-activity wastes, on regulatory measures for the disposal of radioactive waste into the seas, general standards for the safe disposal of wastes into fresh

water, and a legal framework for international or regional burial sites for waste storage. The Agency should try to issue in the coming years standards of at least a general nature on such subjects as site safety assessment, safe operation of research reactors, safe operation of power reactors and safe use of harbours and canals by nuclear merchant ships.

Following the adoption of a Convention on Liability of Operators of Nuclear Ships, in May 1962, the Agency will participate in the work of a standing committee which has been set up to deal with a number of residual questions. It will also take part in the preparatory work for the revision of the Convention, scheduled to take place five years after its entry into force. Following the adoption of the Convention on Civil Liability for Nuclear Damage, the Agency may be called upon to co-operate in drawing up the relevant national laws and regulations and in elaborating regional conventions.

Although it is not possible to predict accurately the rate of growth of the Agency's safeguards responsibilities, indications show that a gradual increase may be expected. It seems likely that most of this increase will be due to the Agency being made responsible for the safeguards administration of bilateral agreements between Member States.

According to a decision taken by the General Conference at its fourth regular session, the basic safeguards document should be reviewed in the light of experience obtained in its application and the technological developments. The Agency may have to undertake the preparation of additional provisions to cover such problems as the depositing of excess quantities of special fissionable material with the Agency in order to prevent its stockpiling; providing security measures for storing special fissionable material; developing safeguards for the transportation of nuclear facilities and materials; and developing safeguards of nuclear materials in possession of the Agency.

Since the basic safeguards document lays down only general principles, additional detailed provisions and procedures may have to be developed, such as those relating to sampling of nuclear material, coverage of costs involved in the application of safeguards, production of small quantities of special fissionable material, and nuclear material losses. General procedures, as well as detailed procedures for particular facilities, should be further developed for the accounting of nuclear material under safeguards.

Assistance Given on Request

In order to estimate future needs of Member States for technical assistance, the Agency should undertake a study of national atomic energy plans and of the resources available. In general, the type and scope of assistance required depends on technical, scientific as well as specifically nuclear development in the countries requesting assistance. From this point of view, countries can be roughly divided into four categories:

(a) Countries that are taking the first steps towards technical, scientific as well as nuclear development. Approximately 20 per cent of the Member States belong to this category;

(b) Countries that have made some progress in introducing nuclear science and the application of radioisotopes. Approximately 25 per cent of the Member States belong to this category;

(c) Countries which have established, or have planned to establish in the near future, research reactors or sub-critical assemblies, and have already established some of the applications of radioisotopes. Approximately 30 per cent of the Member States belong to this category;

(d) Countries that have power reactors in operation or under construction or in an advanced stage of planning, or are undertaking isotope applications to improve industrial processes, and devoting substantial funds for research and development. Approximately 25 per cent of the Member States belong to this category.

The availability of trained personnel is of prime importance at all stages of development and is a prerequisite for passing from one stage to another. The needs for training, as the needs for other types of assistance, will vary from one category to another.

For countries in the first category, scientific and technical education will be a predominant requirement. It is difficult to overemphasize the importance of creating facilities for the teaching of atomic sciences at institutes of higher education, and the Agency must be ready to provide assistance in this respect, especially if such assistance is not obtainable from other sources. The most usual form of assistance will consist of sending visiting professors. Fellowships, especially for the training of future higher education instructors, and the supply of scientific equipment will play complementary roles. In addition, countries in this category may also sometimes seek assistance in the application of radioisotopes in medical and agricultural work.

So far as countries in the second category are concerned, the requests for assistance are of a wider nature. Requests for training are expected to be concerned with various techniques in the application of radioisotopes, especially in agriculture, hydrology and medicine. Both fellowships and training courses will be of particular benefit to this group.

Countries in the third category usually have a comprehensive range of scientific institutions and possess the main elements of technical knowledge necessary to enable them to obtain full benefits of

An IAEA technical assistance expert, Dr. Helge Bergh, of Norway, guiding work at the agricultural isotope laboratory set up with his assistance at the University of Ankara, Turkey. In the greenhouse of the laboratory, superphosphate labelled with phosphorus-32 is ready for mixing in with soils

nuclear technology. Demands for technical assistance made by these countries are possibly the largest in volume. Their training needs will become increasingly variegated and specialized. The need for specialists in isotope applications, including applications in industry, will continue, and the training of reactor physicists and engineers, health physicists and specialists in waste management will become significant.

Even some of the highly advanced countries require outside assistance; countries in the fourth category, however, usually arrange for assistance through bilateral channels, and use the Agency's assistance only occasionally and in connection with highly specialized activities.

As regards types of assistance, a larger number of requests for fellowships is to be expected due to the increasing membership of the Agency and also because more developing Member States are realizing the potentialities of the Agency's fellowships programme. This expected increase may, however, be offset to some extent by the decrease in the number of requests from other countries. It is not anticipated that there will be any significant growth in the total number of requests, although the resources required may increase due to the need for more long-term fellowships. In the first years of the programme, emphasis will continue to be on the training of specialists in isotope applications and in some fundamental disciplines, such as nuclear physics and radiochemistry. At a later stage it may be expected that a larger number of requests will be made for fellowships for training in special branches of the applied sciences related to the construction and operation of reactors, with special emphasis on practical training in a reactor facility. A relatively large increase of requests for visiting professors is to be expected; with the development of national atomic energy programmes, interest will shift to the training of a larger number of specialists in the country itself.

The Agency should be prepared to organize the following types of training courses:

(a) Specialized training in the application of radioisotopes in agriculture, medicine, hydrology and industry;

(b) Regional studies on the effective use of research reactors;

(c) Training in such selected topics as nuclear physics, radiochemistry, radiation chemistry, radiobiology, human bioassay, radiation health and safety, use of high energy radiation therapy, etc; and

(d) Refresher courses for members of the physics, chemistry and biology faculties of higher educational institutions.

Further, the Agency may be asked to assist in establishing regional training centres along the lines of the Middle Eastern Regional Radioisotope Centre for the Arab Countries already established in Cairo.

A gradual increase in the number of requests for the services of Agency experts is to be expected. In some cases it is necessary for a country to receive assistance simultaneously in more than one branch of the nuclear sciences. It is also believed that a group of experts might successively serve several neighbouring countries and thereby effect savings in time and money. In some cases such savings could also be achieved if one expert served as regional adviser to a number of neighbouring countries.

Requests for scientific and technical equipment will increase considerably. The Agency should make a careful study and formulate a policy on the conditions under which it would furnish requesting countries with equipment.

The Agency cannot render effective assistance without remaining in close contact with the conditions prevailing in the requesting countries. While the number of preliminary assistance missions is going to decrease in the future, follow-up missions will continue to play a useful role.

While each of these different methods of assistance serves a separate purpose, it is expected that in the coming years emphasis will be on projects requiring a combination of various types and methods of assistance. For example, assistance in the effective utilization of research reactors may involve missions and experts, awards of fellowships and research grants, and in some cases provision of equipment. Research contracts, although primarily not a means of technical assistance, may also be utilized.

A proposal made at the sixth regular session of the General Conference by a number of Member States

to include in the programme of technical assistance that provision of medical isotope centres and physics laboratories would also involve various other types of assistance, such as the provision of experts and grant of fellowships. This proposal is being explored and, if approved, its implementation would be spread over the next few years as part of the Agency's long-term programme in technical assistance.

THE AGENCY'S LABORATORIES

The types of services which the Agency's laboratories should be prepared to provide during the next few years include:

(a) Distribution of calibrated radioisotopes;
(b) Environmental studies and collection, transmission and analysis of samples for the determination of strontium-90;
(c) Supply of standards and test materials for bioassay techniques;
(d) Analysis of samples for tritium content;
(e) Routine analysis of samples for soil-plant relationship studies; and
(f) Development of standard methods for analysis of reactor materials.

The expected increase in the number and range of requests for services from the Agency's laboratories will necessitate the development of new research methods and techniques. For example, it is planned to start a study on calibration of slow and fast neutron fluxes, and absolute measurements of gamma doses from cobalt-60 may have to be undertaken. The services for the distribution of calibrated radioisotopes should also be improved by including control measurements of data which are not yet known.

Emission spectographs in the IAEA laboratory at Seibersdorf used for the detection and determination of extremely small impurities in nuclear materials; for a hydrological project they are also being used to detect very small amounts of elements present in some samples of water from Turkey

The mass spectrometer in the Seibersdorf laboratory being used to determine the nitrogen-15 content of some plant materials fed with fertilizer enriched in this stable isotope

Studies of radioactivity in marine and fresh water, including research on physical, chemical and biological mechanisms, will be continued and extended to more fundamental aspects. In the application of radioisotopes priority will be given to problems of significance to the developing countries. The Agency's laboratories should participate in integrated projects organized along the lines of the present rice fertilizer up-take study.

Methods for determining radioactivity, including bioassay, may have to be developed and standardized. The whole-body counter should be used, both for studies of persons accidentally or occupationally contaminated with radioactivity and for studies supporting medical programmes or research contracts.

Finally, maximum use should be made of the Agency's laboratories as training facilities which at the same time provide practical experience adapted to special needs.

FINANCIAL IMPLICATIONS

The Director General has prepared a broad estimate of the financial implications of implementing the long-term programme, but it is pointed out that the estimate and the assumptions on which it is based should be regarded as no more than rough guides to probabilities.

The estimates show an average annual rate of growth of 4.8 per cent, bringing the total budget in 1970 to a little over 13 million dollars. The average annual rate of growth in the regular budget is estimated at 3.5 per cent, and that in the operational budget at 8.6 per cent.

The items which account for the estimated increases in expenditure under the Regular Budget include some of the scientific and technical services and laboratory charges, such as the award of research contracts and health and safety services. No breakdown

of the Operational Budget estimates has been attempted; what has been done is to indicate the desirable growth of total resources to meet the needs of the various programmes which are at present financed under the Operational Budget.

In this connection, it may be pointed out that during its June series of meetings, the Board of Governors decided to recommend to the General Conference amendments to the Statute and Financial Regulations which would put the Agency's entire budget on an assessment basis. Under the provisions hitherto in force, the Regular Budget is financed by assessed contributions by all Member States and the Operational Budget by voluntary contributions.

CIVIL LIABILITY FOR NUCLEAR DAMAGE

An international Convention on Civil Liability for Nuclear Damage was adopted in Vienna on 19 May 1963 by a sixty-nation conference convened by the International Atomic Energy Agency. The Convention, which is subject to ratification by the States signing it, will come into force three months after the deposit of the fifth instrument of ratification.

More than four years of preparatory work by the Agency preceded the adoption of the Convention. The considerations that led to this undertaking had been widely recognized since the earliest days of the peaceful applications of atomic energy and their importance has grown with the steady development of these applications in all parts of the world.

It has been clear from the beginning that civil law rules on conventional third party risks are not adequate for the special hazards of atomic operations and the need has been felt for special civil legislation to guarantee the maximum financial protection of the public without, however, imposing on the atomic industry an unreasonable or indefinite burden of liability. While such special legislation has already been enacted in several countries, it can easily be seen that national, or even regional, solutions are not sufficient to cope with all aspects of the problem. Radiation damage resulting from a nuclear incident may occur far away from the source of radiation; the mal-functioning of a nuclear installation may involve manufacturing industries in several countries, and the hazards inherent in the transportation of nuclear materials may well have international implications.

A single nuclear incident could thus generate suits in several States and the courts might apply different laws to different claims arising out of the same incident. This would not only expose the atomic industry to unforeseeable risks of liability but also make it difficult to provide adequate and equitable financial protection to the public. Only an international convention can serve as a basis for effective and largely uniform civil liability rules for nuclear damage.

Preparatory Work and Vienna Convention

In December 1958, the IAEA Director General convened a panel of experts to advise him on problems of civil liability and State responsibility for nuclear hazards. After several meetings in 1959 this panel, composed of experts from Argentina, the Czechoslovak Socialist Republic, India, Italy, Japan, the USSR, the United Arab Republic, the United Kingdom and the United States and presided over by Dr. Paul Ruegger of Switzerland, prepared a draft convention which was then circulated to the Agency's Member States. The draft was later considered by an intergovernmental committee, composed of representatives of Argentina, Brazil, Canada, the Czechoslovak SR, Finland, France, the Federal Republic of Germany, India, Japan, Poland, the USSR, the United Arab Republic, the United Kingdom and the USA. This committee, which met under the chairmanship of Mr. T. Suontausta of Finland, held two series of meetings in 1961 and 1962 and prepared a revised draft convention on Minimum International Standards Regarding Civil Liability for Nuclear Damage. The revised draft, too, was circulated to Member States for observations.

The revised draft, and the observations made and amendments suggested by Member States, were before the international conference when it met in Vienna on 29 April 1963. The conference, which was attended by delegates from 58 Member States and observers from two others, elected Mr. B.N. Lokur of India as its President and Mr. K. Petrzelka (Czechoslovak SR) and Mr. E.K. Dadzie (Ghana) as Vice-Presidents. It set up a number of committees and sub-committees, the most important of which, the Committee of the Whole, was presided over by Mr. A.D. McKnight of Australia.

Three weeks of detailed discussions on draft articles and other related matters resulted in agreement on the final text of the convention and an optional protocol concerning the compulsory settlement of disputes. Both documents were opened for signature