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In Support of Nonproliferation in the Republic of South Africa (RSA)

Over the last year, a significant task was accomplished in support of the international nonproliferation regime. Instrumentation was furnished to the Nuclear Energy Corporation of South Africa enabling them to complete the inventory of nuclear materials present in the country. This accountability data will enable the government of South Africa to complete a commitment to the International Atomic Energy Agency (IAEA) to account for legacy nuclear materials from a weapons program that has been shut down for over a decade.

This effort dates to the early 1990s when President F.W. de Klerk made the stunning announcement that the RSA had produced and dismantled six nuclear weapons devices, verifying the existence of a secret weapons program. At the same time, highly enriched uranium (HEU) enrichment and manufacturing facilities were being dismantled and decontaminated. Most of the residual materials were placed in approximately 40,000 fifty-five-gallon drums and stored in various storage locations at the site.

Following the signing of the Nuclear Non-Proliferation Treaty, the RSA agreed to provide the IAEA with a complete inventory of nuclear materials. However, because they lacked appropriate measurement instrumentation, the effort was delayed many years. In July 2001, the IAEA asked the United States if it would provide assistance to the RSA. Tasked by the National Nuclear Security Administration (NNSA), the Oak Ridge Nonproliferation and Threat Reduction Group conducted a survey of U.S. Department of Energy (DOE) and NNSA sites to determine the existence and availability of suitable instrumentation. An available instrument, known as the IQ3 and manufactured by the Canberra Corporation, was identified at the Y-12 National Security Complex.

An extremely aggressive schedule was undertaken to transport the unit to the RSA. First, the system had to be successfully returned to operation and performance tested. Then, the unit was disassembled and shipped to South Africa. In March 2002, the unit arrived at the site in Pelindaba and was reassembled and tested. Arrangements are now in place to complete the calibration of the system and finish the task.

The RSA has expressed its appreciation for this support since the tragic events of September 11, 2001, have renewed the urgency to effectively quantify and safeguard the materials at the site. The DOE/NNSA management has expressed its pleasure at being able to offer technical assistance in support of international safeguards and further prevent the proliferation of nuclear weapons.

The team supporting the RSA with the IQ3 instrument



2002 Oak Ridge Holdup School

During the week of April 8–12, 2002, a course on “Nondestructive Assay of Uranium Holdup” was conducted in Oak Ridge to teach the fundamental theory and principles of performing holdup measurements on uranium processing equipment. This was the first course of its kind offered in Oak Ridge. The course was the result of a collaborative effort between the Nuclear Science and Technology Division at Oak Ridge National Laboratory and Los Alamos National

Laboratory, Safeguards Science & Technology Group, NIS-5.

Los Alamos developed the training materials, wrote the holdup measurement exercises, and participated in teaching the course. Oak Ridge assembled the measurement equipment, fabricated simulated holdup setups, and developed enriched uranium reference materials required to simulate uranium holdup deposits.

The materials represented typical holdup deposits with finite-source dimensions and thicknesses that were not infinite to the primary gamma ray used for the analysis of uranium. Trainees were able to perform corrections

for effects (e.g., room background, equipment attenuation, finite-source dimensions, and self-attenuation) that would otherwise bias the measurements.

Thirteen trainees from the Y-12 National Security Complex participated in the course, which involved three days of hands-on training in measurements and equipment and the equivalent of one day of lecture. During the course, holdup measurement instruments were calibrated, and the calibrations were verified. Laboratory measurement exercises were designed around eight equipment items, representing process ducts, piping, hoods, high-efficiency particulate air filter housings, and plumbing fixtures. At the end of the laboratory instruction period, half of one day was spent inside the plant, with trainees developing approaches to the measurements of specific plant equipment and presenting these measurement plans to the class and the instructors.

On April 30, nine members of the original group of students participated in a subsequent training course on the use of the automated system for rapid holdup measurements, HMS3. The same simulated process equipment and holdup deposits were used for the HMS3 training. Trainees practiced bar coding the equipment measurement locations, setting up the database, and performing the automatic measurements. They became familiar with the HMS3 user options for control of the field measurements and also exercised the specific measurement-control procedures endorsed by the facility for use in the plant.



Trainees measure the HEU contents of the “large round duct” as an area deposit

Director’s Note

The Center for International Threat Reduction (CITR) is closely watching the developments of the May 2002 treaty between the United States and Russia to reduce their nuclear arsenals to between 1,700 and 2,000 warheads each. This is a great opportunity to remove these weapons from the current stockpile. Although details of the agreement are not currently known, it has been stated that some of these weapons would be put in storage and some dismantled. The nonproliferation community does not want to see these weapons go into a “strategic escrow” account in either country. Rather, we would like to see them dismantled and the weapons-usable material forever rendered nonproliferable. Nonproliferation activities both in the United States and Russia may be impacted dramatically based on these dismantlement decisions. As always, CITR will be willing to step up and lead these national security initiatives.

—Morris Hassler, Deputy Director

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