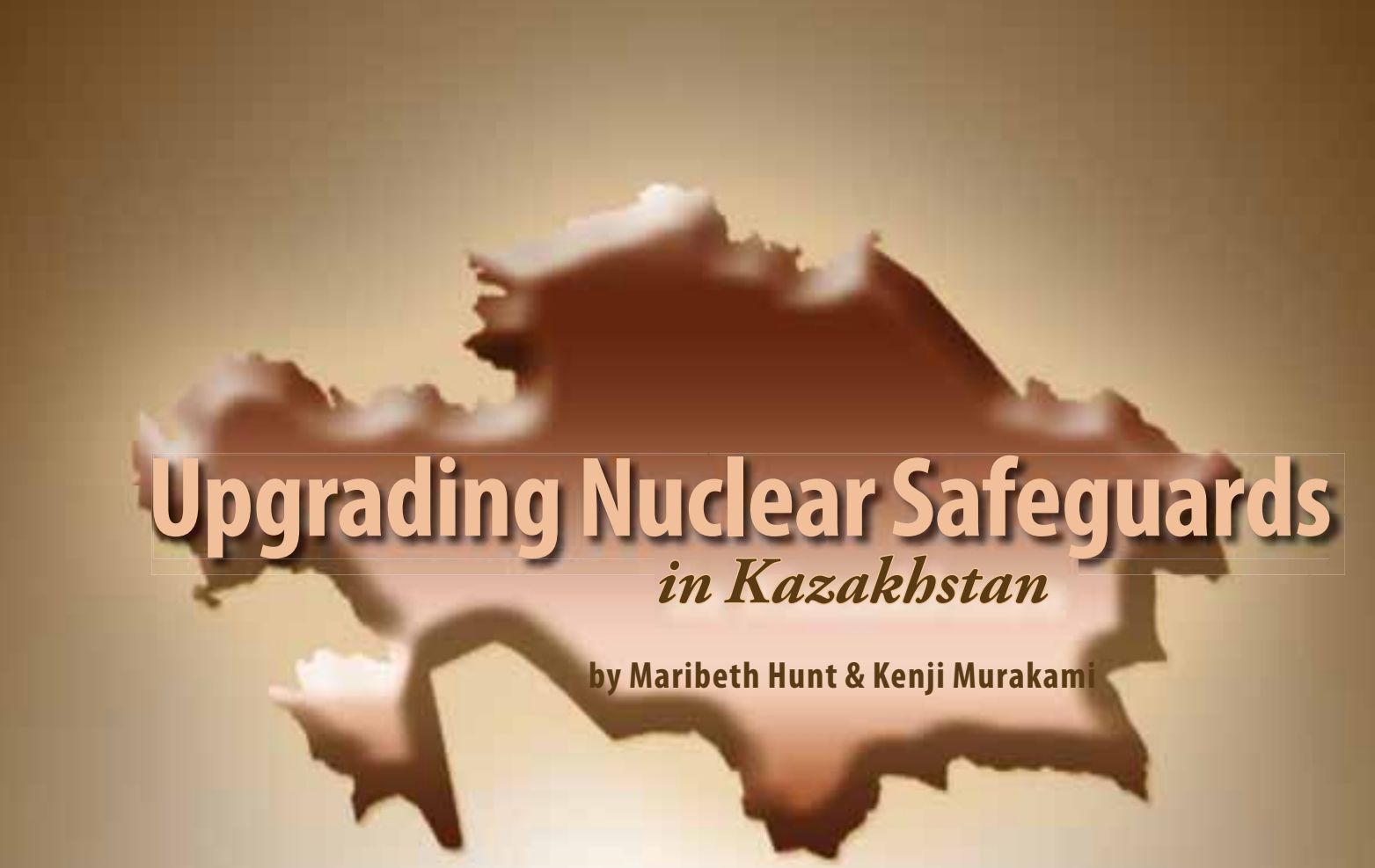

Upgrading Nuclear Safeguards *in Kazakhstan*

by Maribeth Hunt & Kenji Murakami

When the Soviet Union collapsed in December 1991, Kazakhstan inherited 1,410 nuclear warheads. Within three years, by 1994, Kazakhstan had formally acceded to the Nuclear Non-Proliferation Treaty (NPT) and transferred its last nuclear warhead to Russia in April 1995. Its NPT safeguards agreement with the IAEA came into force in 1994 and all facilities are under safeguards. In February 2004 Kazakhstan signed the Additional Protocol to its IAEA safeguards agreement, though this not yet in force.

Kazakhstan played a key role during the Soviet era as a supplier and processor of uranium. The BN-350 fast reactor at Aktau (formerly Shevchenko), on the shore of the Caspian Sea, successfully produced up to 135 MWe of electricity and 80,000 m^3/day of potable water over some 27 years until it was closed down in mid-1999.

The IAEA is involved in upgrading the nuclear material accountancy and control systems of all Member States. At the request of the IAEA, Japan and Sweden conducted independent evaluations at the Kazakhstan Atomic Energy Committee (KAEC), and specifically at the Ulba Metallurgical Plant (UMP) and identified areas that could be improved with respect to nuclear material accountancy and control.

In June 2003 the Agency, with four Member States and the European Union, undertook a programmeme to upgrade the nuclear accountancy and control systems within Kazakhstan with special emphasis on the UMP in Ust-Kamenogorsk in northeast Kazakhstan.

The UMP is highly complex and is the world's largest fuel fabrication facility. Known as Mailbox 10 until 1967, the Ulba Metallurgy Plant was established in 1949. Ulba produced low-enriched uranium fuel pellets used in half of the fuel fabricated for Soviet-designed reactors. In recent years fuel pellet production has been somewhat reduced and the plant has also been converting uranium hexafluoride to powder for use at Western fuel fabrication facilities. During the Soviet era, UMP produced high-enriched uranium (HEU) fuel for the secret Alfa submarine programme and participated in the development of fuel for nuclear-powered satellites. The plant reportedly halted HEU-related activities in the 1980s. UMP has been working on reaching Western standards of safety and security since signing its Comprehensive Safeguards Agreement with the IAEA in 1994.

The current IAEA programme is focused on upgrading hardware and software systems and the training of personnel in Kazakhstan. Due to the complexity of the facility,

special emphasis is on training personnel and upgrading systems at the UMP. At the UMP the focus is on reducing the uncertainty in the hold-up (material which cannot be cleaned out) in the process lines, better determining the amount of nuclear material that is released from the facility as waste or retained at the facility as waste, increasing the ability of the facility to more accurately account for the nuclear material received, and to generally upgrade the safety, security, and accountancy standards.

While the material that is actually in hold-up may not be of particular concern with respect to nuclear proliferation and nuclear security, a plant's declaration of hold-up may be a way of concealing diversion of nuclear material. Overstating the amount of material in hold-up can allow an operator to divert material. In the past, neither the UMP nor the IAEA has had an accurate estimate of the material designated as hold-up. When the hold-up of a plant can be characterized and verified it assures that this proliferation pathway is protected.

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Since the initiation of the project one and a half years ago, significant progress has been made. Funds to the IAEA from the Japanese government provided through the Japanese Nuclear Security Fund have been made available for both non-destructive analysis (NDA) equipment and training. In the first case the funding provided a specific uranium measurement instrument, the In-situ Object Counting System (ISOCS), to characterize the hold-up. The Agency uses this same system and during the Physical Inventory Verification (PIV) in 2003 the IAEA's system was used to inventory parts of the plant.

The system provided by the Japanese funds was delivered to the plant in mid-2004. Extensive training provided to the plant personnel by the manufacturer and the Agency assured that the UMP would be capable of using the system to characterize both the hold up and the waste streams. UMP personnel concentrated on making the measurements themselves based on the training and made several hundred measurements prior to and during the physical inventory in September 2004. The results of these measurements were used by UPM personnel to characterize their hold-up for their declaration for the IAEA's 2004 Physical Inventory Verification.

In line with this, the United States provided additional instruments and training. This training, held in conjunction with the Agency, assured that UMP staff understood where each instrument was most effective.

During the PIV in September 2004, the Agency used its ISOCS system to re-measure points that had been measured during the PIV in 2003 and to measure points that the operator had measured with the systems provided by the Japanese and the United States. The result was that at the Physical Inventory Taking in 2004, UMP staff were able to make an effective declaration of hold-up and the Agency was able to verify it.

At the same time, the rest of the work of the donor States was progressing. Sweden's programme advanced with the development of a State-specific safety and security culture programme and will soon host a State-specific training course. Additionally, Sweden provided upgrades to the nuclear material accountancy and control software at the KAEC. The Joint Research Center Ispra provided new nuclear material accountancy tanks to the UMP for the receipt of uranyl nitrate that have been calibrated and, as of the end of 2004, have been in use. The United States, in addition to providing NDA equipment and training for hold-up measurements, has provided additional training and is in the process of providing a highly sophisticated NDA system to allow the UMP to accurately estimate the amount of nuclear material being released as waste.

Finally, the funding from the Japanese government has assured the preparation of three procedures to standardize the nuclear material accountancy and control at the UMP and has sponsored the training of two UMP safeguards officials in Japan.

One of the original goals of this integrated project was to significantly reduce, by 2005, the uncertainty in the measurement of hold-up at the UMP. Through the concerted efforts of the IAEA, donor States, and the European Union, this goal was reached in September 2004. Over the next year, work will concentrate on further training of personnel, the Russian translation and distribution of the procedures funded by the Japanese government, coordinating the delivery and installation of equipment from the United States, and UMP staff training in safeguards and safety culture.

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