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CERTIFICATION OF U.S. INSTRUMENTATION IN RUSSIAN NUCLEAR PROCESSING FACILITIES

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Introduction

Agreements between the United States (U.S.) and the Russian Federation (R.F.) require the down-blending of highly enriched uranium (HEU) from dismantled Russian Federation nuclear weapons. The Blend Down Monitoring System (BDMS) was jointly developed by the Los Alamos National Laboratory (LANL) and the Oak Ridge National Laboratory (ORNL) to continuously monitor the enrichments and flow rates in the HEU blending operations at the R.F. facilities.

A significant requirement of the implementation of the BDMS equipment in R.F. facilities concerned the certification of the BDMS equipment for use in a Russian nuclear facility. This paper discusses the certification of the BDMS for installation in R.F. facilities, and summarizes the lessons learned from the process that can be applied to the installation of other U.S. equipment in Russian nuclear facilities.

Equipment Certification Process

Background

An agreement was reached between the U.S. and the R.F. in December 1996 laying out the plans for the implementation of the BDMS at the Ural Electrochemical Integrated Plant (UEIP), located in Novouralsk, Russia. Included in the agreements that were reached were the following:

- Agreements in the Annex that any monitoring equipment must meet all applicable R.F. regulations;

- Agreements that the U.S., as the monitoring party, would pay the costs associated with obtaining the necessary certifications; and

- Agreements on the development of a Cost Agreement to cover the costs of the Russian facility associated with the implementation of the monitoring equipment.

Required Certifications

There were two separate certifications that were required for the implementation of the BDMS equipment at UEIP: (1) a certification for the piping modifications that were required to support the installation of the BDMS equipment, and (2) a certification for the installation and operation of the BDMS equipment in R.F. facilities. This paper discusses the process of obtaining R.F. certification for the installation and operation of the BDMS equipment.

All of the certifications required for the implementation of the BDMS equipment flow directly from a regulatory document issued by the Russian Federal Nuclear Radiation and Safety Authority (Gosatomnadzor, or GAN) in June 1997. This new regulatory document (GAN RD-03-36-97) is the guiding document for the installation and use of "foreign" equipment in Russian nuclear facilities. This regulation requires a mandatory review of the safety and operational aspects of the installation and operation of the equipment in the Russian nuclear facility. Also required was an independent peer review of the safety reviews. To prepare the required regulatory documentation, UEIP obtained the services of the State Center for the Testing of Measuring Equipment (SNIIP).

Coincident with the preparation of the regulatory documentation, a demonstration of the BDMS equipment was organized at the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky, during June 1997. A delegation from the R.F. visited Paducah to take part in the demonstration including personnel from Minatom, UEIP, GAN, and the All Russian Research Institute of Technical Physics (VNIITF) (see Fig. 1). The main goals of the demonstration were to:

- Permit the demonstration of the equipment to personnel from Minatom, UEIP, VNIITF, and GAN;

- Provide familiarization training on the theory and design of the BDMS equipment;

- Provide training for UEIP personnel on the installation of the BDMS equipment (see Fig. 2);

- Discuss the process of certification of the BDMS in Russian facilities and provide the basis for UEIP oversight; and

- Establish the frequent communications process between UEIP and DOE to gain certification of the BDMS.

Fig. 1. Visit of Russian Federation personnel to Paducah for the BDMS demonstration.

Fig. 2. UEIP and VNIITF personnel practicing for the installation of BDMS equipment.

In addition, the safety reviews and approvals for installing the BDMS equipment at Paducah were utilized as supporting documents for the UEIP certification process. These reviews and the resulting issuance of a plant operations certificate issued by the Paducah Plant Operating Review Committee (PORC) proved that the installation of the BDMS met all applicable requirements and regulations of the U.S. Nuclear Regulatory Commission (NRC). The NRC approvals for the BDMS demonstration at Paducah were sufficient to allow the installation at UEIP to go forward without further "acceptance tests" which would normally be required by the R.F. regulations.

The U.S. technical experts provided supporting documentation as inputs for the technical work performed by SNIIP. Included in the documents provided by the U.S. side were:

- Certified Engineering Drawings of the BDMS Equipment,
- Certificate of Health Physics Compliance of Dosimetry,
- Installation and Operations Manuals for the BDMS Equipment, and
- Plant Operations Certificate Issued by PORC at PGDP.

SNIIP personnel developed a Requirements document that described all of the safety and operational requirements for the installation and operation of the BDMS equipment at UEIP. This Requirements document was reviewed and approved by personnel from Minatom and UEIP in May 1998. SNIIP personnel then evaluated the implementation of the BDMS equipment at UEIP for any safety or operational impacts using the criteria established in the Requirements document. The results of this evaluation were documented in a Specifications document that was reviewed and approved by Minatom and UEIP in November 1998. The Requirements and Specification documents then underwent an independent review performed by the All Russian Science Research and Design Institute for Energy Technology (VNIPIET). The reviewed and approved Requirements and Specification documents were then submitted to GAN for the final review and approvals necessary before installation of the BDMS could begin. As a part of GAN's approval of BDMS installation at UEIP, GAN required that an Acceptance Committee be established of knowledgeable personnel from Minatom, UEIP, GAN, and the U.S. This committee was directed to inspect the installation of the equipment and grant approval prior to the installation of radioactive sources in the BDMS installation and start of operations involving HEU.

Immediately following the receipt of GAN certification and approvals, the BDMS equipment was installed at the UEIP plant beginning on January 11, 1999, following installation of the BDMS equipment, the Acceptance Committee performed a thorough inspection of the installation and gave approval for the installation of the radioactive sources and the start of gas flow. At the conclusion of these inspections, the Acceptance Committee gave its approval for the installation of the radioactive sources and the start of BDMS operations with HEU present in the UEIP blending facility.

Following the installation of the radioactive sources and the start of gas flow, the operational checkout and calibration adjustments of the BDMS began. During this work, the Acceptance Committee witnessed the operations to verify that the BDMS met the safety and operational requirements. Coincident with this work, UEIP health physics personnel collected data on radiation levels around the BDMS equipment to ensure that the dose rate requirements were met by the BDMS equipment. At the completion of the check-out and calibration of the BDMS equipment, the Acceptance Committee reviewed data from the BDMS, the dose rate measurements, as well as operating data from the UEIP plant (indicating that the BDMS had no impacts on plant operations), and concluded that the BDMS was acceptable for continuous operations at UEIP. The letter of acceptance for the BDMS was signed by the Acceptance Committee on February 2, 1999.

Conclusions

The certification for the BDMS installation at UEIP was an effort that was successfully accomplished only because of the coordinated efforts of technical personnel from numerous organizations in widely dispersed geographical locations, both in the U.S. and in the R.F. Due to the limited time between initiation of the certification process and scheduled installation of the BDMS, DOE and UEIP agreed to monthly teleconferences to keep the process moving forward. The communications link became more frequent as time for installation neared. Final approval for the equipment was obtained in November 1998, thus allowing the January 1999 installation to be accomplished.

Distribution

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