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V. Poplavko, V. Skorkin, G. Myakishev, A. Ilyantsev, V.
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Hirschi, P. Russ III, C. Scherer-Katz

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The MC&A Council at SSC RF - IPPE as a Coordinating Body for System Sustainability

V. Poplavko, V. Skorkin, G. Myakishev, A. Ilyantsev, V. Efimenko (IPPE)
L. Fishbone, J. Valente (BNL), T. Hanley (DOE NNSA), E. J. Hirschi (PNNL),
P. Russ III (LLNL), C. Scherer-Katz (LANL)

Abstract

The State Scientific Center of the Russian Federation - Institute of Physics and Power Engineering's (SSC RF - IPPE) practice of nuclear material control and accounting (MC&A) has undergone significant changes during the period of cooperation with U.S. national laboratories from 1995 to the present. These changes corresponded with general changes of the Russian system of state control and accounting of nuclear materials resulting from the new Concept of the System for State Regulating and Control of Nuclear Materials (1996) and further regulatory documents, which were developed and implemented to take into account international experience in the MC&A [1]. During the upgrades phase of Russian-U.S. cooperation, an MC&A laboratory was specially created within the SSC RF - IPPE for the purpose of guiding the creation of the upgraded MC&A system, coordinating the activities of all units involved in the creation of this system, and implementing a unified technical policy during the transition period.

After five years of operation of the MC&A laboratory and the implementation of new components for the upgraded MC&A system, it was decided that a greater degree of attention must be paid to the MC&A system's operation in addition to the coordination activities carried out by the MC&A laboratory. To meet this need, an organization for operation of the nuclear material (NM) control and accounting system was created as part of the Division of NM Transportation and Storage.

It was also recognized that a new mechanism was required for effective coordination of MC&A activities in IPPE, including the implementation of a unified MC&A policy in methodological, technical and practical areas. This mechanism should allow the IPPE management to gain an objective evaluation of the MC&A system status and provide leading specialists with objective recommendations on maintenance of MC&A system and on basic directions for further improvements. Preliminary discussions indicated that such a mechanism could be created through the establishment of an MC&A Council at SSC RF- IPPE.

The MC&A Council has been created in SSC RF - IPPE as an advisory body without administrative functions. However it is stated in the Council Regulations that if the IPPE Director General or his Deputy responsible for NM control and accounting approves Council recommendations, the recommendations become obligatory. In this paper, the experience of the Council and its initial activities are presented and discussed in, as are possible activities and roles the Council could play in the future.

1. Introduction

IPPE has been involved in material protection, control & accounting (MPC&A) cooperation with the U.S. Department of Energy's National Nuclear Security Administration (DOE NNSA) since 1995. The main objective of this joint DOE NNSA-IPPE cooperation is to reduce the risk of theft or loss of IPPE's weapons-usable nuclear material. Since the start of

cooperation, IPPE staff members have worked with support from the U.S. Project Team to improve the security of IPPE's attractive nuclear material by consolidating it into fewer locations and by installing physical protection and MC&A upgrades at IPPE facilities containing the material. During late 2002, IPPE and the U.S. Project Team began working on a strategy to foster long-term effectiveness of the overall MPC&A system at IPPE. Ensuring the "sustainability" of the MPC&A system at IPPE will be the primary focus of the joint U.S.-Russian project team over the next several years.

Coherent sustainability planning is a necessity for each joint project team working to improve MPC&A at Russian Federation nuclear sites. DOE NNSA has developed an approach for joint project teams to facilitate effective, long-term operation of MPC&A systems based on several key elements: 1) site MPC&A operational plans establishing management structures to support effective MPC&A operations; 2) operational procedures to minimize variation in MPC&A operations; 3) a human resource management system to provide well-trained personnel to perform MPC&A duties; 4) operational cost analysis to guide allocation of resources for MPC&A operations; 5) a maintenance program to promote continuous operation of MPC&A systems and to minimize downtime; 6) a performance testing system that helps ensure that MPC&A systems remain effective; and 7) a configuration management system to ensure that continuity of the MPC&A system is maintained through changes in site operations.

Based on experience at U.S. nuclear sites, an independent MPC&A organization is one of the critical components of sustainable long-term operations. An independent MPC&A organization is necessary to coordinate and oversee coverage of the key sustainability elements, and permits effective MPC&A by planning, coordinating, implementing, testing, and evaluating MPC&A operations. In principle, an effective MPC&A organization has authority to carry out all aspects of MPC&A duties and is sufficiently independent from other site organizations, such as those with production responsibility. The MPC&A organization should have clearly defined roles and responsibilities for all personnel in charge of physical protection, nuclear material accounting and control activities, transportation, protective forces, and other operations personnel. Additionally, the MPC&A organization should have a mechanism for coordinating activities between each facility's MPC&A organization and other entities responsible for nuclear operations.

The MC&A Council represents IPPE's approach to providing oversight with respect to material control and accounting requirements in a cost-effective manner in light of present resource constraints. The Council is drawn from senior staff members of key material balance areas (MBAs), the head of the central storage and transportation organization and a representative of IPPE's internal security organization, and fits well with the sustainability goals by providing an oversight organization as well as a forum for review of issues such as regulatory changes or allocation of site funding for MPC&A. IPPE intends gradually to expand the role of the MC&A council to act as the liaison to the site's organizations responsible for physical protection to better coordinate physical protection and material control and accounting measures.

2. Specific features of MC&A system development at in SSC RF - IPPE.

The transition from the upgrades phase of MPC&A cooperation to the sustainability phase of effective, long-term system operation corresponding to requirements of regulatory documents is marked by several characteristics. First, the system is considered to be complete, requiring

no significant changes and therefore no significant financial and material investments. It is assumed that financing is only required for system operation and maintenance, so financing is limited to a lower level than at the upgrade stage. Second, during the system sustainability phase, more effective coordination of functioning of various components in the system must be ensured than at the stage of improvement implementation, when the major attention was paid to the upgrade of separate elements of the system rather than to their interaction. Third, while operational experience is accumulated, the need for corrections in the system will most likely arise. When operating with limited resources, a very careful consideration of the proposed changes should be carried out before any decision is taken about their implementation.

Taking into account these features of the transition to sustainable operation of the system, various options were considered in the IPPE for ensuring coordinated operation of various components of the system and pursuing a unified policy in methodological, technical and practical areas of nuclear material accounting and control.

IPPE's nuclear material control and accounting system reflects the specifics of NM handling at the institute. At most IPPE facilities, the attractive nuclear materials such as plutonium and highly enriched uranium are used or stored in item form. There are very many such items at the site. Major operations performed with these items include their movements within MBAs and between MBAs. In addition, in MBAs where nuclear material processing and reprocessing of irradiated fuel is carried out, nuclear materials in bulk form are also handled [2].

Within the framework of cooperation with the DOE NNSA U.S. national laboratories, computerized material accounting systems were created, equipment for NM weight, non-destructive measurements and bar coding was received and installed, reference materials of the enterprise level were manufactured, regulations of both the site level and the MBA level were developed, and major MC&A system procedures were implemented in the most significant MBAs [3]. At the stage of sustainable operation of the system, it is necessary to ensure effective operation and maintenance as well as well-defined interaction of the subsystems.

Two levels of the MC&A system can be distinguished at IPPE – the site level and the MBA level. During the system upgrade phase, the coordination functions of the site level were performed by the Laboratory of Nuclear Material Control and Accounting, a part of the specially created division for development in the areas of material protection, control and accounting. As new components of the improved MC&A system were implemented, and in accordance with “Regulations on the State Control and Accounting of Nuclear Materials” approved by RF Government Decree No. 962 in December 2000, it became necessary to designate a unit responsible for the system's operation. According to the decision of the IPPE directorate, the unit for operation of the nuclear material control and accounting system was created by late spring 2002 within the Division of NM Transportation and Storage.

Also, significant experience in the improvement of NM control and accounting systems was accumulated in those MBAs where corresponding activities were carried out in cooperation with U.S. national laboratories. It is desirable to use the expertise of personnel from those MBAs in the interests of IPPE as a whole.

3. Problems of MC&A system assessment and coordination of system operation at the sustainability stage

For sustainable operation of the MC&A system, it is necessary to ensure that a number of conditions and requirements are met and a number of problems are solved, including:

- maintenance of the system of regulations both at the site level and the MBA level;
- maintenance of the information system for nuclear materials of the site, including both accounting documents and the computerized material accounting system, which also provides timely reporting information;
- availability, effective operation, timely maintenance and repair, as well as periodic upgrade of equipment for the MC&A system and its major subsystems (measurements, automated data collection, containment and surveillance equipment or methods, etc.);
- training and periodic retraining of personnel involved in operation of the MC&A system, and ensuring continuity of knowledge and experience transfer during replacement of personnel;
- timely controlled realignment of MC&A system configuration in the event of changes to the NM handling scheme at IPPE or changes of regulatory requirements at the federal or agency level.

Successful resolution of the aforementioned problems presupposes that information about the functioning of the MC&A system is regularly collected, integrated and analyzed. As a result of the analysis and corresponding assessments, areas of the system where the system effectiveness does not meet regulatory requirements should be revealed. The analysis will also indicate areas where the corresponding regulatory requirements can be met with less cost and effort than currently expended in the system. On the basis of the analysis and assessment results, management decisions should be taken to correct under-performing components of the system or to change site or MBA level regulations or procedures intended for better balancing of the system.

In order to ensure a high level of system operational analysis and assessment as well as effective coordination of activities, one desirable approach is to assign these functions to an independent unit that has no responsibility for nuclear material storage or handling. Another approach for ensuring this can be periodic review by many specialists from MBAs who work in various MC&A areas, as well as representatives of IPPE management units. This latter approach was recognized as more appropriate for IPPE's situation.

4. Organization of the MC&A Council of IPPE

Taking into account the aforementioned discussions, it was decided that the creation of an MC&A Council could resolve the problems of the assessment of the MC&A system and development of recommendations for corrections of system problems at the stage of transition to sustainable operation. Special attention was paid to Council staff who could ensure a comprehensive representation of positions and opinions of various IPPE units on major MC&A issues and on objective review of problems of system function.

The following major directions of the Council activities were determined for the stage of transition to sustainable operation of the MC&A system:

- guaranteeing support for reliable and effective management of the MC&A system both on the site level and on each MBA level,
- achieving sustainable operation of the MC&A system, and
- pursuing a unified methodological, technical and practical policy in the MC&A area.

In addition to MC&A system analysis and assessment, the Council tasks include:

- recommendations on development of new regulations, on the use of new measurement techniques and technical means, new TIDs, MC&A system procedures, personnel training programs, and improvements of organization of activities; and
- analysis of anomalies in the MC&A system and development of proposals and recommendations on preventing the anomalies, and
- generalization of working experience, accumulated in MBAs, with the goal of disseminating the most successful methods for resolving problems to all IPPE units.

In accordance with an order of the IPPE Director General, the Council consisting of 15 specialists was created in 2003. Among these, four specialists represent the division of nuclear material transportation and storage (including the site-wide department for operation of the MC&A system), four represent the division of MC&A system development, and four represent typical MBAs. One representative from the security division and one representative from the division of administration for operation and production (which coordinates the operation of experimental facilities) have also been included. The chairman of the Council is the Deputy Chief Engineer for operation. The Council activities are supervised by the Deputy Director General – Chief Engineer of IPPE, who also supervises NM control and accounting at IPPE.

The tasks and functions of the Council, as well as methods for its work and the, frequency of Council meetings, are expounded in the Council Regulations. The Council is an advisory body without any administrative functions. In addition to the permanent members, other specialists from IPPE units can be recruited for Council activities if they are experts in the areas corresponding to the problems under consideration. Participation in Council work of the representative of the security division, which is responsible for physical protection issues, is to provide an interaction on the site level of the MC&A system and physical protection system. The chairman of the Council must report at least once a year to the Deputy Director General – Chief Engineer of IPPE about the Council activities.

5. Initial activities of the MC&A Council

During the initial stage of its activities, the Council paid much attention to various organizational problems, whose resolution was necessary for the normal functioning of the Council. A plan of Council activities to the end of the year 2004 was prepared and approved. In addition to the Council chairman, two of his deputies as well as the Council secretary were nominated. The different members of the Council are primarily responsible for (and have practical experience with) the following working areas:

- organization of NM control and accounting in MBAs with un-irradiated nuclear materials in item form, including carrying out NM physical inventory taking (PIT) in such MBAs;
- organization of NM control and accounting in MBAs with un-irradiated nuclear materials processing, including carrying out NM PIT in such MBAs;
- organization of NM control and accounting in MBAs where irradiated nuclear material reprocessing or storage are performed, including carrying out NM PIT in such MBAs;
- organization of NM control and accounting during movements of nuclear materials between various IPPE MBAs as well as during inter-site NM shipment and receipts;
- organization of NM storage;
- NM measurement programs within the MC&A system, including the site-wide measurement control program;
- program of using tamper indicating devices;
- identification of MC&A system objects and automated data collection in the system;
- integration and analysis of information in the MC&A system;
- threats to nuclear materials, use of information security standards in the MC&A system and links with the program of MC&A culture enhancement;
- issues of interaction with the physical protection system and emergency PITs;
- interaction of the MC&A system with operational departments of the experimental facilities.

In addition to organizational questions, other issues essential for functioning of the IPPE MC&A system were considered in accordance with the working plan of the Council. Foremost among these were the results of PIT in major MBAs obtained during the annual site-wide PIT, the start of activities of the unit for operation of the MC&A system (within the Division of NM Transportation and Storage), and consideration of site-level draft regulations to be revised in accordance with new federal and agency level regulatory documents.

Formation of the MC&A Council activities in IPPE is carried out with the support of US national laboratories and DOE-NNSA. Representatives of the U.S. side of the joint U.S.-IPPE team observed one Council meeting and can provided comments about the Council's work.

6. Planned directions of the future Council activities

In the immediate future, more of the Council's attention will be focused on the issue of sustainable operation of the MC&A system. The Council will analyze a draft plan for sustainable system operation and, after possible revision and approval of the plan, will periodically review how successfully the plan is fulfilled. Some parts of the system sustainability problem will be considered separately, for example job-specific training for MC&A system personnel, which must take into account actual conditions in IPPE MBAs. A number of issues also exist related to the nuclear material measurement system, whose maintenance is one of the key problems to be resolved for ensuring sustainable functioning of the MC&A system.

One of the most important directions of the Council activities should be the periodic assessment of the status and effectiveness of the MC&A system. This year, the problems of development and implementation of corresponding procedures for self-assessment should be

considered, as well as proposed ways for resolving these problems. Criteria for assessment of MC&A system status should be proposed and discussed. Also, procedures for verification of correspondence of the MC&A practice with requirements of regulatory documents and IPPE regulations should be considered. Procedures for testing performance of separate components of the system are currently under development. They should be once more analyzed, discussed at a Council meeting, and used in the future in the process of MC&A system assessment.

The Council will continue to monitor everyday issues of system operation. Late this year, the Council plans to discuss again results of the regular PIT in several MBAs, as was done last year. Since PIT is a complex activity to which most of the MC&A components make their contribution, detailed analysis of PIT results also provides a possibility to assess system effectiveness.

Finally, an assessment of Council activities performed during the year will be performed. Possible corrections will be discussed and introduced to the Council's working methods, and the plan of activities for 2005 will be considered.

Conclusion

The necessity of resolving the problems of transition to the stage of sustainable operation of the MC&A system at IPPE has required changes in organization and coordination of the system operation at the site level. These changes take into account both the necessity of using the MC&A experience accumulated at various IPPE facilities more intensively and the limitations in financial and material support for system operation. On the basis of these considerations, the MC&A Council has been created to ensure an objective assessment of the MC&A at IPPE and to implement a unified methodological, technical and practical policy for the transition to sustainable operation of the MC&A system. In general, the Council has resolved organizational problems and started consideration and discussion of some site level draft regulations to be revised in accordance with new regulatory documents at the federal and agency levels. In the near future the Council will analyze a draft plan for sustainable operation of the MC&A system and, after possible revision and approval of the plan, the Council will regularly assess how successfully the plan is being fulfilled.

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