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**GEORGE KUZMYCZ TRAINING CENTER - 5 YEARS
OF AMERICAN-UKRAINIAN EFFORTS IN THE FIELD
OF MATERIAL CONTROL AND ACCOUNTING**

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George Kuzmycz Training Center – 5 Years of American-Ukrainian Efforts in the Field of Material Control and Accounting

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ABSTRACT

The George Kuzmycz Training Center for Physical Protection, Control and Accounting of Nuclear Material (GKTC) was established in October 1998 at the Kiev Institute for Nuclear Research. During the past six years, about 700 professionals from all Ukrainian nuclear installations, executive and regulatory bodies were trained at the GKTC. Future Material Control and Accounting (MC&A) training courses are going to be held even more frequently because Ukraine has already signed the Additional Model Protocol and its ratification by Ukrainian Parliament is expected to happen very soon. Additionally, a number of new training courses will be developed.

US DOE through Argonne National Laboratory has made significant efforts to transfer Automated Inventory/Material Accounting System (AIMAS) software to Ukraine. As a result, AIMAS software can be used as a basic code for the development of the Computerized MC&A System for all Ukrainian nuclear facilities despite their differences.

In 2003, a new laboratory for Nondestructive Assay (NDA) was established with assistance from the U.S. Department of Energy. As a result, GKTC training capabilities will increase substantially. Furthermore, in order to increase the efficiency of NDA laboratory, it is planned to use the NDA equipment for a program of interdiction of illicit traffic of nuclear materials in Ukraine.

American-Ukrainian MC&A efforts for the last 6 years, the problems encountered and the solutions to these problems, as well as comments, suggestions and recommendations for future activity at GKTC to promote and improve the nuclear material management culture in Ukraine are discussed in detail.

INTRODUCTION

The George Kuzmycz Training Center for Physical Protection, Control and Accounting of Nuclear Material was created in the frame of agreements on nuclear threat reduction between the USA and Ukraine at Kiev Institute for Nuclear Research in October 1998. This was accomplished with significant help from the US DOE and a number of National Laboratories, such as Los Alamos,

Argonne and Sandia. All the details and achievements of this 10 year cooperation between Ukraine and USA is the subject of another paper [1]. Along with training in the field of physical protection [2], GKTC provides extensive training in Material Control and Accounting for the personnel of Ukrainian nuclear facilities, executive and regulatory bodies. This includes both basic and advanced training in the following MC&A fields:

- International Safeguards, including all new MC&A aspects at the state and facility level due to Additional Model Protocol implementation in Ukraine.
- Development of Computerized Systems of Material Control and Accounting.
- Nondestructive Assay of Nuclear Materials.

INTERNATIONAL SAFEGUARDS

From the very beginning this direction of training presents one of the most important activities of GKTC in the field of material control and accounting. Dozens of training courses on MC&A fundamentals, IAEA safeguards approach, principal elements of State System of Accounting and Control, MC&A elements and functions at the facility level, NDA methods and techniques have been held at GKTC during past 6 years. A significant number of professionals from all nuclear facilities, administrative and regulatory bodies of Ukraine have received theoretical training and practical experience for having taken taking part in training courses such as the following:

- Introduction to Material Control and Accounting.
- Advanced Material Control and Accounting.
- NDA techniques of Material Control and Accounting.
- AIMAS - Computerized System of Material Control and Accounting.

Additionally, the following series of IAEA training courses and workshops has been held at GKTC:

- MPC&A Procedures Development Workshop.
- Prevention of Unauthorized Transfer of Nuclear and Other Radioactive Materials in Ukraine.
- Workshop on Nuclear Material Accounting and Reporting.

New initiatives in training will be required because Ukraine has already signed the Additional Model Protocol and its ratification by Ukrainian Parliament is expected soon. Although the present MC&A systems at all nuclear facilities of Ukraine satisfy both IAEA and Ukrainian Regulatory Body requirements, the State System of Accounting should be improved in accordance to Additional Model Protocol requirements. Thus, a substantial number of new regulations, norms and rules must be developed. In this context, Russian experience when such regulations, norms and rules have been developed and implemented with great help and assistance of the US DOE could be very valuable and the USA plans to support such activity in Ukraine. Moreover, the list of all regulations, norms and rules to be developed is almost complete.

One of the very successful examples of this activity is the development of MPC&A English-Russian-Ukrainian Glossary, based on the English-Russian Glossary that had been created in the Russian Federation several years ago. In order to estimate the scale of this work it should be mentioned that even Russian terminology has been somewhat changed for having taken into account the differences between Russia and Ukraine. As a result, all the training activity that originally been presented in English using interpreters can be done not only in Russian, but also in Ukrainian in full accordance with the laws of Ukraine.

At the same time, a mechanism of Additional Model Protocol implementation should be developed including the advanced training program in order to create the national training system. Although GKTC team acquired experience and training materials from the US team and now is almost ready to conduct all the training courses that were originally presented by the US teams of instructors, the need for new training courses is obvious. It can include the following MC&A training courses:

- Nuclear Material Management Culture (in State, at the facility).
- State MC&A system. Operator (facility) MC&A system.
- Fundamentals of Material Control and Accounting.
- MC&A Computerization.
- Nondestructive Assay of Nuclear Materials: Gamma and Neutron Ones.
- Means of Nuclear Material Access Control. Tamper Indication Devices.
- Performance and Efficiency Testing of MC&A Systems and Their Elements.
- Planning, Preparation and Performance of Physical Inventory.
- Statistics Methods Used for Nuclear Materials Control and Accounting.
- MC&A System Inspections.

Furthermore, GKTC and Los Alamos National Laboratory have already developed the detailed plan for how to prepare and conduct such training courses in the near future.

DEVELOPMENT OF COMPUTERIZED SYSTEMS OF MATERIAL CONTROL AND ACCOUNTING

This area of training activity has begun even before the GKTC inauguration in 1998. During all these years, the US DOE has applied significant efforts to transfer AIMAS software to Ukraine via Argonne National Laboratory. In order to do this as effectively as possible, a series of training courses had been held at GKTC. A number of comments, remarks and suggestions was collected from Ukrainian specialists how to improve the code and adjust it to different facilities and installations of Ukraine, taking into account their specifics and sometimes unique requirements. As a result, an understanding has been reached that AIMAS software can be used as a basic code for the development of the Computerized MC&A System for all Ukrainian nuclear facilities despite their unique differences.

Last year, the AIMAS code (Version 2.3.3.4) with all its documentation, was transferred officially to GKTC as the Configuration Management Custodian. GKTC, together with all organizations interested in the AIMAS use, should upgrade the code up to the baseline version in order to support some kind of field tests. A Joint Ukrainian-American Control Board has been created to coordinate AIMAS software development. Some very important changes that should be made in the AIMAS code have already been identified and they include the following:

- Development of isotope composition calculation algorithms taking into accounts all the specifics of every facility.
- Revision of data import/export functions from/to the text files.
- Implementation of quality control for AIMAS input data.

The Control Board should develop all technical specifications, implementation of which would bring the AIMAS code in compliance with the requirements of facilities. The technical specifications will be approved according to procedures established in Ukraine and GKTC will perform the functions of a coordinator.

NONDESTRUCTIVE ASSAY OF NUCLEAR MATERIALS

Up to now all the NDA aspects have been highlighted only theoretically during the training courses. Although the Kiev Institute's Research Reactor was supplied by γ -spectroscopy systems for U enrichment measurements, taking into account not only our limited training abilities, but also the absence of well-prepared premises and proper conditions, no practical training has been conducted yet. It is a big problem for Ukrainian MC&A systems, since no measurements have been performed due to lack of required equipment, and limited number of trained specialists. This is at odds with the Regulatory Body requirements that any facility, having power or research reactor, should perform both input and output control of the nuclear fuel every time material is received from the supplier or shipped to the reprocessing plant abroad. Moreover, there is no means to measure any nuclear materials in less than significant quantities out of sites, as it has been defined by IAEA. One expects that all these problems will become even more severe after Additional Model Protocol implementation.

In anticipation of these problems, in 2003 a decision was made to create new NDA training laboratory with the help of US DOE and its Los Alamos National Laboratory. As a result, three rooms in the Research Reactor building were renovated in order to comply with the local regulations and standards. The NDA laboratory has been equipped with state-of-the-art nuclear instruments that substantially increase the GKTC training capabilities. The major instruments include two spectrometers with HPGe detectors (the coaxial and the extra range ones, so both FRAM and MGAU codes can be used for U enrichment measurements), two NaI gamma spectrometers and an Active Well Neutron Coincidence Counter. In addition, a set of low-enriched uranium isotopic standard (SRM 969) has already been provided and a set of high-enriched uranium isotopic standard (CRM 146) is going to be provided soon for gamma spectrometry measurements. The first NDA training course has already been scheduled for September 2004.

Furthermore, in order to increase the efficiency of NDA laboratory use, there are plans for it to be exploited not only for the training purposes, but also for the program of interdiction of the illicit traffic of nuclear materials in Ukraine as well [3]. Both γ -ray based and neutron based assay techniques could be applied. Taking into account that each method has not only its own sensitivity and accuracy, but limits and restrictions as well, the NDA laboratory will allow us to increase the reliability and precision of every expertise made in the framework of the above mentioned program.

SUMMARY

GKTC training abilities will surely increase after NDA Training Laboratory establishment. A number of new MC&A training courses will be developed and adopted to Ukrainian conditions and Computerized MC&A System will be developed in Ukraine on the base of AIMAS. This is especially important since Additional Model Protocol should be implemented soon.

At the same time, though some of GKTC instructors have already obtained the advanced MC&A training at Los Alamos National Laboratory, most of them will also attend a number of training courses at Russian Methodological and Training Center in Obninsk this year. All this has become possible due to support from the US DOE and will greatly help to raise the professional level of GKTC instructors.

Another possibility and opportunity chance to improve the professional skills of both GKTC instructors and MC&A specialists in Ukraine are Ukrainian MC&A Conferences. The first Ukrainian MC&A Conference was organized and held in November 2003 at the GKTC. In addition, the conference marked the 10th anniversary of the US – Ukrainian agreements to cooperate on nuclear threat reduction and the 5th anniversary of the establishment of the GKTC. Representatives from the US Embassy/DOE Office and the Ukrainian Government have participated in this event. During the Conference, a desire was expressed by the participants to hold such MC&A conferences every year. This year, the MC&A Conference will be held at Zaporozhskaya NPP, and next year - at South Ukraine NPP. These annual Ukrainian MC&A Conferences will foster the opportunity to discuss all the problems encountered and their solutions and simultaneously get much better feedback, obtaining and collecting comments, suggestions and recommendations for future activity at GKTC in order to promote and improve the nuclear material management culture in Ukraine.

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