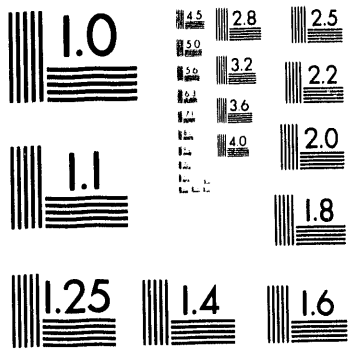
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6

1 of 1

THE STATUS of UNITED STATES R&D PROGRAMS IN SAFEGUARDS AND PHYSICAL PROTECTION*

Dennis L. Mangan
Sandia National Laboratories
Albuquerque, New Mexico, USA
(Chair, Institute of Nuclear Materials Management)

James W. Tape
Los Alamos National Laboratory
Los Alamos, New Mexico, USA
(Vice Chair, Institute of Nuclear Materials Management)

The breakup of the former Soviet Union and the strategic nuclear arms reduction agreements START I and II, when fully implemented, will result in significant reduction and dismantlement of nuclear weapons. These events will produce a significant increase of stored nuclear materials requiring the utmost control and care for the indefinite future. Some of these materials, in addition to existing wastes and residues, may need further processing. Also, the use of nuclear power continues to grow worldwide, and some countries, notably Japan, are considering a plutonium recycle fuel cycle. At the same time, the revelation of Iraq's nuclear weapons program following UN/IAEA inspections has made it clear that nuclear weapons proliferation is a real and urgent threat to the world community. The control of nuclear materials through safeguards, both domestic and international, is one of only a few effective barriers to proliferation. President Clinton, in his message to the United Nations on September 27, 1993 reiterated the US policy regarding nonproliferation and export controls. In that speech, he committed to the strengthening of safeguards, particularly IAEA safeguards.

Improved technology is the key to cost effective safeguards of nuclear materials. To provide assurance that nuclear materials are still where they are supposed to be and have not been stolen, diverted, or unintentionally released to the environment, requires the effective use of safeguards technologies and facility personnel. Although some of the technology can be used to meet the demand of today's problems, new technology is urgently needed to address control of nuclear materials during weapons dismantlement; during transfer of materials between the defense and civilian sectors; in US and Russian storage vaults; to provide better tools to inspectors and agents charged with detecting or deterring proliferation around the world; to improve nuclear emergency detection, search, and analysis methods; and to support nuclear power reactor fuel cycle materials management and control needs. Realizing this, the Department of Energy conducts research and development programs at its national laboratories. Also, many agreements with international organizations are instrumental in establishing an environment that allows for field demonstrations to establish effectiveness of these new technologies and systems. New technologies are made available not only to US organizations but also international organizations through demonstrations and training efforts. Most notable are the International Training Courses on the State System of Accounting and Control and the Physical Protection of Nuclear Facilities and Materials. In the area of international safeguards, the Department of Energy has programs that allow for the development and demonstration of new nondestructive assay equipment, remote monitoring of safeguards instrumentation, new containment and surveillance equipment, integrated safeguards systems, and information management systems. Many of these programs are multi-laboratory efforts whereby teaming by the national laboratories allows for the expertise in the laboratories to be applied to the development efforts.

The Department of Energy's Office of Intelligence and National Security Affairs (DOE/IS) has several organizations that conduct safeguards research and development, demonstrations, and implementation. DOE/IS recently established an Office of Research and Development (DOE/IS/RD) with the responsibility to conduct and coordinate research and development on behalf of all organizations within DOE/IS. Two organizations within DOE/IS that influence domestic and international safeguards research and

*Paper sponsored by the US Department of Energy, Office of Nonproliferation and Arms Control, International Safeguards Division.

development, demonstrations, and implementation are the Office of Arms Control and Nonproliferation (DOE/IS/AN), within which resides the International Safeguards Division (DOE/IS/AN/ISD), and the Office of Security Affairs (DOE/IS/SA), within which resides the Office of Safeguards and Security (DOE/IS/SA/OSS). The technologies pursued include nuclear materials control and accounting, containment and surveillance, and physical protection.

The Office of Safeguards and Security conducts a broad-based technology development program in support of the protection of nuclear materials and other assets at Department of Energy facilities. The basis of the program is described in detail each year in the "Safeguards and Security Technology Development Directory" (Ref. 1). This document contains information regarding the technology development program, the technology development life cycle, the task selection process, the technology development infrastructure, technology transfer initiatives, and the program content for each fiscal year. The technology development life cycle recognizes three broad phases for development activities: Science and Technology Base programs, including basic research, applied research, and exploratory development; Concept and Demonstration Development to support advanced development and engineering development conducted to identify solutions to meet specific safeguards and physical protection requirements; and Full-Scale Development to provide testing, evaluation, demonstration, and documentation of new technologies to facilitate transfer of the technology to DOE field sites and commercial vendors. The directions of the OSS technology development program are influenced by many factors, including the evolving threat to DOE facilities and materials, the dismantlement of nuclear weapons under recent treaties and agreements, the transition of DOE nuclear materials production and processing facilities from an active production role to non-nuclear uses, and the design of new nuclear facilities to support the Department's mission in the future. Developing technology to mitigate the insider threat and providing more cost-effective safeguards and physical protection technologies throughout the DOE are fundamental themes of the current program. The fiscal year 1994 OSS technology development budget is approximately $23 M.

Technology development sponsored by OSS is carried out within the DOE national laboratory system at ten sites. Each laboratory provides expertise and conducts R&D in safeguards or physical protection in one or more areas of specialization including materials control and accountability, integrated systems, physical security, and information security. The transfer of technology from the OSS-sponsored R&D activities to users and commercial vendors is an essential element of the overall program. Publications, seminars, training classes, participation in interagency groups within the US government, technology exchanges, and joint activities with industrial partners are all employed to transfer safeguards and physical protection technology from the laboratories to the users.

DOE's International Safeguards Division (ISD) of the Office of Arms Control and Nonproliferation, Office of Export Control and International Safeguards provides technical leadership in the formulation and implementation of US Government nonproliferation policy. As described in more detail in the "International Safeguards Program Strategic Plan--Fiscal Year 1994" (Ref. 2), as part of the ISD program, technology development activities are carried out in direct support of designing international safeguards strategies, approaches, and procedures; evaluating, demonstrating, and deploying technologies that address urgent needs of the international safeguards community; transferring safeguards technology; and providing training and other technical support to the implementation and operation of strong international safeguards regimes. Technology-related ISD strategic objectives include focusing program resources on meeting international safeguards community customer and user needs, maintaining the technical basis and infrastructure to meet anticipated needs and design advanced safeguards approaches and procedures, and increasing technical assistance to countries and international organizations. Thirteen DOE laboratories provide the technical expertise to support the ISD programs including: providing training courses on all aspects of safeguards; deploying information management and treatment tools; evaluating and implementing on-site inspection procedures and technologies such as environmental monitoring, remote, unattended monitoring, radiation detection and location tools, nuclear materials verification and assay equipment, and containment and surveillance systems; and the design of post-inspection analysis strategies. International cooperation is an essential element of the international safeguards program. Efforts in support of safeguards in a wide range of countries and international organizations such as EURATOM, ABACC, and the IAEA provide a unique opportunity to influence the direction of international safeguards technology development, to test concepts and equipment in the field, and to deploy advanced technologies.

The DOE's International Safeguards Program is organized into four program areas: Direct Technical Assistance and Safeguards Policy Formulation, Safeguards Design and Evaluation, Nuclear Materials Tracking System, and International Training Courses. Under the Direct Technical Assistance category are a number of technology-related areas of current interest including interactions with the Former Soviet Union Nuclear Weapons States in a wide range of safeguards and security areas, support to the IAEA/UNSCOM inspections in Iraq, and training for South Koreans as part of the prospective joint South/North Korean Inspection Regime. Similarly, Safeguards Design and Evaluation activities include investigations of environmental monitoring technologies as a safeguards inspection tool, the development of data management tools, the testing of remote monitoring concepts, the development of nuclear facility inspection approaches, development of nuclear materials assay systems and containment and surveillance systems, and the investigation of inspection procedures. The total ISD budget for FY 1994 is expected to be approximately $21 M.

In addition to these activities that are carried out in direct support of safeguards and physical protection, the DOE Office of R&D under DOE/IS supports a very large technology development effort directed toward basic R&D in support of nonproliferation and arms control activities. Many projects carried out under this program have potential application to solving problems in the domestic and international safeguards communities. Other US Government agencies contribute to the development of safeguards technologies including the Department of State's Program of Technical Assistance (POTAS) to IAEA safeguards and Nuclear Regulatory Commission projects to support safeguards at commercial nuclear facilities. The Institute of Nuclear Materials Management plays a significant role in safeguards technology development in the US and around the world by providing a forum for the exchange of technical information between nuclear materials management professionals, by facilitating technology transfer, and by providing a repository for the safeguards information published in the Journal and the Proceedings of the Annual meetings.

Overall, the US programs in safeguards and physical protection R&D remain vigorous, although not unaffected by budgetary constraints! These activities are consistent with and an integral part of the US commitment to nonproliferation beginning with the responsible stewardship of US nuclear weapons and nuclear materials and extending to direct technical support for international safeguards on a bilateral and multilateral basis.

References:

1. "Safeguards and Security Technology Development Directory FY 1993," US Department of Energy Office of Security Affairs, Office of Safeguards and Security, DOE/SA-0008, June 1993.

2. "International Safeguards Program Strategic Plan--Fiscal Year 1994," US Department of Energy, Office of Arms Control and Nonproliferation, International Safeguards Division, Washington, DC 20505, October 1993.

DISCLAIMER

DATE
FILMED
1/21/94
END