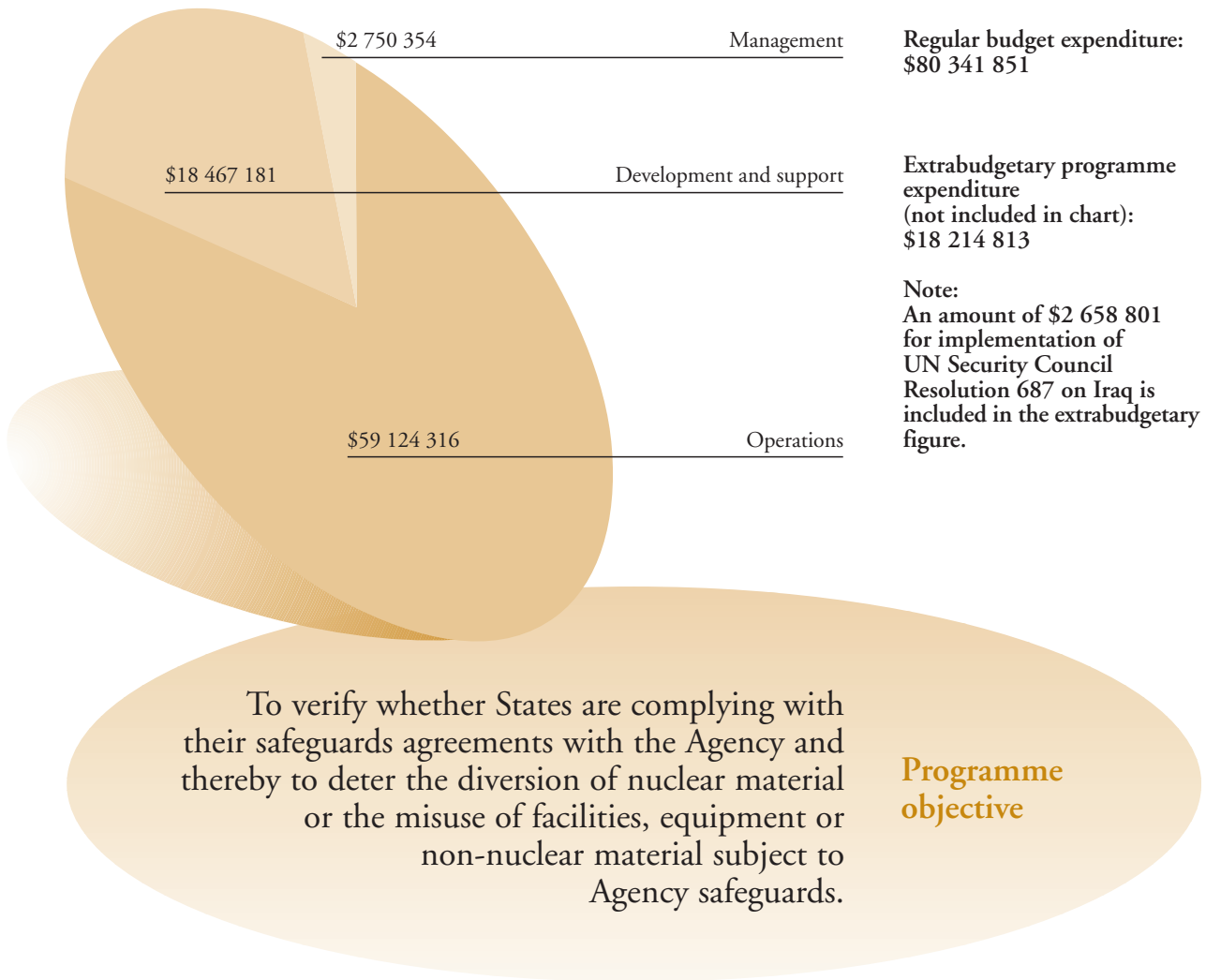


# SAFEGUARDS



During 1998, the main emphasis of the programme was on the implementation of safeguards agreements and on the continued development and implementation of measures to strengthen safeguards.

In fulfilling the safeguards obligations of the Agency in 1998, the Secretariat did not find any indication that nuclear material which had been declared and placed under safeguards had been diverted for any military purpose or for purposes unknown, or that facilities, equipment or non-nuclear material placed under safeguards were being misused. All the information available to the Agency supports the conclusion that the nuclear material and other items placed under

safeguards remained in peaceful nuclear activities or were otherwise adequately accounted for.

The Agency is still unable to verify the correctness and completeness of the initial declaration of nuclear material made by the Democratic People's Republic of Korea (DPRK), and is therefore unable to conclude that there has been no diversion of nuclear material in the DPRK. The safeguards agreement between the DPRK and the Agency remains binding and in force, and the Agency is continuing to implement safeguards measures in the DPRK. These measures include monitoring the "freeze" on the DPRK's graphite moderated reactors and related facilities, as requested by the

United Nations Security Council and as foreseen in the “Agreed Framework” of October 1994 between the DPRK and the United States of America.

Protocols Additional to Safeguards Agreements had at the end of the year been approved by the Board of Governors for 38 States and, when implemented, will enable the Agency to provide increased assurance about the absence of undeclared nuclear material and activities. Five Protocols had entered into force with Australia, the Holy See, Jordan, New Zealand and Uzbekistan by the end of 1998. Implementation of the first Additional Protocol to enter into force, with Australia, began in 1998. In addition, preparations for the entry into force of the Additional Protocols were undertaken with a number of States: an implementation trial, including preparation, submission and evaluation of a declaration and complementary access, was conducted at a large R&D site in Japan; work started on assembling and computerizing all available information on nuclear activities in States; and discussions on possible implementation trials in the non-nuclear-weapon States of the European Union were initiated with EURATOM.

Model Subsidiary Arrangements and statements in connection with the implementation of the Additional Protocols were developed. The current model statements were modified to provide States with information about environmental sampling activities undertaken by the Agency.

The Remote Monitoring Project concluded its work, and steps have been taken to begin implementation of remote monitoring techniques in 1999. In addition, the Agency selected the new generation of digital surveillance systems. An implementation plan was developed and a target was set for the installation of 80 systems per year.

The Secretariat prepared a report for consideration by the Board of Governors in November regarding the proliferation potential of neptunium and americium and outlining options for addressing this issue. The Board requested the Secretariat to provide further information on the legal, technical and financial implications of its recommendations and on possible additional options which might be considered.

As of 31 December 1998, 222 safeguards agreements were in force with 138 States (and with Taiwan, China). At the end of 1998, safeguards agreements which satisfy the requirements of the Treaty on the

Non-Proliferation of Nuclear Weapons (NPT) were in force with 126 States. NPT safeguards agreements entered into force with Ukraine in January, Namibia in April and San Marino in September. The Board of Governors approved draft NPT safeguards agreements with Azerbaijan, Kyrgyzstan (both of which have been signed) and Slovakia. These agreements had not entered into force at the end of the year.

NPT safeguards agreements are in force with seven of the nine States party to the Treaty in the South East Asia Nuclear Weapon Free Zone (Treaty of Bangkok) and with all 11 signatories of the South Pacific Nuclear Free Zone Treaty (Rarotonga Treaty). Thirty-one of the 32 States Contracting Parties to the Treaty for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (Treaty of Tlatelolco) have safeguards agreements in force which satisfy the requirements of this Treaty. Safeguards agreements pursuant to Additional Protocol I of the Treaty of Tlatelolco are in force with the Netherlands and the USA, two of the four States outside Latin America which have jurisdiction over territories in the zone of application of the Treaty. The Board of Governors approved a safeguards agreement with France pursuant to Additional Protocol I of the Treaty. The Treaty of Pelindaba, which has not yet entered into force, also foresees the application of Agency safeguards in the States party to the Treaty.

## Operations

Work continued on implementing strengthened safeguards. Of particular note were the following:

- The implementation of the Additional Protocol with Australia, which began during 1998, included a review of the expanded declaration and complementary access visits.
- A new information system was introduced to process declarations under the Additional Protocol. The first declaration, from Australia, was successfully processed.
- Environmental swipe samples from collections at 6 enrichment plants and 27 facilities with hot cells were sent to the Agency’s Network of Analytical Laboratories (N WAL) for analysis.
- Evaluations of information related to nuclear programmes of States were completed and reviewed for several countries. Further evaluations are under way.

## VERIFICATION ACTIVITIES

	1996	1997	1998
Inspections performed	2 476	2 499	2 507
Person-days of inspection	10 831	10 240	10 071
Seals applied to nuclear material or safeguards equipment, detached and subsequently verified (including seals applied jointly with EURATOM)	27 029	24 943	26 824
Optical surveillance films reviewed	2 173	1 500	932
Video tapes reviewed	4 045	4 010	4 884
Nuclear material samples analysed	937	888	645
Nuclear material analytical results reported	2 299	2 150	1 610
Environmental samples analysed	278	585	497
Environmental sample results reported	4 200	7400	4 000
<b>Nuclear material under safeguards (in tonnes)</b>			
Plutonium contained in irradiated fuel	528	565	593
Separated plutonium outside reactor core	53.6	57.6	62.5
Recycled plutonium in fuel elements in reactor cores	4.5	5.7	7.2
High enriched uranium	20.7	20.5	21.4
Low enriched uranium	48 620	49 282	49 483
Source material	105 395	108 648	90 622

Following discussion with States, new safeguards equipment and techniques were introduced in a number of facilities. For example:

- Short notice random inspections (SNRIs) were implemented at a low enriched uranium (LEU) fabrication facility in Japan. This was the first such routine implementation by the Agency, permitting full verification of the flow of nuclear material without additional interim inspections. Preparations for field testing of a similar safeguards approach based on SNRIs were initiated for another low enriched fuel fabrication plant in Spain. This regime is also part of the new approach being developed to confirm the absence of unrecorded plutonium production at large research reactors.
- Two unattended waste measurement systems, a vitrified waste canister counter and a hull measurement and monitoring system, were installed at a reprocessing plant in Japan; the acceptance test of the vitrified waste canister counter was completed.
- For enrichment plants in Japan, significant progress was made to resolve the longstanding issues of sample taking for destructive analysis and the provision of operator data necessary for the intermittent

assessment of the material balance. An inspection regime for confirming that nuclear material has not been borrowed was agreed upon.

- Agreement was reached with the operator of a Japanese mixed oxide (MOX) fuel fabrication facility and the State's system of accounting and control (SSAC) on a five year programme aimed at reducing the inventory of heterogeneous scrap material. The material will be gradually homogenized to allow enhanced verification, including destructive analysis.
- Unattended safeguards equipment was installed in hot cells in the Republic of Korea in order to monitor experimental powder and pellet characterization studies which are to be carried out under a joint project between Canada, the Republic of Korea, the USA and the Agency on the direct use of spent PWR fuel in CANDU reactors.
- A six month field trial of the continuous enrichment monitor was completed at an enrichment plant in the Netherlands. The equipment performed reliably throughout the trial, the system produced no false alarms and the results confirmed that no production of high enriched uranium (HEU) had occurred during the period. The system

was demonstrated to be a viable means of confirming the absence of HEU production.

- In co-operation with EURATOM, an inspection regime based on the use of unattended, non-destructive analysis equipment in conjunction with multiple surveillance systems and the use of dual containment/surveillance (C/S) measures was introduced at a MOX fuel fabrication plant in Belgium. This regime makes full use of the 'New Partnership Approach' arrangements already in place. The new approach is expected to result in a significant reduction in the presence of Agency inspectors at the facility without reducing the effectiveness of verification activities.
- Unattended verification of inter-bay spent fuel transfers in a CANDU multi-unit plant in Canada was introduced. The use of this system resulted in saving a considerable amount of inspection effort.
- Procedures were tested at enrichment plants in Brazil for unannounced inspections to be carried out by ABACC or Agency inspectors.
- Procedures for the joint use of instruments were agreed between ABACC and the Agency. Such procedures were also proposed to the Republic of Korea and, if implemented, are expected to further strengthen the SSAC and the efficiency of safeguards.

Major efforts were made in the newly independent States of the former Soviet Union:

- After the entry into force of the NPT safeguards agreement between the Agency and Ukraine in January, initial inventory verifications were carried out at all facilities in Ukraine, account being taken of the results obtained under the earlier comprehensive safeguards agreement. An extensive repackaging campaign at a facility for HEU and LEU materials ended in July, at the same time as the verification campaign. This marked the conclusion of a two year effort by the Agency, donor States and the Ukraine to characterize, package and store the materials in such a way that they could be suitably verified. The initial inventory verification was completed in September, and the verification results are being analysed.
- Following the decision of Kazakhstan to start the conditioning of fuel from the BN-350 fast breeder reactor for verification purposes, three meetings were held between Kazakhstan, the USA and the Agency to resolve technical issues and to discuss arrangements for the measurement and fuel canning campaign. The Agency introduced an

advanced non-destructive technique, developed jointly with the USA, for underwater spent fuel measurements.

Activities carried out in nuclear weapon States included the following:

- Inspections at an enrichment plant in China commenced in early 1998. Work on the development of the safeguards approach continued and progress towards its completion is expected in 1999.
- Following the decision by the USA in 1993 to submit to Agency safeguards nuclear material removed from nuclear weapon programmes, the Agency continued inspections of HEU and plutonium.
- Safeguards verification activities in the USA in connection with the down-blending of a quantity of HEU, which the USA stated it acquired from Kazakhstan, were completed at one facility. The evaluation report was completed in early 1998 and transmitted to the State authorities.
- The Agency undertook a verification experiment at an enrichment plant in the USA in relation to the down-blending of a quantity of HEU with a view to developing a suitable verification approach for such down-blending activities. The experiment was completed in October. The Agency observed the down-blending of the HEU to LEU; the feasibility of a new verification concept was demonstrated and innovative verification techniques were tested.

Further progress was made in the negotiation of Subsidiary Arrangements: two new General Parts of Subsidiary Arrangements, as well as 28 new or revised Facility Attachments, entered into force.

An international seminar on safeguards information reporting and processing was held at the end of the year. Discussions focused on: new developments in nuclear material accounting, including the Year 2000 problem; reporting under the Additional Protocol; and the illicit trafficking database programme. The Agency also informed Member States of the new reporting options offered with respect to the accounting correction principle and the electronic transmission of data, and presented the tools it is planning to use and make available to Member States for reporting under the Additional Protocols.

Progress in information retrieval and analysis included the development of a complete set of 'topic trees' for all

steps of the fuel cycle. Topic trees are advanced search tools which embed expert knowledge, permitting the efficient retrieval of documents. In addition, 'Pathfinder', a software tool offering sophisticated functions to support information analysis, was deployed; it is available to users in support of State evaluations.

In the area of equipment management, field tests of a new CANDU bundle counter were completed and authorized for inspection use. Thirteen of these systems were either installed in new applications or replaced old systems. Related core discharge and yes/no monitor systems are undergoing field tests in Canada and the Republic of Korea.

Following the development and evaluation of a number of multichannel analysers early in 1998, two were selected for the replacement of ageing portable multichannel analyser (PMCA) systems. About 40 of these systems were acquired in 1998, and the withdrawal from service of the existing PMCAs began.

The Safeguards Analytical Laboratory (SAL) and NWAL analysed 645 samples of nuclear materials and heavy water, leading to the reporting of 1586 results for the verification of operators' material accountancy. Thirty-five nuclear material samples were taken and analysed for confirming other safeguards relevant information. SAL received and screened over 400 environmental samples. Procedures were set up to examine particles from hot cell swipes by electron microscopy.

SAL continued to support the Agency's Action Team on Iraq by producing 400 sampling kits for inspections and environmental baseline sampling. SAL and NWAL analysed 207 samples taken in Iraq by the Action Team pursuant to United Nations Security Council Resolution 687.

The development and implementation of a safeguards approach for the Rokkasho fuel reprocessing plant in Japan continued. Instrumentation was installed in the spent fuel receipt and storage area. Commissioning will be completed upon receipt of spent fuel at the facility.

The Agency is still unable to verify the correctness and completeness of the initial declaration of the Democratic People's Republic of Korea (DPRK) concerning its nuclear material subject to safeguards under its NPT safeguards agreement with the Agency, and accordingly cannot conclude that there has been no diversion of nuclear material. The DPRK remains in non-compliance with its safeguards agreement.

The Agency maintained a continuous presence of inspectors in the Nyongbyon area throughout 1998. It has done so on the basis of a decision of the Board of Governors, following a request of the United Nations Security Council for the purpose of monitoring the freeze on the DPRK's graphite moderated reactors and related facilities.

Three rounds of technical discussions took place between a technical team from the Agency and the DPRK without progress on any of the key issues outstanding regarding the DPRK's compliance with its safeguards agreement. These include the preservation of information which must remain available to enable the Agency to verify, in the future, the correctness and completeness of the DPRK's initial declaration.

## Development and support

The Remote Monitoring Project, established in 1996 to prepare safeguards policy, approaches and procedures, specify equipment, conduct field tests and develop an implementation scheme for remote monitoring, completed its work in December. The results included the following:

- The safeguards approach for LWRs where remote monitoring will be used was finalized in November. The approaches for other individual facility types, such as CANDU reactors and storage facilities containing unirradiated direct use material, are under way.
- Remote monitoring equipment was selected, installed and tested in a number of facilities.
- Argentina, Canada, Finland, Germany, Japan, the Republic of Korea, South Africa, Sweden, Switzerland and the USA participated in feasibility studies and field trials which were carried out to test the implementation of remote monitoring via satellite and terrestrial communication links.
- The equipment for the initial phase of routine implementation of remote monitoring was specified and procurement initiated for gradual introduction starting in 1999.

Field testing of a new generation of digital surveillance systems was completed in June. On the basis of the test results, technical characteristics, cost and supplier evaluation, the VDIS system with its three different configurations was selected as the digital surveillance system

to be implemented. In addition, EMOSS, in its new configuration, was selected as the alternative system to avoid reliance on a single system and supplier.

New cadmium telluride detectors with improved resolution, combined with new evaluation software, were developed to permit simplified verification measurements of spent fuel. Development work continues to increase the volume of cadmium telluride detectors, making them as sensitive as sodium iodide detectors.

Work continued on ensuring that the computer systems for Agency safeguards are Year 2000 compliant. This has involved major changes to the mainframe information systems. The schedule for completion is March 1999, leaving sufficient time for thorough testing of the systems.

The security of the safeguards network and communications infrastructure was reviewed. As a result, stricter local area network access control from user workstations was implemented and a security incidents response procedure defined.

The Safeguards Research and Development and Implementation Support Programme for 1999–2000 was completed and submitted to Member States with safeguards support programmes. The programme provides a framework for safeguards R&D activities conducted both by the Agency and in Member States on the development and application of the elements of a strengthened safeguards system and the gradual transition to an integrated safeguards system.

Environmental sample collection continued, new sampling tools were tested and implemented, and the development of a central database was largely completed. The services of consultants from NWAL were used to prepare a series of recommendations related to techniques for the screening and analysis of swipe samples, to the quality control programme and to the overall operation of the network services concerning procedures and arrangements for environmental sampling and analysis.

The safeguards training curriculum was improved. In addition to regular training courses for inspectors, staff training focused on the implementation of the strengthened safeguards system and, in particular, on the taking of environmental samples, the nuclear fuel cycle and proliferation indicators, enhanced observational skills, design information review at research

reactors and evaluation of the nuclear activities of States.

