

# The Agency and the World in 2004

Global nuclear developments in 2004, such as the changing outlook for nuclear power, the increasing role of nuclear applications in global sustainable development initiatives, greater international cooperation in matters of safety and security, and the increasing recognition of the need to strengthen the nuclear non-proliferation regime, have created new challenges and opportunities for the Agency. This report highlights the Agency's response to these challenges through activities carried out within the framework of the three pillars of *technology, safety and verification*.

## Technology

### *Nuclear Power: Status and Trends*

The year 2004 marked the 50th anniversary of civilian nuclear power generation — when electricity produced by nuclear power was first delivered to an electrical grid in Obninsk, Russian Federation. Since then, the world has witnessed a steady growth in nuclear power, accompanied by a shift in energy demand growth to the developing countries. Today, developing countries account for 60% of the new reactors under construction, even if 94% of the world's installed nuclear power capacity is in industrialized countries.

With 440 power reactors operating worldwide as of the end of 2004, nuclear energy continues to account for about 16% of world electricity production, keeping pace with the steady growth in the global electricity market. By the end of 2004, 26 nuclear power plants were under construction around the world, the majority (18) being in Asia.

Five new plants were connected to the grid during the year: one in each of China, Japan and the Russian Federation, and two in Ukraine. One laid-up plant was reconnected in Canada, and construction began on India's 500 MW(e) prototype fast breeder reactor and Japan's 866 MW(e) Tomari-3 pressurized water reactor. Five reactors were retired: four 50 MW(e) reactors in the UK and the 1185 MW(e) Ignalina-1 plant in Lithuania.

In Western Europe, excavation work began for the Olkiluoto-3 nuclear power plant in Finland, which will be the first new construction in the region since 1991, and Electricité de France selected the site at

Flamanville for a demonstration European PWR, with construction expected to begin in 2007.

In the USA, the Nuclear Regulatory Commission (NRC) approved 11 more licence extensions of 20 years each (for a total licensed life of 60 years for each plant), bringing the total number of approved extensions to 30. To date, about three quarters of the USA's 104 nuclear power plants have received, applied for or stated their intention to apply for licence renewals. The Department of Energy has also approved financial assistance to two industry consortia for nuclear power plant licensing demonstration projects, which could make new nuclear construction in the USA a near term possibility.

While the current outlook for nuclear energy remains mixed, there is clearly a sense of rising expectations. The near term projections released in 2004 by the Agency (see Fig. 1) are markedly different from those of just four years ago. The Agency's low projection — based on the most conservative assumptions — predicts 427 GW of global nuclear capacity in 2020, the equivalent of 127 more 1000 MW nuclear plants than the 2000 projection.

This change in expectations is rooted in specific plans and actions in a number of countries to expand nuclear power. The new expectations regarding nuclear power, particularly over the longer term, have also been strengthened by the entry into force of the Kyoto Protocol. In the past, the virtual absence of restrictions or taxes on greenhouse gas emissions has meant that nuclear power's advantage — of low emissions — has had no tangible economic value. The widespread, coordinated emission restrictions of the Kyoto Protocol will likely change that over the longer term.

Much of the increase in nuclear generating capacity over the past decade has been credited not to new construction, but to the increased availability of existing plants — a change tied directly to improvements in global safety performance. The result is that existing well-run nuclear power plants have become increasingly valuable assets. Although the initial capital cost of a nuclear plant is high, the operating costs are relatively low and stable.

However, not every country shares the view that improved economics and safety performance

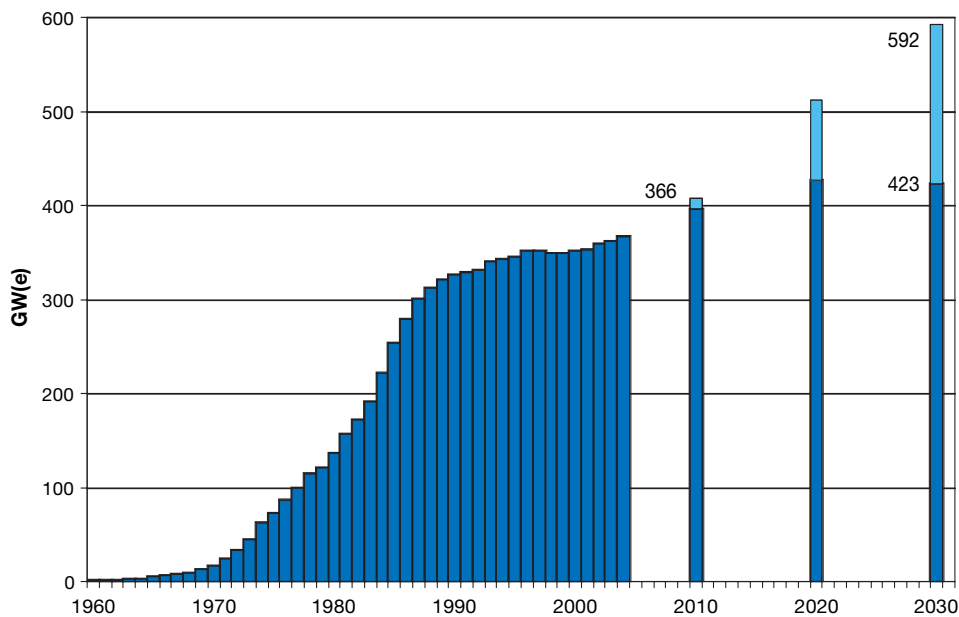


FIG.1. Historical growth in worldwide installed nuclear power capacity, 1960–2004, and the Agency’s latest low and high projections through 2030 (low projections: dark blue bars; high projections: light blue bars). (Source: Energy, Electricity and Nuclear Power Estimates for the Period up to 2030, July 2004, Reference Data Series No. 1, IAEA, Vienna (2004)).

warrant a revival of nuclear power. For example, in Western Europe, Belgium, Germany and Sweden currently have nuclear phase-out policies in place; and a number of others, including Austria, Denmark and Ireland, have stated policies against nuclear power.

### Agency Energy Assessments and Technology Transfer

The Agency assists interested countries to build their energy planning capabilities with respect to all three aspects of sustainable development — economic, environmental and social. It develops and transfers planning models tailored to their special circumstances, as well as making available the latest data on technologies, resources and economics. In addition, it trains local experts, helps with the analysis of national options for meeting energy demands, and helps to establish continuing local planning expertise. Agency energy planning tools are now used in more than 100 countries around the world.

Demand for the Agency’s energy assessment models — which treat all energy supply options equally — and services is growing due to increasingly complex energy systems, market liberalization, privatization and environmental concerns. The number of people attending Agency regional, interregional and national training courses and workshops has risen steadily in recent years

and reached a record high in 2004 of 231 energy professionals from 43 countries.

### Uranium Resources

Agency support for nuclear programmes begins at the very front of the fuel cycle with estimates and analysis of uranium resources. The latest edition of the joint OECD/NEA–IAEA ‘Red Book’ on uranium resources, production and demand, published in 2004, describes a mixed medium term outlook for the uranium market. Of particular importance is uncertainty regarding the continued availability of secondary supply sources — such as civil and military stockpiles, spent fuel reprocessing and the re-enrichment of depleted uranium. While these sources comprised 46% of global uranium needs for civilian power reactors in 2003, their importance is expected to decline as stockpiles are reduced. After 2015, reactor fuel requirements will have to be met by expanded production, development of new sources or the introduction of alternative fuel cycles.

### Decommissioning of Nuclear Facilities

Nearer the back end of the fuel cycle, the Agency provides guidance on when to choose decommissioning over licence renewal, and on the decommissioning process itself. Decommissioning decisions are increasingly pressing for many reactors. Seventy-nine (18%) of the reactors operating at the end of 2004 had been in operation for more

than 30 years, while a further 143 reactors had been in operation for more than 25 years. There are two basic decommissioning options — immediate dismantling and long term safe enclosure followed by dismantling. As of the end of 2004, six plants had been completely decommissioned, with the sites released for unconditional use. Seventeen had been partially dismantled and safely enclosed, 33 were being dismantled prior to eventual site release, and 30 were undergoing minimum dismantling prior to long term enclosure.

Decommissioning generates large quantities of waste, a large part of which has low levels of radioactivity. A new category of radioactive waste — very low level waste (VLLW) — has been introduced in some countries. This category is intended for very low radioactivity decommissioning waste that requires less special treatment than traditional low level waste and thus has a much lower disposal cost. A VLLW repository — opened at Morvilliers, in France, in 2003 — reached full operation in 2004.

### ***Continuous Innovation to Improve Efficiency***

The future prospects of nuclear power will depend on improving the economic competitiveness, ensuring progress on the management and disposal of spent nuclear fuel, and further improving levels of safety, security and proliferation resistance. Innovation is an essential part of progress on all these fronts. The Agency's International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), which focuses on promoting innovations in nuclear reactors and fuel cycles to meet future requirements, added six new members in 2004, namely Armenia, Chile, Czech Republic, France, Morocco and South Africa, bringing the total membership to 22 States. During the year, a number of case studies and reports were completed to test the draft methodology published in 2003 for assessing different innovative nuclear energy systems and concepts. Based on these studies, an improved version of the methodology was published.

The other major international effort to promote innovation is the Generation IV International Forum (GIF), which comprises ten States. Following the finalization of its "Technology Roadmap", GIF has continued to work on the development of future nuclear power technologies that address the issues of economics, safety, energy supply security, waste management and non-proliferation.

INPRO and GIF regularly attend each other's policy and steering committee meetings. One area where they have identified synergies and begun

cooperation is in developing an agreed method to assess the relative proliferation resistance of different nuclear energy systems.

### ***Preserving and Maintaining Nuclear Knowledge***

The ageing of the nuclear work force is a serious concern for a number of Member States, particularly those where nuclear expansion has slowed or is being reversed by phase-out policies. In these countries new talent must be recruited to replace retirees. New recruits are also needed in countries that are planning to expand the use of nuclear power. Agency activities in the field of nuclear knowledge management have sought to address these concerns, and have been making contributions in terms of sharing experience among Member States, assisting in the establishment of regional programmes and collecting information in specific fields that is otherwise increasingly hard to access. A conference on nuclear knowledge management convened by the Agency in September in Saclay, France, recommended the development of 'knowledge packages' targeted at specific user needs. The Agency also supported the establishment in February 2004 of the Asian Network for Higher Education in Nuclear Technology (ANENT). The goal of ANENT is to promote, manage and preserve nuclear knowledge, and ensure the continued availability of talented and qualified staff in the nuclear field in Asia.

The Agency plans to build on this work by expanding educational networks and training opportunities, providing more comprehensive guidance to Member States about establishing nuclear knowledge management programmes, and expanding the scope and accessibility of information assembled through the Agency's knowledge preservation networks.

### ***Research Reactor Conversion and Fuel Return***

For over fifty years research reactors have been a key component in the development of nuclear science and technology. While their contributions to the peaceful applications of nuclear energy are well known, concern has grown in recent years over the proliferation and security risks posed by the high enriched uranium (HEU) fuel used in many of these reactors.

The Agency has supported States wishing to convert research reactors using HEU fuel to low enriched uranium (LEU) (for both fuel and fissile

targets for medical isotope production). Currently, 132 research reactors worldwide are reported in the Agency's database to be operating with HEU, and 99 of these reactors have fuel originally enriched to 90% or more. So far, 33 research reactors have been fully converted and another 6 partially converted.

One of the objectives of the Global Threat Reduction Initiative (GTRI), launched last year by a number of countries, was to speed up conversions of research reactors to LEU fuel. The GTRI also focuses on the equally important task of returning HEU fuel to its country of origin. In December, for example, within the framework of the GTRI, a joint effort between the USA, the Czech Republic, the Russian Federation and the Agency succeeded in safely returning HEU from a research reactor at Rež, near Prague, to the Russian Federation. The Agency also supported similar missions to return significant quantities of HEU from Serbia and Montenegro, Romania, Bulgaria, Libyan Arab Jamahiriya and Uzbekistan to the Russian Federation. By the end of 2004, 95 kilograms of fresh HEU had been repatriated to the Russian Federation. Returns of spent HEU also began; spent HEU of US origin is being returned to the USA routinely, and the first shipment to be returned to the Russian Federation is in an advanced stage.

### *Nuclear Applications*

A major part of the Agency's scientific and technical work involves the transfer of peaceful nuclear technology in such areas as food and agriculture, human health, water resources management, protection of the environment and industrial applications. Many of these applications are proving to be important tools for social and economic development around the world.

#### *Maintaining Human Health*

A major focus of Agency work in human health is combating the growing cancer threat in the developing world. Of the estimated 260 million new cancer cases expected in the next 20 years, approximately 175 million will require radiation therapy, and 100 million of those will be in developing countries that have neither the resources nor the expertise to deal with this crisis. Over the last ten years, the Agency has spent more than \$80 million in 90 countries for the purchase, maintenance and repair of equipment and for human resources development. Furthermore, a large number of national and regional projects in radiotherapy are currently active in more than 100 countries.

The Board of Governors endorsed a 'Programme of Action for Cancer Therapy' (PACT) in June, and the 48th regular session of the General Conference passed a resolution in September supporting PACT. This will help the Agency to acquire funds from a wide range of traditional and non-traditional donors to further enhance its delivery of radiotherapy and related diagnostic techniques to Member States. In cooperation with WHO and others, PACT will assist developing countries in assessing needs, and planning, developing and implementing comprehensive cancer control programmes, with particular emphasis on the provision of cancer therapy in combination with other modalities.

Nuclear medicine is also being increasingly used in cancer management, particularly after the introduction of positron emission tomography (PET) in clinical practice. Through a number of technical cooperation projects, the Agency provided Member States with expertise related to the planning and operation of PET centres. The Agency also initiated projects on the use of molecular biology techniques to investigate resistance to anti-malarial drugs and to the genetic profiling of HIV/AIDS patients resistant to therapy and in this regard, the Agency and WHO are working together in support of programmes in Africa.

Training remains one of the keystones in building professional capacity in nuclear medicine in Member States. The Agency developed a 'Distance Assisted Training Programme' during the year for the benefit of those countries where a specific training programme for technologists in nuclear medicine has not yet been established.

To address problems of malnutrition the Agency, in concert with other partners, continued to provide technical support to Member States to develop nutrition strategies for children. Research has been initiated to evaluate innovative strategies to combat malnutrition by the introduction of nutritionally improved crop varieties, and to evaluate the usefulness of biofortified staple foods as sources of micronutrients.

#### *Enhancing Food Production*

The sterile insect technique (SIT), which involves the production and release of male insects sterilized by gamma radiation, is an effective and environmentally friendly method of pest control. In 2004, the Agency was implementing over 30 SIT projects, either in the field or as feasibility studies for future applications, targeting the tsetse fly, Old and New World Screwworms and various fruit fly and

## United Nations Interagency Coordination on Freshwater Programmes

In 2004, the UN's Chief Executives Board endorsed the creation of an interagency body responsible for coordinating freshwater programmes. This body, called 'UN Water', consists of representatives from more than 25 UN agencies, programmes and funds, and also includes representatives of non-governmental organizations and international programmes active in the field of water. Its aim is to increase the coordination of the UN's programmes on water. One of the major undertakings of UN Water is to produce the *World Water Development Report*, a periodic assessment of the status of global freshwater resources. The next edition is expected in 2006.

moth pests. As a result of area wide SIT campaigns by Member States, fresh vegetable and fruit exports have increased. In the Arava region in the Middle East, fresh vegetable exports have increased in seven years from under \$1 million to over \$30 million per year as a result of a successful medfly suppression programme.

### Water for Life

The global management of fresh water continues to be high on the international agenda. In February 2004, the United Nations proclaimed 2005–2015 as the "Decade for Action: Water for Life", recognizing the growing awareness of the critical linkage between water and development.

Given the increased reliance on groundwater to meet growing water resource needs, relevant international organizations, including the Agency, have been working on developing a "World Groundwater Vision" to be presented at the 4th World Water Forum in Mexico 2006. This is intended to serve as a blueprint for the effective management of groundwater, and will include how to utilize appropriately science and technology, such as

isotope hydrology, for effective groundwater management.

## Technical Cooperation

Promoting the scientific, technological and regulatory capabilities of developing countries through technology transfer and capacity building is among the main tasks of the Agency's technical co-operation programme, with special emphasis given to technical co-operation among developing countries. In 2004, disbursements increased to \$74.8 million, from \$73.5 million in 2003. The major areas of activities were: human health, safety, food and agriculture, applications of physical and chemical sciences, water resources and environmental protection, nuclear science and capacity building (Fig. 2).

## Safety and Security

One of the key elements of the Agency's mandate is to help maintain the safety and security of global nuclear activities. While the overall safety of nuclear

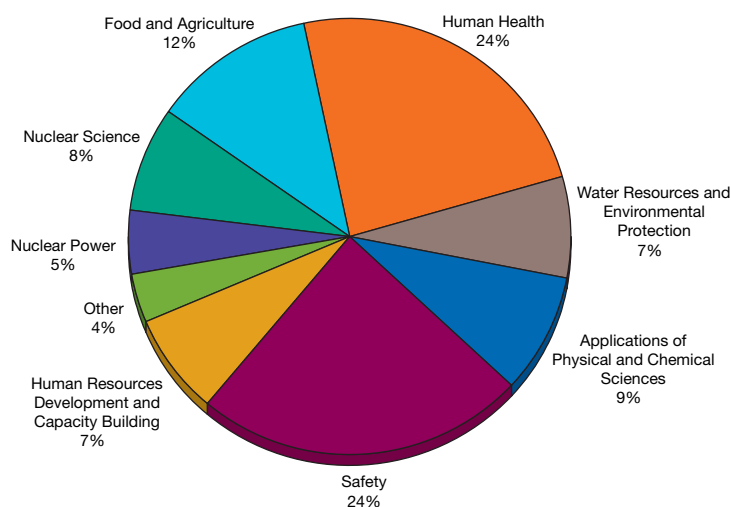


FIG. 2. Technical cooperation programme disbursements in 2004 by area of activity.

installations around the world has improved considerably, there are still a number of challenges to be addressed by States.

### ***Enhancing Global Nuclear Safety***

For nuclear power to operate, it must be not only economically viable, but also safe. Consequently, there is an urgent need to maintain an effective and transparent global framework based on strong national safety infrastructures reinforced by widespread subscription to international agreements and norms. The Agency provides support services for most of these international agreements, and assists States in their efforts to enhance nuclear safety. However, many States are not yet party to these agreements, and universal adherence to them continues to be vital in efforts to enhance global nuclear safety.

#### *Safety Standards*

A main element of these global agreements and norms is the suite of harmonized and internationally accepted safety standards. Over the past few years, the Agency has continued to update these standards. In 2004, the Board of Governors adopted an Action Plan for the Development and Application of IAEA Safety Standards that is currently being implemented with the aim of universal application.

#### *Safety Services*

In providing for the application of these safety agreements and norms, the Agency offers many services. By using the internationally agreed standards as the basis for evaluation, quality and consistency are ensured. Peer review is an important part of most of these services. In 2004, the Agency conducted more than 70 safety review and service missions.

#### *Transport and Radiation Safety*

In March, the Board of Governors approved an Action Plan for the Safety of Transport of Radioactive Material, which provides direction for the Agency's transport safety activities over the next five years, and in November the Board approved the 2005 edition of the Regulations for the Safe Transport of Radioactive Material. A Transport Safety Appraisal Service (TranSAS) mission was completed in France and a preparatory mission to Japan was also undertaken for a TranSAS mission to be carried out in 2005.

Some products, such as wood and foodstuffs, may contain radioactivity at levels that are not significant

from a health perspective. In this connection, international consensus was reached with the publication of a Safety Guide on the *Application of the Concepts of Exclusion, Exemption and Clearance*. This publication establishes levels of radioactivity in such materials below which regulatory controls need not be applied.

#### *Ten Years of the Model Projects on Radiation and Waste Safety*

For the past ten years, the Agency has been implementing "Model Projects" to improve radiation and waste safety infrastructures in Member States. Five milestones have been established: (1) a regulatory framework; (2) occupational exposure control; (3) medical exposure control; (4) public exposure control; and (5) emergency preparedness and response capabilities. By the end of 2004, more than 90 Member States were participating in these projects. Of these, 48 had attained the first two milestones, while the remaining States have made varying degrees of progress towards attaining them. The Agency continues to work with all Member States to achieve the remaining three milestones.

#### *Civil Liability for Nuclear Damage*

The International Expert Group on Nuclear Liability (INLEX), established in 2003, finalized in a series of meetings in 2004 explanatory texts on the nuclear liability instruments adopted under Agency auspices. These texts constitute a comprehensive study of the Agency's nuclear liability regime in order to aid the understanding and authoritative interpretation of that regime. INLEX's work is still ongoing and a number of outreach activities are now on its agenda, in particular the organization of regional workshops on the subject of civil liability for nuclear damage in Asia, the Pacific and the Latin America regions.

## **Nuclear Security**

The security of nuclear and other radioactive material and associated technologies has taken on heightened significance in recent years. However, while nuclear security is and should remain a national responsibility, some countries still lack the programmes and the resources to respond properly to the threat of nuclear and radiological terrorism. For these countries, international cooperation is essential to help them strengthen their national capacities. International cooperation is also essential for the Agency's efforts to assist in building regional

## *International Agreements Related to Nuclear Safety: A Status Report*

- *Convention on Nuclear Safety*: This Convention commits participating States operating land based nuclear power plants to maintain a high level of safety by setting international benchmarks to which States subscribe. The Convention uses a peer review process at a meeting held every three years. At the end of 2004, there were 55 Contracting Parties to the Convention.
- *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency; Convention on Early Notification of a Nuclear Accident*: These conventions provide the legal framework for international cooperation and coordination in the event of a nuclear or radiological emergency. They establish a notification system for nuclear accidents that have the potential for international transboundary release that could be of radiological safety significance for another State and set out an international framework for cooperation among Parties and with the Agency to facilitate prompt assistance and support in the event of nuclear accidents or radiological emergencies. In June 2004, the Board of Governors approved an International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies. At the end of 2004, there were 90 Contracting Parties to the Assistance Convention and 94 Contracting Parties to the Early Notification Convention.
- *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*: This convention is the first and only international, legally binding, treaty in the area of spent fuel and radioactive waste management. It commits participating States to achieve and maintain a high level of safety in the management of spent fuel and of radioactive waste for ensuring the proper protection of people and the environment. The Convention uses a peer review process at a meeting held every three years. At the end of 2004, there were 34 Contracting Parties to the Convention.
- *Convention on the Physical Protection of Nuclear Material*: This convention commits Contracting States to ensure during international nuclear transport the protection of nuclear material within their territory or on board their ships or aircraft. A conference of all States Parties to the Convention has been scheduled for July 2005 to consider amendments to the Convention that would extend it to cover, inter alia, the physical protection of nuclear material used for peaceful purposes, in domestic use, storage and transport and the physical protection of nuclear material and the protection of nuclear facilities used for peaceful purposes against sabotage. As of the end of 2004, there were 106 Contracting Parties to the Convention.
- *Code of Conduct on the Safety of Research Reactors*: The objective of this Code is to achieve and maintain a high level of safety in research reactors worldwide. The Board of Governors adopted the Code at its March 2004 session; the General Conference endorsed the Code in September.
- *Code of Conduct on the Safety and Security of Radioactive Sources*: The objective of this Code is to achieve and maintain a high level of safety and security of radioactive sources. In September 2004, the Board of Governors approved guidance supplementary to the Code of Conduct, on the import and export of radioactive sources; it was subsequently endorsed by the General Conference.
- *Safety Standards*: These comprise publications of a regulatory nature covering nuclear, radiation, transport, waste and general safety. By the end of 2004, the Agency had published a total of 99 safety standards, including 13 standards issued in 2004.

and global networks for combating transnational threats. The Agency's nuclear security plan is founded on measures to guard against thefts of nuclear and other radioactive material and to protect related facilities against malicious acts. Its work has three main points of focus: prevention, detection and response.

In preventing any illicit or non-peaceful use of nuclear or other radioactive material, the Agency has been providing a range of international advisory service missions, training workshops and technical guidance documents — on nuclear security, physical protection, 'design basis threat' assessments, and nuclear material accounting — to assist States

in implementing these preventive measures. In 2004, the Agency conducted 14 International Nuclear Security Advisory Service (INSServ) and International Physical Protection Advisory Service (IPPAS) missions.

To help countries to detect, at an early stage, illicit activity related to nuclear material or radioactive sources, the Agency has been assisting States in training customs officials, installing better equipment at border crossings, and ensuring that information on trafficking incidents is shared effectively. The Agency database on illicit trafficking, now with a total of 81 participating countries, has proven helpful in identifying patterns of trafficking activity. Since 1993,

### *Partnership with Greece to Enhance Nuclear Security*

In cooperation with the Greek Atomic Energy Commission and the US Department of Energy, the Agency assisted Greek authorities in maintaining a high level of nuclear security for the 2004 Summer Olympic Games in Athens. Specifically, the Agency evaluated Greece's nuclear security system, assessing the needs, providing advice on how to improve capabilities, testing and validating detection equipment and providing on-site technical support. Greek authorities were provided with training materials and hands-on practical training in the use of detection instruments and detection methodologies and techniques.

over 650 confirmed incidents of trafficking in nuclear or other radioactive material have been recorded; in 2004 alone, 121 such incidents were reported, 11 of which involved nuclear material. This is the highest number of incidents confirmed to the Agency in a single year since 1993. While the majority of trafficking incidents do not involve nuclear material, and while most of the radioactive materials involved are of limited radiological concern, the number of incidents shows that the measures to control and secure nuclear and other radioactive materials need to be improved.

The Agency has been responding to government requests for the recovery of radioactive sources that have been stolen or lost. It has also been working with national governments and international organizations to establish and strengthen programmes to ensure that, in the event that illicit activity occurs – including acts of terrorism involving nuclear material or radioactive sources – the response can be prompt and well coordinated.

The bulk of this nuclear security activity has occurred in the past three years. Since 2001, working in Africa, Asia, Europe and Latin America, the Agency has conducted more than 125 security advisory and evaluation missions, and convened over 100 training courses, workshops and seminars.

## **Verification**

### ***Strengthening the Safeguards System***

#### *Safeguards Agreements and Additional Protocols*

The implementation of comprehensive safeguards agreements and additional protocols remains crucial for the Agency to be able to provide credible assurances regarding both the non-diversion of declared nuclear material and, importantly, the absence of undeclared nuclear material and activities for a State as a whole. In this connection, the Secretariat continues to promote and facilitate wider adherence to the strengthened safeguards system.

However, the verification activities of the Agency and the non-proliferation regime in general have

been challenged in a number of ways: the rise in international terrorism, the discovery of clandestine nuclear programmes, the emergence of covert nuclear supply networks, and the acquisition by more and more countries of sensitive nuclear know-how and capabilities. The Agency has responded to these challenges, for example, by investigating and analysing the nuclear trade activities of the covert nuclear networks. In June 2004, the Director General also appointed an international expert group to consider possible multilateral approaches to the front and back ends of the nuclear fuel cycle (enrichment, reprocessing, and the storage and final disposition of spent fuel).

In 2004, the number of States where the Agency was implementing strengthened safeguards measures foreseen under an additional protocol increased from 41 in 2003 to 64, including 19 additional States with significant nuclear activities. This substantial increase was due, in part, to the April 2004 entry into force of additional protocols for 15 Member States of the European Union (EU). The number of States parties to the NPT that had yet to conclude comprehensive safeguards agreements decreased from 45 to 40. For these States the Agency cannot provide any level of assurance or draw any conclusions.

#### *Integrated Safeguards*

The Agency moved towards a more flexible and operationally effective approach to safeguards implementation based on State-level considerations. In this regard, the Agency now implements “integrated safeguards” in six States, including in a State with an extensive nuclear fuel cycle. “Integrated safeguards” refers to the optimum combination of all safeguards measures available to the Agency under comprehensive safeguards agreements and additional protocols. Two independent evaluations of the Agency's safeguards activities in 2004 commended the overall effectiveness and efficiency of the way that safeguards are being applied and underlined the importance of giving continued

priority to the implementation of integrated safeguards in States with extensive nuclear fuel cycles.

### *Safeguards Implementation Issues*

In 2004, safeguards were applied for 152 States with safeguards agreements in force with the Agency. The Agency concluded that all declared nuclear material in these States, except in the Democratic People's Republic of Korea (DPRK), has remained in peaceful nuclear activities or has been otherwise adequately accounted for. In 21 of these States with both a safeguards agreement and an additional protocol in force, the Agency was also able to complete sufficient work to provide credible assurance regarding the absence of undeclared nuclear material and activities. Four States had been found to have been previously engaged in nuclear activities of varying significance which they had failed to report; corrective actions are being taken by these States, while the Agency's efforts to verify the correctness and completeness of their respective declarations remain ongoing.

The Agency remained unable to perform any verification activities in the DPRK, and therefore could not draw any conclusions about that State's nuclear material or activities.

#### *Islamic Republic of Iran (Iran)*

The Agency continued its activities to clarify the remaining outstanding issues regarding Iran's past undeclared nuclear materials and activities. In addition, the Agency performed verification activities related to Iran's voluntary suspension of enrichment related and reprocessing activities. Reports by the Director General were made to the March, June, September and November meetings of the Board of Governors covering, inter alia, the Agency's ongoing verification activities, outstanding issues, particularly the origin of enriched uranium particle contamination found at certain locations in Iran and the extent of Iran's enrichment programme, corrective actions and voluntary transparency measures taken by Iran. The Board adopted four resolutions on the implementation of safeguards in Iran<sup>1</sup>.

<sup>1</sup> See <http://www.iaea.org/NewsCenter/Focus/IaeaIran/index.shtml>.

<sup>2</sup> See <http://www.iaea.org/NewsCenter/Focus/IaeaLibya/index.shtml>.

#### *Libyan Arab Jamahiriya (Libya)*

The Director General provided reports on the implementation of safeguards in Libya in February, June and August 2004<sup>2</sup>, covering inter alia Libya's past failures to fulfil the requirements of its NPT safeguards agreement, and that Libya had taken corrective actions, and its decision to sign and implement, pending entry into force, an additional protocol to that agreement. Libya submitted its initial declarations under the protocol and showed good cooperation with the Agency. The Board adopted one resolution on the implementation of safeguards in Libya.

#### *Other Safeguards Implementation Issues*

The Republic of Korea (ROK) informed the Agency about experiments involving nuclear material that should have been previously reported, and has cooperated with the Agency in clarifying these past activities. The Director General submitted a report to the Board in November 2004 on the implementation of safeguards in the ROK, which concluded that there was no indication that the undeclared experiments had continued.

The Agency identified several open source documents that indicated the possibility of unreported nuclear material, activities and facilities in Egypt. Egypt acknowledged that it had conducted unreported experiments involving nuclear material and that it had failed to declare small amounts of nuclear material to the Agency. Egypt continues to cooperate with the Agency in clarifying these past activities.

## **Management**

In 2003, after over a decade and a half in which the Agency strove to fulfil its increasing statutory responsibilities within the confines of the zero real growth budgetary constraint, Member States agreed – following extensive analysis and consultations – to an increase in regular budget resources of \$25 million, to be phased in over two biennia. The year 2004 was the first in that process.

A major project for the modernization of the information platform used for the Agency's safeguards work – the IAEA Safeguards Information System (ISIS) was made possible by

the generous commitment of extrabudgetary funds. The project will replace the current safeguards information technology infrastructure and result in: immediate access on-line to all needed safeguards information for inspectors; the capability to analyse all available information to support strengthened and integrated safeguards; and a flexible and adaptable architecture able to accommodate changes to safeguards activities. After the completion of the detailed planning phase in 2002 and a cost-benefit analysis performed in 2003, most of the work carried out in 2004 concentrated on the procurement process and on finalizing staffing of the project management team.

Also dependent on extrabudgetary contributions is the Agency's Nuclear Security Fund, which, since 2001, has received over \$35 million from 26 countries — as well as from the European Union and the Nuclear Threat Initiative (NTI). Moreover, many countries have provided in-kind support.

With completion of a full biennium in which the results based management approach had been applied, a new form of accountability report ('Programme Performance Report') was for the first time produced in early 2004. This contains an assessment of the achievement of outcomes — the effects or changes brought about in Member States as a result of the work of the Agency — on the basis of predetermined performance indicators. The report also details the resources utilized and the lessons learned through an appraisal of

programme implementation in 2002–2003. These lessons, along with those learned from the reviews and in-depth evaluations conducted on certain parts of the Agency's programme, were applied to the formulation of the draft programme and budget for 2006–2007.

Using the results based approach, the Secretariat is able more effectively to view its programme holistically — the 'one house' approach — and has established mechanisms for coordinating 'cross-cutting' subject areas that would formerly have come under the responsibility of a number of different organizational units. This approach — used initially for work related to the environment, quality assurance, knowledge management, research reactors and security — is now being applied to other areas such as reactor decommissioning, public information, and innovative reactors and fuel cycles.

## Conclusion

This overview of the 'nuclear world' in 2004 highlights achievements and challenges in all areas of the Agency's work. In this regard, its programmes in nuclear technology, safety, security and verification constitute the unique tools that help build a better world for all people. What is needed is continued global cooperation. For the Agency, this cooperation is the key to harnessing nuclear energy in the service of development and peace. ■