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Global Threat Reduction Initiative: Radioactive Source Security in Egypt

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ABSTRACT

Radioactive sources are available worldwide and are needed for a wide variety of applications: hospitals, oncology clinics, manufacturing plants, universities, construction sites, and other facilities in the public sector. Despite the necessity for and accessibility of these sources, many highly radioactive sources can pose significant risks if used maliciously. Radioactive sources can be used in the creation of a radiological dispersal device or "dirty bomb," which can cause significant human, environmental and economic damage. The Department of Energy, National Nuclear Security Administration (NNSA), Office of Global Threat Reduction Programs, working in partnership with the Egyptian Ministry of Health and Population, has worked cooperatively in Egypt to secure high-risk radioactive sources. The overarching strategy for the Egypt project has been to build a solid foundation for radioactive source security through upfront awareness building on the need for it and training. The strategy has proven itself through the establishment of inherently sustainable improvements to source security which will last well beyond the life of the project and have a lasting impact on the regulatory control and security of high-risk sources in Egypt. To achieve inherent sustainability, significant pre-work was performed to achieve a substantial level of understanding between the US and Egyptian counterparts. The Egypt Ministry of Health and Population, the governing body responsible for controlling and licensing radioactive materials in Egypt, is an essential component to the success of the project, and developing a strategy that would work within it's structure was necessary. As a result of the success of the joint cooperation between NNSA and the Ministry of Health and Population, projects to ensure the security of high-risk radioactive sources at over 30 sites have been completed, a ministerial decree enforcing radioactive source security objectives is undergoing final governmental review, and both regulatory staff and site operators have been trained on radioactive source security. This paper presents the process that was utilized in this successful cooperative endeavor.

INTRODUCTION

U.S. Secretary of Energy Spencer Abraham, in a speech to the International Atomic Energy Agency on May 26, 2004, stated, "As the global proliferation threat continues to evolve, it has become clear that an even more comprehensive and urgently focused effort is needed to respond to emerging and evolving threats. Although we are accomplishing much, there is more we can do."[1] As part of this speech, the Secretary unveiled the Global Threat Reduction Initiative (GTRI) to provide a comprehensive effort to secure and remove nuclear and radiological materials around the world.

The National Nuclear Security Administration (NNSA) GTRI program is assisting countries throughout the world to secure their radioactive sources and updating their knowledge with respect to managing their radioactive sources in the most secure manner.

[1] Secretary of Energy Spencer Abraham, remarks from speech to IAEA announcing the unveiling of the Global Threat Reduction Initiative, Vienna, Austria, May 26, 2004.

MISSION

The mission of GTRI is to identify, secure, recover and/or facilitate the disposition of nuclear and high-risk radiological materials around the world that pose a threat to the United States and to the international community. The objective of GTRI is to ensure that these types of materials are adequately secured either on an interim basis until such time that the material is removed to a more secure environment or on a long-term basis for materials that warrant securing-in-place (e.g., high-risk radiological materials).

BACKGROUND

High-risk radioactive sources are limited to a group of ten radionuclides meeting certain radiation thresholds defined by the GTRI program. Egypt has approximately 30 facilities with potentially high-risk radioactive materials meeting the GTRI program's threshold levels. Each of these sites is controlled by either the Egyptian Atomic Energy Authority (EAEA) or the Ministry of Health and Population (MOHP). The EAEA is responsible for peaceful uses of nuclear energy and for all radioactive sources not in the public sector, including all open sources and all radioactive waste. The MOHP has regulatory control over all radioactive sealed sources in the public sector, which includes irradiation facilities, research facilities, several industrial sites, and a large number of hospitals and clinics.

Table 1. High-Risk Sources

Radionuclide	Assessment Threshold GBq (Ci)	Action Threshold GBq (Ci)
Am-241	37 GBq (1 Ci)	370 GBq (10 Ci)
Cf-252	37 GBq (1 Ci)	370 GBq (10 Ci)
Cs-137	3,700 GBq (100 Ci)	37,000 GBq (1,000 Ci)
Co-60	3,700 GBq (100 Ci)	37,000 GBq (1,000 Ci)
Ir-192	3,700 GBq (100 Ci)	37,000 GBq (1,000 Ci)
Pu-238	37 GBq (1 Ci)	370 GBq (10 Ci)
Ra-226	3,70 GBq (10 Ci)	37,00 GBq (100 Ci)
Sr-90	3,700 GBq (100 Ci)	37,000 GBq (1,000 Ci)

Sandia National Laboratories has been leading GTRI program in Egypt since August 2004. The overall goal of the Egypt GTRI project is to ensure the lifetime protection of high-risk radioactive sources throughout Egypt by implementing effective and sustainable physical security systems that will be properly operated and maintained over the long term. The project aims to leave Egypt completely self-sufficient, i.e., capable of securing new sites without US assistance.

The Sandia project team developed a unique strategy, not only for upgrading the security at facilities of interest but also for ensuring that these upgrades would be accepted, fully utilized, and sustained over the long term. The Sandia team realized early on that the only way to ensure long-term sustainability was to educate Egyptian personnel in all aspects of security and then to assist them in implementing the upgrades at sites of interest themselves.

A high-level delegation led by the US Department of Energy (DOE) visited Egypt in September 2004 and met with representatives from the MOHP. The delegation visited several potential upgrade sites and interviewed several candidates for the assignment to serve as the in-country security system integrator. The visit was quite successful in that relationships were established and an agreement to cooperate jointly was obtained.

The US GTRI Egypt project team cooperated closely with another Sandia-led project, the Integrated Management Program for Radioactive Sealed Sources (IMPRSS), which was funded by the US Agency for International Development (USAID). Although this project focused mainly on the safety of sources, many of the personal contacts and lessons learned were leveraged to foster new relationships between the EAEA and MOHP.

STRATEGY

The US project team's primary strategy for Egypt was to install physical protection system upgrades at identified sites to prevent theft of radiological sources. The following was the planned approach:

- Establish relationships with the MOHP and EAEA
- Interview and select a security system integrator
- Provide training to the MOHP/EAEA and integrator to do site assessments, designs and perform upgrades.
- Familiarize the integrator with contracting process.
- Contract the MOHP/EAEA and the security system integrator to provide training to site representation (sites that have radiological sources)
- Initiate contracts for conducting site assessment, design, and implementation of proposed upgrades for MOHP/EAEA sites.
- Assist with any necessary regulatory work.

TRAINING

Under the auspices of the GTRI program, the Egypt project team provided training pertaining to the security of high-risk radiological sources in Egypt to key employees of the MOHP, the EAEA, and selected radiological facilities. The training, which was conducted December 2004, was a cooperative effort between the MOHP, Egypt Markets (the security company that will ultimately be designing and installing the security upgrades), and Sandia.

The objective of the course was to train regulators, health physicists, doctors, and security personnel from various organizations on basic security concepts through a combination of classroom lecture and hands-on exercises, including actual site visits. Students worked in small teams to perform site assessments and develop upgrade plans, which were presented to the overall group at the conclusion of the course.

The training course was considered important and necessary based on past experiences of project team members and requests for such training directly from the MOHP. The structure of the training proved to be extremely effective, accomplishing all of its goals and objectives.

Importance of Training

The Egypt project team recognized the importance of early training and made it a significant component of their overall project strategy for securing high-risk radioactive materials in Egypt. This recognition was based on past international experience and interaction with organizations and individuals dealing with radiological materials. The merits of training were further emphasized when the MOHP representatives expressed their desire for such training during the team's initial visit to Egypt in October 2004. This desire culminated in an official request from the MOHP to DOE.

In response to the MOHP request, the U.S. project team drafted a training plan that would achieve the following goal:

> Establishing a security culture within the Ministry of Health by imparting a basic understanding of security concepts that could be applied to securing Egypt's radiological sources, resulting in the necessary support and buy-in from key stakeholders *prior to* the implementation of upgrades.

A secondary goal was to introduce the GTRI program and to explain how this program can help the MOHPto implement these security concepts.

Both MOHP and the US project team considered achievement of this goal necessary for the following reasons:

- Experience has shown that overall project efficiency and effectiveness is directly proportional to the stakeholders' level of understanding of security concepts and language. By training stakeholders in these areas early in the project, efficiency and effectiveness are maximized.
- Buy-in from upper level management is necessary to ensure full cooperation from the lower levels. Facilities are usually hesitant to cooperate with the United States without specific direction from upper management. Upper-level direction is often not given high priority, because of managers' general lack of understanding with regard to security concepts and the GTRI program. By early training of upper-level management, cooperation from all levels is more forthcoming.
- Through training, a solid foundation for future project work is laid by establishing a group of individuals from a variety of disciplines that understand the GTRI program, security concepts and the work necessary to complete the project. This group is equipped to assist in project implementation by solving any problems that may arise, ensuring continued success.
- To ensure that security upgrades can be effectively operated and maintained over the long-term, the complex relationship between security, safety, operations, and cost must be understood *before* security upgrades are designed and implemented. Training provides this understanding.
- In many cultures (including Egypt) the terms safety and security are used interchangeably by regulators and users of radioactive materials. They believe that by meeting safety requirements, security is also being addressed. Training is necessary to enable regulators and users to think outside the safety paradigm and to demonstrate the differences and commonalities between the two

Traditionally, all training has been provided after the implementation of upgrades. The project team considered this approach ineffective since it does not achieve the goals outlined above. However, the team also understands the importance of training after project implementation in terms of using, maintaining, and continual performance testing of installed security systems.

Participants were not only taught how to conduct a site assessment and develop physical protection system (PPS) upgrade plans, but they also conducted site assessments and developed PPS upgrade plans at two operational sites. Additionally, the manager of Egypt Markets (the PPS installation company) was trained as a trainer and was contracted to conduct additional training to all sites that did not attend the initial training session.

Training course working group participants

Establishing an in-country system integrator was a critical first step in implementing the strategy. Egypt Markets, a well established company based in Cairo, was selected by the US project team to serve as the in-country system integrator. Egypt Markets is responsible for providing training, performing site assessments, developing upgrade designs to be approved by the project team, purchasing and installing the equipment necessary to implement the approved designs, performing acceptance testing, developing procedures, and providing long-term maintenance and repair.

Physical Protection System Upgrades

The main focus of the project is to install physical protection security systems. The sequence of installing a security system is as follows: perform a site assessment, develop an upgrade plan, purchase and install equipment, conduct acceptance testing, and to develop procedures. Each of these is described in more detail below:

Site Assessments—sites are visited by the security company and the current level of security is assessed. All security elements are assessed including access controls, detection systems, access delay, and response by security forces. This information, along with general site information that may affect the overall security such as number of site personnel, work patterns, etc., is documented and presented to the US project team for review and comment.

Upgrade Plans—once the site assessment is finalized, an upgrade plan is developed to correct identified vulnerabilities. This upgrade plan contains a description of upgrades, an equipment list, and drawings showing where equipment will be installed.

Equipment Installation—once the upgrade plan is finalized, the equipment is purchased and installed in accordance with the upgrade plans. To avoid repeated costs associated with the import of equipment, most equipment was pre-purchased and staged at Egypt Markets for future installation. Typical equipment used in an integrated security system include intrusion detection sensors, strobe lights and/or sirens, video cameras and monitors, hardened doors, access control keypads, and door locks.

Acceptance Testing—after the equipment has been installed, a comprehensive acceptance test is conducted to ensure that the system operates in accordance with the upgrade plan. While the acceptance test plans are approved by the US project team, the actual acceptance testing may or may not be performed with US participation.

Long-Term Sustainability

Sustainability refers to all activities necessary to ensure long-term, continued operation of the installed systems. These activities include, maintenance, procedure development, and periodic performance testing.

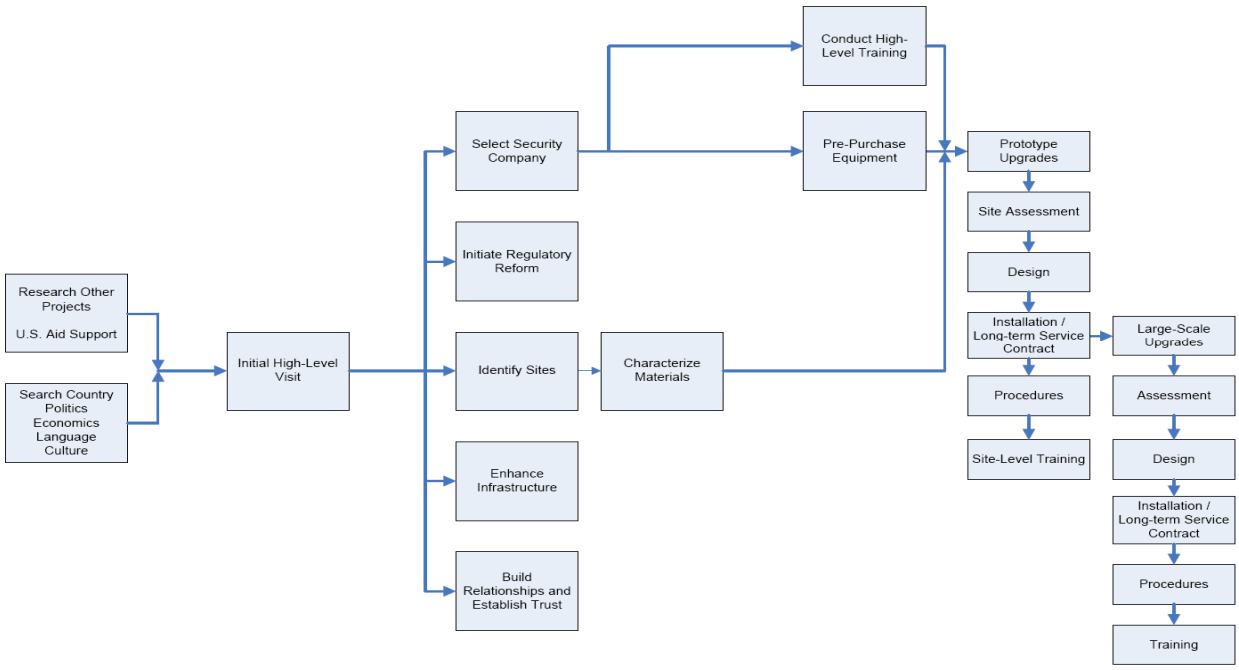
Maintenance—When equipment is installed, a mechanism must be put in place for repairing the system as necessary. Egypt Markets is responsible for maintenance for 1 year after installation. The US project team will contract with Egypt Markets to extend the warranty for an additional period of 2-3 years (assuming available funding). During this 2-3

year transition period, the Egyptian regulatory authorities must develop a plan for ensuring continued operation of the installed systems.

Procedure Development—To ensure effective operation over the long term, procedures are developed to address issues such as day-to-day operation, performance testing, maintenance, response to abnormal circumstances, etc. Once developed, these procedures are used and maintained by site personnel.

Regulatory Infrastructure

To ensure long-term sustainability of the installed systems, security-related regulations should be introduced and enforced. Upon request, the US project team will work with the MOHP in the development of such regulations. The US project team is also prepared to work with the MOHP in the development of an inspection regime. Addressing the regulatory infrastructure should occur in parallel with the installation of upgrades thereby ensuring simultaneous completion.



Project Sequence of Activities

ACCOMPLISHMENTS

A direct result of the training courses was seen at a facility in Egypt that received PPS upgrades and was visited by the US project team. The facility director met the team enthusiastically and expressed her gratitude. She informed the team that one of her employees who attended the PPS training course was so excited that she came back to the facility and asked if she could immediately train her staff and implement the concepts she had just learned. Even before the PPS upgrades were installed, this facility had adopted a new security culture. The US project team is confident that the PPS will be properly operated and maintained by this facility over the long term.

Egypt Project upgrades are being completed at a rate of two or three sites per month. This rapid rate of progress is achievable because sites are willing, if not anxious, for PPS upgrades to be

completed, and the regulators have fully endorsed the project. This is all because the proper ground work was laid. To date, 31 sites have received PPS upgrades and are under three-year maintenance and sustainability contracts provided by NNSA.

The US project team met with the MOHP Executive Office of Radiation Protection (EORP) in October of 2004. During this meeting, the Chairman of the EORP expressed his concerns related to the security of radiological sources and his desire to integrate both safety and security into the current Radiation Safety Program. He requested that the US project team provide assistance and recommendations regarding the implementation of the security aspects of radiological source control. The US project team has provided draft recommendations that helped the EORP establish the necessary language for a ministerial decree for enforcing physical protection security measures and proper handling of the radioactive materials. These recommendations have been drafted into law and are currently the standard for the protection of high-risk radioactive sources in Egypt.

SUMMARY

Establishing an in-country system integrator was a critical first step in implementing the strategy. Egypt Markets, a well established company based in Cairo, was selected by the US project team to serve as the in-country system integrator. Egypt Markets is responsible for providing training, performing site assessments, developing upgrade designs to be approved by the project team, purchasing and installing the equipment necessary to implement the approved designs, performing acceptance testing, developing procedures, and providing long-term maintenance and repair.

In December 2004, the Sandia project team conducted an initial training seminar in Cairo. The training was tailored toward MOHP regulators, EAEA management, Egypt Markets, and key individuals from three MOHP-controlled facilities. Basic physical protection principles were presented, followed by detailed, hands-on training pertaining specifically to the process of conducting site assessments and developing upgrade plans. Working in small groups, the students performed vulnerability assessments at two actual MOHP sites and developed upgrade plans to correct the identified vulnerabilities. Lively discussion and interaction accompanied the group presentations of the upgrade plans. Using the December training as a model, Egypt Markets has conducted follow-on training for many other MOHP site personnel.

An unexpected result of the December training was that the MOHP regulators in attendance immediately recognized the need to implement regulations mandating minimum security requirements. The regulators asked the Sandia team to provide recommendations for such regulations. The team's recommendations resulted in a ministerial decree that is now being reviewed by the MOHP legal council.

The approach of providing training prior to implementation has proved to be extremely successful for many reasons. The Egyptians feel much more involved in the process, which in turn has led to a greater sense of ownership. The initial training also made US viewpoints very clear, minimizing the usual misunderstandings that are inevitable when challenged with cultural differences. To date, approximately 100 individuals have been trained in various aspects of security.

After the initial training had been provided and in parallel with follow-on training efforts, upgrades were being installed at MOHP facilities. To date, eighteen site assessments have been completed and ten sites have been fully upgraded. Extended warranties and long-term maintenance contracts have been put in place for all completed sites.

Work performed in Egypt by Sandia has made a significant impact. In a recent, unsolicited e-mail message, the president of Egypt Markets stated, "It is clear that [the Radiological Threat Reduction Project] RTRP has pumped new life in EORP. The morale and expectations are high."

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