

International Nuclear Safeguards at Sandia

MISSION FOCUS: SURETY OF SAFEGUARDS INFORMATION

Safeguards: An Information System

The international community relies on a regimen of monitoring technologies and inspections to ensure that states honor their commitments to the peaceful use of nuclear energy. These safeguards are part of a larger decision-support information system. When the International Atomic Energy Agency (IAEA) announces a safeguards conclusion for each state with a Safeguards Agreement, those conclusions are only as good as the supporting information system. That system includes all of the people, technologies, measurements, procedures, data, infrastructure, and more that must work together.

Surety: Essential to Safeguards

Surety involves all of the technical means used to ensure that safeguards information can be both trusted and protected. Without due attention to surety, the safeguards information system is at risk of being compromised. Without surety, safeguards would be an illusory and potentially dangerous charade, offering the international community false assurances.

Sandia Safeguards

Sandia National Laboratories has a long history of contributions to international nuclear safeguards, dating to the U.S. Support Program to the IAEA in the late 1970s. Sandia is an advanced systems engineering laboratory with extensive resources, able to draw upon broad expertise in the surety of nuclear weapons, and synergies with other programs in information assurance, domestic safeguards, nonproliferation, physical protection, arms control, and the nuclear fuel cycle.

Core Technical Areas for Sandia

- Information Management and Security
- Containment and Surveillance
- Unattended and Remote Monitoring
- Geological Repository Safeguards

Sandia's capabilities span exploratory research, engineering design and development, systems engineering, simulation and modeling, test and evaluation, implementation, assessments, training and outreach, and program coordination and management.

Sponsor and Partners

Sandia's work is supported principally by the National Nuclear Security Administration (NNSA), spanning all pillars of the NNSA's International Nuclear Safeguards program. The U.S. Program of Technical Assistance to IAEA Safeguards (POTAS) funds selected projects in response to IAEA requests.

Sandia collaborates with international partners, other U.S. Department of Energy laboratories, Department of State, universities, and industry to ensure comprehensive solutions for complex safeguards applications.



Core Capabilities

Information Security and Analysis

Verification of the safeguards system is driven by trusted information that is immune to malicious attack. Safeguards data must be analyzed to be actionable. Sandia provides:

- Vulnerability assessments
- Authentication solutions to confirm data source and integrity
- Encryption solutions to provide confidentiality of information
- Joint use: verification by multiple parties
- Open source and geospatial information integration and analysis
- Advanced data analytics using machine learning to classify, track objects, and discover anomalous behaviors
- Process monitoring modeling to detect undeclared diversions
- Information visualization

Containment and Surveillance (C/S)

Safeguards rely on verified assurance that nothing has changed since nuclear material was last examined (“continuity of knowledge”). Nuclear measurements are expensive; C/S measures offer substantial savings in cost and time. Sandia contributes in these areas:

- Seals and tamper-indicating enclosures assure items have not been breached without detection
- Tags uniquely identify high-value items
- Video surveillance provides the safeguards “eyes” while inspectors are not physically present

Unattended and Remote Monitoring

International safeguards make increasing use of automated measurements at facilities, saving inspectors valuable time for non-routine tasks. Sandia supports the surety of unattended and remote monitoring with:

- Measures to ensure the integrity of verification equipment (tamper indication, state of health)
- Material Control and Accountability hardware / software systems to provide real-time monitoring, tracking, and accountancy of nuclear materials
- Secure transmission to protect from eavesdropping and other threats
- Wireless communications to facilitate system deployment
- Secure branching of operator instrumentation for safeguards inspectors

Geological Repository Safeguards

Appreciable quantities of nuclear material remain in spent fuel buried in deep underground repositories. Sandia develops solutions to a range of geological repository safeguards challenges:

- Identification and containment integrity verification of disposal canisters
- Repository monitoring during construction, operation, and closure phases
- Timescales vastly longer than conventional continuity of knowledge for safeguards
- Long-term information management of data at repositories
- Safeguards implication of deep borehole disposal of spent fuel

Sandia's Contribution

Nuclear proliferation by determined states with enormous resources presents a sophisticated, real, and evolving threat to safeguards information systems. Sandia is the preeminent U.S. national laboratory focused on that most critical aspect of nuclear safeguards: ensuring the cradle-to-grave surety of safeguards information.

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International Safeguards
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