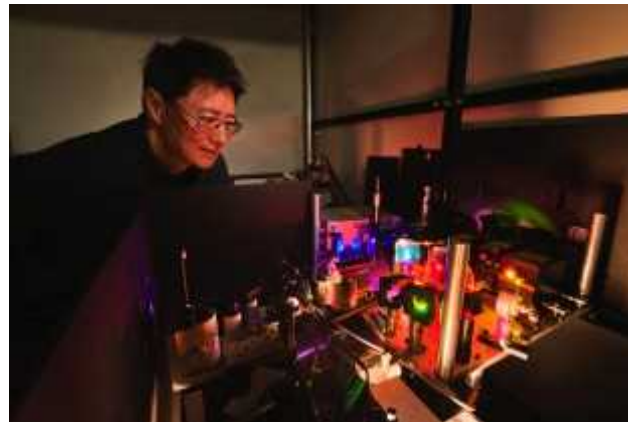


Exceptional service in the national interest

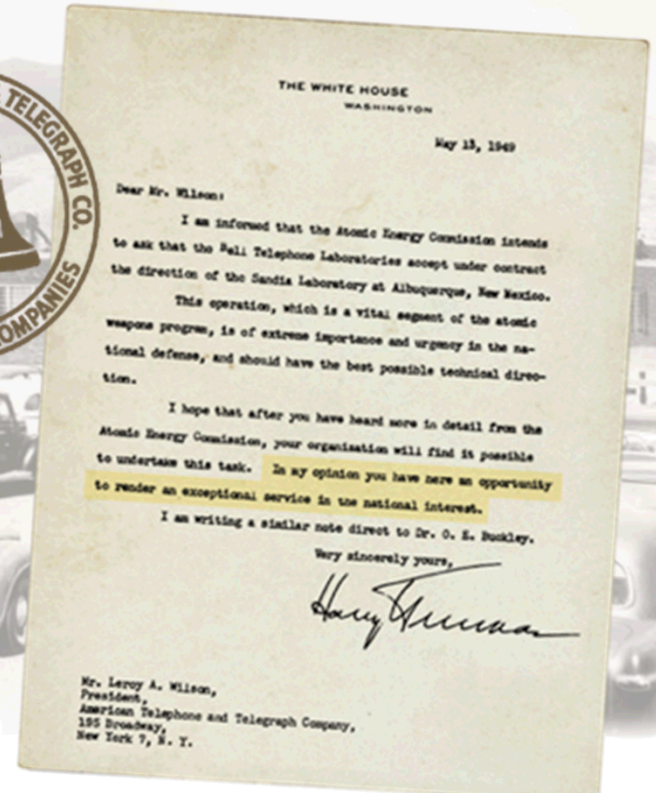
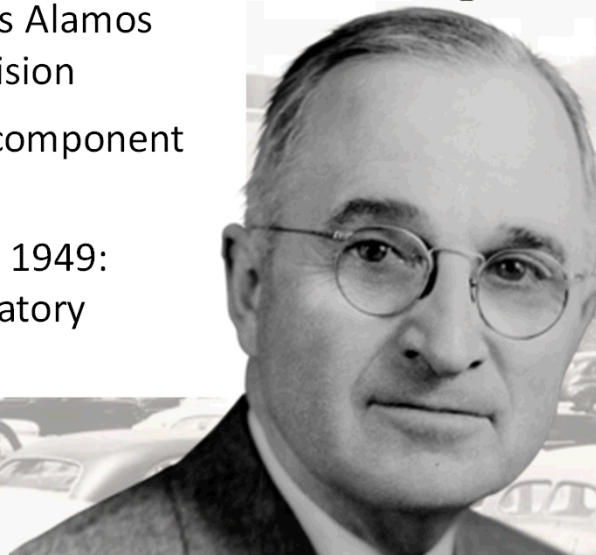


Sandia National Laboratories and Safeguards: *An Overview*

Sandia's History

Exceptional service in the national interest

- July 1945: Los Alamos creates Z Division
- Nonnuclear component engineering
- November 1, 1949: Sandia Laboratory established



to undertake this task. In my opinion you have here an opportunity to render an exceptional service in the national interest.



Sandia Addresses U.S. National Security Challenges

1950s

Nuclear weapons

Production and
manufacturing
engineering



1960s

Development
engineering

Vietnam conflict



1970s

Multiprogram
laboratory

Energy crisis



1980s

Missile defense
work

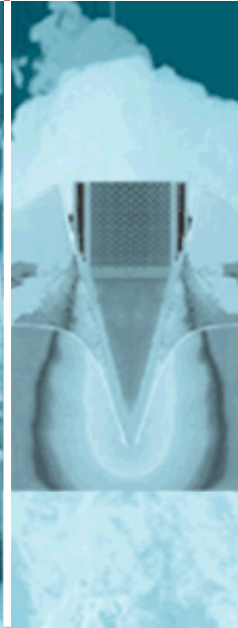
Cold War



1990s

Post-Cold War
transition

Stockpile
stewardship



2000s

START
Post 9/11

National security



2010s

LEPs
Cyber, biosecurity
proliferation

Evolving national
security challenges



Sandia: Governance / Workforce / Budget

Sandia Corporation

- AT&T: 1949–1993
 - Martin Marietta: 1993–1995
 - Lockheed Martin: 1995–present
 - Existing contract expires: April 30, 2016, with a one-year contract extension option
 - Government owned, contractor operated
- Total Sandia workforce: 12,123
 - Regular employees: 10,177
 - Advanced degrees: 6,097 (59%)
(as of February 27, 2015)

Federally funded
research and development center



Total Laboratory Expenditures
(FY2014) \$2,686,329,000

Sandia Sites

Albuquerque, New Mexico



Livermore, California



Kauai, Hawaii



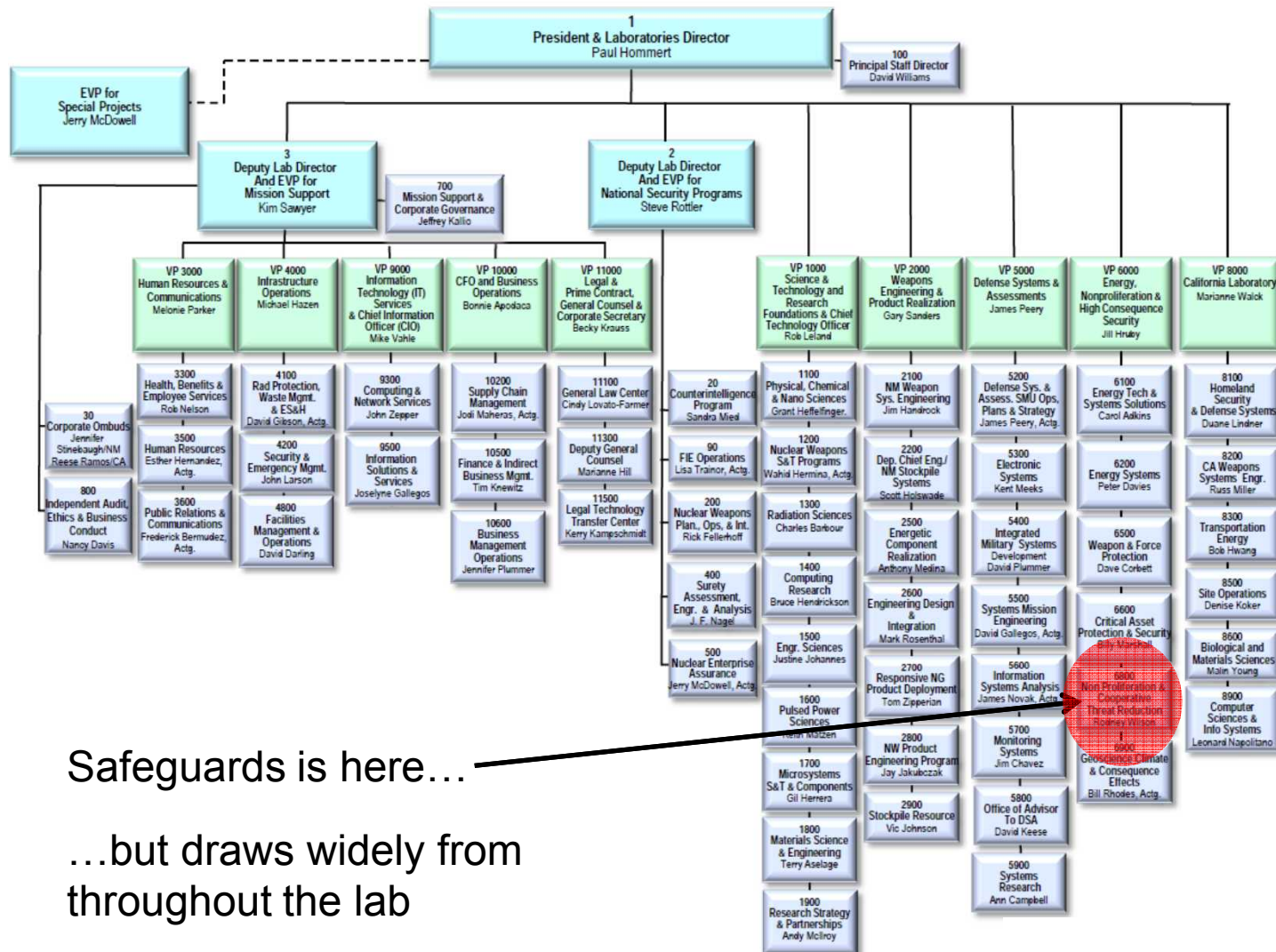
*Waste Isolation Pilot Plant,
Carlsbad, New Mexico*

*Pantex Plant,
Amarillo, Texas*



*Tonopah,
Nevada*

Sandia is organized by Divisions



Safeguards is here...

...but draws widely from throughout the lab

International, Homeland, & Nuclear Security

Global Security



WMD Counterterrorism and Response



Homeland Security Programs



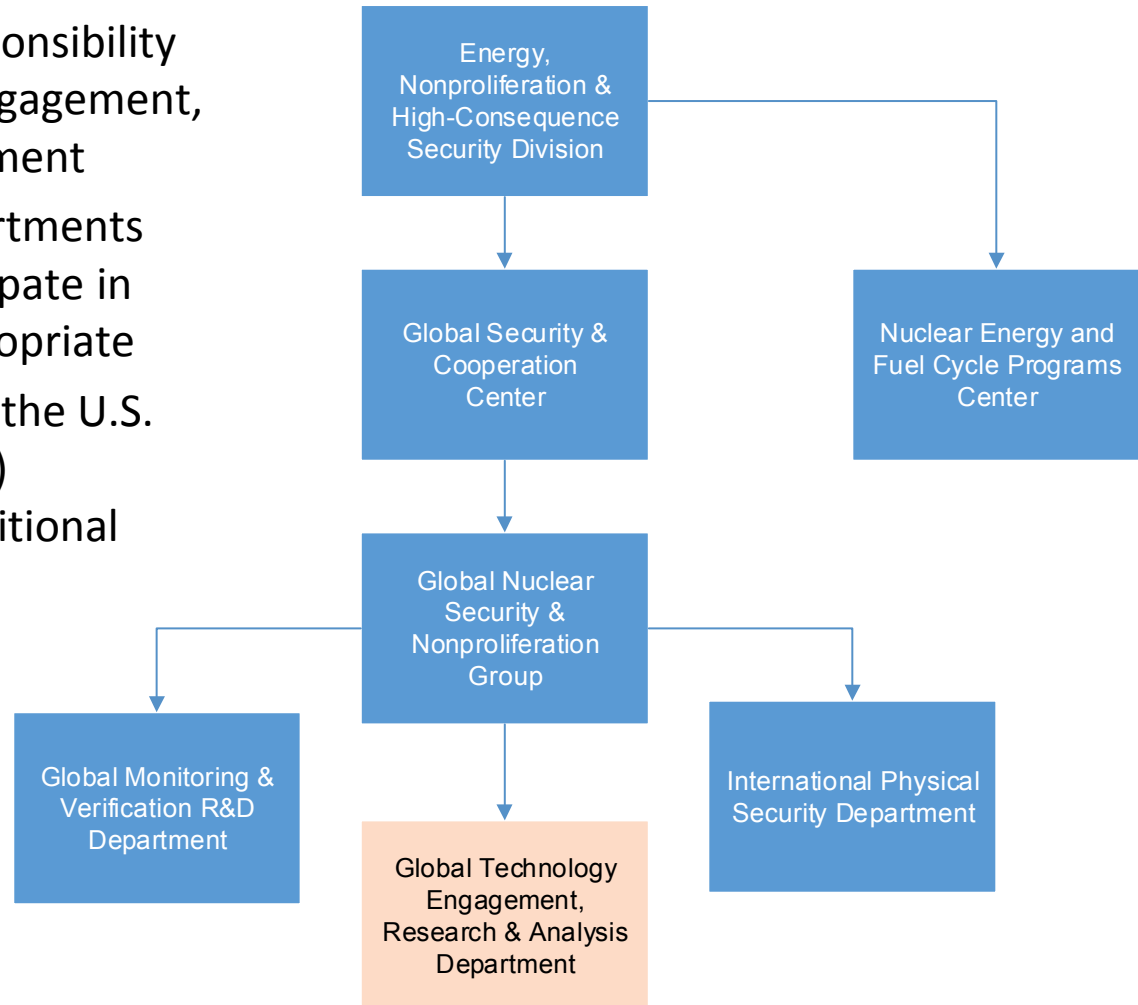
Homeland Defense and Force Protection

Cyber and Infrastructure Security



International Nuclear Safeguards at Sandia: Organization

- Sandia's work on International Nuclear Safeguards is the major responsibility of the Global Technology Engagement, Research & Analysis Department
- Staff from many other departments within the laboratory participate in safeguards projects, as appropriate
- Separately, Sandia supports the U.S. Safeguards (Voluntary Offer) Agreement with annual Additional Protocol reporting to DOE



International Nuclear Safeguards at Sandia: Sponsors and Partners

- National Nuclear Security Administration
 - A semi-autonomous agency within the U.S. Department of Energy
 - The Office of Defense Nuclear Nonproliferation (DNN) is our primary sponsor
 - NA-22 Office of Nonproliferation Research & Development
 - Sponsors advanced R&D concepts
 - NA-24 Office of Nonproliferation and Arms Control (NPAC)
 - Sponsors safeguards engagement, implementation, outreach
 - Next Generation Safeguards Initiative (NGSI)
 - not an organizational entity, but a strategic theme that began in 2008
 - Five “Pillars”: Policy and Outreach, Concepts and Approaches, Technology Development, Human Resources, International Engagement (INSEP)
- Also
 - Program of Technical Assistance to IAEA Safeguards (POTAS)
 - Laboratory Directed Research & Development
 - Other sponsors
- Partners
 - DOE National Laboratories: ANL, BNL, LANL, LLNL, NBL, ORNL, PNNL, SRNL
 - Universities and Industry

International Nuclear Safeguards at Sandia: What We Do

- Our mission focus is ensuring the surety* of safeguards information
- Core Technical Areas:
 - Information Management and Security
 - Containment and Surveillance
 - Unattended and Remote Monitoring
 - Geological Repository Safeguards
- Infrastructure Development is a complementary mission to strengthen nuclear safeguards worldwide
 - Applying systems engineering to promote 3S
 - Cooperative technical engagement to build capacity



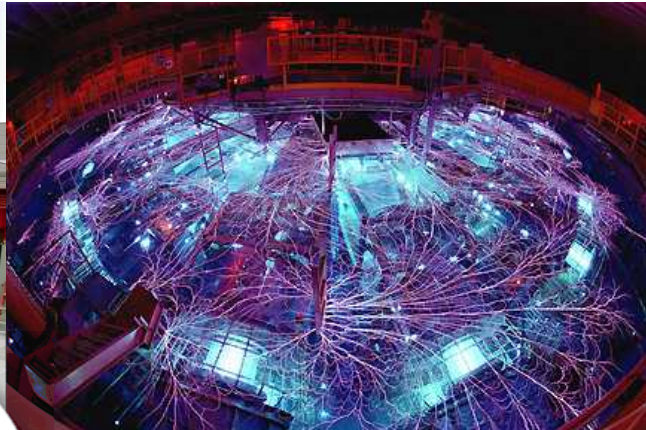
*(information) surety: *a measure of the degree to which information can be trusted*

Baldwin and Tolk, 31st ESARDA Annual Meeting, SYMPOSIUM ON SAFEGUARDS AND NUCLEAR MATERIAL MANAGEMENT,
28 May 2009, Vilnius, Lithuania

Our Research Framework

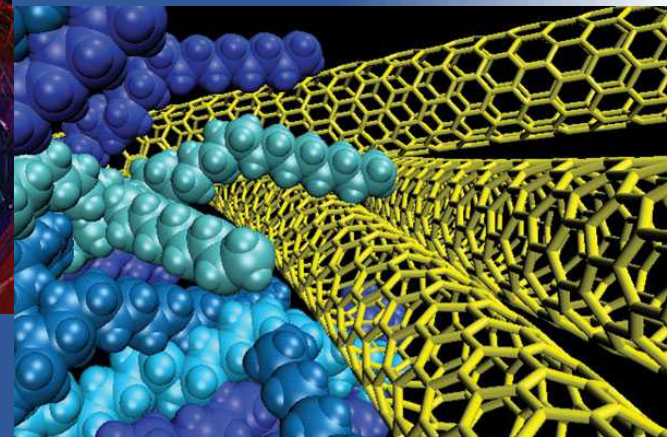
Strong research foundations play a differentiating role in our mission delivery

Computing & Information Sciences

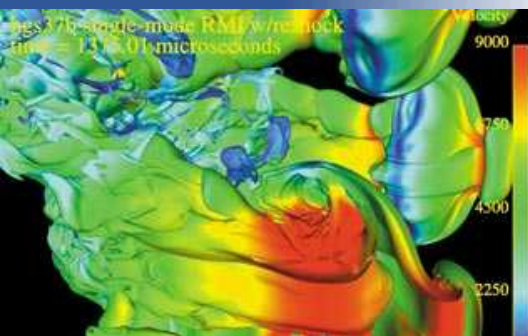


Radiation Effects & High Energy Density Science

Materials Sciences

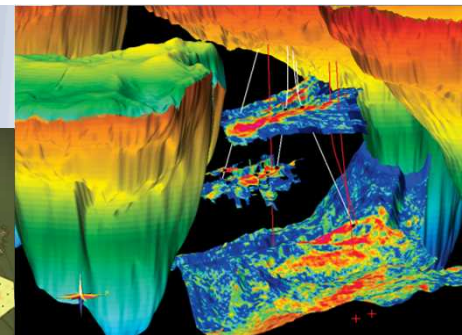
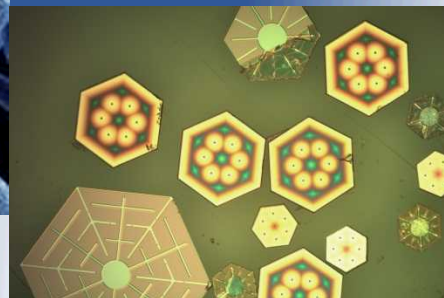


Engineering Sciences



Bioscience

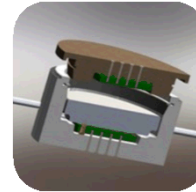
Nanodevices & Microsystems



Geoscience

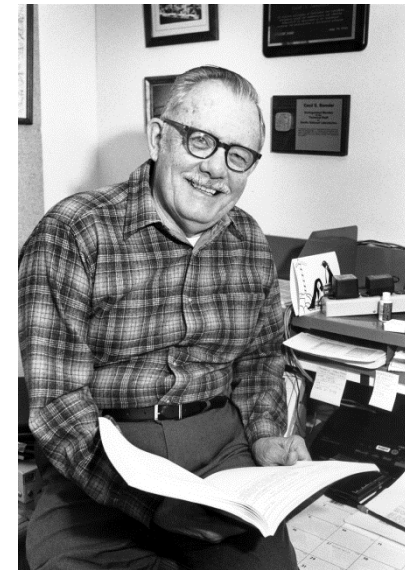
International Nuclear Safeguards at Sandia: Current Activities

- Remotely Monitored Sealing Array (RMSA)
- Next Generation Ceramic Seal
- Magnetic Smart Tag
- Geological Repository Safeguards studies
- INSEP Bilateral Safeguards Collaborations
 - Euratom: Enhanced Data Authentication System (EDAS)
 - INSEP Regional Lead for France/Germany
 - ROK: Safeguards qualification of waste streams for repositories
 - ABACC: Inspector C/S Training
- Participation in the multi-laboratory NGSF Spent Fuel Nondestructive Assay Project



International Nuclear Safeguards at Sandia: Historical

- Individuals
 - Cecil Sonnier, Steve Dupree, Denny Mangan, John Matter, Don Glidewell
- International Assignment
 - IAEA: Balsley, Baldwin, Tolk, Damico, Mascarenhas, Pastercyk, Gastelum
 - Japan: Betsill, Olsen, Lucero, Furaus, Damico
- Systems and Technologies
 - Modular Integrated Video Surveillance (MIVS)
 - Cobra seal
 - Spent Fuel Plutonium Measurement study
 - Secure Video Surveillance System (SVSS)
 - Vulnerability Assessments
- Training
 - ABACC Containment and Surveillance Training (ongoing)
 - IAEA Unattended and Remote Monitoring (2002, 2003)
- Professional organizations
 - INMM: International Safeguards Technical Division
 - ESARDA Working Groups
 - Containment and Surveillance
 - Implementation of Safeguards
 - Verification Technologies and Methodologies
 - ASTOR



Sandia and ESARDA

- We have been partners since the very beginnings

Since its first meeting, the group representing about 21 institutions from 9 countries (see Table 1), has worked within these terms of reference with emphasis on the inventory of techniques and on the aspect of quantification of the assurance from devices and systems.

A seminar was organized at Ispra in September 1980 which was a good conclusion to the first year of work and a re-orientation of some terms of reference.

2. Inventory of C/S techniques

The actions regarding an exhaustive inventory of C/S techniques are illustrated by the joint U.S.A./ESARDA Compendium of C/S techniques which was started by the SANDIA Laboratories continued by the JRC-Ispra and has now been taken over by subgroups on "devices" and "systems" and "NMA".

3. Models for the quantification of the assurance given by C/S systems and NMA

A subgroup on "quantification" mainly composed of representatives of KfK, BNFL, DWK, CEC-DCS, has analysed the problem and concluded on what was necessary to effectively use models as

1. Introduction
Assessment of the assurance obtainable - Costs
Prior to any consideration of effective assurance to be given by devices, or cost evaluation, knowledge of devices is necessary:
• all devices have to be considered
• the sensitivity function of devices has to be available or estimated

TABLE 1

Participating institutions

Belgium	CEN/SCK (VDEW)
France	CEA, DSMN, CEA, DAM
FRG	DWK, KfA, KfK, RWE, VDEW
Italy	CNEN, ENEL/DCO, FABB, NUCL. ECN
NL	BNFL
U.K.	Dept. of Energy, UKAEA, AERE, URENCO

U.S.A.	SANDIA Labs.
Canada	AEC
C.E.C.	JRC, Safeguards Directorate

...the new...
...be roughly...
...has...
...models for quantification...
...assurance...
...C/S devices...
...applications...
...and, e...
...Vulnerability...
...has not yet...
...group repre...
...from 9 coun...
...worked within...
...with emphasis...
...es and on the...
...the assurance...
...d at Ispra in...
...a good con...
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...reference...
...techniques...
...an exhaustive...
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...SARDA Com...
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...Laboratories...
...and has now...
...subgroups on...
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...ification of...
...by C/S...
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...Japan. It is...
...ity-Sensitivity...
...own prior to...
...the assurance...
...devices...
...has been re...

commended by the subgroup. The evaluation of U.S.A. and U.K. models brought them to a unique formulation.

4. Design specifications for C/S devices

Rapporteurs or leaders have been identified (to be informed of and to disseminate information on existing devices as well as in order to be able to specify design criteria for devices) for the following items:

- general purpose seals
 - doorway-monitors
 - cap-seals
 - electronic seals
- Particular questions of the ESARDA Working Group on LEU were answered:
- Interest is expressed concerning the possible use of seals for LWR fuel bundles
 - virtual walls could introduce containment in plants
 - containers of raw material could be uniquely identified but a cost/benefit study has to be performed.

5. Applications of devices - Assessment of the assurance obtainable - Costs

Prior to any consideration of application, effective assurance to be given by devices, or cost evaluation, basic knowledge of devices is necessary:

- all devices have to be considered
- the sensitivity function of devices has to be available or estimated

TABLE 1

Participating institutions

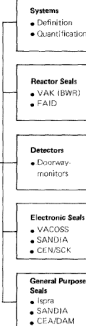
Belgium	CEN/SCK (VDEW)
France	CEA, DSMN, CEA, DAM
FRG	DWK, KfA, KfK, RWE, VDEW
Italy	CNEN, ENEL/DCO, FABB, NUCL. ECN
NL	BNFL
U.K.	Dept. of Energy, UKAEA, AERE, URENCO
U.S.A.	SANDIA Labs.
Canada	AEC
C.E.C.	JRC, Safeguards Directorate

TABLE 2

Subgroups of the ESARDA W.G. on C/S

To avoid losses of time, to get more specialized people in the W.G. actions, four subgroups or task-forces were created by the W.G.

W.G. on C/S
All members
(two meetings a year)



- reliability data have to be generated
- the aspect of tamper-resistance of the devices has to be considered.

The subgroup on devices will thus condition the rest of the work of the working group. Examples are put forward for consideration by the working group:

- VAK seals (cap seal for LWR fuel bundles)
- General purpose seals
- electronic seals.

6. Major conclusions of the working group activity on June 1981

Time has been spent on definitions: it was essential to get all members speaking the same language. The difference between conventional and extended containment/surveillance initiated important discussions which will be concluded only by the subgroup on Systems.

The concept of the assurance to be given by:

- C/S devices
- C/S systems
- NMA systems

as well as the one of the combined assurance obtainable from both C/S and NMA systems, have been a major concern of the whole working group.

The final conclusion was a need for:

- complete descriptions of existing devices
- measurement of the sensitivity function of those devices

ESARDA Bulletin

ESARDA BULLETIN

#1 !!
(1981)

NUMBER 1
OCTOBER 1981

Conclusions

- Sandia National Laboratories has an enduring commitment to supporting international nuclear safeguards
- Sandia has already been an active participant in the ESARDA safeguards community for many years
- Sandia joining as an Associate Member of the ESARDA would formally recognize our mutually beneficial relationship