

# PREFACE

The past year saw a process of strengthening in some important areas of the work of the Agency with the aim of improving the impact and efficiency of its activities.

## *Strengthening of Safeguards*

The Agency's efforts to develop a strengthened safeguards system have been incorporated into its Programme "93 + 2", building on three essential elements: increased access to information about a State's nuclear activities; broader access to sites and locations within a State; and expanded use of new and available technologies to increase detection capacity and, in due course, to reduce the frequency of on-site inspections. The first of two interrelated sets of strengthening measures was accepted by the Board of Governors in June (*see Box 1*).

## *Democratic People's Republic of Korea*

At the end of 1995, the Democratic People's Republic of Korea (DPRK) was still not in full compliance with its safeguards agreement pursuant to the NPT. At the request of the United Nations Security Council, Agency inspectors have been present in the Nyongbyon area since May 1994 and since November of that year the Agency has (with the authorization of the Board of Governors) monitored a "freeze" on the DPRK's graphite moderated reactors and related facilities as provided for in the

"Agreed Framework" between the USA and the DPRK of 21 October 1994. The DPRK has enabled the Agency to implement certain safeguards measures and activities but did not accept other activities, such as the monitoring of the nuclear liquid waste at the reprocessing plant (Radiochemical Laboratory) and measurement of the plutonium content of the spent fuel at the 5 MW(e) reactor. In addition to the safeguards activities carried out at facilities subject to the "freeze", the Agency continued to conduct inspections at DPRK facilities not covered by the "freeze". Agreement was reached with the DPRK in September to enable Agency inspectors to photograph the new process line and other areas of the DPRK's reprocessing plant known as the Radiochemical Laboratory. By the end of the year, however, inspectors had not been allowed to carry out these activities as DPRK operators raised new objections and imposed unacceptable preconditions.

## *Iraq*

The Agency's safeguards obligations in Iraq continued under the mandate assigned to the Agency by resolutions of the United Nations Security Council. Since August 1994, the Agency has maintained a continuous presence in Iraq in order to carry out monitoring and verification inspections to confirm Iraq's compliance with the relevant Security Council resolutions.

### **Box 1**

#### **STRENGTHENING THE SAFEGUARDS SYSTEM**

In 1995 the Board of Governors accepted the Director General's plan to implement at an early date under existing legal authority measures aimed at strengthening the present safeguards system. These measures include:

##### **Broader access to information**

- through the provision by States of: an expanded declaration on the State or regional system of accounting and control of nuclear material (SSAC); information on present nuclear activities; and information on planned nuclear activities;
- through the taking of environmental samples; and
- through the improved analysis of information.

##### **Greater physical access**

- through greater use of unannounced routine inspections.

##### **Optimization of the present system**

- through the introduction of new safeguards measurement and surveillance systems; and
- through increased co-operation with States and SSACs.

In December 1995, the Board of Governors held an initial review of the Secretariat's discussion paper on measures which would require additional legal authority to implement. The discussion paper represents another step in the consultative process designed to foster consensus on the required strengthening measures.

In August, the Agency received additional information on Iraq's former nuclear weapons programme, transmitted by Iraq to the Agency and the United Nations Special Commission following the departure to Jordan of Lieutenant General Hussein Kamel, the former Iraqi Minister of Industry and Military Industrialization. According to this information, a crash programme to produce a nuclear weapon using high enriched uranium (HEU) contained in the safeguarded research reactor fuel stored at the Iraqi nuclear research centre in Tuwaitha had been launched shortly after Iraq's invasion of Kuwait. On 17 January 1991, the programme was effectively brought to a halt by air raids on Tuwaitha which destroyed the building where the uranium extraction was planned before any processing of the fuel could occur. By this time, however, the equipment needed to extract the uranium had been manufactured and installed in a hot cell facility at Tuwaitha. The additional information is being examined for any new indications which might affect the Agency's assessment that Iraq's practical capability to manufacture nuclear weapons had been destroyed, removed or rendered harmless.

The Agency conducted two ad hoc inspections in 1995 to follow up on the new information received and to further clarify the progress made by Iraq in achieving a nuclear weapons capability in the period immediately preceding the outbreak of the Gulf War.

#### *Treaty on the Non-Proliferation of Nuclear Weapons*

In May 1995, the Review and Extension Conference of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) reached the decision to extend the Treaty indefinitely. This decision, and the adoption of the agreed principles and objectives and the strengthened review process, imply a renewed and collective commitment by the Parties to the Treaty to the exclusively peaceful use of nuclear energy and the renunciation of nuclear weapons — a commitment by non-nuclear-weapon States not to acquire such weapons and a commitment by the weapon States to nuclear disarmament.

The outcome of the NPT Conference has far reaching implications for the future work of the Agency. Its role as a central point for international co-operation in the peaceful uses of nuclear energy was confirmed and the Agency was expressly recognized as the competent authority responsible for verifying compliance with safeguards agreements. The Conference called on parties to the NPT who had concerns regarding non-compliance with safeguards agreements to direct such concerns, along with supporting information, to the Agency so that

it could investigate, draw conclusions and decide on necessary actions in accordance with its mandate. The Conference further urged support for Agency efforts to strengthen safeguards and to develop its capability to detect possible undeclared nuclear activities.

Backing was given to the concept of an expanded Agency role in verification and it was recommended that nuclear material released from military use be placed under Agency safeguards as soon as practicable and that safeguards be universally applied once the elimination of nuclear weapons has been completed. There was a call for the early conclusion of an agreement to end the production of material for nuclear weapons or other nuclear explosive devices, and for the creation of additional nuclear-weapon-free zones.

#### *The Nuclear-Weapon-Free Zone Treaty in Africa*

As requested in 1994 by the General Conference, the Secretariat continued to assist the African States in their effort to establish a nuclear-weapon-free zone and, in particular, to help develop its verification regime. A proposed text, which entrusted the Agency with the task of verification, was adopted by the African Heads of State in Addis Ababa in June. Welcoming the adoption of the text (the "Pelindaba Treaty"), the United Nations General Assembly called upon African States in December to sign and ratify the Treaty as soon as possible.

#### *A Nuclear-Weapon-Free Zone for the Middle East*

The General Conference in 1995 requested all parties directly concerned in the Middle East to consider taking steps to establish a mutually and effectively verifiable nuclear-weapon-free zone in the region. The Director General continued consultations with the States of the Middle East to facilitate the early application of full scope Agency safeguards to all nuclear activities in the region and the preparation of model verification agreements.

#### *Nuclear Testing*

The General Conference in 1995 adopted a resolution expressing grave concern at the resumption and the continuation of nuclear testing and calling upon those States which have active nuclear testing programmes in place to desist from testing until a Comprehensive Nuclear Test Ban Treaty enters into force. The resolution also called for co-operation between the States concerned and the Agency. Reservations were expressed by some Member States on this resolution. The Government of France requested the Agency to perform a study to assess the full radiological situation in the atolls of Mururoa and Fangataufa, taking into account all past events of

radiological significance. Such a study — which would be funded by extrabudgetary contributions from France — would consist of two parts: an assessment of the current radiological situation; and an evaluation of the potential long term radiological impact. After consultations with Member States and the French authorities, the Director General informed France that the Agency agreed to conduct the study after the cessation of testing.

#### *Radiological Situation in the Marshall Islands*

The Agency organized a re-examination of the radiological situation at the Bikini Atoll in the Marshall

illicit trafficking in nuclear materials as well as other radioactive sources. In 1995, the Agency established a special programme in this area and set up a database of trafficking incidents to provide factual information to Member State governments and the public. Since effective national accounting and physical protection are basic prerequisites for preventing nuclear material from falling into unauthorized hands, the Agency conducted training courses in the implementation of State systems of accounting and control of nuclear material and in physical protection methods and technology. With the assistance of donor countries, the Agency co-ordinated technical support for the upgrading of physical protection of

### **Box 2**

#### **REASSESSMENT OF A FORMER NUCLEAR WEAPON TEST SITE**

As a consequence of the nuclear weapons tests in the 1940s and 1950s, the inhabitants of the Bikini atoll (now part of the Republic of the Marshall Islands) were evacuated. In the early 1970s, US scientists advised the Bikinians that they could return to the atoll without risk. A few years later, however, the islanders had to be removed from Bikini again. The intake of radioactive substances via the main diet — coconut — had been underestimated.

Since then, several in-depth studies of the radiological situation on and around the former test sites have been made. The US Government sponsored long term studies, and the Marshall Islands themselves financed a completely independent survey. Both undertakings showed that the affected islands would, by now, be safe to live on, providing the islanders did not rely exclusively on local food.

But some scepticism remained and the Marshall Islands, after becoming a Member State of the Agency in 1994, asked for international assistance in reviewing the situation. After considerable preparatory work, an Advisory Group, set up by the Agency and involving experts from Australia, France, Japan, New Zealand, the Russian Federation, the United Kingdom, the USA and WHO, together with a delegation from the people of Bikini, met in Vienna in December.

The panel concluded that the available data on the radiological situation on the Bikini atoll were correct — the different studies, carried out independently of each other, had come to essentially the same results. To further assure the Bikinians, it was agreed that there will be additional radioactive contamination tests of various local foods, carried out at the Agency's laboratories at Seibersdorf.

The Advisory Group concluded that the safe return to Bikini would require measures to reduce the existing radioactivity in local crops to meet the strict international safety standards. It was the unanimous opinion of the experts that caesium remained the only risk factor to the Bikinians. International standards in this regard could be readily achieved by two main strategies: the removal and replacement of contaminated soil; or the effective chemical decontamination of the nutrients taken up by the plants by fertilizing the soil with potassium which would be absorbed by the plant roots and effectively block the residual radioactive caesium.

The decision about a return to Bikini will ultimately have to be made by the Marshall Islanders themselves. However, it is clear that remedial measures are available and that after remedial treatment the atoll could be re-occupied without restriction.

Islands (*see Box 2*). It also undertook a review of an area in Kazakhstan where nuclear weapons had been tested for many years: comprehensive studies were made on potential doses to the population and on levels of plutonium contamination in the vicinity of the former test site. The results confirm overall that there is no need for concern among those living in the settlements around the test site.

#### *Illicit Trafficking in Nuclear Materials*

For the last two years the international community has been concerned about the large number of incidents of

nuclear material in the newly independent States of the former Soviet Union. In July, the United Nations Security Council expressed its full support to the Agency and other international bodies for their work in this field.

#### *The 'Red Book'*

The new edition of the joint IAEA–OECD/NEA 'Red Book' (*Uranium 1995 — Resources, Production and Demand*), which has long served as a reference text, became a genuinely global report as a result of the inclusion of a large volume of new data from countries from

which information had previously not been available. In addition, 1995 saw the completion and publication (in co-operation with the Geological Survey of Canada) of a new map of the world's uranium deposits.

#### *Plutonium Inventory*

Worldwide estimates of civil separated plutonium were developed by the Secretariat and published in the *IAEA Yearbook 1995*. These estimates should serve as a foundation on which appropriate plutonium management concepts can be developed.

#### *Nuclear Liability Convention*

The question of nuclear liability continued to be of concern to Member States. At the thirteenth session of the Standing Committee on Liability for Nuclear Damage, broad agreement was achieved on the revision of the Vienna Convention. The Committee adopted, albeit with certain exceptions and reservations, a full set of texts for amendments to the Convention. On supplementary funding, the discussions were based on the new text of a free standing draft convention. While work continued on the strengthening of an international nuclear liability regime, the numbers of States that have adhered to the Vienna Convention and Joint Protocol increased, especially in terms of States in eastern and central Europe, and at the end of the year stood at 26 and 20 respectively (increases of 2 and 4 over 1994).

#### *Convention on Waste Safety*

The preamble of the Convention on Nuclear Safety adopted in 1994 urges the preparation of a convention on the safe management of radioactive waste. The Board of Governors convened an open-ended group of legal and technical experts who entrusted its chairman with the preparation of a draft of the convention. The group held a second meeting in December, making good progress.

#### *Co-operation in Nuclear Waste Management in the Russian Federation*

In the context of measures to resolve international waste management issues, the Agency, at the request of the Nordic Council of Ministers and with the co-operation of the Russian Federation, organized in May a seminar on international co-operation on nuclear waste management in the Russian Federation. A Contact Expert Group was established under the auspices of the Agency for the purpose of organizing and following up co-operative activities between the Russian Federation and other States and the group held its first meeting in Stockholm.

#### *Nuclear Safety in Eastern Europe and the Former USSR*

Agency work on the assessment of the safety of nuclear power plants in eastern Europe and countries of the former USSR made steady progress throughout the year. Since an international consensus has been reached on the major safety issues and their significance for each of the various reactor types, the emphasis shifted to a review of the status of the implementation of the proposed improvements. The results of this work provided critical input into bilateral and multilateral assistance projects co-ordinated by the G-24 mechanisms.

Following the decision by the Armenian Government to restart the Medzamor Unit 2 reactor, an Agency mission visited the plant in April 1995. Its report pointed to a difficult safety situation, including a number of unresolved technical issues. The Director General conveyed the results to the Armenian Government, stressing the importance of solving the safety issues before the plant was restarted and reiterating the need for highly competent and well trained operating staff to be available.

#### *Sealed Radiation Sources*

A contribution to the safety of radiation sources worldwide was made by the release during the year of the Sealed Radiation Sources Registry package, consisting of a program diskette and documentation for use by register administrators in Member States. This formed one of the major components in the Agency programme to help improve the control of in-use and spent radiation sources.

#### *Sustainable Development and Nuclear Energy*

One of the major challenges in the energy field is to ensure sustainability — a goal that requires improved management of natural resources and a reduction of the emissions which are dangerous to health and the environment. The threat of global climate change due to such emissions is a matter of concern to many governments. However, the first conference on the Framework Convention on Climate Change, held in Berlin at the end of March, showed that reaching an international consensus will take time. Three years after the Rio "Earth Summit" the progress made, for example, in reducing greenhouse gas emissions is extremely small. Carbon dioxide emissions have slowed only marginally in industrialized countries, and have increased significantly in most developing countries owing to energy demand growth and the increasing use of fossil fuels, which are the most readily available energy source. In this context,

the Agency continued to co-operate with other international organizations in drawing up methodologies and databases for the comparative assessment of different options for the production of electric power. An international symposium addressed this issue in Vienna in October (*see Box 3*).

### *Technical Co-operation Programme*

At present only a few developing countries use nuclear power. However, most of them are interested in using non-power nuclear techniques that may help their development and in this regard the Agency continued its major

#### **Box 3**

### **ELECTRICITY, HEALTH AND THE ENVIRONMENT: COMPARATIVE ASSESSMENT IN SUPPORT OF DECISION MAKING**

As a follow-up to the Agency's 1991 symposium in Helsinki on *Electricity and the Environment*, an international symposium on *Electricity, Health and the Environment* was organized in Vienna in October by the Agency and nine other international organizations<sup>1</sup>. The main objective was to exchange information and enhance co-operation between interested parties in the field of electricity demand analysis and supply planning, aiming towards implementing sustainable policies in the power sector, taking into account economic, social, health and environmental factors. Topics covered included data acquisition, the development of computer models for the analysis and assessment of different energy systems, the risks associated with emissions of CO<sub>2</sub> and other greenhouse gases, the health effects of chemical releases, the subjective perceptions of risk, and the inclusion of external costs.

The symposium concluded that:

- Much progress has been made since the Helsinki meeting as a result of the fact that more data and better computer tools, including those developed within the DECADES project, have become available. What is needed now is to promote the use of these tools in comparative assessment studies. This is being done through technical co-operation projects.
- Nuclear power can, and already does, play an important role in reducing CO<sub>2</sub> emissions and other pollutants from the electricity sector. Results were presented showing that the health impacts from nuclear power plants are far lower than those from coal fired plants.
- Significant uncertainties still exist in a number of areas, for example the risks associated with CO<sub>2</sub> emissions and the effects of these emissions on the average temperature, and the risks of small releases of chemical substances. However, it was concluded that if greenhouse effects are included in the overall assessment, hydro power and nuclear power are the only currently available large scale energy sources that have relatively low external costs.
- Positive messages about nuclear power are not getting through to decision makers and the public, or at least are not leading to a more supportive climate for nuclear power. It was therefore recommended that efforts be made to present the results from comparative assessment studies in a more transparent manner so they can be used more readily in decision making processes and communicated to the media and the public. It was suggested that the DECADES project could provide a useful framework for achieving greater international consistency in the approaches used for comparative assessment and for reducing uncertainties in the key data needed for such studies.

The proceedings of both the Helsinki and the Vienna symposia are published by the Agency.

<sup>1</sup>The EC, ESCAP, the World Bank, IIASA, OECD/NEA, OPEC, UNEP, UNIDO and WMO.

A potential application of nuclear power that received particular attention in 1995 was related to the growing problem of potable water in many Member States. Considerable progress was made on the evaluation of the technical and economic feasibility of seawater desalination using nuclear energy. The North African regional feasibility study was completed, showing that the use of nuclear power plants for desalination is technically feasible and that the costs are competitive with those of fossil fuelled plants in the region. A similar feasibility study for Saudi Arabia was under way at the end of the year.

task of assisting in the transfer of the relevant technology. Emphasis was placed on those techniques which will contribute to sustainable development, food production and preservation, the harnessing of fresh water resources, the improvement of industrial processes and the promotion of human health.

Several initiatives were undertaken to strengthen the technical co-operation programme and to make it more effective and more relevant to sustainable development. Many of these initiatives concentrated on improved planning — such as, for example, the preparation of 27 Country

Programme Frameworks, which provide an orientation for the technical co-operation programme and help to maintain the focus on activities which result in a significant benefit. Other initiatives taken in 1995 involved improvements in management, such as the systematic assessment of the status of radiation safety in Member States and the planning of time limited follow-up activities. These and other measures, together with the careful use of overprogramming, combined to produce the highest programme delivery ever.

A Standing Advisory Group on Technical Assistance and Co-operation (SAGTAC) was established and met for the first time in December. The Group will review policy and strategy and make recommendations to the Secretariat on means of improving the effectiveness and efficiency of the technical co-operation programme.

*Joint Programme with FAO*

A number of new directions were introduced into the Agency's joint programme with the FAO. In particular, increased use was made of modern biotechnology. A symposium in June confirmed that radiation induced mutations followed by appropriate selection procedures had been successful in improving the performance of germplasm throughout the world: significant achievements during the year in Peru, China and Mali were reported. There was a major success in 1995 with the eradication, using the sterile insect technique (SIT), of the medfly pest from Chile through an IAEA/FAO

supported project. The benefits to the Chilean economy were estimated at \$500 million annually.

*Use of Isotope Techniques in Hydrology*

An important part of the Agency's programme in research and development is related to the use of isotope techniques in hydrology. At a symposium in March — the ninth in a regular series — the focus was on practical applications of the techniques in the management of groundwater resources. In this area, a model technical co-operation project in Venezuela produced valuable results (*see Box 4*).

*'Hidden Hunger'*

The Agency embarked on new programmes in the area of human nutrition, where isotope techniques are being developed and used to monitor and control the impact of nutritional intervention programmes for overcoming "hidden hunger", a term coined by WHO and UNICEF to describe the deficiencies of vitamin A, iron and other essential micronutrients that are affecting hundreds of millions of people in developing countries. Major projects were planned in several Member States in collaboration with WHO and a model technical co-operation project was supported in Peru.

*Irradiation of Sewage Sludge*

A new Agency co-ordinated research programme was initiated in 1995 on the use of irradiated sewage sludge

**Box 4**

**TAPPING GROUNDWATER RESOURCES IN THE CARACAS VALLEY**

The city of Caracas relies on treated surface water derived from a number of reservoirs for its water supply. Increased demand as a result of rapid growth in the city's population (now exceeding 5 million inhabitants), the poor condition of the water distribution system and adverse climatic conditions have led to a serious deficit in the drinking water supply. Additionally, water losses from the distribution system have led to a rise in the water level, making it necessary to pump groundwater to prevent flooding of the underground transportation system. Exploitation of the Caracas aquifer has long been considered as the best approach to reducing the water deficit (currently 260 000 m<sup>3</sup> per day) and avoiding engineering problems in the underground transport system and geotechnical problems in the basements of many buildings.

In 1994, the Agency launched a special technical co-operation project to provide key information on the potential and properties of the Caracas aquifer as an additional source of water. During the past year, hydrological, geophysical, chemical and isotopic data were collected to characterize and identify the sources of recharge to the aquifer, to study the dynamics of the groundwater, and to evaluate the vulnerability to pollution of different sectors of this aquifer located in an urban environment. The information indicated the existence of two groundwater subsystems: the shallow part of the aquifer, characterized by groundwater with fast circulation and highly vulnerable to pollution, and the deep part (below 50 m) with older groundwater, better protected from pollution and with good quality water for drinking purposes.

On the basis of the information obtained through this study, the location and design of new wells was proposed. Fifty new wells will be drilled during 1996 and it is expected that they will contribute to reducing the present water restrictions (up to 12 hours a day in some districts), providing more than 112 000 m<sup>3</sup> per day (around 43% of the existing water deficit). These wells, together with other measures to reduce wastage and leakage to groundwater, will improve the availability of water to the population, especially in some outlying areas of the city where water is still distributed by trucks. Monitoring of the quality of the water pumped from the Caracas aquifer will be carried out by a laboratory being upgraded with Agency assistance.

to increase soil fertility and crop yields and help preserve the environment. The aim is to find ways by which solid and liquid wastes from households and industry can be utilized as a source of organic matter and nutrients for increasing crop production. This could reduce the need for chemical fertilizers and the pollution of other sewage treatment processes. The use of gamma and electron beam irradiators to eliminate disease-producing microbial pathogens is a promising technique that may permit the safe utilization of sludges as a biofertilizer.

#### *Twenty-Fifth Anniversary of INIS*

In May, the International Nuclear Information System (INIS) celebrated its 25th anniversary. INIS has played a key role in providing access to nuclear information to support activities worldwide. By December, the INIS database included over 1.8 million references to nuclear literature and was growing at the rate of about 7000 records per month.

#### *International Centre for Theoretical Physics*

At the end of the year, administrative responsibility for the International Centre for Theoretical Physics in Trieste was handed over to UNESCO. The Agency, which remains one of the partners in the operation of the Centre, will continue to follow the future activities of the Centre and to co-operate with it actively in certain fields.

#### *United Nations Co-ordination*

The fiftieth anniversary of the United Nations, which was celebrated in 1995, encouraged wide public scrutiny of the system. For the Agency it is clear that co-ordination and co-operation amongst international organizations remains a major goal. This was an important theme at a meeting of the United Nations Administrative Committee on Co-ordination (ACC), which was chaired by the Secretary-General and hosted by the Agency in February.

#### *The Agency Beyond 2000*

At a two day meeting in June, a number of high level officials from Member States met with the Agency's senior management to look beyond the year 2000. There was a common understanding on a number of points: the role of the Agency will continue to evolve; the verification functions will expand; many of the present activities in the areas of nuclear safety and technology transfer will remain essential; and programmes in the field of nuclear waste are expected to grow. Further, it was generally agreed that although the acquisition of nuclear technolo-

gies will increasingly become a matter of commercial rather than governmental decisions, the Agency should be ready to provide impartial advice on the advantages and disadvantages of available nuclear and non-nuclear approaches — in both power and non-power applications.

#### *The Agency on the Internet*

Greater use was made throughout the Secretariat in 1995 of new technologies, especially in the area of communications. As the Internet became a more common tool for the public, the media and decision makers, steps were taken to ensure that many Agency products were made available on it.

#### *Gender and Geography in Staff Recruitment*

In response to resolutions adopted by the General Conference, special efforts were made to increase the professional representation of women and staff from developing countries in the Secretariat. In a situation where the number of staff is static and where some activities require very specialized skills which are available only from a very limited labour market, rapid change is not easy. However, the Secretariat continued to look for ways to improve the situation.

#### *Membership and Budget*

During 1995, Bosnia and Herzegovina joined the Agency, bringing the total membership to 123, an increase of more than 40 over the number of "initial members". It is worth recalling that now for more than a quarter of its history the Agency has been operating under zero real growth. In 1995, the regular budget appropriation for Agency programmes was approximately \$251 million and total new resources amounting to around \$64 million were available for technical co-operation activities. Extrabudgetary funds, apart from those directed to technical co-operation and the ICTP were at a level of about \$32 million.

#### *The Agency Remains Dynamic and Solvent*

In spite of the constraints on approved resources and continued difficulties caused by some countries failing to make contributions on time, the Agency has managed during the last ten years to deliver an expanding programme and to respond to the needs of Member States. This result certainly could not have been achieved without extrabudgetary contributions from a number of governments. It is also in large measure attributable to the continued search for efficiency and savings as well as to the commitment and professionalism of the Agency's staff and its collaborators around the world.