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ABSTRACT

This paper describes the new directions for the Nuclear Materials Protection, Control, and Accounting (MPC&A) program at the All Russian Scientific Research Institute of Technical Physics (VNIITF), also called Chelyabinsk-70. Chelyabinsk-70 is located in the Ural Mountains, approximately 2000 km east of Moscow and 100 km south of Ekaterinburg.

US sponsored MPC&A work has been underway at VNIITF since mid 1995. During the first three years of the VNIITF project, emphasis was on the Pulse Research Reactor Facility (PRR), which contains one metal and two liquid pulse reactors and associated nuclear material storage rooms and a control center. A commissioning of the PRR was held in May of 1998. With the completion of the MPC&A work in the PRR, new physical protection work has focussed on building 726, which contains a pulse reactor and a criticality facility. Physical protection work is now complete at building 726.

Several changes in the direction of MPC&A work at VNIITF have taken place and others are underway as a result of new DOE Guidelines for MPC&A at Russian Facilities, the National Research Council report issued in late 1999 and other recommendations. A major change is to do MPC&A work only at facilities for which the US can assure the proper categorization of nuclear materials, that upgrades are appropriate, properly installed and operational and that the equipment and funds used to implement and support those upgrades are being utilized in the manner intended. Other changes in direction which will be described include, an increased emphasis on completing inventories, the use of “inherently sustainable” upgrades wherever possible, and completing improved accounting systems and other MPC&A upgrades on a prioritized facility by facility basis rather than attempting to implement them site wide.

INTRODUCTION

The work described in this paper is part of an effort called the Nuclear Materials Protection, Control, and Accounting (MPC&A) Program which was created as a cooperative program between the US and Russian Federation to improve the protection on proliferation of attractive material. The objective of the program is to reduce the risk of nuclear proliferation by strengthening MPC&A systems at Russian nuclear facilities. More specifically the MPC&A program is attempting to make rapid improvements in the protection, control, and accounting of nuclear material, especially weapons-grade materials such as separated plutonium and highly enriched uranium, by having the

US laboratories and Russian institutes and other nuclear facilities work directly and cooperatively with each other.

This paper describes progress to date and some new directions for that portion of the MPC&A program that is conducted at the All Russian Scientific Research Institute of Technical Physics (VNIITF), also called Chelyabinsk-70, which is located inside the closed city of Snezhinsk. VNIITF was established in 1955 as a second nuclear weapons design institute for competition and peer review of the initial Russian nuclear design institute at Arzamas-16. The site contains a number of research facilities which use nuclear material, i.e. plutonium and highly enriched uranium (HEU), as well as assembly, disassembly, and testing of prototypes (pilot samples) of nuclear weapons. Chelyabinsk-70 is located in the Ural Mountains, approximately 2000 km east of Moscow and 100 km south of Ekaterinburg.

HISTORICAL BACKGROUND OF VNIITF SECURITY

Many social-political changes have occurred in Russia since the early 1990s, which have impacted the physical security program at VNIITF. For example, the former Soviet Union emphasized more strict control over individuals. Russia is now in a very different situation, where their diversification activities are resulting in an influx of business and industrial people whose reliability cannot be guaranteed through personnel screening. These changes in addition to the economic difficulties there have caused VNIITF to modify its security systems to apply to this different situation.

The improvement of MPC&A at VNIITF began in 1993 as a result of edicts of the Russian Federation President, government resolutions, and the subsequent Ministry of Atomic Energy, (Minatom) regulatory documents. However, the completion of the planned programs was not easy because of the difficult economic situation in Russia, and the resulting lack of consistent funding. Through agreement between Minatom and DOE, MPC&A cooperation with VNIITF began in 1995. Today all MPC&A work in Russia is managed by the DOE Office of International Material Protection and Emergency Cooperation.

MPC&A ACCOMPLISHMENTS AT VNIITF

After a thorough analysis, VNIITF selected the Pulse Research Reactor Facility, (PRR) at the Experimental Physics area, also called Site 20, for the initial enhanced MPC&A systems implementation. The PRR consists of building 711, which contains one metal pulse reactor, building 712, which contains two liquid pulse reactors, and building 713, which contains a reactor control system. During a meeting with the US laboratories at Lawrence Livermore National Laboratory (LLNL) in early 1995 it was agreed to focus the initial MPC&A work at the PRR, as well as do some work that would be applicable at the entire VNIITF site. The work was divided up into tasks which were prioritized to form a planned approach beginning with a site characterization study and analysis of the existing system followed by system design and installation.

US and Russian personnel shared safeguards and security Vulnerability Assessment (VA) techniques and approaches and obtained some early results by actually applying them to building 711. This included a two-week Vulnerability Assessment workshop conducted jointly in July, 1995,

by LLNL and Sandia National Laboratories (SNL) at VNIITF. In May, 1998 DOE Under Secretary Moniz participated in the Commissioning of the PRR, which was a major milestone for the MPC&A program at VNIITF. The commissioning included all physical protection systems, including an alarmed perimeter fence, and alarm center as well as nuclear material measurement and computerized accounting systems. After the Commissioning VNIITF held a formal demonstration of the improvements for several other Russian nuclear facility representatives.

In early 1998, VNIITF identified the remaining buildings for which MPC&A upgrades would be needed as part of an "Institute-Wide Study of Nuclear Material Protection Control & Accounting Requirements." In addition to the PRR, it included the Research Technological Center (RTC) (buildings 717/718), building 726, and a central alarm station (CAS), all at Site 20, a production building of Trial Production Plant #1, a production building of Trial Production Plant # 2, and one building in the Testing Complex (Site 8). In addition it was proposed to upgrade the personnel access control system, and to build a CAS for the whole facility. It was also proposed to upgrade the video-assessment system at the Technological Site perimeter and upgrade the vehicle entry portals at Sites 8 and 20. VNIITF subsequently requested MPC&A support for a new Central Storage Building.

Physical protection work has been completed at the PRR, the Site 20 entrance, and building 726. The CAS at Site 20 is in pilot operation, and the preliminary designs for the RTC and the Site 8 building upgrades have been completed. The first stage of upgrading the personnel access control system has been completed. An automated central badge office has been in operation since 1998 and automated access control has been implemented at Site 20. The video-assessment upgrade at the Technological Site is underway and the physical protection work at the Trial Production Plant #1 production building will be completed this year.

A nuclear material accounting system is being implemented at eleven nuclear material balance areas at several production sites. It includes integrated electronic weight measurements and bar-code technology. The VNIITF is participating in a pilot project to integrate its nuclear material accounting system with the Federal Information System. VNIITF has developed and tested methodology for inventory taking of large amounts of nuclear material, and performed physical inventory taking at several of their facilities. The design of a new Central Storage Facility is nearly complete, although a decision to support it has not been made.

The MPC&A program has also supported a number of technical and software activities for nuclear material protection. This includes access control booths with a built-in radiation monitor, a hand geometry identification device, control software for the access control systems, and several tamper indication devices.

Minatom has also established the Ural-Siberian Methodology and Training Center, at VNIITF, to train the personnel operating MPC&A systems at facilities within Ural-Siberian region. This, and other training centers, lay out the foundation for long-term self-sustainability of MPC&A systems at Russian facilities.

RECENT DEVELOPMENTS AND NEW DIRECTIONS

Since the commissioning of the MPC&A upgrades in the PRR, and the completion of physical protection upgrades at building 726, new work is focusing on other areas, both inside Site 20, i.e., the RTC (buildings 717/718) and at other locations. Many of the newer facilities are considered more sensitive by the Russian side. Limited or no access to these facilities has posed problems in validating physical protection needs, designing physical protection systems, and obtaining assurance that work is completed according to contractual agreements.

For example, contracts were signed and work began at the production building for Trial Production Plant #1 and at the Technological Site perimeter. DOE has been unable to obtain the needed access and thus required assurances for these new sites. However, it was decided to let work continue under the existing contracts but to not initiate any new contracts until the assurance issue was resolved

It is hoped that efforts to resolve the assurance issue at VNIITF will lead to an increase of U.S. sponsored MPC&A upgrades similar to those at ECP and UEIP in which accelerated "Fast Track" upgrade plans were developed and are currently being implemented. This will allow VNIITF to take a lead role in MPC&A sustainability efforts..

Rapid baseline inventories must be done in order to quickly establish facility inventories and to provide a baseline to design and implement more advanced material accounting and measurement techniques. Inherently sustainable MPC&A upgrades (such as building hardening, bricked windows, concrete blocks, steel cages etc.) will be used wherever possible, and MPC&A upgrades will be done on a prioritized facility by facility basis rather than site-wide.

There has been significant progress in resolving the assurance and other issues through a series of meetings among Minatom, DOE, VNIITF and the US laboratories. A pilot facility has been identified to work through the specifics of the access and assurance issue. The facility that will be used is the Research Technological Complex. It is hoped that once these issues are successfully addressed for the pilot facility, we will be able to resume progress on other facilities at VNIITF and address larger scale projects such as the central storage facility, which would result in the protection of up to 90% of the site's SNM.

SUMMARY

An integrated MPC&A system, consisting of physical protection upgrades, nuclear measurements, and periodic inventories, has been in operation at the PRR since its commissioning in May, 1998. The US has had good access at the PRR and one other facility, building 726, where physical protection upgrades are now complete.

Physical protection upgrades have begun at a third facility, the production building of Trial Production Plant #1, and at the perimeter of the Technological Site. The US side has not had enough access to either of these to provide required assurances. VNIITF agreed to provide before and after photographs and video of the upgrades, and a signed statement by the Institute Director, that the upgrades were made in accordance with the contract. A decision was made last year to allow this

work to continue, since the contracts were in place, but to not implement any new contracts until the assurance issue is resolved.

New MPC&A contracts were halted at VNIITF in late 1999 due to concern about appropriate assurances. Recent meetings among Minatom, DOE, VNIITF and the US laboratories lead us to believe that the assurance issue can be resolved in the near future.

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