VERIFICATION IN NEWLY INDEPENDENT STATES

BY KENJI MURAKAMI

The break-up of the former Soviet Union in 1989 created the Russian Federation and 14 Newly Independent States (NIS). Eleven of the NIS are known to have nuclear activities. All of the NIS have acceded to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), and seven have concluded safeguards agreements with the Agency *(See table.)*

Long before the individual NIS States ratified the NPT and signed the safeguards agreements, IAEA experts and safeguards staff went on technical visits to locations where the State informed the Agency that there was nuclear material. The purposes of these visits were to advise the country on the possible safeguards activities for each facility, to explain these activities to State and facility representatives, and to demonstrate safeguards equipment that would be used, thereby preparing the facility for eventual inspections. A wide variety of different types of nuclear facilities (uranium mining, fuel fabrication plants, commercial nuclear power plants, research reactors, and storage facilities) are located in the NIS.

This article reviews the Agency's safeguards-related experience in the NIS, from a State-by-State perspective. Many of the NIS have substantial nuclear programmes, and verification in these countries poses a considerable challenge to the IAEA and State authorities.

Armenia. Armenia has one nuclear power plant with two WWER-440 type reactor units. Unit-l started up in 1979 and Unit-2 in 1980. Both units were shut down in 1989 for seismic considerations following an earthquake in 1988. The loading of Unit-2 was initiated in August 1995, and the reactor has been in operation since 27 October 1995. The main materials in these reactors are low-enriched uranium (LEU) and plutonium contained in irradiated fuel.

On 23 August 1994, the Agency received the Initial Report of the nuclear material inventory. Its verification started in February 1995 and was completed in January 1997. The Agency has installed necessary containment and surveillance measures in the Armenian nuclear power plant. The plant is under ad-hoc inspection arrangements.

Armenia was one of the first countries to accept the Strengthened Safeguards System under the Additional Protocol. Consultations with the country on details of the Protocol have started.

Belarus. Most nuclear materials and nuclear facilities are concentrated within the industrial zone of the Sosny Science and Technology Complex (Sosny STC). These facilities are critical assemblies identified as "Rosa" and "Cristal", fresh fuel storage identified as "Landysh", and spent fuel storage identified as "Iskra".

All nuclear material from critical assemblies has been removed and is stored in the fresh fuel storage facility. There is a small amount of nuclear material at a waste storage location close to the Sosny STC. The types of nuclear material in Belarus facilities are high-enriched uranium (HEU) and low- and natural-enriched uranium.

The IAEA received the Initial Report on 19 October 1995. Verification of the initial inventory is not yet complete, as the Agency is in the process of preparing standards for non-destructive analysis (NDA) of certain items in the inventory. To implement Part-1 measures of the Strengthened Safeguards System during 1997, the State authorities have provided the Agency with required additional information about nuclear facilities in the country.

Kazakhstan. Safeguards-relevant facilities in Kazakhstan and their main types of nuclear material are the fast-breeder reactor BN-350 at Aktau

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(HEU, LEU, and plutonium); the LEU fuel pellet fabrication plant at Ulba; thorium storage at Ulba; three research reactors at the Institute of Atomic Energy of the National Nuclear Center in Kurchatov near Semipalatinsk (HEU, LEU); and a research reactor at Alatau near Almaty (HEU, LEU). The Initial Report on nuclear materials was received by the Agency on 4 September 1995. The initial verification is complete at the Ulba fabrication plant and at the research reactor near Almaty; it is in progress at the fast-breeder reactor and at the research reactors at Kurchatov.

As part of implementation of the Part-1 measures under the Strengthened Safeguards System, Agency inspectors have been granted one-year multiple entry visas by Kazakhstan; environmental sampling of hot-cells has started to establish baseline signatures; and the State System of Accounting and Control (SSAC) of Nuclear Material has provided additional information about nuclear facilities.

Latvia. Latvia has one IRT research reactor (5 megawatts-thermal) located 20 km from Riga; a radioactive waste disposal facility; and a number of different enterprises located throughout Latvia that use small plutonium sources. The reactor uses HEU, but its load factor is very low. Its operation is anticipated for another year using the remaining fresh fuel. A plan has been drafted for the decommissioning of the reactor. The operator is concerned about the future storage of spent fuel.

The Agency received the Initial Report covering the nuclear material inventory on 22 February 1994 and verified it by June 1994. This work included mainly the verification of all HEU and spent fuels. Since June 1994, ad hoc inspections have been carried out.

To implement Part-1 measures of the Strengthened Safeguards System during 1997, the State authorities have provided the Agency with required additional information about nuclear facilities. Additionally, the Agency collected environmental samples with a view to establishing baseline signatures of hot cells.

Lithuania. Safeguards-relevant facilities are the Ignalina Nuclear Power Plant (two RBMK-1500 reactor units) and miscellaneous locations with insignificant quantities of nuclear materials. The two reactors at Ignalina are identical in design but operate independently of each other. Unit-1 started up in 1983, and Unit-2 followed in 1987. The Initial Report was provided to the Agency on 31 October 1992. Several technical visits were carried out to prepare for safeguards implementation. The implementation started with the installation of containment and surveillance equipment in December 1992 to freeze the inventory of the spent fuel ponds and to provide surveillance for the reactor cores. Quarterly inspections have been carried out at Ignalina since August 1993. The first verification of the physical inventory was carried out in February 1994.

Recently, a new neutron and gamma NDA instrumentation system operating in an unattended mode was introduced to enhance the safeguards capabilities. To implement Part-1 measures of the Strengthened Safeguards System during 1997, the State authorities have provided the Agency with required additional information about nuclear facilities.

It should be noted that the operator's accountancy system was significantly improved with the change from a "hard copy" system to a fully computerized system during the time of safeguards implementation.

Ukraine. On 2 March 1995, the Agency received the Initial Report on all nuclear material subject to the safeguards agreement. Verification started in April 1995, and ad hoc inspections are now carried out at all facilities. The facilities include 15 nuclear power units (one twin WWER-440 unit, 11 WWER-1000 units, and three RBMK-1000 units), one research reactor, one naval nuclear reactor training facility, one sub-critical facility, and one research centre. The verification of the initial inventory is about to be completed. The surveillance equipment installations were completed in mid-1997; however, a number of improvements are still needed.

To implement Part-1 measures of the Strengthened Safeguards System during 1997, the State authorities have provided the Agency with required additional information about nuclear facilities. Additionally, the Agency collected environmental samples with a view to establishing baseline signatures of hot cells.

At the Chernobyl plant, two unattended monitoring

STATUS OF THE NPT AND SAFEGUARDS AGREEMENTS IN NEWLY INDEPENDENT STATES

(YEAR/MONTH/DAY)

STATE	NPT ADHERENCE	IAEA SAFEGUARDS AGREEMENT	
		Signed	Entry into Force
Armenia	93-07-15	93-09-30	94-05-05
Azerbaijan	92-09-22		
Belarus	93-07-22	95-04-14	95-08-02
Estonia	92-01-31		
Georgia	94-03-07	97-09-29	
Kazakhstan	94-02-14	94-07-26	95-08-11
Kyrgyzstan	94-07-05		
Latvia	92-01-31	93-12-21	93-12-21
Lithuania	91-09-23	92-10-15	92-10-15
Moldova	94-10-11	96-06-14	
Tajikistan*	95-01-17		
Turkmenistan	94-09-29		
Ukraine	94-12-05	94-09-28	95-01-13
Uzbekistan	92-05-07	94-10-08	94-10-08

*Accession to the NPT still requires official notification to the IAEA.

systems were installed in September 1996 — one at the operating reactor (Unit-3) and the other at the separate storage facility for spent fuel.

The Agency also has installed satellite communication systems at Ukraine's main facilities, including the State office, and taken other measures to facilitate transportation of inspectors and logistics.

Uzbekistan. Uzbekistan has a research reactor (10-megawatt-thermal water-cooled and -moderated), a pulse reactor by the name of Photon used for testing the effect of radiation on space equipment, and four uranium mining and milling facilities producing U_3O_8 as the final product. The main material types in Uzbekistan are HEU and LEU. The Initial Report was received by the Agency on 18 November 1996. Verification started in December 1996 and is expected to be completed by the end of 1997.

Georgia. Georgia acceded to the NPT on 7 March 1994 and during the IAEA General Conference in September 1997 signed the safeguards agreement, which now is being ratified. Georgia will be one of the first countries to start implementing the Strengthened Safeguards System under the Additional Protocol. Once the agreement enters into force, safeguards implementation can begin. The IAEA Director General visited Georgia in July 1997. According to information available, Georgia's nuclear facilities and activities consist of a pool-type research reactor (8-megawatt-thermal) near Tbilisi that started up in 1959 and has been shut down since 1990, and the Institute of Physics and Technology, which conducts research and development activities, in Sukhumi.

Estonia. Safeguard-relevant facilities are a former training site (Paldiski Russian naval base) with two decommissioned nuclear reactors, a metallurgical conversion plant with former uranium recovery activities (Sillamae Plant), and waste disposal sites.

The Agency carried out a fact-finding mission to Estonia in April 1993. This mission concluded that the scope of safeguards to be applied in Estonia at this stage would be rather limited and that there were existing uncertainties in the decommissioning of the reactors by the Russian Federation. Three years later, in April 1996, a second technical visit was carried out confirming that the facilities, which previously handled nuclear materials in Estonia, were no longer operating.

Estonia acceded to the NPT on 31 January 1992. Its safeguards agreement with the Agency was approved by the IAEA Board of Governors at its session of February 1992. It will be signed by Estonia shortly, at which time the IAEA's implementation of safeguards will start.

SAFEGUARDS PROBLEMS

The IAEA had to start its safeguards implementation activities in the NIS while the

countries were still recovering from problems due to the dissolution of the Soviet Union. Some problems that were faced by the Agency include:

Limited Experience. Safeguards as applied under comprehensive safeguards agreement were unknown to the NIS. They did not have a sufficient knowledge in safeguards infrastructures, including the SSAC, training resources, computer equipment and accountancy software, and the legal framework.

Logistics. Reaching the countries and travelling locally were often difficult. Flights were cancelled (often due to shortage of fuel) or unduly delayed causing disruption to Agency schedules. In some places, the Agency had to overcome transportation problems by providing its own cars.

Communication. Communications with IAEA headquarters were problematic. In many places, the Agency now has its own satellite communication system to send or receive messages on the phone, fax or by electronic mail. Another problem was language. Since Russian is the common language in the NIS, the Agency tried to cope with the problem by selecting inspectors with Russian language ability to work in this area. The Agency tried to schedule at least one such inspector in each team. This is becoming increasing difficult to manage as more NIS facilities are entering a regular inspection regime. Some facilities in the NIS came to the Agency's help by providing their own translators to Agency staff in the field.

Radiation and Health Physics. The monitoring of radiation levels and health physics protection measures were skimpy in many places. Personal electronic dosimeters worn by inspectors sometimes warned them about the existence of a high radiation field. Additional effort is required to ensure the development of a proper radiation safety culture.

Harsh Weather and Living Conditions. A number of locations in the NIS have extreme weather conditions. Thus, inspectors and safeguards equipment have had to face these harsh conditions. Accommodation in a number of locations have been far from ideal.

IMPROVEMENTS BEING MADE

Working in cooperation with local authorities, IAEA inspectors have been able to achieve positive results in several areas. They include:

- acquiring knowledge about safeguards-relevant facilities through numerous fact-finding missions, technical visits, and inspections;
- development of nuclear material accountancy and control systems at both the facility and State levels; (some of these facilities were processing nuclear material without a clear concept of gain or loss or of material unaccounted for; dramatic changes have taken place in accountancy systems when operators switched to fully computerized accountancy systems.)
- improvement of the physical protection of nuclear material, particularly of HEU and plutonium, through the use of state-of-the-art sensors and techniques;
- initiation of training in relevant fields to local staff through numerous workshops, seminars or courses organized by the IAEA and by donor countries in which Agency staff sometimes took part as instructors. Local staff have quickly adapted to the modern practices.

All these developments were possible in part due to the dedicated work of the State and facility operators in the NIS. In spite of these improvements, however, work is still required to improve lingering problems in logistics and communication, and nuclear accountancy at the State and facility levels for an effective SSAC in some of the Newly Independent States.

SUSTAINING PROGRESS

Significant work has been carried out in introducing safeguards in the NIS over the last five years. However there is still work to be done. The international community and donor States to the NIS should continue to provide the necessary support for advancing the goal of proper accounting and safekeeping of nuclear material in these countries.

The IAEA plans to conclude the verification of the initial inventory in most Newly Independent States by the end of 1997. Thereafter the Agency will focus attention on the completeness of the initial declarations and assessment of the nuclear fuel cycles in these States. Other aspects of the Strengthened Safeguards System will also be implemented in due time. ❐

TECHNICAL SUPPORT

Over the years, a number of States have provided the NIS assistance on a bilateral basis to set up an appropriate State System of Accounting and Control (SSAC) that includes import/export controls and the physical protection of nuclear material in each State. An IAEA Co-ordinated Technical Support Programme today brings these activities more coherently and efficiently together. The IAEA's role has involved identifying detailed needs in individual States, providing a platform for Member States to identify areas where they could provide the optimum support, and developing and preparing Coordinated Technical Support Plans (CTSPs). All donor and recipient countries annually meet to review the focus and implementation status of the coordinated technical support activities. The contents of the CTSPs and the IAEA's role in monitoring progress of individual tasks were reviewed at the IAEA's Safeguards Symposium in a paper by Mr. Kenji Murakami, Mr. Richard Olsen, and Ms. Charlene Blacker of the Department of Safeguards, and Mr. Sheel Sharma of the Division of External Relations.

Coordinated efforts began following a meeting of potential donor States in May 1993. The participants at that meeting expressed interest in helping the NIS in establishing and improving their SSACs. A number of countries made funding available and became actively involved in providing support to the NIS. Today the active donor States include: Australia, Finland, France, Hungary, Japan, Norway, Sweden, the UK, and the USA. Additional countries have indicated an interest in joining the coordinated technical support programme.

CTSPs were developed to provide adequate support in several areas. They include nuclear legislation, the SSAC at State and facility levels, physical protection, and export/import control. The Plan is implemented in three phases that address immediate, near-term, and future needs. Phase I activities have been mainly covered and many tasks have been completed. Work is ongoing in Phases II and III. Today, CTSPs are active in the following countries: Armenia, Belarus, Georgia, Kazakhstan, Latvia, Lithuania, Ukraine, and Uzbekistan. Implementation of the CTSPs are pending in Azerbaijan, Estonia, Kyrgyzstan, Moldova, and Turkmenistan.

Progress is monitored by the IAEA using a computerized monitoring system that provides the latest status of each task. These data have been recently made available to the donor and recipient countries on computer disk. The data can be used to assess progress of the tasks and to identify open areas for support. The Agency also updates and distributes a Calendar of Events of project activities, meetings, and visits. It further maintains a Training Profiles Database to provide the parties involved with information on the training received by State and facility personnel, and to help countries identify training needs.

In general, significant progress has been made in implementing the support programme tasks. On average, 24% of the tasks are completed, 54% are on-going, and 22% are open (that is no donor country has been identified). It should be noted that a majority of the open tasks occur in recipient countries with small nuclear programmes.

Overall, the support to the NIS on a bilateral basis and through CTSPs has enabled the Agency to implement safeguards under the agreements now in force. However, improvements are still needed at State and facility levels for developing effective SSACs, and to improve controls for physical protection and the export/import of nuclear materials. To maintain progress, the work ahead will require greater commitment by the NIS to upgrade their capabilities and infrastructures and continuing strong cooperation and support from donor countries. The IAEA is committed to continuing its support in the implementation and monitoring of the progress of the CTSPs, through annual review meetings and the provision of updated status reports.

Photo: The Ignalina nuclear plant in Lithuania, one of the facilities at which IAEA safeguards are being applied in the NIS. (Credit: IAEA)