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PHYSICAL PROTECTION UPGRADES IN UKRAINE

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DISCLAIMER

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Abstract
The U.S. DOE is providing nuclear material safeguards assistance in both material control and accountability and in physical protection to several facilities in Ukraine. This paper summarizes the types of physical protection upgrades that have been or are presently being implemented at these facilities. These facilities include the Kiev Institute for Nuclear Research , Kharkov Institute of Physics and Technology, Sevastopol Institute of Nuclear Energy and Industry, and the South Ukraine Nuclear Power Plant. Typical upgrades include: hardening of storage areas; improvements in access control, intrusion detection, and CCTV assessment; central alarm station improvements; and implementation of new voice communication systems. Methods used to implement these upgrades and problems encountered are discussed. Training issues are also discussed.

INTRODUCTION

The work described in this paper is part of the U.S. Department of Energy's (DOE's) cooperative effort with the Ukrainian Government in the area of Nuclear Materials Protection, Control and Accounting (MPC&A). Funds for this program have been provided by the U.S. Department of Defense through the Cooperative Threat Reduction (CTR) initiative and by DOE to enhance the security of weapons-usable nuclear material at civilian facilities in Ukraine.

The U. S. Department of Energy is providing nuclear material safeguards assistance in both material control & accountability (MC&A) and physical protection (PP) to the national regulatory authority and to four facilities in Ukraine. The four facilities are: (1) Kiev Institute for Nuclear Research (KINR); (2) Kharkov Institute of Physics and Technology (KIPT); (3) Sevastopol Institute of Nuclear Energy and Industry (SINEI); and (4) South Ukraine Nuclear Power Plant (SUNPP). General descriptions of the program have been published in the Proceedings of the 36th Annual Meeting [1], the Proceedings of the 37th Annual Meeting[2], and the Proceedings of the 38th Annual Meeting[3].

The United States is coordinating its assistance efforts with other donor states to avoid duplication of effort. U. S. Representative have attended IAEA Coordinated Technical Support Plan meetings as well as meetings with representatives from Finland, Japan and Sweden. Sweden and Japan are actively involved in the physical protection efforts at KIPT. The U. S. effort is centered on the buildings, containing the nuclear materials while Sweden and Japan are upgrading the site perimeter.

The physical protection system installations are currently on-going at all of above mentioned facilities except for the system at KINR which was commissioned in October of 1997. The bulk of the installation activities at the remaining three sites is expected to be completed by the end of this calendar year.

BACKGROUND On December 18, 1993 the document "Agreement between the Department of Defense of the United States of America and the Ukrainian State Committee on Nuclear and Radiation Safety concerning development of state systems of control, accounting, and physical protection of nuclear materials to promote the prevention of nuclear weapons proliferation from Ukraine" was signed by both parties. Commonly referred to as the Implementing Agreement, the document initiated the Safe, Secure and Dismantlement (SSD) or Nunn-Lugar Program in the area of Material Control and Accounting (MC&A) and Physical Protection (PP). In early 1994, DoD renamed the SSD initiative as the Cooperative Threat Reduction (CTR) Program. The Department of Energy, International Safeguards Division and now the Russia/NIS Material Security Task Force is responsible for the MC&A and PP portions of the Nunn-Lugar program. These are separate from other program areas, such as silo dismantlement and export control.

REGULATIONS The system designs are based on international physical protection guidelines. The IAEA information circular, INFCIRC/225/Revision 3, "The Physical Protection of Nuclear Material," is being used as the basis for determining the adequacy of existing physical protection systems and the design of the upgraded systems.

During the past several years, the Ukrainian government has passed a number of Decrees relating to physical protection at nuclear facilities. These include:

1. The Decree of the Cabinet of Ministers of Ukraine №66 of January 27, 1993 "About measures on safe carriage of radioactive substances".
2. The Order of the Cabinet of Ministers of Ukraine №266-p of April 30, 1993 about creation at Ministry of Internal Affairs, in the frame of internal and escort forces, the especial division on protection of means of transport with fresh and spent fuel during it transport within the limits of country and in transit through its territory.
3. The Decree of the President of Ukraine "About measures on physical protection of a nuclear material and nuclear facilities in Ukraine" (№3182-X II).
4. The Decree of the President of Ukraine "About measures on physical protection of a nuclear material and nuclear facilities in Ukraine" №608/93, of 28 December, 1993.
5. "Rules on physical protection of a nuclear material and nuclear facilities", IA 306.802.94 of 12.07.94.
6. The Decree of the Supreme Soviet and Law of Ukraine on February 8, 1995 №40/95-BP, №39/95-BP about the order of commissioning the Law of Ukraine. "About use of a nuclear energy and radiation safety".
7. The Decree of the Cabinet of Ministers of Ukraine. "About use of a nuclear energy and radiation safety" №643 of August II, 1995.
8. The Decree of the Cabinet of Ministers of Ukraine about fulfillment of requirements of article 5 of the "Convention on Physical Protection of a Nuclear Material", №861 of July 30, 1996.

PHYSICAL PROTECTION UPGRADES

The overall upgrade strategy is to provide improved protection against the most vulnerable outsider and insider threats. This usually requires focusing on the protection elements nearest the target. Protection is usually provided in one or more of three forms: barriers (concrete, steel, etc); technology (sensors, cameras, card readers); and manpower (guards). A balanced approach using all three forms has been implemented at all four Ukrainian facilities.

Physical protection systems provide the capability to detect, delay, and respond to adversarial acts, including attempts at theft and sabotage. Systems to accomplish each of these elements have been provided at each site. They include physical barriers, interior intrusion detection and assessment, entry control, perimeter intrusion and detection, voice communication, central alarm station; and guard force training.

PHYSICAL BARRIERS Physical barriers are probably the most important feature in a well balanced system of physical protection. They provide long delays to an attacking adversary and are fairly inexpensive to install and maintain. Because physical barriers are mostly comprised of concrete and metal, they are generally low tech in design and extremely long lasting.

Many different types of physical barriers have been installed at the upgraded facilities. They range from simple door replacements to the installation of a full perimeter fence and vehicle barrier. The protected materials are usually stored in the vault areas and these areas generally provide the best place to install new physical barriers at the lowest overall cost to the project. Vault area enhancements range from the construction of a totally new vault to fortification of the existing vault doors and walls. In some instances, the added protection of heavy metal material tie-downs and vaults within the vault have also been implemented to significantly add to adversarial attack delay times.

INTERIOR INTRUSION DETECTION AND ASSESSMENT Interior intrusion detection and assessment systems are being employed at all facilities. These systems include interior lighting, cameras, and sensors. Generally anywhere that intrusion sensors are installed, video cameras and lighting are included to provide timely assessment and response by the guard force monitoring the system.

Many different types of sensors have been installed at the various facilities for interior protection. These sensors include infrared, microwave, and vibration detection sensors. The majority of all interior wiring is contained in metal conduit and is wired to a local stand-alone control panel to provide system redundancy for protection against system wide failures and power outages.

ACCESS CONTROL Various levels of access control have been implemented at all upgraded facilities. A layered approach was used to vary the level of access depending on the authorization level of the individual. This allows the system to control the number of people who can access the most secure areas. Programming of the system access levels and alarm sequences is password protected to ensure that only the appropriate personnel can change system parameters.

Individuals can gain access to protected facilities with an access card (or badge), PIN, or a combination of both. When both card and PIN are available the system manager can choose the appropriate combination. Particularly sensitive areas, such as access to the vault, have been configured to use two-person access control rules. Both proximity and Wiegand card readers have been implemented depending on facility preference. A significant number of doors have been upgraded at each facility. Door upgrades include hardening the door and installation of card readers, PIN pads, balanced magnetic switches, and magnetic locks.

PERIMETER INTRUSION DETECTION AND ASSESSMENT All of the facilities that are being upgraded in the Ukraine have either an existing perimeter system or a newly upgraded system. Perimeter systems include clear zones, detection sensors, video assessment and recording systems, and vehicle barriers. In some locations, new chain link fences were installed. Newly installed perimeter sensors include infrared curtains, microwaves, E-field, and fence protection systems.

VOICE COMMUNICATION Voice communication systems have also been installed at all facilities. Motorola base stations have been installed in all Central Alarm Stations and hand-held radios have been provided for guards at all locations. In some cases, phone services have also been improved

CENTRAL ALARM STATION Each facility that has been upgraded had a small central alarm station (CAS) that contains some alarm monitoring equipment. However, because of their small size, and sometimes vulnerable locations, new central alarm stations were implemented at all of the sites. Usually, the process consisted of upgrading a secure area within the administrative area of a building. Windows were removed or hardened. Existing doors were replaced with more secure doors. Walls and ceilings were painted. New flooring was usually installed. Utilities were upgraded to provide adequate lighting, heating and air conditioning. Uninterruptable power supplies have also been provided to provide backup for power outages. In addition to the main CAS, a secondary monitoring location has been installed at most of the facilities to provide increased protection and monitoring flexibility.

Each CAS has been provided with a console containing from four to seven bays, depending on system size. The console houses the alarm monitoring, entry control, and CCTV monitoring equipment. The console and the associated electronics at all of the upgraded facilities was provided and installed by Advantor Corporation. A simplified block diagram of a typical system is shown in Figure 1.

GUARD FORCE The guard forces at all facilities are provided by the Ukrainian Ministry of Domestic Affairs Relationships with the Ukrainian guard forces are developing into a very strong alliance and have fostered a good working relationship with all parties involved. Currently, a program is being initiated to further this relationship by involving US guard force representation to help with procedural development and system training issues.

The Ukrainian guard force has been highly proactive in using the new physical protection features installed at the facilities. While they have not fully embraced all of the US concepts, they are using and maintaining the provided systems and are enthusiastically supporting the new training initiatives.

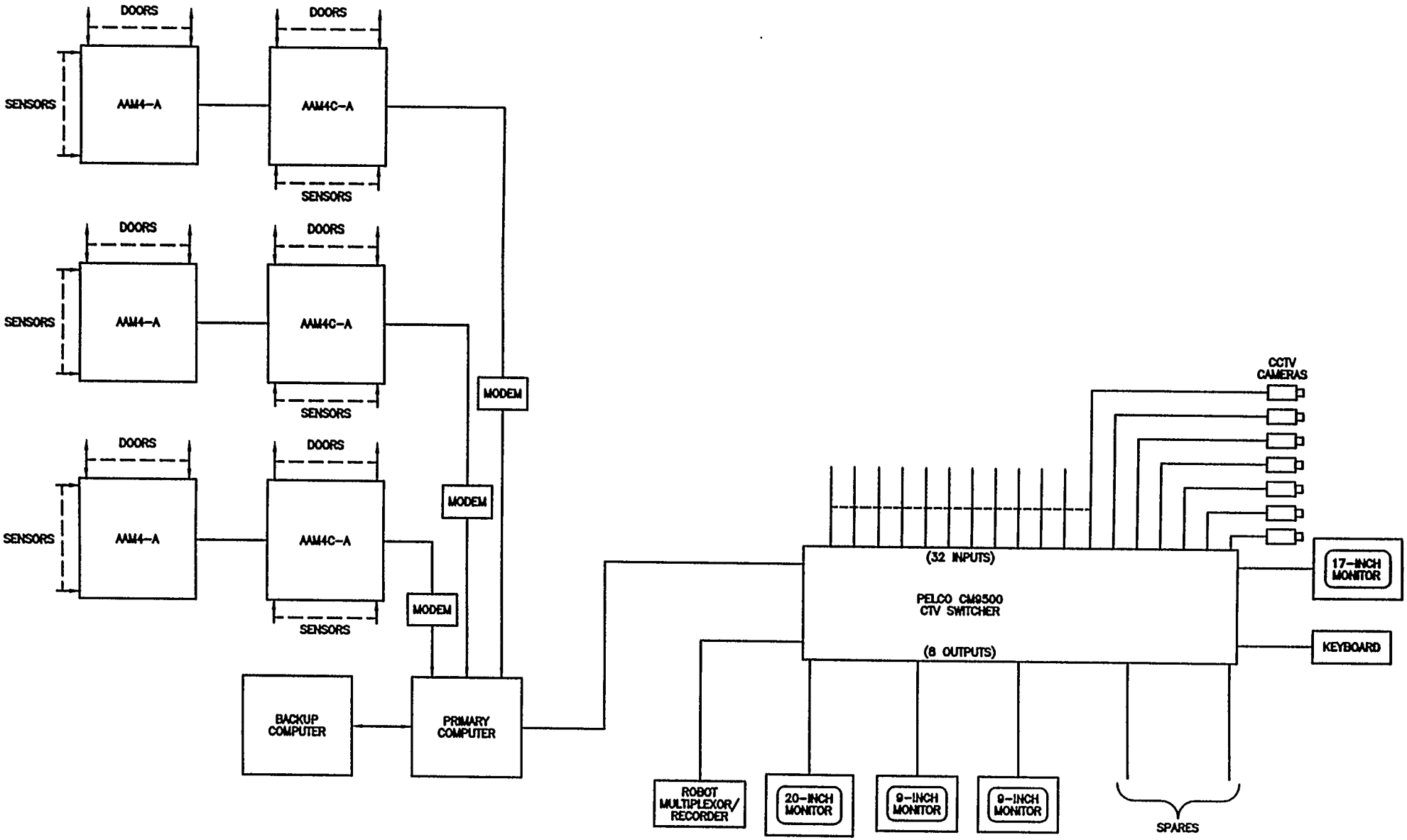

Figure 1. Simplified Block Diagram at Alarm Monitoring Entry control and CCTV Assessment System.

LONG TERM SUSTAINABILITY

Long term sustainability issues have long been a concern of the overall MPC&A program. In Ukraine the main focus of the implemented upgrades has included strong mechanical upgrades of steel and concrete. These mechanical upgrades should be long lasting and easy for the Ukrainian government to maintain. Of course, today's sophisticated alarm and access control systems tend to increase the concerns of long term sustainability.

Because the systems installed in Ukraine have all been standardized on the same manufacturer the long term sustainability issues connected with the maintenance of the electronic systems should be minimized. Long term warranties will be provided by Advantor Corporation to support the systems in the years to come. Currently it is planned to purchase a county wide long term warranty for all of the upgraded facilities in Ukraine.

Other approaches to the sustainability issues include: Strong partnerships with the guard force; continued training for both system managers and guards; maintenance of long term, high integrity relationships; and in-county Advantor support.

CONCLUSIONS

The US and Ukrainian teams have been working together for many years and the system in Kiev has been up and operating for almost a year. A significant amount of experience has been gained on the long term cooperation between the two countries and the long term sustainability of a complicated physical protection system. The teams are very pleased with the results so far and are looking forward to the challenges of completing our installations together in the remaining calendar year.

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