



Journal of Nuclear

Materials Management

Future Perspectives on Nuclear Issues

Pete V. Domenici

13

**Report on the Science and Technology Association
Safeguards Symposium**

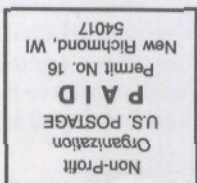
Masayori Tsutsumi

17

**Summary of the First Closing Plenary Session
of the INMM 38th Annual Meeting**

John C. Matter, Robert G. Behrens, James R. Lemley, and M. Teresa Olascoaga

21



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CONTENTS

Volume XXVI, Number 1 • Winter 1998

PAPERS

Future Perspectives on Nuclear Issues

Pete V. Domenici13

Report on the Science and Technology Association Safeguards Symposium

Masayori Tsutsumi17

Summary of the First Closing Plenary Session of the INMM 38th Annual Meeting

John C. Matter, Robert G. Behrens, James R. Lemley,
and M. Teresa Olascoaga21

EDITORIALS

INMM President's Message2

Technical Editor's Note3

Readers' Forum4

INMM NEWS

Chapter News6

Division Reports8

News Brief: Peña and Security at DOE Defense Nuclear
Facilities10

New Members12

ANNOUNCEMENTS & NEWS

Calendar28

Author Submission Guidelines28

New Year, New Opportunities



I am excited as the Institute's new fiscal year gets underway. During my tenure it has been gratifying to see the support that our programs and activities have

received from members and supporters, and this year should be no exception. We are fortunate to have many hard workers who will successfully meet the opportunities and challenges that lay ahead.

Fiscal 1998 activities began in October with the Institute's participation as a cooperating organization for the 8th International Atomic Energy Agency Symposium on International Safeguards. I had the opportunity to represent the Institute at this outstanding symposium, and it was clear that the organizational contributions of INMM were significant and appreciated by the IAEA. The week-long event was attended by representatives from more than 50 countries and provided the opportunity to reflect on the past and look to the future of safeguards and the role of the IAEA with respect to safeguards in the new millennium. I found it interesting and noteworthy that each of the INMM's 10 chapters were represented at the symposium.

At the fall Executive Committee meeting in early November, general business and operational directives for the fiscal year were addressed. In addition to the scheduling of Technical Division workshops, budget approval, and committee assignments, there was considerable discussion regarding the formalization of the Memorial Educational and Outreach Fund. Past President Jim Tape has put a great deal of effort into the development of this

program and will be formally announcing the program via several avenues in the near future.

On several occasions I have encouraged Institute members to take advantage of the opportunities available through chapter participation. Regional chapters worldwide routinely conduct meetings, social events, and workshops to promote the professional development of their members. I recently had the pleasure of attending the inaugural dinner meeting of the newly formed Northeast Regional Chapter in Washington, D.C. Chapter President Ken Sanders, the entire Executive Committee, and all chapter members should be congratulated on the aggressive course they have set for the chapter. With the high frequency of business travel to the northeastern United States, the Northeast Regional Chapter will be sending notices of all of its activities to the other chapters to facilitate participation by a wide range of members. If you are in the Northeast when a chapter event is scheduled, I encourage you to attend.

I also would like to mention one other avenue for participation — one that should be attractive to members who may not be able to attend Annual Meetings or other workshops due to the great distances and expenses — the *Journal of Nuclear Materials Management*. *JNMM* is an excellent mechanism for sharing your work or technological developments with other professionals around the world. If you have technical information, research-and-development results, or a personal perspective you would like to share, I encourage you to pursue publication in the *Journal*.

Planning is well underway for the 39th Annual Meeting, which will be held in Naples, Florida. Technical Program Chair Charles Pietri and the headquarters staff have developed a new

electronic formatting and submittal procedure for abstracts, which was detailed in the call for papers. The new submission mechanism will improve the review process, reduce production cost, and facilitate early distribution of the preliminary program. All of the activities underway in the nuclear materials management arena and the extraordinary preparatory efforts of the Program Committee should make this year's meeting another winner.

In closing, I would like to reiterate my desire to hear from any of you who may have comments or questions regarding the Institute. Please feel free to give me a call at (509) 372-4663.

*Obie P. Amacker, Jr., INMM president
Pacific Northwest National Laboratory
Richland, Washington*

Changing of the Guard

In the last issue of *JNMM*, our beloved outgoing editor Darryl Smith began, "It is with mixed feelings that I write this message," as he announced his retirement as technical editor. I understand Darryl's feelings, as it is with mixed feelings that I too write this message as the new technical editor. To follow in the footsteps of Willie Higinbotham and Darryl Smith, both of whom left a legacy, is a challenging task.

We owe appreciation to Darryl for the past three years that he has been *JNMM* editor. He provided quality journal articles and added to the professionalism of the *Journal* in his typical can-do style. We will miss him. To Darryl, the Institute thanks you, and I personally want to say thank you for a job well done. *Now* you can retire!

On November 7, 1997, the Secretary of Energy provided an important press release regarding the action DOE will pursue to Boost Security at DOE Defense Nuclear Facilities. This release is reproduced on page 10 and should be interesting reading for not only U.S. readers, but also our international members.

This issue contains one of the most thought-provoking speeches I have heard in a long time, "Future Perspectives on Nuclear Issues." It is the keynote address that Senator Pete Domenici (R-New Mexico) gave at the Annual Meeting of the American Nuclear Society, held in Albuquerque, New Mexico on November 17, 1997. It is similar to the speech he gave at the dedication of the Belfer Center for Science and International Affairs at Harvard University on October 31, 1997. It is a bold speech, and one that captures some of the thoughts many of us have had over the years. It is a refreshing speech, and it likewise is a logical speech. Toward the end, Domenici states, "My intention is to lead a new dialogue with serious discussion about the full range of nuclear technologies. I intend to provide national leadership to overcome barriers." I suggest that the INMM and its Technical Divisions indeed address some of the barriers that exist and need to be overcome. I also believe the senator would welcome our involvement in the dialogue.

Another article, prepared by

Masayori Tsutsumi, is a summary report on a safeguards symposium held in Toyko on February 17, 1997, commemorating the 20th anniversary of the signing of the NPT Safeguards Agreement between Japan and the IAEA.

This issue also includes a summary of presentations made at the first plenary closing of the Institute's Annual Meeting in Phoenix last July. The summary was prepared in part by John Matter, chair of the INMM Government-Industry Liaison Committee, which sponsored the closing. Also helping with the summary preparations were Bob Behrens, Jim Lemley, and Terry Olascoaga. I believe you will find the four summaries interesting.

If you have any comments or suggestions, please let me know.

Dennis L. Mangan
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Mangan is New *JNMM* Technical Editor

INMM welcomes long-standing member Dennis L. Mangan as the new technical editor of the *JNMM*. In this volunteer position, Mangan will oversee the solicitation and review of journal content. A brief biography follows.

Dennis L. Mangan is manager of the Nuclear Materials Management Systems Department at Sandia National Laboratories in Albuquerque, New Mexico. He is presently a program manager responsible for the Nuclear Materials Management Initiatives at Sandia. He is a senior advisor providing support to the Department of Energy's involvement in the U.S./Russian Federation/International Atomic Energy Agency Trilateral Initiative to investi-

gate the technical, financial, and legal aspects of a verification regime for weapons-origin material declared excess to defense program needs.

Prior to his current assignment, he was responsible for the Technical Support Program that Sandia provided to the Department of Energy's Office of Fissile Materials Disposition. He was manager of the On-Site Monitoring Applications Department, where he had programmatic responsibility for the DOE's International Safeguards Program at Sandia, as well as DOE's On-Site Monitoring Program. Past assignments at Sandia, where he has worked for over 35 years, included development of equipment for international safeguards

applications, treaty verification applications, and domestic security applications. He also has been involved in weapons radiation-effects studies and weapon component development.

He received a doctorate in nuclear engineering from the University of New Mexico in 1972 and has a M.S. from the University of New Mexico and a B.S. from the University of Notre Dame. He is a past chair of the Institute of Nuclear Materials Management, having served as chair during the 1993 and 1994 fiscal years. He has been a member at large of the Executive Committee and has served on numerous committees of the INMM.

Recent Articles 'Exploited' JNMM Forum

Two recent issues of the *Journal* have prompted me to write this note to express my deep concern about the exploitation of the JNMM forum. The August 1997 issue of the *Journal* had a lead article ["Safeguards Termination limits on Immobilized Nuclear Material"] that was an attempt to justify a bad decision to discard large quantities of plutonium from Rocky Flats. The second was the "Safeguards Roundtable" published in the fall 1997 issue, where the guest promoted his prejudices and paranoia even during inquiries about business opportunities.

Safeguards termination limits (STL) recently granted to Rocky Flats to discard rich plutonium residues are neither technically or morally justifiable. Those INMM members who have had a chance to review the STL decision papers, the second WIPP supplementary EIS, and the recent draft EIS on the management of plutonium residues at Rocky Flats could not help wondering about a possible conspiracy to embarrass the United States government in front of world organizations. Those who are familiar with U.S. positions on STL at the IAEA will dread having to go to another international gathering. Although U.S. defense facilities are not under obligations to follow IAEA guidelines, we have a moral obligation to show the rest of the world that we believe in what we preach.

The guest at the Safeguards Roundtable has been pontificating on both plutonium and proliferation as a career goal for a long time. The growth of antinuclear lobbying organizations as tax-free institutions in the United States and misinformation campaigns into business ventures have been detrimental to all peaceful applications of nuclear technologies.

However, it is important for all to recognize that plutonium is here to stay and it will survive all its detractors. As

the finite energy resources of this planet are being rapidly depleted, a future generation will recover and reuse the most valuable energy source known to man — plutonium — whether this generation buries it half-a-mile or 10 miles deep.

The paranoia now prevalent in the United States about proliferation is one of the greatest achievements of the anti-nuclear career lobbyists. Most people outside the United States often wonder about this illogical fear of proliferation promoted by xenophobes in the media, and its exploitation by the entertainment industry. Those who have seen any of the recent Hollywood blockbusters ("Broken Arrow," "Peace Keeper," or "Medusa's Child") will recognize why this paranoia is so pervasive.

Unfortunately, even some in the pronuclear community have joined the bandwagon to extract more funds from the U.S. Congress to finance their addictions. Those who know the history of the nuclear era will recognize that so far, there has not been a successful diversion of a meaningful quantity of SNM by anyone in the world. And those who have circumvented the international safeguards regime have been severely dealt with. How many world leaders want to be in Saddam Hussein's shoes? Yes, there are potentials for diversion and there always will be potentials. Those are not good enough reasons for intelligent people to buy into phantom risks and promote paranoia and extortion.

In a recent letter to the *New York Times*, Senator Pete Domenici of New Mexico wrote "We aren't wisely using nuclear technologies. The current anxiety-laden, fragmented state of nuclear policy debate in the country has created this situation. Irrational fears of perceived risks of nuclear technologies prevent us from actions to address real risks."

Let us stop the exploitation of the JNMM forum and help promote sane dialogues to sustain our leadership in all areas of nuclear technologies.

K. K. S. Pillay
Los Alamos, New Mexico

JNMM encourages feedback through its Readers' Forum. If you have comments or opinions about any of the *Journal's* content, please send them to:

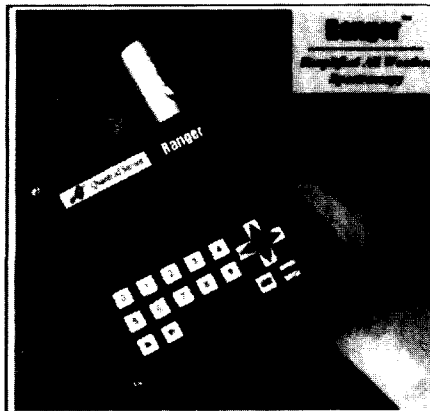
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INMM 38th Annual Meeting Proceedings Now Available

The Proceedings of the 38th Annual Meeting of the Institute of Nuclear Materials Management are now available in CD-ROM format. These proceedings are a valuable reference, containing the complete text of papers presented at the Annual Meeting, held July 20-24, 1997 in Phoenix, Arizona. Copies are available for \$120 to members, \$175 to nonmembers (plus shipping) for the CD-ROM; \$200 to members, \$250 to nonmembers (plus shipping) for the printed version.

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39th Annual Meeting

The Institute of Nuclear Materials Management is proud to announce the INMM 39th Annual Meeting

July 26-30, 1998
The Registry Resort
Naples, Florida, USA



Chapter News

Japan

The eighty-third Japan Chapter's Executive Committee met in Tokyo on October 3, 1997 and approved the 1997 annual business report and 1998 business plan. The 18th Annual Meeting of the Japan Chapter was held November 27–28, 1997 in Tokyo. The major business plan priorities for 1998 follow:

1. The 8th workshop will be conducted in June 1998.
2. The election of the chapter's officers and members at large for 1999–2000 will be performed in accordance with Article 3 of the Japan Chapter's bylaws.
3. Group participation in the 39th Annual Meeting of INMM in Naples, Florida and a nuclear energy related facility observation program will be established.
4. An ad-hoc working group will be organized to prepare the budget plan for the "Science and Modern Technology Workshop in Japan" in the year 2000.

*Tohru Haginoya, president
INMM Japan Chapter
Tokyo, Japan*

Northeast

The officers of the Northeast Regional Chapter appreciate the official recognition of the new chapter that was provided at the 1997 Annual Meeting banquet held in Phoenix, Arizona, and they welcome the opportunity to further the objectives of the INMM in the advancement of nuclear materials management. They recognize that we live in an age of unique nuclear danger as well as unsurpassed professional opportunity.

On March 3, 1997, eight founding members of the INMM, led by Amy Whitworth, petitioned the INMM

requesting authorization to establish the Northeast Regional Chapter. The INMM Executive Committee granted the petition and awarded the charter for the Northeast Regional Chapter on March 5.

On March 15, 1997, a draft of the chapter constitution and bylaws was submitted to INMM. The chapter was notified that the chapter constitution and bylaws were approved by the INMM Executive Committee in May 1997.

Following the distribution of ballots on July 8, 1997 to INMM members in the Northeast Regional Chapter, an election for chapter officers was held. As the newly elected president, I am pleased to be joined by Vice President Joseph Indusi, Secretary/Treasurer Bruce Moran, and Members-at-Large David Crawford, Yvonne Ferris, Michael Heaney, and Amy Whitworth. As of July 18, 1997, there were more than 65 chapter members. A total of 135 INMM members either work or reside in the 12-state Northeast region.

At the Awards Banquet during the INMM Annual Meeting, the INMM president announced the formation of the Northeast Regional Chapter and presented a plaque and banner for the chapter to the new chapter president.

The first chapter officers' meeting was held September 9, 1997 to begin getting ideas, organizing the chapter, and planning activities for the next two years for the main purpose of advancing the management of nuclear materials. The first general chapter meeting was held October 28, 1997.

The chapter currently has assets of \$126 and eight postage stamps worth 55 cents each! On October 14, a letter was sent to INMM headquarters requesting the fiscal year 1998 allotment of \$300 from the INMM for the Northeast Regional Chapter. These funds will aid in defraying administrative costs, such

as postage on meeting announcements to current and prospective members.

*Kenneth Sanders, president
INMM Northeast Regional Chapter
U.S. Department of Energy
Monrovia, Maryland*

Obninsk

INMM Obninsk Regional Chapter members held their first meeting on October 3, 1997 and elected the following officers: Gennady M. Pshakin, president; Andrey V. Mozhayev, vice president; and Irina Khoptynskaya, secretary/treasurer.

A number of administrative issues were discussed and resolved, including financial management and communications with INMM headquarters. In addition, chapter members addressed ways to more closely involve other Russian facilities and experts through communication and outreach activities.

The chapter plans to be involved in a number of activities in 1998, including:

- A tripartite seminar on the role of MC&A in radiochemical plants;
- Organization of a workshop on NDA instrument calibration methodologies for MC&A;
- Organization of a workshop on verification problems of excess materials in prospective of technical support of trilateral initiative; and
- Identification of nuclear materials management educational or post-graduate training opportunities for Russian specialists at U.S. institutions and facilities.

*G.M. Pshakin, president
INMM Obninsk Regional Chapter
Institute of Physics and Power
Engineering
Obninsk, Russia*

Pacific Northwest

The Pacific Northwest Chapter held its annual picnic at Leslie Groves Park in Richland, Washington on September 18, 1997. The chapter hosted four IAEA safeguards inspectors who had just finished an inventory verification at the Plutonium Finishing Plant. The Pacific Northwest National Laboratory had two Russian visitors who were hosted by the vice president, making this a truly international event. Several retired chapter members were in attendance, and it was nice to see past co-workers. The president presented the senior member certificate to Gary Fetterolf. Fortunately, the weather held and the food was great. Everyone had a good time.

The chapter completed its election of officers and Executive Committee positions. The 1998 officers and Executive Committee members are: Brian Smith, president; Rod Martin, vice president; Deanna Osowski, secretary/treasurer; Jim Andre, Dean Scott, Terri Welsh, Carrie Mathews (special position), and Don Six (past president), Executive Committee members.

A half-day Technical Paper Presentation Seminar was held November 18, 1997 at the Battelle Auditorium in Richland. The seminar was designed to provide papers of general interest to chapter members and others regarding the Hanford Site. The 10 papers presented included topics on MC&A measurements, international safeguards, arms control and nonproliferation, the Siemens MOX Consortium, and the spent nuclear fuel project. The seminar was well-attended and received many favorable comments.

*Deanna Osowski, secretary/treasurer
INMM Pacific Northwest Chapter
B & W Protec Inc.
Richland, Washington*

Russian Federation

On August 29, 1997, INMM Russian Federation Chapter members unanimously elected chapter officers for 1998: Alexander Izmailov, president; Igor Bumblis, vice president; and Andre Zobov, secretary/treasurer.

*Vladimir Shmelev
INMM Russia Chapter
Division of Non-proliferation & Control
Moscow, Russia*

Southwest

INMM Southwest Regional chapter members elected Cindy Murdock, president; Chad Olinger, vice president; and Cary Crawford, secretary/treasurer. The chapter members at large are Albert Garrett, Sherri Rudolph, Nannette Fairrow, and Neil Zack.

*Cindy Murdock, chair
INMM Southwest Regional Chapter
Paragon Technical Services Inc.
Albuquerque, New Mexico*

Vienna

The election of Vienna Chapter officers was held in August. Chapter Executive Committee members for 1997-1998 are

Jill Cooley, president; Jaime Vidaurre-Henry, vice president; Susan Pepper, secretary; Richard Hartzig, treasurer; Martha Williams, past president; Reinhard Antonczyk and David Sinden, members-at-large; Lorilee Brownell and Maribeth Hunt, symposium co-chairs; Ed Kerr, special event chair.

The first chapter-sponsored luncheon meeting of the 1997-98 year was held October 16, during the week of the IAEA Safeguards Symposium. Obie Amacker, INMM president, spoke on "INMM Going Global," a very relevant topic for the members of the international safeguards community attending the luncheon. Also during the week, INMM, in conjunction with the Vienna and Japan chapters, hosted a reception for symposium attendees.

The second luncheon meeting of the year was held November 13. Graham Andrew, head of the UK Safeguards Office and chair of the IAEA's Standing Advisory Group on Safeguards Implementation (SAGSI), addressed the group on "Safeguards Changes and Challenges."

*Jill Cooley, president
INMM Vienna Chapter
International Atomic Energy Agency
Vienna, Austria*



Bruno Pellaud, Jill Cooley, Andre Petit, and Obie Amacker at the INMM-sponsored reception during the IAEA Safeguards Symposium in October 1997.

Division Reports

International Safeguards

On October 17, 1997, the INMM International Safeguards Division (ISD) met at the IAEA, the site of the 1997 IAEA International Safeguards Symposium. Forty-three members of the international safeguards community, from the IAEA, European Community, JRC-Ispra, ABACC, Argentina, Australia, Austria, Canada, Czech Republic, France, Germany, Japan, Russian Federation, South Korea, United Kingdom, and United States participated in this meeting.

The topics for discussion were:

- the impacts of the Strengthened Safeguards System (SSS) on all participating parties (inspectors, States, and facility operators) and the benefits that could be provided to States accepting the new measures, and
- the "data-rich environment" that will be encountered from all aspects of the SSS.

Major discussion centered around the impact of the SSS, including the new Model Protocol reflected in the new INFCIRC/540 (Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards). As may be expected, a wide variety of issues surfaced, principally the legal aspects of the new protocol, subsidiary arrangements with states accepting the protocol, the benefits that could be provided to States accepting the new measures, and the recent and future related activities of the Standing Advisory Group on Safeguards Implementation (SAGSI).

Approximately one-third of the meeting was devoted to discussions on the "data-rich environment" that will be encountered with the SSS. This topic will be the subject of one of the Working Groups in the 1998 ESARDA/INMM Workshop on Science and Modern Technology, to be held in Albuquerque, New Mexico, U.S.A.,

September 21–24, 1998.

As in past meetings of the ISD, it was recognized that many factors must be considered in the introduction of the variety of changes inherent in the new system and its protocol, as well as the vast array of new technology which will support these changes. It seems clear that the meshing of the new system with the old and the full implementation of the SSS will be a challenging effort for all parties, requiring a very cooperative atmosphere.

Cecil S. Sonnier, chair
Roger Howsley, vice chair
Stephen Dupree, secretary
International Safeguards Division

Material Control & Accountability

The INMM Material Control & Accountability (MC&A) Division held a meeting July 20, 1997 to discuss:

- a perceived problem between the way that physical protection programs and material control and accountability programs are directed and funded, and
- ways that the Neutron Users Group may be restructured in order to increase interest and participation.

Physical Protection vs. MC&A Programs

The discussion centered around the idea that the allocation of resources for physical protection programs typically is not well-integrated with the allocation of resources for MC&A. There was a general sense that these elements of the overall Safeguards/Security strategy don't compete on equal footing because of historical differences in the way the two program elements are administered. There were four principal points that highlighted the nature of the problem:

1. Allocation of resources and funding to address perceived weakness in physical protection or MC&A is

often not based on a systems analysis of overall nuclear safeguards risk. This situation continues to persist even though safeguards funds are increasingly scarce.

2. The role of MC&A at DOE EM sites is poorly understood. The focus tends to be toward Environmental Protection Agency and Department of Transportation regulations once nuclear material inventories are declared "excess to programmatic needs." Often these [EM] facilities have significantly reduced their MC&A activities, while keeping physical security programs intact.
3. While the United States is pressuring the former Soviet Union to implement a fully integrated Material Protection Control and Accountability program, the Russians are quick to recognize that U.S. nuclear facilities generally lack such integration. This appears to be the result of long-standing practices and the way that the DOE is organized. Funding for security and MC&A typically comes from different Department sources.

Furthermore, the compliance basis for the two disciplines is separate. It was noted that in some Russian facilities where Safeguards & Security programs are being created "from scratch," it may be easier to build a fully integrated program.

This advantage may arise because of the lack of a history of administrative separation of safeguards disciplines.

4. Vulnerability analysis (VA) techniques could be designed to integrate threats from insiders as well as outsider scenarios. Such integration may ultimately bridge the gap between physical security and MC&A. It was noted that a lack of integrated VA is not a problem unique to the United States. Statistical analysis for integration of physical security and MC&A was recently disapproved at

the UK THORP facility. A general frustration was expressed over the lack of a systems approach to safeguards and security.

There was a discussion over the possibility of sponsoring a joint Physical Protection/Material Control & Accountability workshop on the integration of physical security and MC&A in spring 1998. Most people at the meeting expressed interest in participating. Meeting participants then discussed the possible workshop format and agreed that there would be an equal emphasis on invited papers and roundtable discussions. It was generally agreed that it would be necessary to invite officials who set policy and regulations for safeguards and security. It would also be beneficial to hear from our Russian colleagues who are developing MPC&A programs. Three people expressed a willingness to assist with the preparations for a workshop.

Improvements to the Neutron Users Group

Norbert Ensslin asked if the MC&A technical division participants had any ideas concerning how the Neutron Users Group might be structured to better meet the needs of the MC&A community. There was a considerable interest expressed in developing a measurement exchange program.

The lack of a sufficient number of exchange standards could be overcome by shipping an instrument around the complex where the standard reference materials are held. Another idea was to shift the emphasis away from neutron assay instruments to embrace other non-destructive assay techniques.

Lynn Preston suggested using the CALEX standards that were prepared for the calorimetry exchange program. Ed Sadowski suggested using DOE 3013 containers to ship a new set of standards that is being made around the complex for this broader mission.

Ensslin expressed his gratitude for these ideas and agreed to take them into consideration in future discussions with the Neutron Users Group.

*Dennis L. Brandt, chair
INMM MC&A Technical Division
Los Alamos National Laboratory
Los Alamos, New Mexico*

Physical Protection

Explosive Protection Workshop

The workshop that was to take place in the United Kingdom last September has been postponed until the April 14–16 time frame. The workshop host is still Nigel Custance, head of consultancy for the Special Services Group in London. For more information, please contact INMM headquarters at 847/480-9573.

The main topic of the Physical Security Committee discussion at the INMM Annual Meeting last July in Phoenix, Arizona was how to increase physical protection participation in INMM. In the past several years, participation has clearly diminished. At the Annual Meeting there were no physical protection vendors and only a handful of physical protection related papers.

To begin to resolve the problem, a survey was created to understand the interests of INMM members. Also, the committee pulled together mailing lists of members and nonmembers who may have interest in physical protection papers and hardware. The goal is to serve the needs of INMM members as well as recruit new members whose interests lie in physical protection. The survey was mailed to committee members for review and then to members and targeted nonmembers.

*Jim Chapek, chair
INMM Physical Protection Division
Sandia National Laboratories
Albuquerque, New Mexico*

Waste Management

The second Low Level Waste Management Seminar was held October 8–10, 1997 in Cordoba, Spain. The seminar, co-sponsored by ENRESA, included a technical visit to the El Cabril LLW disposal site. About 105 registrants from 17 countries participated in the seminar's five sessions. Forty speakers from industry and regulatory bodies discussed the status of waste acceptance criteria and requirements, very low level waste management issues, waste measurement and conditioning techniques, performance assessment studies, and safety-related aspects of disposal facilities. The waste management division is planning to continue this series of technical seminars at 18–20 month intervals.

The 15th Annual Spent Fuel Management Seminar was held at Loews L'Enfant Hotel in Washington, D.C., January 14–16, 1998. The seminar included sessions on spent fuel management programs and policies, spent fuel storage technologies, spent fuel projects, spent fuel transportation, and the status of repository and spent fuel disposal projects. A panel discussion, "Should There Be a 10CFR71 Equivalent for 10CFR72.48?" was also on the program.

The 16th Annual Spent Fuel Management Seminar has been scheduled for January 13–15, 1999 at the Loews L'Enfant Plaza Hotel in Washington, D.C.

*E.R. Johnson, chair
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Peña Takes Action to Boost Security at DOE Defense Nuclear Facilities

Secretary of Energy Federico Peña recently announced several actions to strengthen safeguards and security at the Department of Energy's defense nuclear facilities. The measures include deployment of new technologies, involvement of Navy SEALs in training for "force-on-force" exercises, and additional involvement and advice from outside experts.

"The Cold War is over, but the potential threat to our nation's security is not. At Energy Department sites, where we are dismantling and cleaning up after 50 years of building nuclear weapons, we face new security challenges that demand new security solutions," Peña said.

In announcing the actions, Peña released two reports that he had ordered earlier this year on safeguards and security — one by the independent Office of Oversight and one by the Director of the Office of Security Affairs. Both reports indicate that there is no immediate danger to nuclear material at any DOE site but highlight the need for significant improvements.

"Several months ago when security concerns were first brought to my attention, I ordered these reports. Today, I am publicly releasing them because I think we have a responsibility to the American people to address these challenges as openly and directly as possible. More importantly, we are taking actions to further secure our facilities. The reports highlight problems, but they also show that our site managers have been instrumental in helping to identify the problems and have been working to address them," Peña added.

Peña announced several actions that have been initiated to enhance security and respond to the recommendations in the reports, including:

Security Oversight Board: Establishing a Security Board that will include three members selected by the Secretary of Defense, one by the director of the Federal Bureau of Investigation and one

by the director of the Central Intelligence Agency.

Enhanced Training: Involving Navy SEALs in training for the force-on-force exercises that DOE uses to test security and train security police officers, and enhancing cooperation and training between the FBI and DOE field sites for threat contingency planning and emergency response.

Security Improvements: Having already completed an inventory of special nuclear material and its Site Safeguards and Security Plan, Rocky Flats has committed more than \$19 million to upgrade and replace aging security alarm systems. Hanford, the Nevada Test Site, and Los Alamos National Laboratory are increasing the number of security police officers and Lawrence Livermore National Laboratory is reestablishing a special response team. Security systems and equipment at several other sites are also being upgraded.

Technology: Establishing a special security review team led by Sandia National Laboratories that will use state-of-the-art technology to more effectively and efficiently protect sites.

Permanent Director: To strengthen DOE's security management team, Peña appointed Rose Gottemoeller as permanent director of the Office of Nonproliferation and National Security. She will direct, manage, and coordinate all intelligence and safeguards and security activities for the Department. She will also serve as Peña's principal advisor on nonproliferation and intelligence matters.

Protecting Classified Information: An additional \$5 million will be provided to increase protection of classified national security secrets and preventing industrial espionage.

Management Reforms: Deputy Secretary Elizabeth Moler will lead a security management council to evaluate and follow up on the recommenda-

tions in the reports. Peña has directed a status report on these activities by February 1998.

Site-by-Site Report by the Independent Office of Oversight: The site profiles were completed over six months by teams of security specialists from the Department's Office of Oversight, which is independent of the various organizations responsible for managing safeguards and security policy. Actual security performance was closely observed at each facility, including the conduct of "performance tests" — including actual attempts to penetrate alarmed barriers and simulated terrorist attacks that used laser devices that simulated automatic weapons. The outcome of each performance test was evaluated along with conclusions from computer models and the analyses of technical experts.

The report, which summarizes more than 2,000 classified pages, identified the need to continue to improve protection at four sites — Lawrence Livermore National Laboratory (evaluated May 1997), Rocky Flats (evaluated April 1997), Pantex Plant (evaluated August 1997), and Los Alamos National Laboratory (evaluated May 1997). According to the report, these sites do not have "vulnerabilities that would have allowed an adversary to penetrate the facility, but rather that one or more of the layered elements of the protection system surrounding a very important asset had an exploitable weakness." At the remaining sites, the combination of multiple layers of protection — including security clearances, access controls, sophisticated alarm systems, and highly trained and armed protective forces — provide an adequate safety margin. The oversight review concludes that there is no immediate security danger at any DOE site.

This is the first time an unclassified report on safeguards and security at all major DOE facilities has been prepared and released to the public.

Office of Security Affairs Report to the Secretary on the Status of Safeguards and Security

Last May, Secretary Peña appointed Joseph Mahaley as director of the Office of Security Affairs and instructed him to review security at DOE sites as well as issues affecting the department's security management structure. His 56-page report highlights issues, initiatives, and achievements which characterize the current protection posture and status of safeguards and security programs at DOE's 12 major defense nuclear facilities. The report found that the current level of security is satisfactory at most locations. "Three facilities are not fully satisfactory at this time, although, with very few exceptions, these marginal facilities are currently implementing compensatory measures or developing and implementing corrective actions to upgrade their status," the report notes in its executive summary.

The Office of Security Affairs Report also highlights the need to improve DOE's management of security affairs. Several reports have made the same recommendations. Secretary Peña is establishing a Security Management Council to make recommendations and follow up on management reforms. The council will be led by Deputy Secretary Moler.

New Board to Advise on Safeguards and Security

The Security Oversight Board, which was first proposed by Sen. John Warner (R-Virginia) and is pending in the National Defense Authorization Act of 1998, will counsel the Secretary on policy, operational concerns, strategic planning, personnel, budget, procurement, and development of priorities relating to the DOE safeguards and security program.

The board will consist of experts from both inside and outside the department. Members will include the Secretary of Energy (chair); Director of

the Office of Nonproliferation and National Security; Assistant Secretary for Environmental Management; Assistant Secretary for Defense Programs; Assistant Secretary for Environment, Safety and Health; Associate Deputy Secretary for Field Management; and five additional members appointed by the Secretary of Energy who are not employees of DOE or its contractors and selected as follows: three by the Secretary of Defense, one by the director of the FBI and one by the director of the Central Intelligence Agency.

Board members will evaluate the Department's procedures for protecting nuclear weapons and weapons-capable material at facilities that were involved in building nuclear weapons during the Cold War. The board will disband on October 31, 2000.

Navy SEALs, FBI to Help Train Protective Forces

The Department of Energy will start using U.S. Navy SEALs for training and planning tactics for the force-on-force exercises that DOE uses to test security and train security police officers. The specialized SEAL units have the advanced tactical skills and the technology that is available to potential adversaries. They are trained to accomplish highly focused military objectives. The Department will also enhance cooperation and training between the FBI and DOE field sites for threat contingency planning and emergency response.

More Protective Forces, New Technologies, Background Checks

To further ensure the security of DOE nuclear laboratories, facilities and sites, additional security officers would be hired at four locations — Lawrence Livermore National Laboratory (California), Hanford (Washington), Nevada Test Site (Nevada), and Los Alamos National Laboratory (New

Mexico). Upgrades to security systems at facilities throughout the DOE complex, including Pantex Plant (Texas), Idaho National Engineering & Environmental Laboratory (Idaho), Lawrence Livermore National Laboratory, Hanford, Oak Ridge Reservation (Tennessee), Savannah River Site (South Carolina), Rocky Flats Environmental Technology Site (Colorado), and Los Alamos, are either planned or already under way.

Examples of recent and continuing enhancements include construction of new guard stations, guard towers, and vehicle barriers; improved security fencing and lighting systems; new gamma ray, X-ray, and metal detectors; improved security alarm and aircraft detection systems; closed-circuit TV systems; improved computer protection systems; and installation of upgraded encryption and technical countermeasure instruments.

The Department is taking steps to strengthen the process for checking backgrounds of foreign visitors to DOE's nuclear facilities, including allocating an additional \$5 million to enhance counterintelligence resources and the security activities that support them. The aim is to clarify sensitive subject areas that require protection and apply that knowledge to actual visits to DOE facilities by foreign nationals.

The Department will also evaluate several new technologies to enhance protection of DOE sites, nuclear materials and classified information, including a heartbeat detector that can find humans in confined spaces; a device that automatically screens vehicles and pedestrians entering/leaving DOE facilities; a high-speed network intrusion detection system for identifying suspicious activities on a computer network; and non-lead/non-toxic ammunition, which provides safer, healthier firearms training for DOE protective forces.

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INMM Explosive Protection Workshop

April 14-16, 1998
Marriott/Georgetown
University Conference Center
Washington, D.C. USA

Purpose

The purpose of the workshop is to introduce and update participants on the many areas of explosive protection. Topics will range from threat and threat trends to current standards and policy. Attendees should be those who have an interest in, or are responsible for, the protection of personnel and facilities from explosives.

Goals of the workshop are to:

- Provide participants with access to experts in the field;
- Provide a forum where individuals can discuss their specific problems;
- Create a network among participants;
- Introduce and/or update knowledge regarding technologies; and
- Provide techniques and knowledge that can be applied to attendee specific problems.

Special Events

Opening Reception

Tuesday, April 14, 1998
6 p.m.-8 p.m.

Exhibitors' Luncheon

Thursday, April 16, 1998
Noon-2 p.m.

Sponsored by: Institute of Nuclear Materials Management
Physical Protection Division and the
National Defense Industrial Association
For more information, contact INMM at (847) 480-9573;
e-mail, inmm@inmm.com; Web site, www.inmm.com.



Future Perspectives on Nuclear Issues

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Senator Pete V. Domenici (R-N.M.)

Keynote Address

American Nuclear Society

Albuquerque, New Mexico

November 17, 1997

■

The United States has made nuclear policy decisions based on a number of incorrect premises. The 1977 decision by the United States to halt research into reprocessing and mixed-oxide fuel did not curtail other countries' pursuit of those technologies. Now the United States is unable to use those technologies to meet urgent energy or nonproliferation needs and has largely been left out of international nuclear fuel cycle issues. Scientific evidence may not support the "linear-no-threshold" assumptions used to predict the effects of radiation. As a result, the United States spends billions each year cleaning up sites to levels within five percent of natural background radiation, even though natural background radiation varies by up to 50 percent. Irradiation of food products is rarely used in the United States, despite convincing evidence of its benefits in curtailing food-borne illnesses.

While those decisions need to be reexamined, other decisions need to be made on the basis of the best available science and evaluation of new national policies. Nuclear energy, which in 1996 reduced U.S. greenhouse gas emissions from electric utilities by 25 percent, should be expanded to enable the United States to meet greenhouse gas emissions goals without imposing taxes or other costly limitations on the use of carbon-based energy forms. The United States should move away from sizing its nuclear stockpile in accordance with bilateral accords with Russia. Instead, within the limitations of existing treaties, the United States should move to a "threat-based stockpile." The United States should consider de-alerting its nuclear stockpile and eliminating the ground-based leg of the nuclear triad. As the United States and Russia rapidly dismantle nuclear weapons, both should pursue a swift program to convert classified weapons components into unclassified shapes that are quickly placed under international verification. That material should then be transformed into MOX fuel for use in civilian reactors. The United States should move to interim storage of spent nuclear fuel while continuing to actively pursue the permanent repository. In the years before that repository is sealed, there will be time to study alternative options. A serious review of accelerator transmutation of waste should be undertaken. The Federal government should stop blocking the State of California's efforts to build a low-level nuclear waste disposal

facility at Ward Valley. The United States should expand programs to protect fissile materials in Russia and shift the activities of former Soviet weapons scientists into commercial projects.

Two weeks ago, the Vice President and I both spoke at Harvard as they dedicated their new Belfer Center for Science and International Affairs. He went first and spoke about global warming. I went second and focused on a set of strategic issues that our nation is not addressing — issues that all depend on nuclear technologies. In contrast, the Vice President didn't once say the word "nuclear."

Strategic national issues are always hard to discuss. In no area has this been more evident during these last few decades than in development of public policy involving energy, growth, and the role of nuclear technologies.

But as we leave the 20th century, arguably the American Century, and head for a new millennium, we truly need to confront these strategic issues with careful logic and sound science.

We live in the dominant economic, military, and cultural entity in the world. Our principles of government and economics are increasingly becoming the principles of the world.

There are no secrets to our success, and there is no guarantee that, in the coming century, we will be the principal beneficiary of the seeds we have sown. There is competition in the world and serious strategic issues facing the United States cannot be overlooked.

The United States, like the rest of the industrialized world, is aging rapidly as our birth rates decline. Between 1995 and the year 2030, the number of people in the United States over age 65 will double from 34 million to 68 million. Just to maintain our standard of living, we need dramatic increases in productivity as a larger fraction of our population drops out of the workforce.

By 2030, 30 percent of the population of the industrialized nations will be over 60. The rest of the world the countries that today are "un-industrialized" will have only 16 percent of their population over age 60 and will be ready to boom.

As those nations build economies modeled after ours, there will be intense competition for the resources that underpin modern economies.

When it comes to energy, we have a serious, strategic problem. The United States currently consumes 25 percent of the world's energy production. However, developing countries are on track to increase their energy consumption by 48 percent between 1992 and 2010.

The United States currently produces and imports raw energy resources worth over \$150 billion per year. Approximately \$50 billion of that is imported oil or natural gas. We then process that material into energy feedstocks such as gasoline. Those feedstocks — the energy we consume in our cars, factories, and electric plants — are worth \$505 billion per year.

We debate defense policy every year, as we should. But we don't debate energy policy, even though it costs twice as much as our defense. Other countries' consumption is growing dramatically, and energy shortages are likely to be a prime driver of future military challenges.

Even when we've discussed energy independence in my quarter century of Senate service, we've largely ignored public debate on nuclear policies.

At the same time, the antinuclear movement has conducted their campaign in a way that has been tremendously appealing to mass media. Scientists, used to the peer-reviewed ways of scientific discourse, were unprepared to counter. They lost the debate.

Serious discussion about the role of nuclear energy in world stability, energy independence, and national security retreated into academia or classified sessions.

Today, it is extraordinarily difficult to conduct a debate on nuclear issues. Usually, the only thing produced is nasty political fallout.

My goal today is to share with you my perspective on several aspects of our nuclear policy. I am counting on you to join with me to encourage a careful, scientifically based, reexamination of nuclear issues in the United States. I am going to tell you that we made some bad decisions in the past that we have to change. Then I will tell you about some decisions we need to make now.

First, we need to recognize that the premises underpinning some of our nuclear policy decisions are wrong. In 1977, President Carter halted all U.S. efforts to reprocess spent nuclear fuel and develop mixed-oxide fuel (MOX) for our civilian reactors on the grounds that the plutonium was separated during reprocessing. He feared that the separated plutonium could be diverted and eventually transformed into bombs. He argued that the United States should halt its reprocessing program as an example to other countries in the hope that they would follow suit.

The premise of the decision was wrong. Other countries do not follow the example of the United States if we make a decision that other countries view as economically or technically unsound. France, Great Britain, Japan, and Russia all now have MOX fuel programs.

This failure to address an incorrect premise has harmed our efforts to deal with spent nuclear fuel and the disposition of

excess weapons material, as well as our ability to influence international reactor issues.

I'll cite another example of a bad decision. We regulate exposure to low levels of radiation using a so-called "linear no-threshold" model, the premise of which is that there is no "safe" level of exposure.

Our model forces us to regulate radiation to levels approaching 1 percent of natural background despite the fact that natural background can vary by 50 percent within the United States.

On the other hand, many scientists think that living cells, after millions of years of exposure to naturally occurring radiation, have adapted such that low levels of radiation cause very little if any harm. In fact, there are some studies that suggest exactly the opposite is true — that low doses of radiation may even improve health.

The truth is important. We spend over \$5 billion each year to clean contaminated DOE sites to levels below 5 percent of background.

In this year's Energy and Water Appropriations Act, we initiated a 10-year program to understand how radiation affects genomes and cells so that we can really understand how radiation affects living organisms. For the first time, we will develop radiation protection standards that are based on actual risk.

Let me cite another bad decision. You may recall that earlier this year, Hudson Foods recalled 25 million pounds of beef, some of which was contaminated by *E. Coli*. The Administration proposed tougher penalties and mandatory recalls that cost millions.

I'd bet that everyone in this audience knows that *E. Coli* bacteria can be killed by irradiation and that irradiation has virtually no effect on most foods. But irradiation isn't used much in this country, largely because of opposition from some consumer groups that question its safety.

But there is no scientific evidence of danger. In fact, when the decision is left up to scientists, they opt for irradiation. The food that goes into space with our astronauts is irradiated. And if you're interested in this subject, the current issue of the MIT Technology Review details the advantages of irradiated food.

I've talked about bad past decisions that haunt us today. Now I want to talk about decisions we need to make today.

The President has outlined a program to stabilize the U.S. production of carbon dioxide and other greenhouse gases at 1990 levels by some time between 2008 and 2012. Unfortunately, the President's goals are not achievable without seriously impacting our economy.

Our national laboratories have studied the issue. Their report indicates that to get to the President's goals we would have to impose a \$50/ton carbon tax. That would result in an increase of 12.5 cents/gallon for gas and 1.5 cents/kilowatt-hour for electricity, almost a doubling of the current cost of coal or natural gas-generated electricity.

What the President should have said is that we need nuclear energy to meet his goal. After all, in 1996, nuclear power plants prevented the emission of 147 million metric tons of carbon, 2.5 million tons of nitrogen oxides, and 5 million tons of sulfur

dioxide. Our electric utilities' emissions of those greenhouse gases were 25 percent lower than they would have been if fossil fuels had been used instead of nuclear energy.

Ironically, the technology we are relying on to achieve the benefits of nuclear energy is over 20 years old. No new reactors have been ordered in this country for almost a quarter of a century, due at least in part to extensive regulation and endless construction delays — plus our national failure to address high level waste.

We have created an environment for nuclear energy in the United States wherein it isn't viewed as a sound investment. We need absolute safety, that's a given. But could we have that safety through approaches that don't drive nuclear energy out of consideration for new plants?

The United States has developed the next generation of nuclear power plants which have been certified by the NRC and are now being sold overseas. They are even safer than our current models. Better yet, we have technologies under development like passively safe reactors, lead-bismuth reactors, and advanced liquid metal reactors that generate less waste and are proliferation resistant.

A recent report by Dr. John Holdren, done at the President's request, calls for a sharply enhanced national effort. It urges a "properly focused R&D effort to see if the problems plaguing fission energy can be overcome economics, safety, waste, and proliferation." I have long urged the conclusion of this report — that we dramatically increase spending in these areas for reasons ranging from reactor safety to non-proliferation.

I have not overlooked that nuclear waste issues loom as a roadblock to increased nuclear utilization. I will return to that subject.

For now, let me turn from nuclear power to nuclear weapons issues.

Our current stockpile is set by bilateral agreements with Russia. Bilateral agreements make sense if we are certain who our future nuclear adversaries will be and they are useful to force a transparent build-down by Russia. But our next nuclear adversary may not be Russia. We do not want to find ourselves limited by a treaty with Russia in a conflict with another entity.

We need to decide what stockpile levels we really need for our own best interests to deal with any future adversary.

For that reason, I suggest that, within the limits imposed by START II, the United States move away from further treaty imposed limitations to what I call a "threat-based stockpile."

Based upon the threat I perceive right now, I think our stockpile could be reduced. We need to challenge our military planners to identify the minimum necessary stockpile size.

At the same time, as our stockpile is reduced and we are precluded from testing, we have to increase our confidence in the integrity of the remaining stockpile and our ability to reconstitute if the threat changes. Programs like science-based stockpile stewardship must be nurtured and supported carefully.

As we seriously review stockpile size, we should also consider stepping back from the nuclear cliff by de-alerting and carefully reexamining the necessity of the ground-based leg of

the nuclear triad.

Costs certainly aren't the primary driver for our stockpile size, but if some of the actions I've discussed were taken, I'd bet that as a bonus we'd see some savings in the \$30 billion we spend each year on the nuclear triad.

Earlier I discussed the need to revisit some incorrect premises that caused us to make bad decisions in the past. I said that one of them, regarding reprocessing and MOX fuel, may hamstring our efforts to permanently dismantle nuclear weapons.

The dismantlement of tens of thousands of nuclear weapons in Russia and the United States has left both countries with large inventories of perfectly machined classified components that could allow each country to rapidly rebuild nuclear arsenals. Both countries should set a goal of converting those excess inventories into non-weapon shapes as quickly as possible. The more permanent those transformations and the more verification that can accompany the conversion of that material, the better.

Language in this year's Energy and Water Development Appropriations Legislation that I developed clearly sets out the importance of converting those shapes as part of an integrated plutonium disposition program.

Technical solutions exist. Pits can be transformed into non-weapons shapes and weapon material can be burned in reactors as MOX fuel — which, by the way, is what the National Academy of Sciences has recommended. However, the proposal to dispose of weapons plutonium as MOX runs into that old premise that MOX is bad despite its widespread use by our allies.

I believe that MOX is the best technical solution. The economics of the MOX solution, however, need further study. Ideally, incentives can be developed to speed Russian materials conversion while reducing the cost of the U.S. effort. Maybe some of you can devise an appropriate approach for MOX to address its economic challenges — perhaps something paralleling the U.S.–Russian agreement on highly enriched uranium.

I said earlier that I would not advocate increased use of nuclear energy and ignore the nuclear waste problem. The path we've been following on Yucca Mountain sure isn't leading anywhere very fast. I'm about ready to reexamine the whole premise for Yucca Mountain.

We're on a course to bury all our spent nuclear fuel, despite the fact that a spent nuclear fuel rod still has 60–75% of its energy content — and despite the fact that Nevadans need to be convinced that the material will not create a hazard for over 100,000 years.

Reprocessing, even limited reprocessing, could help mitigate the potential hazards in a repository, and could help us recover the energy content of the spent fuel. Current economics may argue against reprocessing based on present-day fuel prices, but now we seem to be stuck with that old decision to never reprocess, quite independent of any economic arguments.

For Yucca Mountain, I propose we use interim storage now, while we continue to actively advance toward the permanent

repository. In addition to collecting the nation's spent nuclear fuel in one well secured facility, far from population centers, interim storage also allows us to keep our options open.

Those options might lead to attractive alternatives to the current ideas for a permanent repository in the years before we seal the repository. Incidentally, 65 senators and 307 representatives agreed with the importance of interim storage, but the Administration has only threatened to veto any such progress and has shown no willingness to discuss alternatives.

Let me highlight one attractive option. A group from several of our largest companies, using technologies developed at three of our national laboratories and from Russian institutes and their nuclear navy, discussed with me an approach to use spent nuclear fuel for electrical generation. They use an accelerator, not a reactor, so there is never any critical assembly.

There is minimal processing, but carefully done so that weapons-grade materials are never separated or available for potential diversion. Further, this isn't reprocessing in the sense of repeatedly recirculating fissile materials back into new reactor fuel, this is a system that integrates some processing with the final disposition.

When they get done, only a little material goes into a repository — but now the half lives are changed so that it's a hazard for perhaps 300 years a far cry from 100,000 years. The industrial group believes that the sale of electricity can go a long way toward offsetting the cost of the system, so this process might not add large costs to our present repository solution. Furthermore, it would dramatically reduce any real or perceived risks with our present path. This approach, accelerator transmutation of waste, is an area I want to see investigated aggressively.

I still haven't touched on all the issues imbedded in maximizing our nation's benefit from nuclear technologies, and I can't do that without a much longer speech. For example, I haven't discussed the increasingly desperate need in the country for low level waste facilities like Ward Valley in California.

In California, important medical and research procedures are at risk because the Administration continues to block the state government from fulfilling its responsibilities to care for low level waste.

And I haven't touched on the tremendous window of opportunity that we now have in the former Soviet Union to expand programs that protect nuclear material from moving onto the black market or to shift the activities of former Soviet weapons scientists onto commercial projects. Those are programs directly in our national interest. I know that some national leaders still think of these programs as foreign aid; I believe they are sadly mistaken.

We are realizing some of the benefits of nuclear technologies today, but only a fraction of what we could realize.

Nuclear weapons, for all their horror, brought to an end 50 years of world-wide wars in which 60 million people died.

Nuclear power is providing about 20 percent of our electricity needs now and many of our citizens enjoy healthier longer lives through improved medical procedures that depend on nuclear processes.

But we aren't tapping the full potential of the nucleus for additional benefits. In the process, we are short-changing our citizens.

I hope in these remarks that I have demonstrated my concern for careful reevaluation of many ill-conceived fears, policies, and decisions that have seriously constrained our use of nuclear technologies.

My intention is to lead a new dialogue with serious discussion about the full range of nuclear technologies. I intend to provide national leadership to overcome barriers.

While some may continue to lament that the nuclear genie is out of his proverbial bottle, I'm ready to focus on harnessing that genie as effectively and fully as possible, for the largest set of benefits for our citizens.

You, in this room, have the knowledge to address these critical national issues. I need you to join me in this dialogue.

Report on Science and Technology Association Safeguards Symposium

■
Masayori Tsutsumi

*(Director, Secretariat of the Safeguards Symposium in Japan)
Nuclear Material Control Center (NMCC)
Tokyo, Japan*

■

Introduction

This year marks the 20th anniversary of Japan's signing of the NPT based Safeguards Agreement with the IAEA. A symposium sponsored by the Science and Technology Agency (STA) was held in Tokyo on February 17, 1997, inviting experts from various institutions in Japan and overseas (ABACC, EURATOM, IAEA and USDOE) to discuss related issues and increase the participants' understanding of the future role of the safeguards regime amid the changing circumstances of nuclear nonproliferation and safeguards systems.

The symposium was organized into three parts as follows:

- Session 1: Safeguards in Japan in the last 20 years,
- Session 2: Current status of safeguards based on recent international situations, and
- Session 3: Prospect safeguards regime in Japan and the East Asia region in the 21st century.

This paper summarizes the symposium.

Session 1: Safeguards in Japan during the Past 20 Years

From an Institutional Point of View

Yoshiaki Ando (Deputy director, International Affairs and Safeguards Division, Atomic Energy Bureau, Science and Technology Agency [STA])

Yoshiaki Ando's lecture focused on the actual state of Japan's safeguards system and how it has changed over the years.

Japan has concluded safeguards agreement with the IAEA based on the NPT and has bilateral agreements on nuclear cooperation, each of which also obliges to implement safeguards, between Japan and other several countries. To fulfill these agreements, the government carries out a variety of regulations based on the "Law for the Regulation of Nuclear Source Material and Nuclear Fuel Material and Reactors."

After explaining these structures, Ando discussed changes that have taken place in the safeguards system. Following the 1977 signing of the IAEA safeguards agreement, Japan intro-

duced the current safeguards system, which is based on accountability. The entire system underwent major changes as a result, including the establishment of accountancy regulations and designated information processing institutions (NMCC). This was followed by a period in which the safeguards system, while coping with an increase in the number of monitored facilities, gradually took root and flourished while solving a variety of problems raised at various facilities. He stated that, while no significant changes have taken place in the system during the past 20 years, substantial changes are anticipated in the near future because of efforts to strengthen the effectiveness and improve the efficiency of IAEA safeguards system as seen in the "Program 93 + 2," and in other recent developments related to nuclear nonproliferation. He stated that the Japanese government is committed to making the safeguards more effective and efficient by smoothly introducing the Program 93 + 2 and by elaborating domestic measures. In addition, he suggested that it is time for Japan to actively make best efforts to strengthen the international safeguards system and to work to make it more effective and efficient as well.

PNC's Safeguards Experience

Takao Yagi (Deputy director, Nuclear Materials Management Division, Power Reactor and Nuclear Fuel Development Corporation [PNC])

Takao Yagi focused his lecture on inspections carried out at PNC facilities. He first explained how PNC has been entrusted with the important role of implementing safeguards related to the operation of reprocessing and plutonium-handling facilities; such areas were the main focus of attention when the United States formulated its NPT policies and signed a new bilateral agreement with Japan. He mentioned that about 17 percent of the IAEA's total inspection efforts have been spent on PNC facilities during the past decade. Yagi added that the organization fully understands the important part safeguards play at these facilities and that PNC has thus far accepted the safeguards appropriately while vigorously pursuing technology development. He also discussed how specific safeguards are

being carried at each PNC facility.

With respect to technology development through international cooperation, PNC provides technical assistance to the IAEA and cooperates with the United States and Euratom as well. Included among the company's future plans are the development of technologies laid out in the 93 + 2 Program and development of near real-time material accountancy technologies for use in large scale facilities.

Safeguards Inspection Experiences at JNF

Takeshi Osabe (Consultant, Environmental Safety Department, Japan Nuclear Fuel Limited [JNF])

Takeshi Osabe's lecture centered on experiences gained by JNF from past inspections. Safeguards carried out at the nuclear fuel (low-enriched uranium) fabrication facilities were also changing in many ways, prompted in part by improvements following the signing of the NPT safeguards agreement. Before the safeguards were introduced, a supervisor would simply note the amount of change in inventory for each measurement period and log the result. After the NPT safeguards were introduced, a computer management system was introduced because an increased need for processing and reporting of various material accounting information arose and material inventory in the plant increased. Therefore a full-scale improvement of the nuclear material accountancy system was undertaken.

He went on to explain how the inspection process became more effective with (1) the establishment of IAEA safeguards criteria which clarified inspection procedures and facilitated the introduction of necessary devices and systems, and (2) the sharing of inspection instruments between Japan and the IAEA.

Finally he commented that, while more reliable nuclear material control would be required in the future, in order to realize a stable supply of high-quality fuel, Japan would benefit from a study of the possibilities of significant rationalization of the inspection process for low-enriched uranium plants.

The Development of Safeguards in Japan Over the Past 20 Years

Hideo Nishimura (Director, Safeguards Technology Research Office, Japan Atomic Energy Research Institute [JAERI])

Hideo Nishimura began with a description of JAERI's successes in technology research. The institute embarked on research regarding safeguards in 1970, and in 1978 set up project teams inside departments in order to establish and reinforce the accountancy setup under the NPT safeguards. As examples of the institute's achievements to date he cited the following: (1) development and establishment of a new accountancy system (NRTA) that detects the diversion of nuclear materials in a timely manner; (2) development of the safeguards effectiveness evaluation system; (3) development of a monitoring system for entrance, exit, and penetration tunnels in the Fast Critical Assembly (a system to detect the movement of nuclear materials using the facility's structure); (4) COSMOS, a monitoring

camera (featuring increased recording capacity and longer hours of operation); (5) development of on-site detectors of optical fiber seals; and (6) development of a remote monitoring system. He emphasized the importance of developing related technologies while cooperating with various institutions to step up measures to reinforce the CTBT and safeguards, and to improve their efficiency.

Summary

Tsuneo Futami: Moderator (Director, Atomic Energy Management Office, Tokyo Electric Power Company [TEPCO])

In terms of energy supply through peaceful use of atomic power, energy must be supplied in a safe, stable, and economical manner. From this perspective, safeguards must be implemented reliably, effectively, and rationally. We must use our past achievements as a base to disseminate appropriate information in a timely manner. Japan is expected to play a central role in using atomic energy for peaceful purposes in the Asian region.

Session 2: The Current State of Safeguards in Light of Recent International Developments

Strengthening the Effectiveness and Improving the Efficiency of IAEA Safeguards System — Increasing Cooperation with the SSAC (domestic safeguards system)

Olli Heinonen (Manager, Implementation Section A, IAEA)

Olli Heinonen first gave an outline of the Program 93 + 2 aimed at strengthening the effectiveness and improving the efficiency of the IAEA safeguards system. He then spoke about stepping up cooperation among the SSAC in various countries. In terms of strengthening cooperation with domestic safeguards systems, the link between the IAEA and each country's system is the basis for implementing safeguards effectively and efficiently. It is thus important that the IAEA takes each country's system into account and uses it fully. To improve domestic safeguards systems, the IAEA plans to draw up guidelines and train personnel from member nations.

Heinonen commented that if each country would, for example, employ highly reliable measuring devices and accountancy systems and provide data through remote monitoring, the IAEA could successfully reduce the number of inspections or carry them out with less effort. He explained that a basic condition for greater reliance on the SSAC would be the transparency of the state's nuclear activities. Other prerequisites with regard to the SSAC include the following: the SSAC must have the adequate independence, capability and experience to perform the agreed tasks; the SSAC must satisfy all agreed reporting requirements; the SSAC must have documented criteria and procedures compatible with Agency's criteria for tasks to be performed. It is important, he said, that all the measures laid out in Parts 1 and 2 measures of the Program 93 + 2 be carried out. He expressed his strong hope that Part 1 will be implemented soon, and that consultations regarding Part 2 be completed as soon as possible,

adding that details of the implementation regarding Part 2 measures will be finalized by the end of this year.

Japan's Position in Recent Safeguards Trends

Kenji Seyama (Director, International Affairs and Safeguards Division, Atomic Energy Bureau, STA)

Kenji Seyama spoke on Japan's activities undertaken to cope with recent developments in safeguards regimes.

Safeguard measures are currently undergoing many changes. In a period marked by important developments in areas such as nuclear nonproliferation and disarmament, discussions of safeguards should focus on the near future of the next five to 10 years. We have to discuss how safeguards should be improved in the future based on the good understanding of nuclear nonproliferation and disarmament movement.

The START agreement signed by the United States and the Soviet Union reduces stocks of nuclear warheads of strategic nuclear weapons, meaning that surplus plutonium and highly-enriched uranium will be taken from these weapons. Those materials should be placed under IAEA safeguards. CTBT requires a verification system, and here again, some of the safeguards technique will probably be used. The Fissile Material Cut-Off Treaty needs a verification system which might be IAEA safeguards technique as well. Under these circumstances, we must recognize that safeguards technologies could be applied to various fields in the course of new movement of nuclear nonproliferation and nuclear disarmament.

Part 2 measures of the Program 93 + 2 is currently being discussed; study of the draft protocol among the member states is in its final stage. Final adjustments will be made in April, and then the protocol might be approved at the IAEA Board of Governors in May 1997. Generally speaking, Japan supports this plan but considers it important that it be applied to the related countries universally.

As far as criteria for implementation of the Program 93 + 2 are concerned, it is important to develop criteria suitable for the new measures that focus more on qualitative methods rather than the conventional quantitative methods. The IAEA has already begun discussing this issue, and Japan also intends to cooperate in this work to the extent possible.

The IAEA has made it clear that it will use the SSAC as long as it meets a certain standard. It is necessary for each state to improve its SSAC so that cooperation between SSAC and the IAEA might be enhanced, and Seyama asked JAERI and PNC to make further effort to develop relevant technologies.

He ended his remarks by saying: "From now on, we will work much more positively and flexibly for sound development of safeguards system, free from conventional modes of thought."

Summary

Mitsuru Kurosawa, Moderator (Professor, Osaka University)

The word *safeguards* has not yet gained popular recognition. I have the impression that the Science and Technology Agency

should place much more emphasis on efforts to make safeguards well understood by public. In answering why Japan needs rigorous safeguards, we must remember that, even if we insist that there is no need for nuclear armament because we have the constitution, the three non-nuclear principles, and the Atomic Energy Basic Law, other countries are doubtful about our nuclear activities in terms of peaceful use because we use large amounts of plutonium. As a whole, safeguards might place a huge burden on Japan in certain respects. They are, however, indispensable from the global viewpoint to make the international community more secure and more peaceful. Japan should therefore pursue safeguards in a cooperative and forthright manner.

Session 3: Prospects for the Safeguards Regime in Japan and the Asian Far East in the 21st Century

Nuclear Safeguards in the European Union — The Euratom Safeguards System

Wilhelm Gmelin (Director, Euratom Safeguards Directorate, Euratom)

Wilhelm Gmelin gave a lecture outlining Euratom's safeguards. He talked about Euratom's legal base, number of member countries, number of facilities subject to safeguards, degree of inspection efforts, number of Safeguards Bureau staff members, and budget. He also touched upon the relationship between IAEA and Euratom, and explained the new partnership approach.

The ABACC and the Regional Approach for the Application of Safeguards

Carlos Feu Alvim (Secretary, Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials [ABACC])

Carlos Feu Alvim gave an outline of the ABACC. He explained how the ABACC came to be established, the makeup of the organization, inspection format, number of facilities subject to safeguards, degree of the inspection efforts, and budget. In discussing the issue of nuclear nonproliferation, he said that two points must be considered: (1) impediments to nuclear nonproliferation and (2) motivation. Should there be no outside threats, and if regional pressure against and anxiety regarding nuclear power can be minimized, the technological and economic barriers to nuclear development can be reduced.

Nuclear Materials Control Activities in Republic of Korea [ROK]

Byung-Koo Kim (Director, Technology Center for Nuclear Control, Korea Atomic Energy Research Center [KAERI-TCNC])

Byung-Koo Kim outlined the safeguards system in ROK. He explained the history of safeguards in ROK, number of facilities subject to safeguards, degree of inspection efforts, as well as the safeguards implementation setup.

He further stated that, while countries in Asia have unique characteristics relative to other regions, they are unable to solve a variety of problems on their own. They must therefore cooperate with one another in order to solve such problems as the increase in spent fuel in ROK and low-level waste in Taiwan. He pledged to hold seminars that would enhance a sense of trust among relevant nations, and to promote cooperation between NMCC and TCNC.

International Safeguards in the United States in Relation to the National Safeguards System

Kenneth Sanders (Director, International Safeguards Division, United States Department of Energy [USDOE])

Kenneth Sanders gave a lecture on IAEA safeguards implementation in the United States. He explained the history of the safeguards, the president's decision to offer surplus special nuclear material to the international safeguards, the amount of the surplus material and number of facilities to be safeguarded, and the fact that a great many IAEA safeguards have come into force in the United States since 1980. He also talked about the structural organization of the safeguards, the law concerning safeguards in the United States, the safeguards implementation setup, and research and development on safeguards technologies carried out by DOE research institutes.

Summary

Hiroyoshi Kurihara, Moderator (Senior Executive Director, NMCC)

Two types of safeguards — IAEA's international safeguards and regional and/or national safeguards in the form of SSAC — complement each other. Unless the two work in an effective manner, global nuclear nonproliferation cannot be guaranteed. There are two things Japan must do now. One is to increase transparency within the country. Although it is a matter of course that Japan adheres to the use of nuclear power for peaceful purposes only, this is not necessarily understood by the rest of the world. Thus, Japan's intentions must be clarified and domestic transparency fostered through the implementation of IAEA safeguards. Promotion of the IAEA's safeguards is an important factor for Japan; the other is for Japanese to consider what can be done to improve the world's safeguards and to contribute to international nuclear nonproliferation policies, rather than merely thinking about domestic safeguards. Japan must disseminate a wide range of information, covering regional safeguards and the proposed ASIATOM, to give a boost to nuclear nonproliferation policies worldwide.

Acknowledgment

There were more than 170 symposium participants, which far exceeded expectations. Almost all the results of the questionnaires collected from participants after the symposium said each of the sessions was very useful for them. Organizers' judging from the number of participants and results of the questionnaires.

Summary of the First Closing Plenary Session of the INMM Annual Meeting



John C. Matter
Sandia National Laboratories
Albuquerque, New Mexico, U.S.A.

Robert G. Behrens
Los Alamos National Laboratory
Los Alamos, New Mexico, U.S.A.

James R. Lemley
Brookhaven National Laboratory
Upton, New York, U.S.A.

M. Teresa Olascoaga
Sandia National Laboratories
Albuquerque, New Mexico, U.S.A.



For the first time, a closing plenary session was held as part of the 38th INMM Annual Meeting, on July 24, 1997, in Phoenix, Arizona. This session was organized by the INMM's Government-Industry Liaison Committee (GILC), chaired by John Matter (Sandia National Laboratories). There were five invited speakers who addressed topics of current interest to the INMM membership:

- Harold P. Smith, Jr., Ph.D., assistant to the secretary of defense for nuclear and chemical and biological defense programs, U.S. Department of Defense;
- William C. Potter, Ph.D., professor and director, Center for Nonproliferation Studies, Monterey Institute of International Studies;
- Frank S. Houck, Ph.D., senior scientist for international safeguards, U.S. Arms Control and Disarmament Agency;
- Richard Hooper, Ph.D., director, Division of Concepts and Planning, International Atomic Energy Agency; and
- Hironobu Okamoto, Ph.D., director, Washington Office, Power Reactor and Nuclear Fuel Development Corp.

This summary article of the closing plenary session was prepared by several members of the GILC.

Defense Programs for Reducing the Nuclear Threat and Promoting Global Nonproliferation

Remarks by Harold P. Smith, Jr.

(Summary by Robert G. Behrens)

The closing plenary session's first speaker was Harold Smith, Jr.

Smith's opening presentation was titled "Defense Programs for Reducing the Nuclear Threat and Promoting Global Nonproliferation." This talk presented a status report of the first 1,500 days of the Nunn-Lugar Program, also known as the Cooperative Threat Reduction Program (CTR Program). Secretary of Defense William Perry has called this program "defense by other means." Smith noted that the CTR Program is not a foreign aid program. It is, however, a program aimed at cooperatively removing weapons of mass destruction that could have destroyed — and still can — American society during the Cold War.

The program manager for the CTR Program is Major General Roland LaJoie, U.S. Army (ret.). According to Smith, General LaJoie deserves the credit for implementing the program around the world.

American firms are recruited to conduct the work in Russia and other States that once resided within the former Soviet Union. Companies such as Bechtel, Parsons, Browne and Root, and Lockheed-Martin have been forging relations with these countries, building markets, and educating our former adversaries on how Americans do business. Smith considers these firms to be "our public relations arm as well as our contractors in the rural parts of Russia."

Success of the CTR Program revolves around intensive planning because the program ends in the year 2001. The Department of Defense intends to hold firmly to this deadline. Accordingly, a firm deadline helps in negotiating with the Russians, as they know that achievements must be made within

a well-defined window of opportunity.

The CTR Program began in late 1991 during the Bush administration and had a budget of \$800M: \$400M in 1991 and an additional \$400M in 1992. During those two years, only \$23M out of the \$800M was actually obligated because the money was not appropriated specifically for the CTR Program. Therefore, the funds had to be taken from other DoD programs, such as modernization, quality-of-life for U.S. military personnel, peacekeeping, and R&D. Accordingly, then Secretary of Defense Richard Cheney made the decision not to spend much of the \$800M on the CTR Program. Today, however, is a different story, with over \$2billion having been notified, and \$1billion having been obligated to contractors.

Smith gives credit to the CTR Program for making the Ukraine a non-nuclear state. Nuclear warheads residing in the Ukraine have been sent back to Russia safely in rail cars with security upgrades designed by Sandia National Laboratories, with nuclear materials being monitored using radiation gauges proposed by the Los Alamos National Laboratory. The Department of Energy and its National Laboratories were key in helping to ship the weapons back to Russia with no incidents.

In the meantime, some of these nuclear weapons have been dismantled and will be sent to Mayak for storage in a facility being built by Bechtel using Russian subcontractors. The United States will be allowed to inspect the weapons components to assure that weapons grade plutonium resides in the containers being stored. "If we can negotiate a START III Treaty, we think it will be a warhead counter. This is a much more difficult task than a strategic vehicle counter, which is what START I and II are," claimed Smith. "What we're learning at Mayak is the groundwork for how we will try to verify the conditions of a START III."

Over 10,000 weapons have not yet been dismantled in Russia, and they sit at 50 different sites throughout Russia. They are "guarded by underpaid, underfed, sometimes demoralized, Russian soldiers," claims Smith. Accordingly, Smith believes that the greatest threat to nuclear proliferation is the exchange of parts between a demoralized soldier and a "million-dollar buyer." "Therefore," asserts Smith, "the Nunn-Lugar Program is doing all it can to assist our Russian colleagues in guarding those facilities." The best way to assist, according to Smith, is to help the Russians with implementation of technology. For example, the United States is currently training Russian soldiers on how to guard these weapons using remote cameras, computerized inventory, and personnel reliability programs. Unfortunately, the United States is not allowed to go to the 50 weapons sites in Russia. The United States can, however, audit the U.S.-supplied equipment at these sites to assure that it is being used for the purposes intended.

Through the CTR Program, the United States is also engaged in the Ukraine and in Russia with total demobilization. Demobilized officers of the Russian Strategic Rocket Forces are guaranteed, by law, a house once they become demobilized. Unfortunately there is no money available in Russia to build such houses. Nunn-Lugar has, therefore, provided funding for

prefabricated houses built by a U.S. contractor in a factory in Ukraine that formerly built control systems for strategic missile submarines. This novel part of the CTR Program, however, has come to an end because Congress does not want the DoD building houses for our former enemies. However, a factory has been built in Russia, and the Russian government can now supply money to buy these houses for the demobilized military personnel.

As a further example of progress within the CTR Program, Smith stated that the DoD has just issued a contract to Lockheed-Martin to assist Russia in destroying some 700 SS-25, SS-24, and SSN-20 solid-rocket motors. Russian military aircraft and ballistic submarines are also being destroyed as a result of the CTR. In addition, noted Smith, tunnels at the Semipalatinsk nuclear test site are being permanently closed and sealed.

Concluding his presentation, Smith drew a distinction between the Marshall Plan of 1947 and the Nunn-Lugar Program: "This year marks the 50th anniversary of the Marshall Plan. The Nunn-Lugar Program, the Cooperative-Threat Reduction, is not a Marshall Plan, but it is the right plan. A cold and forbidding peace hung down upon Europe in 1947. In 1997, I think, there is vibrant hope. But first we must eliminate the very engines of war that held us in thrall for half a century. And that is what the CTR Program is doing. That is what the Nunn-Lugar Program is doing."

During the question-and-answer session, a question was presented to Smith concerning the plans and incentives needed to assure safe, secure dismantlement beyond 2001. Smith believed that we should not worry about the time frame beyond 2001, that we needed to focus on the major work that needed to be done now. William Potter disagreed somewhat with Smith's position. He thought that we need to think about the transition now "so we are not put in a situation that comes back to haunt us 20 years from now" even though we have today spent considerable funds and have made much progress in dismantlement.

Outlook for the Adoption of a Safeguards Culture in the Former Soviet Union

Remarks by William C. Potter, Ph.D.

(Summary by Terri Olascoaga)

Introduction

William Potter began his discussion of the topic with a statement that the concept of a nonproliferation safeguards culture is amorphous, intangible, and difficult to quantify. As a consequence of these attributes, there is a strong bureaucratic disinclination to focus on the issue. He encouraged adoption of the definition proposed by Steve Mladineo and Jim Doyle in their presentation "Assessing the Development of a Modern Safeguards Culture in Russia, the NIS, and the Baltic States," at the Center for Nonproliferation Studies, Monterey Institute of International Studies (June 19, 1997). They define a safeguards culture as "a pervasive, shared belief among political leaders, senior managers, and operating personnel that effective mater-

ial protection, control, and accounting (MPC&A) is critically important, as manifested in decisions and actions, large and small." Some of the performance indicators or metrics proposed by Mladineo and Doyle are leadership awareness, emergence of indigenous MPC&A advocates, investment in MPC&A, development of independent nuclear regulatory bodies, and training and development of a cadre of MPC&A specialists. Using these indicators, as well as anecdotal evidence, Potter summarized the progress made to date and areas of concern, and concluded with recommendations for next steps.

Progress to Date

Potter referenced the U.S. Cooperative Threat Reduction Program, discussed by Harold Smith in the preceding presentation, as one source of the significant positive nonproliferation developments in the Former Soviet Union (FSU). Other U.S. sources include the Department of Energy's nuclear MPC&A Program, the Nuclear Regulatory Commission's program, and Potter's Monterey Institute of International Studies. In particular, he noted the following areas in which progress has been made to support the creation of a safeguards culture in the FSU:

- an increased level of awareness of the importance of MPC&A activities among the leadership at selected nuclear facilities in Russia and the other FSU states;
- the growth of both governmental and nongovernmental advocates of effective MPC&A activities as demonstrated in new Russian-language publications that focus on nonproliferation and safeguards issues;
- the emergence of a private-sector industry in the field of safeguards technologies;
- the growth of relatively independent, if underfunded and understaffed, nuclear regulatory bodies in a number of FSU states, and a trend toward the adoption of a legal basis for independent regulatory action (unfortunately, with little progress in the enactment of enforcement measures for MPC&A violations); and
- the emergence of indigenous safeguards training programs including the MPC&A training center at Obninsk and the graduate MPC&A curriculum to be introduced this fall at the Moscow Engineering Physics Institute (MEPhI), also called the Moscow Physical Engineering Institute.

Potter continued his presentation with a list of concerns related to areas where signs of an evolving safeguards culture are less visible. These concerns include the following:

- lack of high-level political support for nonproliferation and safeguards as a priority national security issue in most FSU states, as evidenced by the very scant resources devoted to MPC&A and by the lack of candor on the part of most of the relevant organizations regarding the extent of the problem;
- the relatively small number of advocates for MPC&A, many of whom are former IAEA inspectors (Outside of this small group, very few of the workforce has an understanding of, much less an appreciation for, the necessity and importance of safeguards.);
- a cultural tendency on the part of most Russians and others

in the FSU to be extraordinarily deferential to authority (this deferential behavior manifests itself in behavior that undermines effective safeguards such as the ability of senior plant officials to bypass physical protection measures such as access controls); and

- the constriction of public information on national security issues, and the precarious position in Russia of those nongovernmental organizations and the press who attempt to perform the role of nonproliferation watchdogs and whistle-blowers (as one Russian observer put it, more progress appears to have been made in controlling information about nuclear smuggling and nuclear security than in controlling the material itself).

Next Steps

Having considered both the positive signs and the concerns that still remain regarding the outlook for creation of a safeguards culture in the FSU, Potter concluded with several recommendations. Some of these recommendations have been proposed in other publications, including the 1997 report of the National Research Council of the National Academy of Sciences, which Potter helped draft and which he cited in his presentation. His recommendations focus on two key efforts, education and the creation of indigenous MPC&A capabilities.

A sustained educational effort is required to change attitudes and to instill a new nonproliferation and safeguards culture. Potter argued that education is an important but underutilized nonproliferation strategy in both the United States and the FSU. This is a strategy that must be embraced more fully by national governments and nongovernmental organizations if we are to succeed in fostering the development of nonproliferation and safeguards cultures, norms, and political constituencies. Potter proposed the passage of legislation to create a National Nonproliferation Education Act, which would, among other things, provide fellowships to U.S., Russian and other graduate students for advanced training in the area of nonproliferation.

A second factor that will determine the long-term sustainability of current MPC&A activities and will determine the viability of a safeguards culture in the FSU is the creation of indigenous MPC&A capabilities. Citing the 1997 National Research Council report, Potter presented a number of specific recommendations to facilitate this process:

- continue to emphasize the importance of MPC&A as a nonproliferation imperative at the highest political levels in the FSU;
- obtain assurances at both the ministry and institute levels, that MPC&A upgrade programs will be sustained after improvements have been made;
- involve institute personnel to the fullest extent possible in determining how to use available funds for upgrades;
- emphasize near-term training of local specialists;
- reward those institutes that are making significant progress in upgrading their MPC&A systems by giving them preference for participation in other U.S.-financed cooperative programs;

- encourage the establishment of new income streams that can provide adequate financial support for MPC&A programs in the long term, e.g., earmarking a portion of the revenue from Russian sales of HEU for MPC&A activities;
- rely increasingly on domestically produced and locally available MPC&A equipment;
- encourage a system of incentives, including monetary rewards, that will stimulate participants in MPC&A programs to report promptly to the central authorities any irregularities in MPC&A systems;
- create an MPC&A work environment that stresses individual responsibility and places high value on full implementation of rules and regulations;
- continue to stress the nontechnical aspects of MPC&A and the relationship of MPC&A to broader nonproliferation objectives; and
- promote greater communication and cooperation among ministries and facilities in MPC&A in each country where U.S. and international assistance programs are being implemented, e.g., the DOE-sponsored MPC&A conference held in Obninsk in early 1997.

Conclusion

Potter concluded by reminding the audience that it would not be easy to overcome the economic, political, and cultural barriers in the FSU to arrive at a deeply rooted and widely shared belief in the significance of effective MPC&A to address proliferation concerns. He also cautioned that it would be naive and counterproductive to assume that we can affect the long-term solution to MPC&A concerns in the FSU without creating a meaningful safeguards culture there.

In short, Potter's assessment of the state of a safeguards culture in the FSU today was summarized in three words: not good enough.

Strengthened IAEA Safeguards and Their Implementation in the United States

*Remarks Frank S. Houck, Ph.D.
(Summary by James R. Lemley)*

The discovery of an extensive clandestine nuclear weapons development program in Iraq following the Gulf War generated resolve among many nations to strengthen International Atomic Energy Agency (IAEA) safeguards, especially for the purpose of detecting clandestine nuclear weapons programs. Houck described the development of the IAEA's two-part 93+2 Program and the steps culminating in approval of a Model Protocol for Part 2 by the Board of Governors (BOG). He focused particularly on the efforts of the United States to achieve consensus for the 93+2 Program and on plans for its implementation in the United States.

Background

The Board reaffirmed the requirement that IAEA safeguards provide assurance regarding both the correctness and the com-

pleteness of nuclear material declarations by states with comprehensive safeguards agreements. In 1992, the Board reaffirmed the IAEA's right and obligation to conduct special inspections when needed, required States to submit design information on each new facility when the decision to construct it is made, and established a voluntary reporting scheme for informing the IAEA of all exports and imports of nuclear materials and certain equipment, whether for nuclear or non-nuclear use.

In December 1993, the secretariat presented proposals for strengthening IAEA safeguards and improving cost effectiveness. The comprehensive program presented to the Board in June 1995 consisted of two parts: measures that could be implemented under the Agency's existing authority and those requiring complementary authority. Part 1, to be implemented at an early date, included:

- broader access to information on state systems of accounting and control (SSAC) and on closed down installations;
- environmental sampling at all locations to which the IAEA has access;
- improved information analysis;
- better procedures for protecting safeguards confidential information;
- better use of no-notice inspections; and
- use of advanced technology for unattended operations, remote monitoring, and transmission of data.

The Board established Committee 24 to negotiate, based on the Secretariat's draft, a Model Protocol which would provide the IAEA with the complementary authority needed to implement the new measures. Four rounds of negotiations were carried out between July 1996 and April 1997. In May 1997, the Board approved the Model Protocol and requested the director general to use it as a standard for additional protocols to be negotiated with States having comprehensive safeguards agreements.

Negotiation of the Protocol

Work on the Model Protocol resulted in a successful balance on a wide range of issues. Promoting transparency through improved access and provision of information to the IAEA was balanced with the need for confidentiality and assurance that requests for access and information would be reasonable. Reporting provisions became more focused; for example, reporting of actual exports of specified nuclear equipment became obligatory, rather than optional, on a quarterly, rather than annual, basis.

Physical access to locations within a State, including the IAEA's need to receive information about and access to private property, received much attention. The principle agreed upon was that the more heavily an activity was regulated, the more readily the IAEA would be able to obtain access to it. For example, at heavily regulated nuclear facilities, the IAEA can obtain access anytime during regular working hours, and within two hours if so requested, for the broadly stated purpose of assuring the absence of undeclared materials and activities. In

contrast, for locations not having any nuclear material, the notice period must be at least 24 hours; the basis for access is limited to resolving the correctness or completeness of information provided by the State; and the State must be given opportunity to clarify questions before the IAEA gives notice that access is required.

For locations not included in a State's declarations, some States wanted to limit the IAEA's activities to environmental sampling. On this issue Committee 24 reached a compromise which illustrated its flexible consideration of issues raised by various States. The accommodation reached was that environmental sampling alone would be used at such a location but that if this did not resolve the question, then visual observation and radiation detection devices could be used.

Probably the issue receiving the most attention was whether the Model Protocol would be limited to States with comprehensive safeguards agreements or whether it would be applied universally, particularly in the nuclear weapons States. On this issue the United States provided dramatic leadership in support of universal application. As the Model Protocol approached completion, the United States announced that it intended to accept the Protocol in its entirety and to treat it as an integral part of its voluntary-offer safeguards agreement. It would become legally binding, and IAEA access would be excluded only from locations and associated information of direct national security significance. Houck considered this U.S. position to be a major factor in the success of the negotiation along with the willingness by the U.K. and France and, to a lesser degree, China and Russia to accept elements of the Protocol.

Houck emphasized that the Model Protocol was truly a collective effort on the part of many States. He noted the demonstrated willingness of States to provide information and the resolve of both the IAEA and the Board to make use of all information available to the Secretariat. He asserted his belief that the IAEA, under these conditions and exercising fully its rights under safeguards agreements and the new protocols, would be able to provide credible assurance of the absence of undeclared nuclear activities.

The emphasis now shifts to each State negotiating and bringing into force a Protocol to its safeguards agreement with the IAEA. Significant time and effort may be required, in some instances, because of the need for States to adopt enabling legislation. It is expected that today's comprehensive safeguards agreement together with the additional Protocol will soon become the norm for the application of safeguards.

Plans for Implementing the Model Protocol in the United States

The United States has developed an action plan for bringing into force a new Additional Protocol based on the Model Protocol approved by the Board in May 1997. The plan will be implemented by the U.S. government through an interagency process coordinated through the IAEA Steering Committee, which was established several years ago by Ambassador Nelson Sievering while serving as U.S. governor to the IAEA, and its

Subcommittee on International Safeguards and Monitoring. Negotiations with the IAEA will begin in early 1998.

Several categories of steps will be carried out. One category involves decisions regarding the language of the protocol. It must be decided whether the protocol is to be an executive agreement or whether it will be submitted to the Senate for advice and consent to ratification, as the U.S. safeguards agreement was. Since Article 1 of the Model Protocol specifies that in cases of conflict the provisions of the Protocol take precedent over the safeguards agreement, conflicts between the U.S. safeguards agreement (INFCIRC/288) and the Model Protocol must be identified and resolved. Legal interpretations of terms such as "every reasonable effort," as applied to reporting and access conditions, may need to be established.

Another category of important steps involves the handling of the national security exception. In Houck's view, a good understanding of principles to be followed has already been delineated in a May 1996 memorandum of understanding on the application of Programme 93+2 measures in the United States, which preceded negotiation of the Model Protocol.

A third category of steps involves who is going to be responsible for implementation of various Protocol provisions and how various responsibilities will be exercised. For nuclear facilities on the eligible list, the responsible agencies may be obvious, e.g., NRC and the DOE. For provisions such as information about and access to locations without nuclear material and to locations identified by the IAEA but not included in declarations, the choice is not so obvious.

In the interagency process, proposals must be developed at the working level and approved at the policy level. Developments must be coordinated with industry that would be affected and with the Congress. Clearly much work remains to be done.

IAEA Protocol Additional to Safeguards Agreement and Issues Related to Implementation

*Remarks by Dr. Richard Hooper, Ph.D.
(Summary by John C. Matter)*

Richard Hooper managed the IAEA's Programme 93+2 for strengthened safeguards and is the Director of the Division of concepts and Planning. He received the INMM's 1997 Distinguished Service Award at the Annual Meeting. Hooper summarized the contents of the Protocol and discussed issues related to the implementation.

Additional Protocol

Programme 93+2 was designed for strengthened safeguards in States with comprehensive safeguards agreements. Part 1 measures could be done with existing legal authority and implementation of those measures began in June 1995. The Protocol, which was approved on May 15, 1997, by the Board of Governors, contains the Part 2 measures that were negotiated as a protocol additional to the safeguards agreement.

The Forward of the Protocol deals with the question of universality, which was a very difficult negotiating issue. For States with comprehensive safeguards agreements, the Protocol will include all measures. For nuclear weapons States, the hope is that these States will accept all measures consistent with their NPT Article 1 obligation. For other States, it is hoped they will accept those measures that make their safeguards stronger and more cost effective.

Article 2 deals with the additional information that States party to the Protocol will be obligated to provide to the IAEA; this information has the legal standing of a State declaration. Information the States are required under the Protocol to provide to the IAEA includes: (1) nuclear-related R&D, not involving nuclear material (for example, development of centrifuge enrichment technology); (2) the purpose of all the buildings in the geographical area that constitutes a site (to deter the use of existing infrastructure in a clandestine nuclear weapons development program); (3) the whole of a State's nuclear material holdings and dealings; (4) the location and processing of any nuclear waste upon which safeguards have been terminated; (5) the export of certain equipment that would be useful in a nuclear weapon development program; and (6) any plans for future development of the nuclear fuel cycle.

A series of six articles deals with *complementary access*, access to locations beyond that currently provided for in safeguards agreements. The basis for this additional access is to gain assurances regarding the absence of undeclared nuclear material and activities. Article 4 lays out the conditions for this additional access, which could be any location in the State as specified in Article 5. Article 6 specifies the activities that may be carried out by IAEA inspectors in the course of this complementary access and includes any "objective technical measure approved by the Board and agreed with the State". Article 7 addresses the issue of managed access at specific locations which the States has identified and has the right to protect proprietary information. In this case an alternative must be negotiated to satisfy the needs of both parties. Article 8, in contrast, provides that the State can request an inspection at a specific (internal) location to assure (other States) the absence of undeclared nuclear material activities. Article 9 provides the right to the IAEA, in consultation with the State, to implement wide area environmental monitoring, different than location specific environmental sampling. Article 10 contains reporting requirements for the IAEA to communicate to the State the results of the activities carried out in the State under the Protocol.

This additional access will be provided to the IAEA specifically for the purpose of providing assurance of undeclared nuclear material and/or activity at those locations. Article 5 specifies access to several categories of locations: sites of nuclear facilities (including decommissioned), locations where nuclear material is present, locations with nuclear related R&D activities, sites related to nuclear fuel cycle operations, and locations the IAEA specifies for environmental sample collection. Article 4 also addresses the notification process. The IAEA has the right to obtain this access with 24-hour notification,

unless access is sought in connection with other inspection activities carried out under the existing safeguards agreements. In this case, the required access notification is two hours.

Two annexes relate to State declarations. Annex 1 is a defined list of nuclear fuel cycle related R&D activities which States are required to report to the IAEA. Annex 2 is a list of equipment which, if exported, the State is obligated to declare to the IAEA.

Implementation Issues

Hooper concluded his presentation by addressing a few factors related to implementation of the Protocol. First, there are some key States that will play a pacing role with respect to implementation of the Protocol overall. These include the United States, Japan, and the European Community States.

Second, a whole new infrastructure needs to be established for implementation of the Protocol. This includes guidelines for the required information collection, the technical basis for seeking complementary access, model agreements, model communications, and implementation criteria. The implementation criteria will range from existing mechanistic criteria for facilities with direct use material to performance-based criteria (based on collected information) for complementary access. Letters have already gone out to the States inviting them to inform the IAEA when they are ready to proceed with implementation.

Third, resources of the IAEA must be shifted to support implementation of the Protocol. The IAEA is committed that the implementation of strengthened safeguards will be cost neutral. Increased efficiencies must free up enough resources to implement the Protocol. (There is an interim five-year period when additional resources will be necessary; in 1997 this is expected to be about \$3 million.) Cost neutrality will be difficult to measure against a background of increasing nuclear material under safeguards and increasing obligations with respect to material accountancy.

There are resource implications for the States too. Two examples are substantially broader information collection and reporting, and greater IAEA use of State systems of accounting and control. Among operators there will be winners and losers. LWR operators may be winners from better safeguards technology and fewer inspections. Research installations may be losers due to increased scrutiny, safeguards effort, and intrusiveness.

Report on the Incident at Japan's Tokai Reprocessing Bituminization Facility

Remarks by Hironobu Okamoto, Ph.D.

(Summary by John C. Matter)

On March 11, 1997, fire erupted in the bitumen filling room of the bituminization demonstration facility (BDF) at PNC's Tokai Works. Ten hours later an explosion rocked the same facility. What caused this series of events at this low level radioactive waste processing facility and what can be learned from this unfortunate accident by other nuclear material management professionals?

BDF processes low level liquid radioactive waste by mixing it with bitumen which then solidifies in drums. PNC has much experience with this process: about 30,000 drums had been solidified using waste from the Tokai Reprocessing Plant without any accidents. This time one of the drums ignited during natural cooling and in turn ignited several others. After a few minutes, an operator extinguished the fire using a water sprinkling system. Within several minutes the ventilation system in the building was stopped, preventing the spread of smoke and fumes. The explosion 10 hours later blew out numerous doors and windows in the facility, allowing smoke to exit.

Radiation exposure to workers in the facility and in the vicinity was limited to 37 persons, as determined by whole-body counts. The highest dosimetry readings were much less than (1/2000) regulated values. Traces of radioactive substances were detected in the Tokai peripheral monitoring area and as far away as PNC's Oarai Engineering Center, 50-km distance, at levels that PNC believes will not affect public health or the environment. Since then, PNC has hermetically sealed the BDF to provide containment of the contamination, decontaminated the BDF and surrounding areas, installed additional process monitors, and repaired the damaged ventilation system.

PNC is conducting an internal investigation into the causes of the fire and explosion and the Minister of the Science and Technology Agency (STA) has formed an external committee to investigate the accident. On the other hand, because PNC has had two accidents at the BDF of Tokai Works and the prototyped FBR at Monju in the last two years, the PNC reform review committee started to review from the viewpoint of (1) renewal of the PNC organizational management, (2) which mis-

sions to be the focus of the new PNC, (3) functions to ensure nuclear facility safety, and (4) openness to the public.

Some preliminary, tentative findings are available from these investigations. The drum apparently self ignited about 20 hours after filling due to an elevated temperature caused by an excess of catalytic agents from the bottom of the waste liquid tank that caused an oxidation reaction in the material mixture. The explosion 10 hours after the fire is believed to be due to spontaneous ignition of flammable gases produced by the continuing oxidation reaction and contained by the shutdown ventilation system.

Okamoto stated that this incident is not a nuclear materials management and safeguards matter, but a risk-management matter of a nuclear facility handling low level radioactive waste. Several management and operation issues have already been identified by the investigating committees: (1) by following the operation procedure manual, significant time was wasted after the operator noticed the fire and the supervisor gave the instructions; (2) the manual did not specify the duration of water sprinkling; (3) some of the actions in the accident measures procedure were not followed (e.g. activating the fire alarm system). This review is continuing to investigate the management and operation organization, the operations schedule, and education and training.

Okamoto concluded by stating that "PNC reconfirms that safety assurance of the facilities is a prerequisite for technical development, and is determined to improve the functions of the safety system by thoroughly emphasizing the importance of the shop floor and revitalization of the workplace."

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