Nuclear material accounting and control: Co-ordinating assistance to newly independent States

An overview of IAEA-supported activities to help former Soviet republics establish State systems of accounting and control

by Sven Thorstensen

Nuclear trade and co-operation among States are essentially dependent upon effective and credible safeguards. The disintegration of the former Soviet Union has resulted, *inter alia*, in the emergence of a number of newly independent States (NIS). Many of them have nuclear programmes. However, the nuclear infrastructure on which those programmes once rested is no longer in place and needs to be reconstructed.

The application of IAEA safeguards depends for its effectiveness largely on the extent to which governments ensure that operators keep accurate, precise and complete records; promptly send the IAEA the required reports; employ reliable and accurate equipment for measurement and analysis; take inventories of nuclear material at the prescribed intervals; and determine, at each inventory taking, the amount of nuclear material unaccounted for.

In safeguards agreements pursuant to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the State is required to establish and maintain a State System of Accounting and Control (SSAC) of nuclear material within its territory, jurisdiction or control. Many of the NIS have nuclear programmes that include uranium mining and refining, as well as other types of nuclear activities. States in this category are Armenia, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Russia, Tajikistan, Ukraine, and Uzbekistan. *(See table.)*

This article outlines work under way among the IAEA, its Member States, and the NIS relating to the establishment and development in the NIS of SSACs of nuclear material. It describes IAEA activities in the NIS, including fact-finding missions and technical visits, the successful attempts to find donor States providing voluntary funding and expertise, and the co-ordination of technical support between the IAEA and the donor States.

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IAEA activities in the NIS

The IAEA has a direct interest in matters relating to international safeguards and non-proliferation. To support NIS non-nuclear weapon States in meeting national and international obligations, either assumed or in prospect, in the field of nuclear non-proliferation, the IAEA embarked in 1992 on a number of activities aimed at helping them to establish and/or further develop their SSACs.

As in many countries, SSACs are also charged with responsibilities in physical protection, import/export control, and regulatory matters. It became logical to incorporate these topics in the support activities to SSACs for the NIS where such assistance would be required. In order to cover all of these topics, extensive support from IAEA Member States (donor States) became essential.

The work consisted of and continues to consist of carrying out fact-finding missions/technical visits; finding interested donor States; and co-ordinating technical support.

IAEA fact-finding missions/technical visits. Beginning in 1992, fact-finding missions have been carried out in many NIS. In 1992, they were carried out in Belarus, Kazakhstan, and Ukraine. In 1993, such missions took place in Armenia, Estonia, Kyrgyzstan, Latvia, Lithuania, and Uzbekistan. Further missions to Azerbaijan,

Nuclear facilities in the newly independent states

Armenia	Two WWER nuclear power reactors
Belarus	Critical assemblies (2) Fresh and spent fuel storage
Estonia	Uranium ore refining plant (Two training reactors)
Georgia	Two research reactors (IRT, TTR) R&D facility Critical assembly
Kazakhstan	Fast-breeder reactor (BN-350) Four research reactors (WWR, pulse graphite, IWG, RA) Low-enriched uranium fuel fabrication R&D facility Critical assembly Uranium mining, ore refining plants
Kyrgyzstan	Uranium mining plants
Latvia	Research reactor (IRT) Critical assembly
Lithuania	Two RBMK nuclear power reactors
Tajikistan	Uranium mining and refining plants
Ukraine	Four RBMK reactors (separate SF storage) 16 WWER reactors Two research reactors (WWR, training) R&D facility Critical assembly Uranium ore refining plant
Uzbekistan	Two research reactors (WWR, pulse type) Several mining and refining plants

Note: All newly independent States (NIS) of the former Soviet Union, with the exception of the Russian Federation which is a declared nuclear-weapon State, have stated their intention either to become or to remain non-nuclear-weapon States. Thirteen of these States — Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Turkmenistan, Ukraine, and Uzbekistan — are Parties to the NPT Moldova and Turkmenistan have no known nuclear programmes. The facility in Ukraine identified above as an R&D facility has several significant quantities (SQ) of highly enriched uranium

Many of the newly independent States have nuclear programmes that include uranium mining and refining. Shown here is uranium mining in Uzbekistan.
(Credit K Bergman, IAEA)

IAEA fact-finding missions and technical visits to newly independent States

	Fact-finding missions /technical visits
Armenia	3
Azerbaijan	Planned in 1995
Belarus	4
Estonia	1
Georgia	Planned in 1995
Kazakhstan	8
Kyrgyzstan	1
Latvia	1
Lithuania	1
Tajikistan	Planned in 1995
Ukraine	13
Uzbekistan	2

Georgia, and Tajikistan are planned for 1995. *(See table.)* The objectives of these missions have been, *inter alia,* to inquire about the timing of likely accession to the NPT and acceptance of technical visits to prepare for the NPT; identify relevant contact persons and organizations; and identify and list needs as regards co-ordinated technical support plans for each individual NIS.

In 1993 and 1994, technical visits were conducted to most major facilities in Armenia, Belarus, Ukraine, Kazakhstan, and Uzbekistan. The objectives of these visits were to obtain information about the operator's nuclear material flows, quantities, categories, and measurement system; further define lists of needs (i.e. requirements related to non-proliferation) for co-ordinated technical support; identify safeguards equipment requirements; and demonstrate the verification of nuclear material and equipment used.

Technical discussions and demonstrations also took place. These visits have been a valuable means of supplying the basic information needed for the IAEA Department of Safeguards to initiate preparations for implementing safeguards in the respective countries, and to familiarize the relevant State and facility officials with the IAEA's procedures and requirements.

Those facilities which may become subject to safeguards have been identified and associated information concerning nuclear material flow quantities and categories has been obtained. On the basis of this information, safeguards equip-

Selected training events in newly independent States

Event	Location	Date	Organizer
SSAC Seminar	Kiev, Ukraine	December 1992	Ukrainian State Committee on Nuclear and Radiation Safety and the IAEA
Safeguards Seminar	Stockholm, Sweden	March 1993	Swedish Nuclear Power Inspectorate
Safeguards Seminar	Springfield and Dounreay, UK	April 1993	UK Dept. of Trade and Industry
Training Course on Physical Protection	Santa Fe, New Mexico, USA	May 1993	US Department of Energy
Training Course on the Implementation of SSACs	Los Alamos, New Mexico, USA	May 1993	US Support Programme to the IAEA
Seminar on the Organization of SSACs	Alma-Ata, Kazakhstan	June 1993	Atomic Energy Agency of Kazakhstan and the IAEA
Nuclear Material Accountancy at WWERs	Paks, Hungary	November 1993	Hungarian and Swedish Support Programmes to the IAEA
Seminar on Nuclear Law	Leiden, Netherlands	September 1993	OECD Nuclear Energy Agency and the IAEA
Seminar on the Accounting of Nuclear Material	St. Petersburg, Russia	October 1993	Russian Ministry of Atomic Energy
Safeguards for Uranium Processing and Breeder Reactors	Springfield and Dounreay, UK	November 1993	UK Dept. of Trade and Industry
Training Course on Fundamentals of Material Accounting and Control	Ulba, Kazakhstan	September 1994	US Department of Energy
Workshop on Analysis Methods for Safeguards	Springfield, UK	October 1994	UK Dept. of Trade and Industry
Physical Protection Seminar (Lithuania)	Stockholm, Sweden	October 1994	Swedish Nuclear Power Inspectorate
Seminar on Safeguards Accounting Data and Reporting	Vienna, Austria	November 1994	IAEA

ment needs have been identified, budgeted for, and initial purchases made for longer lead time items. Estimates of the requirements for inspection resources have been made based upon draft safeguards approaches prepared or updated for all major NIS facility types.

In discussions with facility operators, IAEA inspection procedures have been reviewed in detail, the associated equipment demonstrated, and technical requirements documented for surveillance equipment installation. At some sites, the nuclear material measurement capabilities of the facilities have been reviewed with IAEA experts and compared with international standards to help define "equipment needs". Through these interactions, the needs of the individual State for assistance with infrastructure development and equipment have also been identified.

Discussions at all levels have also helped to identify hardware and training needs in the basic SSAC infrastructure, including computers and software for nuclear materials accounting, communication systems, and instrumentation used by State inspectors. Consultations are continuing about the legal aspects of the NPT and safeguards agreements, and on facility design verification procedures.

Finding donor States. From the outset, the IAEA recognized that it could not complete this extensive work alone and would have to rely heavily on voluntary funding and expertise from its Member States. The IAEA consequently compiled and sent to potential donors the lists of needs, as discussed with the recipients. Being aware that some countries had already initiated support activities to one or more NIS or were in the process of establishing bilateral agreements, the IAEA expected that donor States would consider granting additional funds and harmonize their support activities in a co-ordinated manner. On the basis of suggestions from some Member States, a meeting was called in Vienna on 27-28 May 1993 where representatives from Australia, Belgium, Canada, Finland, France, Hungary, Japan, South Africa, Sweden, the United Kingdom, the United States, the Commission of the European Communities, and the Organization for Economic Co-operation and Development (OECD) expressed their readiness to help the NIS improve their SSACs in a co-ordinated man-

ner. So far, seven countries have made funding available and have been active or are expected soon to participate actively in actual support activities. Additional countries are ready to be called upon to assist if the need arises.

Co-ordinated technical support. "Co-ordinated Technical Support" is the term used to describe support by the IAEA and donor States to the NIS in order to support SSACs at facility and State levels, including physical protection and export/import. The "Co-ordinated Technical Support Plan" is approved by the State concerned and is intended to be a main tool in helping both State and facility authorities in meeting their responsibilities. Co-ordination of efforts has since focused on the preparation and subsequent implementation of these Plans for each individual NIS. They identify the needs to be addressed, the timescale over which the associated activities are to be conducted, and the areas of intended contribution from each of the donor States. The Plans contain a phased approach to the support.

Phase I addresses immediate needs, with emphasis on support to existing authorities in improving legislative infrastructure and on SSAC requirements, in particular in relation to concluding and implementing a safeguards agreement with the IAEA. Phase II will include completion of the legal infrastructure, improving operators' measurement systems and other components of material control and accounting, physical protection, and export/import control systems. Training is recognized as an important element in the successful transfer of donor support and is included with each planned technical activity.

To date, such Plans have been agreed for Belarus, Latvia, Lithuania, Kazakhstan, and Ukraine; donor States have been identified, and Implementation/Co-ordination Committees with responsible persons from each of the donor States and the IAEA have been established. Representatives of donor States are presently making facility visits in order to familiarize themselves with the areas, as identified in the Co-ordinated Technical Support Plan, for which they have accepted responsibility. Funds have been made available to implement the complete Plan for these States. Plans for the remaining NIS are in the process of being set up. One donor State has offered its assistance to help the remaining NIS in setting up the basic infrastructure of their SSACs; such assistance would contribute to achieving a certain degree of compatibility among all NIS. Other donor States have expressed willingness to contribute to the implementation of identified elements of the Plans in one or more of the NIS. The IAEA will contact potential donor States to solicit funding and expertise in order to cover the complete Plans for NIS.

Additional assistance. Additional support by donor States and the IAEA to the NIS has included contributions to SSAC training activities organized by donor States and seminars on the organization of SSACs in Ukraine and Kazakhstan. *(See table.)* These enjoyed broad NIS participation.

The IAEA and donor States have also given legislative assistance to the NIS. This is aimed at establishing a comprehensive framework of nuclear law covering all areas of nuclear activity. Examples of recipients of such assistance are Kazakhstan, Belarus, and Ukraine. In 1993 in Leiden, Netherlands, the IAEA also co-sponsored with the Nuclear Energy Agency of the OECD, a Training Seminar for Lawyers and Regulators; a similar seminar also was held in 1994.

A co-operative, constructive approach

Soundly established SSACs are fundamental to a State's ability to benefit fully from the peaceful uses of nuclear energy. Nuclear trade and co-operation among States are essentially dependent upon effective and credible safeguards. These, in turn, rely heavily on SSACs.

In newly independent States formed after the disintegration of the former Soviet Union, the nuclear infrastructure needs to be reconstructed if the new States are to derive maximum benefit from the peaceful exploitation of the atom. The IAEA, together with donor States, has been helping the NIS to build up their respective nuclear infrastructures. Much of the activity relates directly to the establishment of reliable SSACs. The IAEA and donor States are therefore fulfilling a vital function in the NIS. Much remains to be done, but much is already under way.

The co-operative spirit of all parties involved is very much in evidence; the NIS have been very open and have provided IAEA and donor States access to their nuclear programmes and, to a large extent, to facilities without a safeguards agreement in place. Also, donor States, recognizing the common interest in strengthening the SSAC infrastructure in the NIS, have responded in a very positive manner. ❐