Strengthening nuclear and radiation safety in countries of the former USSR

The UNDP and IAEA join forces with newly independent States to build adequate national infrastructures for nuclear safety

by Morris Rosen

Early in 1994, a multimillion dollar international programme will be fully under way for providing practical assistance to successor States of the former Soviet Union in areas of nuclear and radiation safety.

The initiative was launched at a ministerial level *Forum for Information Exchange* at IAEA headquarters from 4-7 May 1993. Senior governmental officials of these countries outlined their existing programmes, problems, needs, and priorities as part of efforts to determine how assistance under the international programme can best be directed. The programme is a joint initiative of the IAEA and the United Nations Development Programme (UNDP). Funding and other support for assistance services is being sought from governments, international funding agencies, and private industry.

The joint programme is designed to include areas not covered by international efforts already in place for assisting countries in Central and Eastern Europe in the nuclear power sphere. These include bilateral and multilateral assistance programmes to improve the safety of nuclear power plants, including a co-ordination structure set up by the Group of 24 countries of the Organization for Economic Co-operation and Development (OECD) through the Commission of the European Communities (CEC) in Brussels. The IAEA itself is carrying out comprehensive programmes for each of the various generations of pressurized light-water reactors, known as WWERs, and the graphite moderated RBMK reactors. These reactors are located in Lithuania, Russia, and the Ukraine, all countries emerging from the former USSR, and also in Bulgaria, the Czech Republic, Hungary and the Slovak Republic.

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There have been no collective initiatives to deal with the more widespread problem of the safety of facilities such as research reactors, uranium mining and milling facilities, and installations containing radiation sources used in medicine, agriculture, and industry. The new joint programme takes advantage of the IAEA's extensive experience in building safety infrastructures, including legal and regulatory frameworks, and the UNDP's ability to obtain funding and to build national capabilities for management of assistance. The UN system provides impartiality and universality which may offer governments and donor organizations an appropriate mechanism for furnishing assistance. United Nations Integrated Offices have been opened in most of the newly independent republics to allow for a more consolidated and collaborative approach to assistance efforts of organizations within the United Nations system.

The first steps

The joint programme was planned as a three-step operation beginning with the Vienna forum which had representation from Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrghyzstan, Latvia, Lithuania, Moldova, Russia, Ukraine, and Uzbekistan. *(See maps.)* Two of the newly independent republics, Tajikistan and Turkmenistan, did not attend. Here, sufficient details were obtained to outline an action plan. It was recognized that country-specific assistance programmes would need to provide up-to-date equipment along with specialized expert and advisory services. Information exchange and training activities to include workshops and scientific visits equally would play an important role in bringing about the needed exposure to the international scientific community and to international practices.

Financing could be the limiting factor in providing assistance, and observers from potential donor countries and financial organizations were also invited to the Vienna forum. Among these were the CEC, the Group of 24, the European Bank for Reconstruction and Development, and the World Bank.

Some main problems

IAEA consultants followed the deliberations at the forum and held extensive discussions with participants in special working groups. There was one clear finding. An acute need exists to develop independent national approaches to replace the void produced by the breakup of the former Soviet Union.

All countries had provisions for radiological protection but were dependent for direction and advice on All Union organizations in the former USSR. The breakup of the Soviet Union removed these arrangements as well as the central authority based in Moscow. The creation of new self-reliant national authorities and institutions as well as legislation and standards has became a priority concern. While national approaches are being established, there is duplication of responsibility in some areas and a lack of adequate responsibility in others. Ministries dealing with health and others concerned with the environment or industry along with State committees and institutes can all be involved.

Authorities and institutions will need to develop their own expertise in the policy as well as in the technical sphere. Training courses to demonstrate international practices were called for by most delegations. An awareness of the standards of protection that are accepted worldwide, such as the Agency's *Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources*, will be an essential step in building the new safety infrastructures.

There are common problems. All countries have radiation sources for use in medical therapy and industrial radiography while some also employ them for product sterilization purposes. There are sources of unknown composition and quantity which have been abandoned and their whereabouts are not known. The safety of shallow land burial waste disposal facilities which have existed in most countries since the early 1950s is in several cases largely unknown or unsatisfactory. Where uranium has been mined and processed there are problems with the stabilization of spoils and tailings. Decommissioning of research reactors and fuel cycle facilities will eventually require attention.

There is a general lack of emergency response capabilities, particularly in the communication area and in the ability to carry out radiological analyses. A number of countries were also concerned about the adequacy of nuclear safety in neighbouring republics.

The initial fact-finding missions

The programme's second phase is now under way through fact-finding missions of specialists which will be carried out in each country and completed by early 1994. They will lead to detailed country-specific assistance packages as well as efforts directed at groups of former Soviet republics with similar needs.

The first missions were undertaken in July 1993 to Kazakhstan, Uzbekistan and Kyrghyzstan. *(See accompanying box and maps.)* They were carried out by Agency staff and one consultant who had also participated in the Vienna forum. Nuclear power and research reactors, uranium mining and milling facilities, and the principal installations using radiation sources in medicine and research were seen. Discussions centred on legal frameworks for the use of nuclear energy; regulatory oversight including licensing and control of radiation sources and the safety of radiation workers; environmental protection and monitoring; waste handling; and emergency preparedness.

In all three countries, senior officials who had participated in the Vienna forum were active in making arrangements and in the discussions. Some principal observations from the fact-finding missions follow.

Legal and regulatory situation. While new national organizational arrangements are being established to oversee safety activities, many existing requirements and safety standards remain in force. There is a general recognition that rapid progress is desirable, but the time period will depend on overall priorities for governmental reorganization. Until completed, provisional bodies and regulations will probably continue to be used. Although safety documents of the former USSR are available, it appears that little other national or international material is accessible. Constructive co-operation with Russia will be essential as much relevant data and design information for the various nuclear installations remain there.

Personnel. Skilled administrative and technical staff are available; however, their experience is limited to operating within the former USSR system. Licensing and inspection staff seem to have good academic backgrounds but insufficient practical experience. There are

Selected characteristics of countries visited

Under the joint UNDP-IAEA international project, specialists have visited a number of countries to lay the basis for future assistance. The countries visited in July 1993 were:

Kazakhstan. The country has a population of 16.7 million and an area of 2.7 million square kilometers. The capital is Alma Ata. Kazakhstan declared its independence in December 1991. The country is rich in mineral resources. Coal mining, oil and chemical production, non-ferrous metallurgy, and heavy engineering are important industries. Kazakhstan's agriculture has changed from primarily nomadic cattle breeding to the production of grain, cotton, and other crops.

In the nuclear field, facilities include three research reactors at Semipalatinsk, which was the test site for Soviet nuclear weapons from 1949-89; one research reactor in Alma Ata; one breeder reactor outside Aktau; various uranium mining and processing sites; the Institute of Nuclear Physics near Alma Ata; and disposal sites for nuclear waste near Alma Ata and Aktau.

Kyrghyzstan. The country has a population of 4.4 million and an area of 0.2 million square kilometers. Its capital is Bishkek. Kyrghyzstan declared its independence in September 1991. It has over 500 large industrial enterprises, including sugar refineries, tanneries, cotton and wool cleansing works, flour mills, a tobacco factory, food processing plants, and timber, textile, engineering, metallurgical, oil and mining works. The country is known for its livestock breeding.

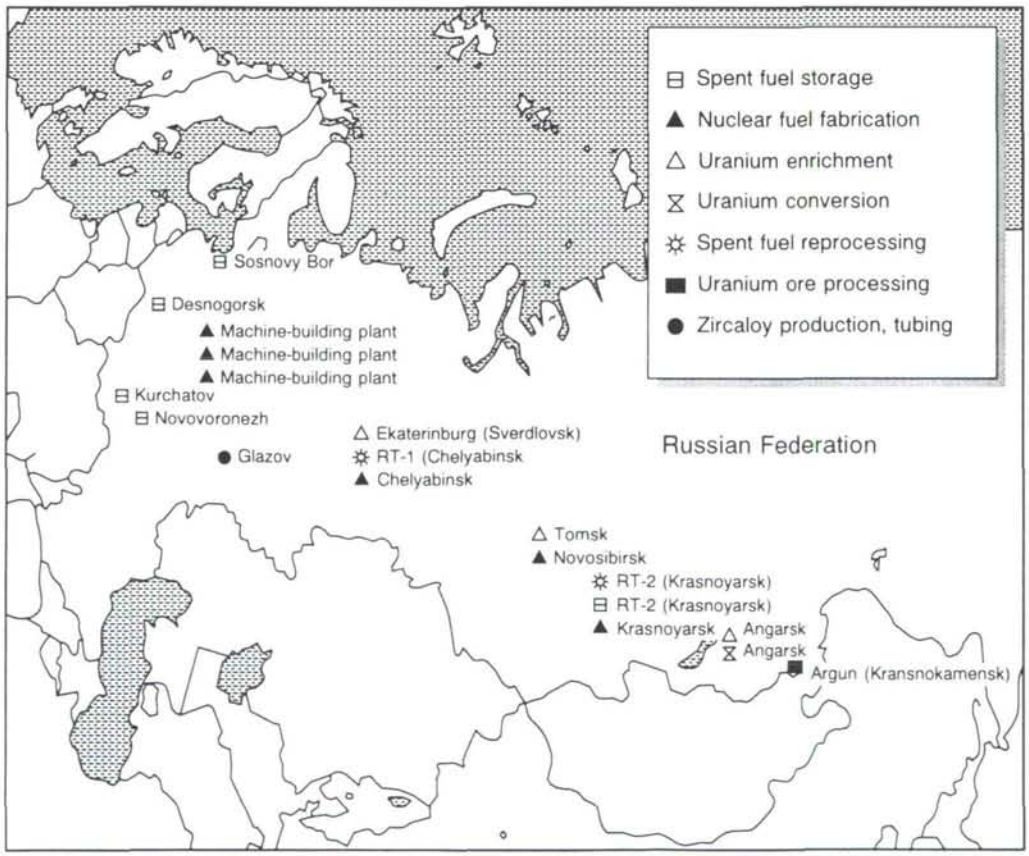
In the nuclear area, the main activities relate to uranium mining operations.

Uzbekistan. The country has a population of 20.3 million and an area of 0.45 million square kilometers. The capital is Tashkent. The country declared its independence in August 1991. It has approximately 1600 factories and mills with oil, coal, copper and building materials being the main exports. Uzbekistan is a land of intense farming based on irrigation, with cotton, rice and fruit being cultivated.

Nuclear facilities include a research reactor near Tashkent; a 15-kW pulsed neutron source at the Institute of Nuclear Physics; a uranium mining and milling site; and a central nuclear waste disposal facility.

Uranium open pit mining in Uchkouduk, Uzbekistan. *(Credit: C. Bergman, IAEA)*


Uranium processing
Uranium recovery from phosphoric acid
Nuclear fuel fabrication
Russian Federation
Tselinny
Semipalatinsk
Ust-Kamenogorsk
Kazakhstan
Aktau
Prikaspiy Complex
Aral Sea
Stepnoye
Alma Ata
Bishkek
Kyrgiz
Kyrghyzstan
Caspian Sea
Georgia
Azerbaijan
Uzbekistan
Tashkent
Navoi
Chkalovsk
China
Armenia
Iran
Turkmenistan
Tajikistan


Spent fuel storage
Nuclear fuel fabrication
Uranium enrichment
Uranium conversion
Spent fuel reprocessing
Uranium ore processing
Zircaloy production, tubing
Sosnovy Bor
Desnogorsk
Machine-building plant
Machine-building plant
Machine-building plant
Kurchatov
Novovoronezh
Glazov
Ekaterinburg (Sverdlovsk)
RT-1 (Chelyabinsk
Chelyabinsk
Russian Federation
Tomsk
Novosibirsk
RT-2 (Krasnoyarsk)
RT-2 (Krasnoyarsk)
Krasnoyarsk
Angarsk
Angarsk
Argun (Kransnokamensk)

many bilateral arrangements with Russia which include co-operative arrangements with various institutions. These will be maintained and provide some opportunity for personnel training. Senior level staff are being given opportunities for contact with the international scientific community and this should be extended to the more junior levels.

There has been a significant "brain drain" of Russian-born staff as a result of impending decisions on nationality and on language requirements. In Kazakhstan, the Kazakh and Russian populations are almost equal at about 40% of the total. The Russian component in Kyrghyzstan is 21% while in Uzbekistan it is only 8%. Russian scientists played an important role in many industrial and scientific bodies. In particular, operation of the BN-350 breeder reactor in Kazakhstan could be severely affected if it were to lose highly experienced technical and management staff.

The creation of the many new governmental bodies has also resulted in talented individuals being reassigned. The need to establish diplomatic missions worldwide has required not only political scientists, but also technical experts. The IAEA mission was the first official visitor to the new Foreign Minister of Uzbekistan who had just taken office; the previous two Ministers had been reassigned to embassies.

Facilities and equipment. Many facilities and much of the scientific equipment are old and outdated. The mission was continuously informed of a general shortage and deficient state of equipment, particularly of some common measurement devices. There is a lack of computers and software for modern information storage techniques and a general need for direct and rapid communication systems, not only for international but also for domestic use.

Facilities will need to be modernized with up-to-date equipment to bring operations up to international levels. However, in the short term it will be difficult to respond to the numerous requests for equipment without a better knowledge of priority work programmes and of the availability of sufficient staff. Requests for equipment will need co-ordination nationally.

A positive sign was the dedication of management and technical staff at the many industrial, research, and medical facilities visited. It was evidenced not only through their technical knowledge, but also the relatively good level of cleanliness and order at the installations. This was particularly obvious at the BN-350 nuclear power reactor in Kazakhstan. The plant has an excellent operating history and the areas visited were in an excellent state of housekeeping.

Public concern. In all three countries, there was concern about radioactive tailings from ongoing or discontinued uranium mining. However, it seems not to be an unduly serious problem. There is strong public opinion in Kazakhstan originally focused against nuclear weapons testing, but which may be directed at the upcoming safety review necessary to restart a 10-MW research reactor. This facility, which can produce radioactive isotopes, has been shut down since 1988 as a result of concerns about its seismic design. Radiation exposures and existing radiation contamination resulting from atmospheric weapons testing, which was halted in the early 1960s, remain of concern to the Kazakhstan public and also to their neighbours.

Initiating assistance efforts

There is a general weariness with fact-finding missions. One authority asserted that over 100 environmental missions had taken place over the past 2 years with essentially no practical assistance provided. To maintain credibility and interest in the recipient countries, it will be necessary for the joint UNDP-IAEA programme to initiate assistance efforts rapidly.

Practical assistance which could be commenced over the late 1993 and early 1994 time period would consist of the provision of some measurement and monitoring equipment. Additionally, a number of safety advisory missions and expert assistance activities to complement efforts for information exchange, such as national or regional workshops and scientific visits, could be carried out. To meet the need for up-to-date text books and journals, efforts could be made to set up libraries of key texts and to provide subscriptions to major scientific journals.

In line with this "demand driven" approach of the joint project, the assistance would primarily respond to the stated needs of the organizations visited. These short-term efforts and further follow-up work will lead to a fuller appreciation of the requirements of the three countries.

The IAEA does not have sufficient financial resources and specialized staff to provide all the support needed. Significant expert assistance will be required and extrabudgetary funds will be necessary. Promising contacts have already been made with several countries and there are possibilities of receiving some equipment on a cost-free basis. ❐