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PHYSICAL PROTECTION COOPERATION BETWEEN US DEPARTMENT OF ENERGY NATIONAL LABORATORIES AND SPECIAL SCIENTIFIC AND PRODUCTION STATE ENTERPRISE ("ELERON") OF RUSSIA

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ABSTRACT

US Department of Energy (DOE) national laboratories and Russian institutes are becoming increasingly cooperative in support of nonproliferation of nuclear materials. This paper will describe completed projects, current work, and areas of possible future cooperation between US laboratories and a Russian Ministry of Atomic Energy (MINATOM) entity, Special Scientific and Production State Enterprise (SNPO), henceforth referred to as "Eleron."

The Kurchatov Institute, Eleron, and the US national laboratories jointly completed a physical protection system (PPS) for a facility housing two reactors at Kurchatov Institute within a very short time frame in 1994. Spin-off projects from this work resulted in a US-witnessed acceptance test of the new system adhering to a procedure adopted in Russia, and visits by DOE laboratories' personnel to Eleron's sensor development and test facilities at Dubna and Penza. Eleron was one of the MINATOM sites at which Lawrence Livermore National Laboratory and Sandia National Laboratories (SNL) conducted a vulnerability assessment training course.

Current cooperative projects include additional physical protection upgrades at Kurchatov where Eleron is involved as an installer and supplier of sensors, alarm display, video, and fiber optic equipment. Two additional contracts between SNL and Eleron result in information on Russian sensor performance and cost and an exchange of US and Russian sensors. Russian sensors will be tested in the United States, and US sensors will be tested in Russia. Pacific Northwest Laboratory administers a contract to document the process of certifying physical protection equipment for use at MINATOM facilities. Recent interest in transportation security has opened a new area of cooperation between the national laboratories and Eleron.

Future projects are expected to include Eleron participation in physical protection upgrades at other locations in Russia, pedestrian and vehicle portal development, positive personnel identifier testing, and the exchange and testing of additional equipment. Other physical protection elements, workshops, and software enhancements are also being discussed.

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DISCLAIMER

INTRODUCTION

In 1989, one of the major departments of the Ministry of Atomic Energy (MINATOM) of Russia became a separate organization known as the Special Scientific and Production State Establishment (SNPO), "Eleron," It is still closely associated with MINATOM and continues the work of the former MINATOM department in developing and installing physical protection equipment in high-priority facilities. Additionally, Eleron designs and installs physical protection systems for banks and offices. During Eleron's peak production period, more than 40 plants were involved in producing equipment to Eleron specifications. Currently, about 2,500 experts and specialists work at Eleron: 1,200 in Moscow and 1,300 at other locations such as Penza and Dubna. Including the time Eleron was a MINATOM department, Eleron has 33 years of experience in developing and installing physical protection equipment.

COMPLETED PROJECTS

A new chapter for Eleron began in 1994 when it began cooperating with DOE laboratories in support of nonproliferation of Russian nuclear material. In September 1994, SNL and the Russian Research Center, Kurchatov Institute entered into a contract to improve the physical protection of a building housing two research reactors and nuclear material. The contract specified a physical protection system consisting of perimeter sensors, lighting, video assessment, access control, interior sensors, and alarm communication and display. The system was to be installed between September and the end of December (Figure 1). Eleron was a subcontractor to Kurchatov Institute and also later contracted directly with SNL to purchase video equipment and add a secondary alarm communication and display system at the response force headquarters.

The installation was fully operational on February 24, 1995, when a joint Russian–American system demonstration meeting was held at Kurchatov. US personnel caught the Russian attendees unawares by proposing a US-witnessed acceptance test at the technical level. This detail was inadvertently omitted in the haste of placing the contract and performing the installation during the Russian winter. Additionally, responsibility for the system had been assumed by the Ministry of Internal Affairs. This was a separate agency not enthusiastic about sharing sensitive information with foreigners.

Figure 1. Kurchatov Physical Protection System

Negotiations between Kurchatov Institute, Eleron, the Ministry of Internal Affairs, and SNL resulted in another acceptance test being successfully conducted in May 1995. One pleasant benefit of the testing negotiations was an invitation to DOE laboratories' personnel to visit Eleron facilities at Dubna and Penza.

DOE laboratories' personnel visited Dubna in February 1995. The host organization was Dedal, originally a part of the Joint Institute for Nuclear Research at Dubna. Dedal, in the physical protection business before becoming independent, was acquired by Eleron in 1977. Equipment developed by Dedal includes:

- SIGMA—a capacitive sensor and predecessor to the RADIAN, which is widely used on existing installations in Russia and other former Soviet Union installations
- DELPHIN—a fence vibration sensor
- PRIZNAK—a metal detection booth

DELPHIN and PRIZNAK are manufactured in Dubna. Sensors under development at Dedal include:

- DROZD—a sensor that detects motion of twisted pair cables in the earth's magnetic field
- BAGULNIK—a combination seismic and magnetic buried-line sensor

The DROZD is currently undergoing certification testing.

DOE laboratories' personnel visited Penza in October 1995. The host organization was a branch of Eleron, the Scientific, Research and Design Institute of Radio Electronics (NIKIRET). NIKIRET is the primary developer of microwave and other sensors and systems, including locking devices, for use in Russia. Several types of microwave sensors—LENA, RUTA, PROTVA, KROKUS, GARUS, RLD-94 and DON-M have been developed at NIKIRET.

A 500 x 500 meter fenced and sensored test area (with several buildings) accommodates interior and exterior sensor testing as well as testing to international radio frequency standards including a lightning simulator. In addition to microwave sensors, other sensors were undergoing testing during the visit: the GAZON and URAN both best described as wire guided radar sensors detecting the presence of an intruder near the wires. Especially impressive was the degree of testing and burn-in that production sensors are subjected to before shipment. In addition to climatic chambers where the sensors are subjected to humidity, rain, etc., all exterior sensors are temperature cycled between –60° and +60°C for 120 hours while the sensor is operating.

A recently completed US–Eleron contract resulted in draft and final reports describing 15 pieces of Eleron physical protection equipment. The report, *Survey of the Russian Sensors Used for Facilities Physical Protection*, includes information on sensor type, purpose, environmental specifications, sensitivity adjustment, maintainability, warranty, and cost. Operations manuals are also included for the equipment. This information will be especially valuable in future cooperative projects with Eleron where knowledge of equipment performance is a vital part of physical protection system design.

Two workshops have been conducted at Eleron. The first, a Safeguards and Security Planning Vulnerability Assessment workshop, was conducted June 12–23, 1995 and featured the use of the computer code ASSESS. The students were very enthusiastic and had experience with the SAVI, BATTLE, and ET computer codes. Adapting ASSESS to Russian use is being considered. This would include translating, accounting for specific design basis threats, and developing a database representative of Russian requirements. The students had extensive experience in physical security analysis and design, which greatly aided their grasp of the concepts presented in the workshop. Both workshop participants and Eleron management commented positively on the workshop. Because all of the students were very familiar with the Kurchatov Institute, the gas plant storage facility was modeled during the workshop. As a final class analysis exercise, Eleron management selected a generic site typical of Russian high security facilities. The instructors and students were provided detailed facility information, including its perceived strengths and weaknesses. The facility was analyzed using the methodologies taught in the class, and some important weaknesses were uncovered. The US instructors gained valuable insight and understanding of Russian Material Protection

Control and Accounting (MPC&A) systems and analysis methodologies.

The second workshop, Physical Protection Systems, was held September 11–14, 1995, to encourage Russian information exchange. Approximately 80 attendees participated. Thirty different Russian organizations were represented, and 24 Russian papers were presented. Eleron arranged for an equipment exhibit. American attendees presented five papers (Figure 2), several of which were presented as poster sessions (Figure 3). This was the first such workshop to be held in Russia—it was very successful.

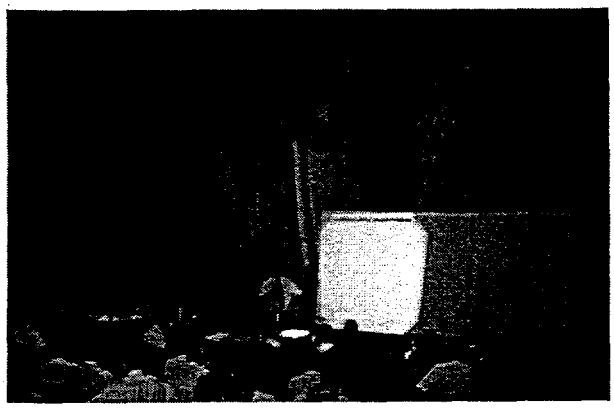


Figure 2. Eleron Physical Protection Workshop

Figure 3. Poster Session at Eleron

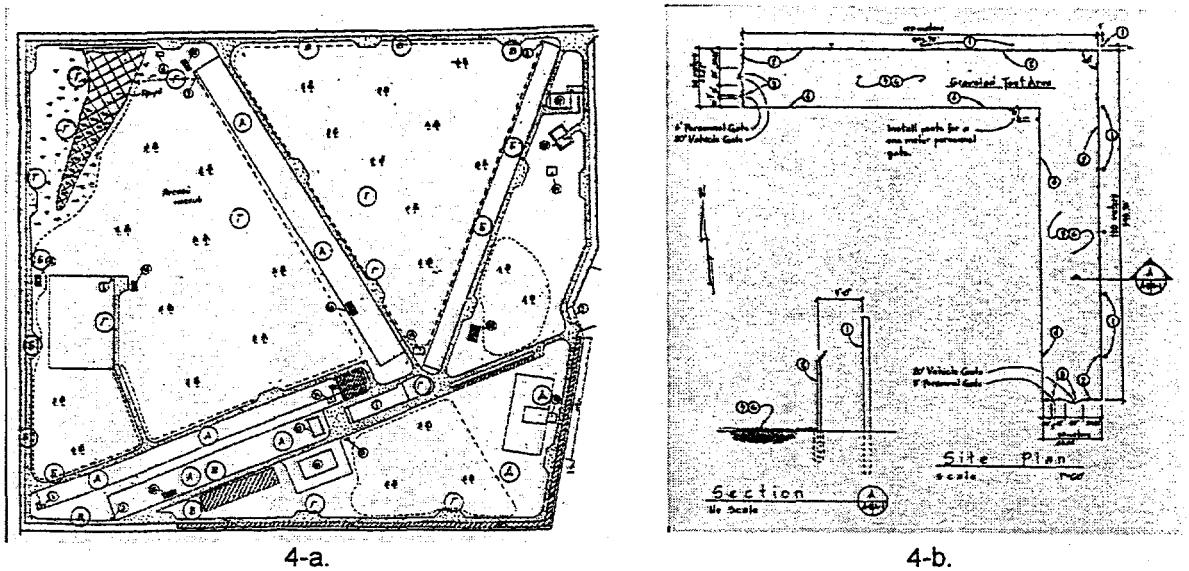
CURRENT PROJECTS

Physical protection upgrades to the Kurchatov Central Storage Facility is another joint venture involving Kurchatov Institute, Eleron, and SNL. In contrast to the compressed schedule of the first Kurchatov project, the Central Storage Facility project schedule evolved into a more orderly pattern. Most physical protection improvements at other Russian institutes are now following this pattern. In this pattern, the first contract calls for a draft design report prepared by the Russian facility for MPC&A improvements. DOE laboratories' personnel then comment on the draft design, and these comments, including a detailed cost estimate, are incorporated into a final design report. Using the final report as a baseline, other contracts are negotiated which may include all or part of the MPC&A upgrades described in the design report.

Installation of the Central Storage Facility upgrade is well underway and should be completed by October 1996. The major physical protection portion of these upgrades is being performed by Eleron. It includes perimeter sensors, lighting, video assessment, access control, interior sensors, fiber optic video transmission and the TSIRKONI alarm communication and display system. This system may be expanded to include future physical protection upgrades at Kurchatov. Eleron is a subcontractor to Kurchatov Institute on this project as well as contracting directly with SNL for video and fiber optic equipment.

An interesting SNL-Eleron contract now in progress involves the exchange of US and Russian sensors: US sensors will be tested at Eleron, and Russian sensors will be tested at SNL. Sensors have recently been installed at each site and testing is underway. The US test area during its preparation is shown in Figure 4-b. Although test plans have been exchanged, each facility has the flexibility to choose testing methods. Quarterly test reports will also be exchanged. It is hoped that this interaction will be successful and result in the exchange and testing of additional equipment. It is feasible that Russian and US equipment may eventually be combined to enhance physical protection.

Certification is required for all equipment before being installed at Russian nuclear installations. It is a very rigorous process. Eleron is approved by GOSTANDART and MINATOM to conduct certification testing in Russia. With the Ministry of Interior, Eleron has jointly developed a series of training courses for proper operation and maintenance of physical protection systems. Special training for technicians and guard force personnel has also been developed.



4-a. 4-b.

Figure 4. A Russian physical protection test area design (a) and a US test area design (b).

Pacific Northwest Laboratory has placed a contract with Eleron to develop organized, streamlined procedures for enhancing the timely certification of physical security systems protecting nuclear materials at Russia's nuclear facilities. This contract is expected to be completed before the end of calendar year 1996.

In late 1995, SNL initiated a small effort to evaluate the security of direct-use materials under the control of MINATOM during the rail shipment of material between the many MINATOM sites in Russia. Previously the US Department of Defense Cooperative Threat Reduction program had addressed the issues of Russian transportation security, but this had been limited to Russian Ministry of Defense-owned weapons. Under contract to SNL, Eleron has produced a conceptual design of an improved security system for transportation named an Automated System. Eleron has also provided a threat analysis, a concept of operation to include the users of the system, a detailed functional design, and a proposal for the demonstration of the Automated System. Eleron personnel worked for four weeks in the United States interacting with DOE laboratories' personnel to jointly formulate a program. A contract was signed in late June for Eleron to produce a version of the Automated System; this work is now in progress.

The joint US–Eleron concept is centered on the addition of security and safety sensors on the railcar, the local display of sensor status to existing railcar security and owner-agency personnel, the addition of access control and delay features on the railcar, the seamless integration of the transport system to the fixed-site MPC&A system, and the remote reporting, perhaps ultimately via satellite, of the location and status of the cargo to a central command and control facility in Moscow. A key feature of the joint proposal is the use of combined Russian and US technology. Three demonstrations are to be conducted during 1996 and 1997 culminating in a demonstration of a complete prototype in September 1997.

FUTURE COOPERATION

As US-Russian cooperation in the nonproliferation effort increases, more and more sites will receive physical protection improvements. The pattern for implementing these improvements heavily involves the site and, in some cases, a subcontractor to the site such as Eleron. The process of getting a good MPC&A design for each site is similar to that described above for the Kurchatov Institute's Central Storage Facility in which Eleron personnel may have the major responsibility for the design, but DOE laboratories have the opportunity to review and negotiate the design.

Locations where this process is taking place with Eleron's involvement include Dubna, Luch, Dimitrovgrad, and Beloyarsk. Although each site

may decide whether to involve Eleron in the physical protection improvement process, US personnel welcome Eleron's participation because of their experience and equipment designed for the severe environment. Equipment documentation written in Russian and the rapid availability of replacement parts are other benefits of using Russian equipment.

Several additional areas of cooperation which have been or are being discussed with Eleron include:

- US participation in Eleron training at the Obninsk training area
- Eleron participation in Russian inspection and evaluation teams to ensure continuing maintenance and testing of installed physical protection systems
- construction of universal pedestrian and vehicle entry control portals
- additional equipment exchange and testing
- upgrade of the TSIRKONI system to allow information transmission over fiber optics

Eleron has also developed a positive personnel identifier which will probably be evaluated by one of the DOE laboratories.

SUMMARY

For 33 years, Eleron has been a major participant in Russian physical protection development and implementation. In its new role as a MINATOM entity, with the rights and functions of a department, it continues positive relations with DOE laboratories in a joint effort to prevent the proliferation of nuclear material. Cooperative efforts include physical protection system design and installation, training and education, technology and equipment exchange, and development of secure material transport. It is hoped that this increased cooperation will continue in these areas and expand into new endeavors.

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