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THE US PROGRAM OF TECHNICAL ASSISTANCE TO THE ATOMIC ENERGY AGENCY OF THE REPUBLIC OF KAZAKSTAN*

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ABSTRACT

In the summer of 1993, the US Department of Energy (US government) received a formal invitation from the Atomic Energy Agency of the Republic of Kazakstan (AEARK) to visit Kazakstan to prepare a program for US cooperation with the AEARK to improve material protection, control, and accounting (MPCA) at Kazakstani nuclear facilities. As a result of this visit, an agreement for such cooperation was prepared and a program plan was formulated. The Program Plan includes provisions for Technical Working Group meetings, a site survey of a Kazakstani nuclear facility for possible upgrades in MPCA, assistance to AEARK in the regulatory area, training courses to familiarize AEARK and nuclear facility personnel with US safeguards practices, and supply of US safeguards equipment. This cooperative program is funded by the Nunn-Lugar program and the Department of Energy. The program is coordinated with the International Atomic Energy Agency and similar programs of other donor countries (Sweden, Japan, and the United Kingdom). This paper summarizes accomplishments of the program to date and future plans.

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I. NEGOTIATING HISTORY

In the summer of 1993, the US Department of Energy (US DOE) received a formal invitation from the Atomic Energy Agency of the Republic of Kazakstan (AEARK) to visit Kazakstan for the purpose of preparing a program of cooperation with the AEARK to improve nuclear material control and accounting (MC&A) and physical protection, collectively referred to as material protection, control, and accounting (MPCA). During the visit, two representatives of the DOE were provided a tour of the VVER 1000 fuel pellet

fabrication facility operated by the Ulba State Holding Company at Ust Kamenogorsk, and meetings were held with AEARK senior staff in Almaty. As a result of this visit an agreement for such cooperation and a draft program plan were formulated.

The Umbrella and MPCA Implementing Agreements under the Cooperative Threat Reduction (CTR) Program were both signed on December 13, 1993. The MPCA Implementing Agreement is expected to be modified in the near future to increase the CTR program funding limit from $5 million to $8 million. Further expansion is likely in FY 96 to include facilities other than Ulba.

The US program is coordinated with the IAEA and with similar programs of other donor countries (Sweden, Japan, and the United Kingdom). In May 1994, one DOE and one NRC representative participated in an IAEA familiarization visit with other donor country representatives to Ulba, the BN-350 breeder reactor at Aktau, and the research reactor at the Institute of Nuclear Physics in Almaty.

II. DEVELOPMENT OF PROGRAM PLAN

A Technical Working Group (TWG) meeting between American and Kazakstani safeguards experts was held in July 1994 in Almaty and Ust Kamenogorsk. At this time, the AEARK officials prioritized their request for assistance as (1) the Ulba plant, (2) the BN-350 breeder reactor at Aktau, (3) the research reactors at Semipalatinsk and Almaty, and (4) physical protection upgrades at the AEARK headquarters at Almaty. The group toured the RBMK fuel pellet plant at Ulba. The TWG meeting led to the identification of technical training that could be provided by the US and to a formal site survey of the Ulba plant in September 1994 by MPCA experts. This visit and the resulting site survey report identified MPCA upgrades that are desirable if the Ulba plant is to meet international standards.

III. IMPLEMENTATION OF THE PROGRAM PLAN

Training Courses

In September 1994, the US presented a training course on Fundamentals of MC&A at the Ulba facility to approximately 50 Ulba safeguards personnel. The course was taught with participation by the IAEA Facility Officer. The following topics were covered:

- Requirements for Safeguards
- IAEA Requirements/Actions (by the IAEA)
- MBA Structure at Ulba (by the IAEA)
- Measurement Methods
- Nondestructive Assay (NDA) Methods
- Measurement Control
- Physical Inventory Taking
- Statistics in the MC&A Process
- Data Treatment
- IAEA Safeguards Implementation Criteria for Ulba (by the IAEA)
- A Workshop on Safeguards for Ulba

In January, 1995 a course on NDA was presented at the Los Alamos National Laboratory for six Ulba and AEARK personnel. The course included NDA measurement of uranium enrichment and measurement of process holdup of uranium. The course also included a lecture on IAEA use of NDA equipment in low-enriched uranium fuel fabrication plants by the IAEA facility officer.

A training course on Use of Seals was presented to Ulba and AEARK personnel during a visit to the US in the spring of 1995.

Courses in Advanced Statistics and Measurement Control, Computerized Accounting Systems, and Physical Protection are planned for presentation in 1995.

Assistance in Physical Inventory Taking

Because safeguards as practiced in western countries were nonexistent in the Former Soviet Union (FSU), the Ulba facility had never been required to perform a physical inventory during its over 40 years of producing fuel pellets. Therefore, upon acceding to IAEA safeguards, one of the first tasks the facility is required to undertake is a declaration of initial inventory. The facility had never been shut down and cleaned out. Additionally, thousands of containers of UO_2, uranyl nitrate, and UF_6 had accumulated at the facility. As a result, the AEARK requested assistance from the US DOE in their first physical inventory taking (PIT). Two MC&A experts, one each from Los Alamos and Oak Ridge, spent three weeks in December 1994 at the Ulba plant to provide training in PIT procedures and the use of NDA equipment in performing a PIT. A follow-up visit is planned for the summer of 1995.

Procurement of MC&A Equipment

Because measurements were never a safeguards requirement in the FSU, the Ulba facility had no need for NDA equipment. In August 1994, the US DOE, through Los Alamos, provided the facility with a portable multichannel analyzer with a sodium iodide (NaI) detector and training for its use in LEU measurements. Additional analyzers and detectors will be provided in the future.

Scales used at the Ulba plant often do not meet international standards for accuracy and precision. Modern scales also will be provided in the future.

Use of unique seals for identification of items has not been a past requirement at the facility. The US program has provided seals both for the Ulba facility and for the AEARK inspectorate.

Additional equipment that is planned for purchase and delivery to the AEARK at Ulba includes the following:

- computer network supplies;
- copiers;
- gamma-ray spectroscopy system including portable multichannel analyzer, NaI detectors, laptop computer, and germanium detectors;
- enrichment calibration materials;
- ultrasonic thickness gauge;
- precision balances;
- certified weights;
- bar-code readers and supplies;
- automatic titrators;
- hand-held gamma monitors; and
- hand-held alpha monitors.

Regulatory System Development

The primary goal of NRC's assistance to Kazakstan is development of a set of safeguards regulations that profit from NRC's experience, yet has the flexibility to accommodate Kazakstan-specific needs. Work with Kazakstan includes the following:

- training in use of logic trees to permit development of country-specific regulations,
- assistance with design-basis threat guidance,
- comprehensive training on NRC's inspection procedures,
- licensing training,
- review of Kazakstani national regulations, and

- coordinated procurement of computers, local area networks, and other office equipment for AEARK use.

In May 1995, NRC hosted a delegation from Ulba, Semipalatinsk, and AEARK to learn NRC safeguards regulations and to visit the Westinghouse fuel fabrication plant for in-depth discussions on facility implementation of regulations.

Cooperation in Physical Protection

Physical protection systems that were once considered adequate for the protection of nuclear materials in Kazakstan may not conform to INFCIRC-225, REV 3. For example, in the past the threat of the insider acting alone or in collusion with outsiders was not considered in the design of physical protection systems. Today, however, because of the current political and economic situation, the insider threat must be considered. Other physical protection concerns in Kazakstan include a shortage of maintenance and repair equipment, a lack of spare parts, and the continuing emigration of technical specialists. Upgrades to the existing physical protection systems are required to address these concerns.

As part of the physical protection upgrade process for the Ulba facility, physical protection experts from Sandia, Argonne, and Oak Ridge met with technical specialists of the facility in Kazakstan in April 1995. The purpose of this meeting was to begin the joint design of physical protection upgrades for the nuclear material located at the facility. Based on the information exchange during this meeting, samples of physical protection sensors, response force communications equipment, nuclear material detectors, door locks, and door alarms will be sent to the AEARK for evaluation at the Ulba site in the beginning of July.

IV. FUTURE PLANS

The most important part of the Ulba program is now beginning; this involves designing, implementing, and assessing a new MPCA program at the fuel fabrication plant. The hardware to build a computer accounting and control network throughout the process buildings is being procured. The network will include two servers and over 40 PC terminals interconnected by twisted pair or fiber optic cable. The major scales and NDA instruments may in the future be interfaced to the network to input data directly to the accounting database. Operator terminals will be located at building input, output, and storage areas and at process and flow key measurement points. Bar codes may be added to many of the material storage and transfer containers and readers may be included at each measurement point. Basic system software may be purchased commercially, and the nuclear material accounting system will be assembled using existing software. The accounting system will support a near-real-time nuclear material database. Later, the physical protection system may also be connected to this network. Installation of the computer network is planned to begin in the last quarter of 1995.

The proposed physical protection system upgrades for Ulba may include the following:

- hand-held nuclear material detectors,
- an alarm system for the VVER uranium processing building,
- hand-held radio communication system for the response force,
- mechanical coded door locks for uranium storage areas, and
- identification badge fabricating equipment for uranium workers.

Upon the successful evaluation of the equipment sent in July, the above system may be procured and delivered to Ulba in 1996.

Although the present program is focused on Ulba, the US would like to cooperate in upgrading safeguards at other facilities. At the BN-350 breeder reactor at Aktau, the Power Reactor and Nuclear Fuel Development Corporation of Japan is providing a gate monitor for detection of movement of spent fuel from the reactor core to the spent fuel storage pond. The system is similar to a system previously installed at the MONJU breeder reactor in Japan. The US DOE, through Los Alamos, will provide software support for the system, similar to support provided for the MONJU system. The system will be installed at the reactor in late summer, 1995. It is anticipated that US physical protection assistance also will be provided. An MPCA site survey of the BN-350 reactor and the Almaty Institute reactor is scheduled for the end of July.

An MPCA site survey was performed in October 1994 at Semipalatinsk-21 near Kurchatov, Kazakstan. This facility, which was an underground test site for the Soviet Union, houses three research reactors and associated fuel storage facilities. The primary upgrades for this site probably will be in the physical protection system with a lesser emphasis on material control and accounting than at Ulba. An MPCA team may travel to Semipalatinsk in midsummer for a design information exchange meeting and to deliver some initial MPCA equipment. Further work at this site requires modification of the existing implementing agreement between the United States and Republic of Kazakstan. There is a small research reactor in Almaty; there may be an MPCA effort here also.

Over the next several years, the US expects to continue a fruitful cooperation with the AEARK and the nuclear facility operators of Kazakstan. The present relationship between the US and the AEARK and between their respective laboratories and nuclear facilities shows a growing trust and a spirit of cooperation that should produce an upgraded MPCA program in Kazakstan and a growing cooperation between our two peoples.