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Russian Navy Fresh Fuel MPC&A Training

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Abstract

The goal of the Russian Navy Fuels Program is to incorporate nuclear fuel that is in the custody of the Russian Navy into a materials protection, control and accounting program. In addition to applying MPC&A upgrades to existing facilities, a program is underway to train site personnel in MPC&A activities. The goal is to assure that the upgraded facilities will be managed, operated and maintained in an effective, sustainable manner. Training includes both the conceptual and necessary operational aspects of the systems and equipment.

The project began with a Needs Assessment to identify priorities and objectives of required training. This led to the creation of a series of classes developed by Kurchatov Institute. One course was developed to allow attendees to get a general understanding of goals and objectives of nuclear MPC&A systems in the context of the Russian Navy. A follow-on course provided the detailed skills necessary for the performance of specialized duties. Parallel sessions with hands-on exercises provided the specific training needed for different personnel requirements. The courses were presented at KI facilities in Moscow.

This paper will review the work to date and future plans for this program.

Introduction

The Training Project is part of the U.S.-Russian Federation Materials Protection, Control, and Accounting (MPC&A) Cooperative Program to protect Russian Navy Fuels. The goal of the overall program is to upgrade the physical protection and item accountancy of the fuel assemblies of Russian Navy reactors. The program will upgrade the land-based storage of Russian Navy fresh fuels, the floating platforms that are used for fuel storage and reloading to Russian Navy reactors, and inter-site land transportation. Two land-based fresh fuels storage facilities and three floating platforms have been chosen for immediate MPC&A upgrade. Specific instructions for operating and maintaining upgraded MPC&A systems will be prepared for each of the facilities.

An important facet of the program is training development. Training will help ensure effective, long-term operation and maintenance of MPC&A systems. A goal of the training program is to instill in managers a culture of sustainable commitment to MPC&A through the

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understanding of its principles and philosophies. In addition, it will help ensure that upgrades are effectively utilized and maintained by training operators and maintenance personnel.

Background

The Russian Navy (MPC&A) upgrading project started in March 1995 with a request from the commander-in-chief of the Russian Navy to the Kurchatov Institute Russian Research Center (KI RRC) to cooperate on MPC&A upgrades for Russian Navy nuclear fuels storage and handling. Possible U.S. cooperation in this work was also suggested. After several communications and meetings on the working level, the U.S. Secretary of Energy, the Russian Navy representative, and the President of KI RRC issued a joint statement on the subject in July 1996. This statement announced that "the Russian Ministry of Defense and United States Department of Energy decided to jointly cooperate to ensure the highest possible standards of control, accounting, and physical protection for all storage locations of the Navy of the Russian Federation, containing fresh highly enriched uranium fuels for naval nuclear reactors." This effort would be conducted through the MPC&A program. The Russian Navy MPC&A program was formally initiated in response to this joint statement.

Needs Assessment

The Russian Navy training project is implementing a training program so that management and operational and support staff responsible for MPC&A activities will understand both the theoretical and the necessary operational aspects of the systems and equipment. The first phase of this project was an assessment of the current training needs. A formal needs assessment study was undertaken to identify the training objectives, the number of trainees, the skills required, and the resources necessary to meet those objectives.

The following training objectives were identified:

1. Train specialists that will be working at the first of the sites to be upgraded so that all the new equipment being operating under new criteria and requirements will be used effectively.
2. Train specialists from other sites that are to be upgraded.
3. Train supervisory and inspection personnel to perform their required duties.
4. Maintain an on-going capability to train new personnel and refresh or enhance the skills of existing personnel.

A short-term program was identified to address the first two objectives. The number and functional purpose of the facilities where MPC&A systems were to be installed were identified. The skill sets necessary for the effective operation of MPC&A systems at each type of facility was established. The numbers of persons and the required skill sets needed immediately were determined. The scope was then broadened to include support facilities and inspection functions. These facility functions are as follows:

- land-based storage facilities with fresh and irradiated nuclear fuels,
- floating platforms with the storage facilities for nuclear fuel on board,
- nuclear material control and accounting services in the Regional Departments at the Northern and Pacific Fleets,

- nuclear material control and accounting services at the Main Technical Office of the Russian Navy,
- inspection by the State Supervision of the nuclear and radiation safety of the nuclear power installations of the Russian Navy.

The necessary MPC&A skills for various experts in these organizations are different. The following specialization profiles were created to cover the range of skills necessary:

- personnel implementing daily accounting of nuclear materials at the land-based storage sites and floating platforms,
- personnel responsible for the operation and maintenance of physical protection equipment and systems at the land-based storage sites and floating platforms,
- experts in the field of computer technologies,
- personnel directly implementing MPC&A in the Regional Technical Departments and Main Technical Office,
- personnel involved in inspection activity.

Descriptions of competencies as well as curricula outlines and description of training materials were developed for each profile. Training materials from the Russian Methodological Training Center (RMTC), the Moscow Engineering Physics Institute (MEPhI), and other sources that were appropriate to the various curricula were identified.

Completed Courses

Based upon the results of the original needs assessment, a series of two courses (two-weeks long) has been developed and presented. The first course, held in the fall of 1998, presented the fundamentals of nuclear material control and accounting and physical protection. The second course, held in the spring of 1999, provided a detailed study of methods and equipment providing MPC&A at Navy facilities. There were 25 attendees of the first course, all of which were invited to the second course. The 20 participants in the second course had all taken the first class.

Fundamentals of MPC&A for the Russian Navy

The fundamentals class consisted of approximately 80 hours of instruction that included both class lecture and practical training at various facilities. Included in the demonstrations to attendees were:

- the automated accounting and control system of nuclear materials in the Central Storage Facility,
- the laboratory of remote monitoring technologies,
- the physical protection system in Building 116.

In addition, attendees visited ELERON for the demonstration of modern physical protection instruments and equipment. Attendees were very interested in a more detailed study of instruments and equipment of nuclear material MPC&A.

The course on the study of computerized accounting and control systems provided for a brief theoretical study of such systems in general, and of KIMACS in particular, as well as practical sessions using the computer. Because only one computer was available for this purpose, it was not possible to conduct detailed training, but all attendees got a general idea of computerized

accounting and control systems. A brief introduction to bar code technologies was presented. The course included discussion of regulatory documents on MPC&A of nuclear materials at Russian Navy facilities. Representatives of the Central Technical Department together with organizers of the courses conducted two discussion sessions on these documents. This was very useful for people from the Navy and KI RRC who develop these documents since representatives of many Naval facilities (and not only office employees) participated in these discussions; the representatives made a number of useful comments related to real situations at facilities. The complete list of discussion topics is as follows:

1. Fundamentals of nuclear material accounting and control
    - MC&A principles
    - Methods of non-destructive analysis of nuclear materials
    - Nuclear material accounting
    - Physical inventory taking
    - Nuclear material access control
    - Concise glossary
    - Concise description of equipment for non-destructive analysis
2. Physical protection of nuclear materials
    - Definition of a possible threat
    - Physical protection systems
    - Exterior detectors
    - Interior detectors
    - Entry control systems
    - Access delay
    - Response
    - Communication of response forces

The manual that was distributed to all attendees covered each of these topics and included material beyond that introduced in the lectures. In addition to the instruction manual, the following documents were distributed and discussed:

- *Temporary Guide on Accounting, Control and Physical Protection of Nuclear Materials in the Russian Navy*
- Extracts from the *Draft Guide on the Physical Protection of Nuclear Materials, Nuclear Facilities, and Nuclear Material Storage Locations in the Russian Navy"*
- *"Compilation of Federal Regulatory Documents Related to Nuclear Activities"*
- *"Automated System of Accounting and Control of Nuclear Materials, Radioactive Substances and Radiation Sources of KI RRC (KIMACS)*. This system will be installed at Russian Naval facilities.

Upon completion of the course, all attendees were subjected to oral examinations on the entire curriculum. The exams covered only general subjects of MPC&A of nuclear materials and did not include details. Attendees demonstrated a good knowledge and were ready to continue the training at the next, more detailed course. All attendees received certificates on the completion of the training course on nuclear material MPC&A fundamentals at Kurchatov Institute.

Following the course, attendees presented their comments on the organization and conduct of the first training course and wishes regarding future courses. Among other comments, there were suggestions to develop a more detailed course taught in two, or even three, individual groups to provide specialization and detail. The importance of inviting the same attendees to the following, more detailed course was noted. This eliminates having to repeat material to allow new students to catch up so that the second course can start immediately with detailed instruction for in specialized topics. Each of these courses will be prepared separately, including curricula and manuals.

Detailed Methods and Operations for MPC&A at Russian Navy Sites

The objective of this second training course is to prepare Naval personnel to work independently in their particular area of MPC&A at Naval facilities. All attendees had successfully completed the previous fundamentals course. The attendees were divided into two groups, either materials accounting and control or physical protection, depending upon their major work responsibilities. Participants involved in supervisory activities attended the classes of their interest. The development of the curriculum for this class took into account the experience and comments of the instructors and attendees of the first course. As with the first course, material from RMTC and MEPhI was incorporated where appropriate.

In this class much attention was paid to practical sessions and student participation. A flexible format was maintained, allowing the instructors to test progress as the class progressed and adjust the content to address any deficiencies that arose. Examples and exercises were developed with the first of the Naval facilities to be upgraded in mind (land-based and floating platforms).

Trainees in the nuclear materials accounting and control group had practical sessions in measurements and measurement data processing at the KI Central Storage Facility. Practical sessions were held on the preparation of accounting records and reports using a computerized system. The training process for this group included the following topics:

- legislation and regulatory basis at the federal, ministerial, and facility levels;
- review of accounting and control systems in the fuel cycle with emphasis on implementation in the Russian Navy;
- principals of MC&A organization at Russian Navy facilities, including material balance areas and key measurement points (examples were taken from land-based sites and floating platforms);
- methods of containment and surveillance at Russian Fuel facilities, including remote monitoring technologies, methods of non-destructive analysis, statistical processing of measurement results, and bar code technologies;
- preparation and conduct of physical inventory, analysis of possible errors and means of correction (examples were taken from land-based sites and floating platforms);
- computerized system of MC&A for the Navy, including system operation and maintenance of records and reports;
- management and supervision of MC&A at the level of a Naval facility, including verification of records and reports and conduct of inspections.

Attendees in the physical protection group participated in practical sessions in KI buildings 116 and 106 where the Eleron ZIRCONIUM system is employed. They also received practical training at Eleron on the EVRIDICA system that is employed on the land-based naval sites. The following topics were included in the physical protection curriculum:

- legislation and regulatory basis for physical protection at the federal, ministerial, and facility levels;
- terms and definitions;
- design and organization of physical protection systems (using as examples land-based sites and floating platforms), including threat assessment and generation of theft scenarios, adversary models, possible consequences and risk assessment;
- quality indicators and optimization methods for physical protection systems;
- integrated PP systems, including equipment certification;
- use of computer technologies in evaluating physical protection at Russian Navy facilities and the role of human factors.

The second Russian Navy training course, Detailed Methods and Operations for MPC&A at Russian Navy Sites, was well received by both attendees and the Navy command. The success of this and the first class, Fundamentals of MPC&A for the Russian Navy, have resulted in plans to repeat this series to another set of trainees with classes planned for the fall of 1999 and spring of 2000.

Future Plans

Activities at Kurchatov Institute

The two-course instruction series discussed above will be revised to reflect experience and comments of instructors and attendees from the first presentations, and they will be repeated in the fall and spring of 1999 and 2000 respectively. In the meantime, an update of the needs assessment study is underway. As with any endeavor, with time come changes in conditions, priorities, and perceptions. We learn from what we have done. Now is a good time to review the assumptions and parameters of the original needs assessment and make whatever course corrections appropriate. Plans are also underway for developing a specific course for inspection personnel and possibly another for supervisory personnel.

MPC&A Training at Naval Training Center

Plans are underway and funds have been allocated in the FY2000 MPC&A budget to incorporate MPC&A training into the curriculum at a Naval Training Center. This facility will become the primary location for a sustained naval MPC&A training program. A full complement of training hardware to simulate operations at the upgraded naval sites will be included.

The training center staff has prepared a report providing the details of the proposed program. A comprehensive list of occupational skills has been generated. Five groups of trainees have been identified and the skill mix required for each has been identified. From this matrix, five curricula result. The overall training process has been described, and required equipment has been identified. Acquisition of equipment will begin early in FY2000.

Conclusion

The Russian Maritime Fuel project is a major component of the US-Russian Federation MPC&A cooperative program. The training component is key to establishing and maintaining effective oversight, operation, inspection, and maintenance of the upgraded systems. Kurchatov Institute has developed the objectives, requirements, and implementation plan to provide qualified MPC&A operation, maintenance, and management personnel for the upgraded naval facilities. The first series of courses has been successfully presented and evaluated. An updated needs assessment is being performed to take into account programmatic changes and experience acquired to date. A second updated presentation of the series is being planned, taking into account the experience from the earlier classes and the revised needs assessment.
A permanent MPC&A training facility is being incorporated into a Naval Training Center. The curricula and presentation experience gained through the courses developed at KI will be transferred to the new facility.

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