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JNMM

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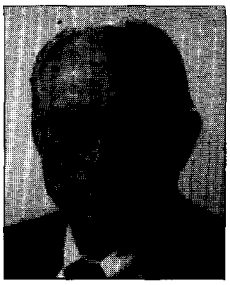
The Graying Nuclear Workforce



The graying of the science and technology workforce is an issue worldwide. The number of future engineers, scientists, and mathematicians entering the nuclear industry is diminishing. This is bad for the nuclear materials management field, and for the Institute of Nuclear Materials Management, because it is from these fields we draw our members. Many of our members and potential members are from laboratories and facilities that require citizenship in the country in which they are located. About 50 percent or less of Ph.D. candidates and a high percentage of lower degree candidates in the United States are not citizens, further diminishing the supply of potential employees.

Some of the immediate needs for personnel in nuclear materials management are now being met by hiring retired staff, but needs are becoming acute because of the lack of young people entering the profession to replace those who retire permanently.

This problem was discussed in-depth at the INMM Executive Committee meetings in July and November, at some of the division meetings, and at the membership committee meeting. (See Jack Jekowski's paper on page 10.) We are committed to doing more than talking and will continue to investigate ways in which INMM can help.

Our organization is graying for the same reasons that many science and technology industries are graying. The graying of INMM members is compounded by the many young people who, upon entering the field, appear uninterested in professional society participation.

INMM is working to solve this problem. The Executive Committee approved a new student membership program to encourage interest in INMM while students are still in school. (See Inside Insights on page 4 for details.) Other efforts include plans for a student résumé section on the INMM Web site (http://www.inmm.org). We can prepare presentation materials for current members to use to make presentations to acquaint students and the public about INMM and the nuclear industry. These will be aimed at answering questions, dispelling myths, and educating the public. Communication Committee Chair Jim Griggs will coordinate posting these presentations on the Web site, but he needs help preparing material. We could also produce a "Frequently Asked Questions," section on our Web site. I hope that after reading Jekowski's article, volunteers will be forthcoming.

What else can individual INMM members do to help? First and foremost talk to the young people who work at your individual facilities. Encourage them to join INMM, to participate in chapter and division meetings, and to attend annual meetings and workshops. Encourage them to read *JNMM* and to prepare papers for publication and presentations at chapter meetings, in the *JNMM,* and at annual meetings. Invite them to chapter meetings, and introduce them to other INMM members. If each company or laboratory represented at the annual meeting sent one student we could have a vibrant student session at the annual meeting. During that session we could present tutorial talks about the opportunities for careers in nuclear materials management. Newcomers could visit with our exhibitors and become more familiar with INMM and our industry.

You can also contact professors and students at nearby institutions and/or your alma mater. It is important to make professors as well as students aware of student memberships, reduced student annual meeting fees, and student paper awards. Chapters should consider conducting meetings on nearby university campuses to gain exposure to students and staff. We have also suggested that the chapters sponsor student paper contests. Winners could compete at the annual meeting with winners from other chapters. Volunteer to be a mentor for a young person at your facility. Help them to plan their career, choose paper topics, and counsel them in the preparation of their papers and presentations.

Finally you can critique the ideas presented here and generate new ideas. At the last annual meeting, our opening plenary speaker Robert Kuckuck addressed the need for new people to become involved in the nuclear industry. We expect that the recent electrical shortages in the United States will mean that more nuclear power plants will be built there. Some countries are building more nuclear power plants and some are building less than before. Weapons states want to retain their capabilities even if there is no production or testing. For the foreseeable future there will be a need for nuclear professionals to staff new facilities, to sustain existing facilities, and to protect the nuclear materials that already exist (both fresh and spent). Please contact any member of the Executive Committee with your suggestions. I will guarantee that all will be seriously considered.

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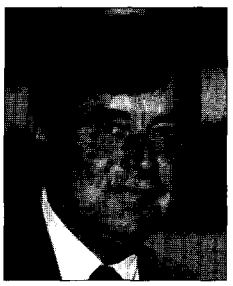
Insightful Presentations, New Features Highlight Winter *JNMM*



This edition of *JNMM* contains exciting articles from the INMM Annual Meeting and the IAEA Symposium of Nuclear Safeguards and introduces two new features.

Jack Jekowski's paper, "Preparing for the Next Generation Nuclear Stewards," delves into the "quiet" global crisis of nurturing the next generation of nuclear scientists and engineers to provide stewardship for our nuclear legacy. He notes that while efforts are addressing this problem, they are not tied to an overarching strategy and thus their effectiveness is questionable. He challenges INMM "to reassess its role to ensure that the legacy of our founders is maintained, and the future of the world is in knowledgeable hands."

We feature three papers presented at the IAEA's Symposium on International Safeguards: Verification and Nuclear Material Security held in Vienna October 29-November 2. The symposium was extended one-day for a special session on combating nuclear terrorism. I selected three papers from the symposium that I thought the *JNMM* readership might find thought provoking.

The paper "NNSA: Its Mission and Goals" was presented at the opening plenary session of the 42nd INMM Annual Meeting by Robert Kuckuck, deputy director, National Nuclear Security Administration, on behalf of NNSA Director John Gordon. It is accompanied by the Roundtable discussion with Kuckuck that followed his plenary presentation. I trust you will find this reading interesting. Kuckuck was enjoyable to interview and responded quite candidly

Also included in this issue is the Summary of the Closing Plenary Session of the 42nd INMM Annual Meeting assembled by Jim Lemley (chair of the Government-Industry Liaison Committee) and Amy Whitworth, vice chair. It highlights the remarks by the three discussants in the closing plenary: John Todd, chief, Defense Nuclear Security, NNSA; Laura Holgate, NTI, and Diane Jackson, NRC. This summary, as well as the plenary paper by Kuckuck and the Roundtable discussion, would have appeared in the fall issue of the *Journal* had it not been for the events of September 11.

Also at the 42nd INMM Annual Meeting, Susan Pepper, Brookhaven National Laboratory, arranged for the INMM Panel Discussion in Recognition of Twenty-five Years of Member State Support Program. We include Pepper's summary of this informative discussion.

We do have a technical paper, "Advanced Approaches to the International Oversight of Neptunium: Challenges and Opportunities," by William Stanbro, Sin-Tao Hsue, Thomas Burr, Michael Collins, Cyndi Wells, and George Eccleston, all of Los Alamos National Laboratory, and William Charlton of the University of Mechanical Engineering, University of Texas.

Two new features appear in this issue. Inside Insight is INMM Vice President John Matter's new column that reports on the discussions at the Executive Committee Meeting held in San Antonio in November 2001. In the debut of Meet the Member, Managing Editor Patricia Sullivan profiles Technical Program Chair Charles Pietri.

In Reports to the Executive Committee, we note that these reports will now be posted on the Web site. Should they be included in the Journal as well? Let us know your thoughts.

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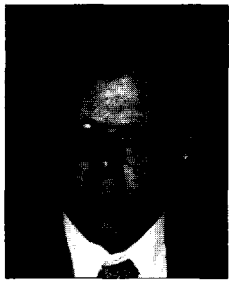
Correction

In the Fall 2001 issue of *JNMM*, we inadvertently published an incomplete list of INMM Sustaining Members. We apologize to JAI Corp. for our error.

The complete list of INMM Sustaining Members is:

ABACC
Amarillo National Research Center
Aquila Technologies Group Inc.
Argonne National Laboratory
Australian Safeguards & Nonproliferation Office
Bechtel BWXT Idaho LLC
BNFL Instruments Ltd.
Brookhaven National Laboratory
BWXT Y-12 - Pantex
BWXT Y-12 LLC
Canberra Industries
EG&G Inc.
Exchange Monitor Publications, Inc.
Handwood Enterprises Inc.
Hollitz International
IAEA
International Fuel Containers, Inc.
JAI Corp.
Lawrence Livermore National Laboratory
Los Alamos National Laboratory
NAC International
NCI Information Systems Inc.
Nuclear Fuel Services Inc.
Nucsafe, LLC
Pacific Northwest National
PerkinElmer Instruments-ORTEC
Sandia National Laboratories
Senstar Stellar Inc.
Wackenhut Services Inc.
Westinghouse Savannah River Co.
Wyant Data Systems Inc.

Executive Committee Approves 2002 Budget, Change for Annual Meeting



This is a new column for the *JNNM,* and I hope it will become a regular item. But that's for you to decide—please provide feedback! I like to believe that all members, and potential INMM members, have an interest in how our professional society operates behind the scenes. So here's a summary of the highlights of the recent INMM Executive Committee meeting held November 7-8, 2001, in San Antonio, Texas. (Note: these are not the official INMM Executive Committee meeting minutes, which are prepared by INMM Secretary Vince DeVito and Executive Director Rachel Airth and approved by the EC.)

- **Budget.** Treasurer Bob Curl presented the proposed fiscal year 2002 INMM budget and led the Executive Committee through its detailed consideration. We approved a budget with a small deficit, with the expectation that actual income will exceed budgeted income and budgeted costs will exceed actual costs, as was the case in fiscal year 2001 and most years.
- **Funding.** INMM is basically self-funded through a combination of membership fees and Annual Meeting and technical workshop registration fees. This obviously has limits and it was suggested we should consider other sources of income, including corporate sponsorships, grants, and philanthropic gifts. This will likely be a topic for future discussion during strategic planning.
- **Technical Workshops.** Technical division workshops have been a major activity for our six technical divisions and a significant income source. We plan to give increased emphasis to this sector of our Institute.
- **PATRAM.** Billy Cole, chair of the Packaging and Transportation Technical Division Chair, reported on the successful PATRAM workshop conducted September 3-7, 2001, in Chicago. The U.S. Department of Energy and International Atomic Energy Agency have asked INMM to host future PATRAM symposiums in the United States and we are working on an agreement to do that. It was noted that many PATRAM attendees were unfamiliar with INMM—we will work to change that!
- **Spent Fuel Management Seminar.** Ed Johnson, Waste Management Division chair, conducted the Spent Fuel Management Seminar XIX in Washington, D.C., January 9-11, 2002. We'll report on this seminar in an upcoming issue of *JNMM.*
- **Annual Meeting.** Charles Pietri, Technical Program Committee chair, has a good start for the 43rd INMM Annual Meeting. The Call for Papers was mailed several weeks ago and has been posted on the INMM Web site at http://www.inmm.org. The abstract deadline is the same as usual, February 1, but please note that the Annual Meeting is earlier than usual this year. Mark your calendar for June 23-27, in Orlando, Florida U.S.A. Plenary speakers are still being identified—your input is welcome! The most up-to-date information on the Annual Meeting is posted regularly on the INMM Web site.
  - **Computer Projectors.** Charles Pietri and the Technical Program Committee have recognized the growing need and expectation for computer projectors at the Annual Meeting technical sessions. Several options are being explored and we expect to have a partial trial implementation at the 43rd Annual Meeting this June.
  - **Companion Fees.** The INMM has subsidized Annual Meeting companion programs and participation for many years. The Executive Committee has recognized a need to reduce the size of this subsidy. Beginning with the 43rd Annual Meeting, registered companions will be charged $50. This will include tickets to the opening reception, awards banquet, and the daily companions' breakfasts.
  - **Opening Reception.** Historically the Sunday evening opening reception at the Annual Meeting has been a complimentary event provided by the conference hotel. This has become increasingly difficult to negotiate with hotel management. For the 2002 Annual Meeting, the current hotel contract is limited to a one-hour complimentary event, instead of the traditional ninety minutes. We are exploring options to extend the contract for an additional thirty minutes.
- **New Appointments.** President J.D. Williams announced the new committee chair assignments. Richard Rawl is the new ANSI N-14 Committee chair, replacing John Arendt, who will continue as a consultant. Scott Vance is the new Membership Committee chair, replacing Nancy Jo Nicholas, who was elected INMM Executive Committee member-at-large. Please welcome and support Rich and Scott in their new roles for INMM.
- **Emeritus Members.** The EC approved INMM Fellow Emeritus status for Carleton Bingham and Cecil Sonnier. We hope there will still be opportunities to benefit from their distinguished careers.
- **Volunteerism.** As you know, INMM is a volunteer organization. We always have, expect, and benefit from volunteer turnover. The Executive Committee is

always looking for new active volunteers for a variety of positions—let us hear from you! We expect a certain level of activity from the appointed chairs but have realized some unevenness in performance. We are making a renewed effort to communicate Executive Committee expectations to the committee, chapter, and technical division chairs.

- **Students.** If you attended the Annual Meeting last summer, you probably heard a lot of discussion of and interest in doing something to attract more students into nuclear careers, nuclear materials management, and the INMM. The Executive Committee is exploring a plan to sponsor more students at the Annual Meeting as part of a student paper session. Watch for an announcement of this effort later this year. (See Jack Jekowski's article on the need to recruit more students and young people into the nuclear materials management professions on page 10 of this issue.)
- **Outreach.** Several years ago, an INMM Memorial Fund was established and has grown through donations to a restricted account. It was intended to support unfunded worthy causes such as student scholarships but there has been no dispersal of funds to date. The Executive Committee has now established a Memorial Fund Outreach Committee to address these funds. This committee will define its scope, subject to Executive Committee approval. This will include a student scholarship process. The committee chair is Jim Tape and the other members are *JNMM* Technical Editor Denny Mangan and Immediate Past President Debbie Dickman.
- **Communications.** Our principal means of communications are the *Journal of Nuclear Materials Management (JNMM)* and the INMM Web site (www.inmm.org). Denny Mangan, *JNMM* technical editor, and Jim Griggs, Communications Committee chair, are both looking for new ways to improve these communications vehicles. Please contact them with your ideas.
- **Strategic Planning.** It's been several years since the Executive Committee did any strategic planning, and we recognize a need to do this in the near future. Please let any member of the Executive Committee know what you would like the Executive Committee to consider in a strategic planning session.

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Reports to the Executive Committee Posted on the Web Site

The INMM Executive Committee meets three times each year—in November, in March, and again at the Annual Meeting. At those meetings, the technical divisions, committees, and regional chapters usually report to the Executive Committee on their activities since the last meeting.

Traditionally, we have published these reports in *JNMM*. But now, these reports will be posted on the INMM Web site (at http://www.inmm.org). This means INMM members will have access to these reports within days—rather than months—of when they are submitted to the Executive Committee.

The following are the reports submitted at the November 2001 Executive Committee meeting. (See INMM Vice President John Matter's new column, Inside Insights, on page 4 for more information on the November Executive Committee meeting.)

Technical Division Reports

Nonproliferation and Arms Control

During the past year, the emphasis of the Nonproliferation and Arms Control Division has been on reaching out to the INMM membership and to the larger nonproliferation and arms control community. Additionally, we have been working to fill out our organization, and expand participation in our programs. We have now completed the establishment of our executive committee. Larry Satkowiak is deputy chair. Nancy Suski is the secretary. The chairs of the standing committees are:

- John Smoot—Committee on U.S.–Former Soviet Union Nonproliferation and Arms Control
- Fred Luetters—Committee on Global and Regional Nonproliferation and Arms Control
- Paul Rexroth—Committee on Proliferation Assessment and Analysis

Each committee is developing a charter.

As others have observed, the various divisions of the Institute have much to contribute to the subject of anti-terrorism. Ours is no exception, and we have talked about this to determine the best way to contribute. Terrorism will be a topic at our division's annual meeting in June, and we expect to contribute to any special sessions on the subject at the Institute's annual meeting.

We are also engaged in the issue of proliferation-resistant reactors and fuel cycles. We intend to have a session at the annual meeting on the subject. We have also considered conducting a workshop on the subject next year, followed by a focused issue of the *JNMM* on the subject, but this is still in the early planning stage.

Steve Mladineo
Chair, Nonproliferation and Arms Control Technical Division
Pacific Northwest National Laboratory
Falls Church, Virginia U.S.A.

Physical Protection

The Physical Protection Technical Division met at the 42nd INMM Annual Meeting. We decided to host two workshops this calendar year. The first workshop we discussed was in the area of explosives detection, planned for spring 2002. The coordinator for this workshop is Rebecca Horton from Sandia National Laboratories. We also agreed to conduct a special session at the 2002 Annual Meeting in the area of Vulnerability Assessment. We planned to follow the Annual Meeting with a one-day workshop on Vulnerability Assessment conducted by Jim Blankenship, Sandia National Laboratories, and Paul Ebel, BE Inc. We felt that good discussion on this topic could be generated on Friday if the VA technical paper session were held on Thursday.

I met with Rebecca Horton following the Annual Meeting to discuss the explosives detection workshop. She learned that this may not be a good topic for a workshop since the FAA was planning to conduct such a workshop in the near future. We decided that a better focus would be in the area of access control. We could bring together vendors and users to discuss needs and available technology in this area. The plan was to conduct this workshop in early summer, with Rebecca as the leader.

The events of September 11, 2001, have caused us to once again change the focus of the workshop. Requests for vulnerability assessment of various facilities across the nuclear industry have escalated since the terrorist attacks. There is a great need in our industry for people to be trained in this area. I have confirmed that Sandia National Laboratories could provide a three-day training course on vulnerability assessment for the nuclear industry in the spring of 2002. The details for this workshop are currently being addressed.

This workshop would be held in the Albuquerque area, so I discussed with the leadership of the INMM Southwest Chapter the possibility of their participation. We are exploring ways they may be able to support our efforts.

Since September 11, the Physical Protection Technical Division has been asked to identify some focus sessions for the 2002 Annual Meeting around the topic of nuclear anti-terrorism. In response to this request, the Physical Protection Technical Division has identified two special sessions for the 2002 Annual Meeting focusing on nuclear anti-terrorism. These sessions will be held in addition to others in general physical protection technologies, general access control technologies, cyber security, and vulnerability analysis. The Physical Protection Technical Division is also planning a workshop on vulnerability analysis that would take place on the Friday morning following the Annual Meeting.

One special session will focus on detection of nuclear materials that may be transportable by terrorists. Technology to detect nuclear materials could be applied to access control points such as airports and shipping ports for detection of hand-carry items, or it could be applied to access control points for cargo sent by air, sea or ground transportation.

A second session will focus on technology or systems that can be applied to identify potential terrorist movement within a country. This technology or systems could be applied wherever transactions take place, i.e., purchasing airline tickets, entering/exiting a country, movement within a country, phone calls. Technologies or systems that may be applicable are biometrics, data mining, video, profiling, and others.

Steve Ortiz
Chair, Physical Protection Technical Division
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Albuquerque, New Mexico U.S.A.

Waste Management

The Waste Management Technical Division has revised and updated the preliminary program for the INMM Spent Fuel Management Seminar XIX scheduled for January 9-11, 2002, at Loews L'Enfant Plaza Hotel in Washington, D.C. Invitations have been made to most speakers, with a high rate of acceptance. The registration brochure was printed and mailed in early October.

The division held a meeting in conjunction with the INMM Annual Meeting in Indian Wells, California, in July. Some topics of discussion included:

- Setting up the preliminary program for the January 2002 seminar, and preparing a list of possible speakers.
- The possibility of organizing a third LLW technical seminar, modeled on the same approach as the first two held respectively in Troyes and Cordoba. A tentative schedule of either June 2002 or October 2002 was set. (This has been put on hold in light of the September 11 attacks against the United States and the continuing uncertainty around the world.)

- The need for the development of papers (for *JNMM*) to bring waste management technologies to the attention of readers is a necessity. Meeting attendees were invited to submit ideas on papers for the *JNMM* to further the goals of the Waste Management Division. It was determined that the division should try to develop theme-related papers (on reprocessing/ ATW for example) and then assign knowledgeable people to write them.
- The possibility of developing a quarterly newsletter for the Waste Management Division was also discussed.

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Committee Reports

Government-Industry Liaison Committee

The Government-Industry Liaison Committee met immediately following the conclusion of the 42nd INMM Annual Meeting and discussed potential topics and speakers for the closing plenary of next year's annual meeting. A suggestion received since September 11, 2001, from INMM sources outside the committee, is to focus the closing plenary on anti-terrorism at the 43rd Annual Meeting. The committee will discuss this suggestion and coordinate it with other INMM activities.

We welcome a new committee member, Patricia Comella, U.S. Department of State, Nonproliferation Bureau. The current members of the Government-Industry Liaison Committee are:

Jim Lemley, BNL, Chair
Amy Whitworth, NNSA, Vice Chair
Pierre Aucoin, NAC
Robert Behrens, LANL
Patricia Comella, State Department
Vince De Vito, private consultant
Tohru Haginoya, Japan
John Matter, SNL
Bruce Moran, NRC
Anita Nilsson, IAEA
Terri Olascoaga, SNL
Brian Smith, PNNL
Joseph Stainback, BWXT
Meggen Watt, PNNL (DOE/NN-43)
Mike White, Aquila Group

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

Amy Whitworth
Vice Chair, GILC
National Nuclear Security Administration
Washington, D.C. U.S.A.

Fellows Committee

The Fellows Committee meeting held in conjunction with the Annual Meeting in Indians Wells, California, was well attended and provided the opportunity for two of the three newly named Fellows (Ted Osabe and Debbie Dickman) to interact with the group. The discussion was quite lively and set the stage for continued dialogue on a number of issues.

The specific issues addressed included expectations of committee and division chairs; financial programs to support Annual Meeting attendance by economically challenged individuals; and the generation of white papers to promote understanding of technical issues. The Fellows Report provided to the Executive Committee at its November meeting provided background information and a recommendation related to each of the issues.

JNMM Editor Denny Mangan mentioned his desire to include human-interest articles related to INMM members in the *Journal.* The Fellows were interested in participating and Charlie Vaughan volunteered to spearhead the activity. Charlie will work with Mangan and the *JNMM* staff to meet the desired timelines.

The INMM Executive Committee formally approved the designation of the Fellows Committee consisting of Ken Sanders, Charlie Vaughan, and Jim Tape, and reconfirmed the designation of Obie Amacker as chair.

Obie P. Amacker, Jr.
Chair, Fellows Committee
Pacific Northwest National Laboratory
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Chapter Reports

Northeast Chapter

A meeting of the nominating committee of the Northeast Regional Chapter was held on July 17, at Indian Wells, California, to nominate officers and executive committee members for the coming year. Ballots were mailed to all chapter members on September 16, 2001, and results since tabulated. The following individuals will serve as officers of the Northeast Regional Chapter of INMM for 2001-2002:

- President: E.R. Johnson (JAI Corp.)
- Vice-President: Susan E. Pepper (Brookhaven National Laboratory)
- Secretary: Teri Westerfeldt (U.S. Department of Energy)
- Treasurer: Bruce Moran (U.S. Nuclear Regulatory Commission)
- Members-at-Large (one-year terms): Martha Williams (U.S. Nuclear Regulatory Commission and Colin Carrol (Sonalysts, Inc.)

A chapter meeting was held October 18, at Brookhaven National Laboratory, Upton, New York. An afternoon panel discussion was held on terrorist threats. The panel consisted of J. Indusi, A. Locke, L. Fishbone, E.R. Johnson, T. Fainberg, and R. James. Dinner followed with approximately thirty members attending. Alan Locke, former director of the Office of Analysis for Strategic, Proliferation, and Military Issues, U.S. Department of State, gave a presentation after dinner.

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President, INMM Northeast Chapter
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Southwest Regional Chapter

The Southwest Regional Chapter held elections for officers and members-at-large in late September. The elections were to fill the three executive positions, president, vice president, and secretary/treasurer, and two of the member-at-large positions, who serve for a two-year term. The results are as follows:

- President: Donnie Glidewell (Sandia National Laboratories)
- Vice President: Hiroshi Hoida (Los Alamos National Laboratory)
- Secretary/Treasurer: Lawrence Kwei (U.S. DOE/Los Alamos Area Office)
- Members-at-Large: Leigh Bratcher (BWXT Pantex)
- Robert Marshall (LANL/Weirich)

The electees join Grace Thompson and Steve Ortiz, both of Sandia National Laboratories, who are members-at-large starting the second year of their two-year term.

As called for in the bylaws for the Southwest Regional Chapter, the outgoing and incoming Executive Committees met on October 23 to turn over responsibilities and discuss ongoing chapter initiatives.

The chapter's nearest term activity is the winter dinner meeting, which will be held in Sante Fe, New Mexico, in January. Planning is ongoing for this event.

The chapter is also planning to support the INMM Physical Protection Technical Division's "Vulnerability Analysis for Nuclear Facilities" workshop, planned to be held in Albuquerque, New Mexico, next spring. Ideas for support that the chapter is considering are sponsoring a student from a local college to attend the workshop and organizing an evening social reception.

Lawrence K. Kwei
Secretary/Treasurer, Southwest Regional Chapter
U.S. DOE/Los Alamos Area Office
Los Alamos, New Mexico U.S.A.

Vienna Chapter

The selection of Vienna Chapter officers was held during September 2001. The Chapter Executive Committee Members for 2001-2002 are:

- President: Shirley Johnson
- Vice President: Neil Tuley
- Treasurer: Diane Fischer
- Secretary: John Oakberg
- Members-at-Large; Joe Carrelli (second year of a two-year term) Svetlana Abakumova (first year of a two-year term)
- Past President: Jaime Vidaurre-Henry

Jaime Vidaurre-Henry coordinated the election committee and reported the results to all Vienna Chapter members.

Members of the Vienna Chapter participated actively at the recent INMM meeting in Indian Wells, California. The winning paper at our local safeguards minisymposium in Vienna, "Application of Thermo-Hydraulic Power Monitors at Large Research Reactors," was presented at the 42nd Annual Meeting by IAEA Inspector J. Araujo. Several additional Symposium papers, sponsored by the IAEA Department of Safeguards, were presented at the meeting.

The Vienna Chapter and the Japan Chapter co-sponsored a reception during the IAEA Symposium on International Safeguards: Verification and Security, held in Vienna October 29-November 2. During the week of the IAEA Symposium, the Vienna Chapter and the International Safeguards Division co-sponsored a no-host dinner evening, followed by a discussion program.

John Oakberg
Secretary, Vienna Chapter
IAEA
Vienna, Austria

Harley Toy
October 17, 1927–October 17, 2001

Harley Toy, one of the earliest members of the Institute, passed away in Columbus, Ohio, on October 17, 2001. He was 74 years old.

In the more than forty-year history of the Institute, few have had such an impact on the existence and success of the INMM. His membership began on October 7, 1958.

Following his graduation from Ohio State University, Mr. Toy was employed by the Battelle Memorial Institute in Columbus, Ohio. He remained with Battelle until his retirement in 1993.

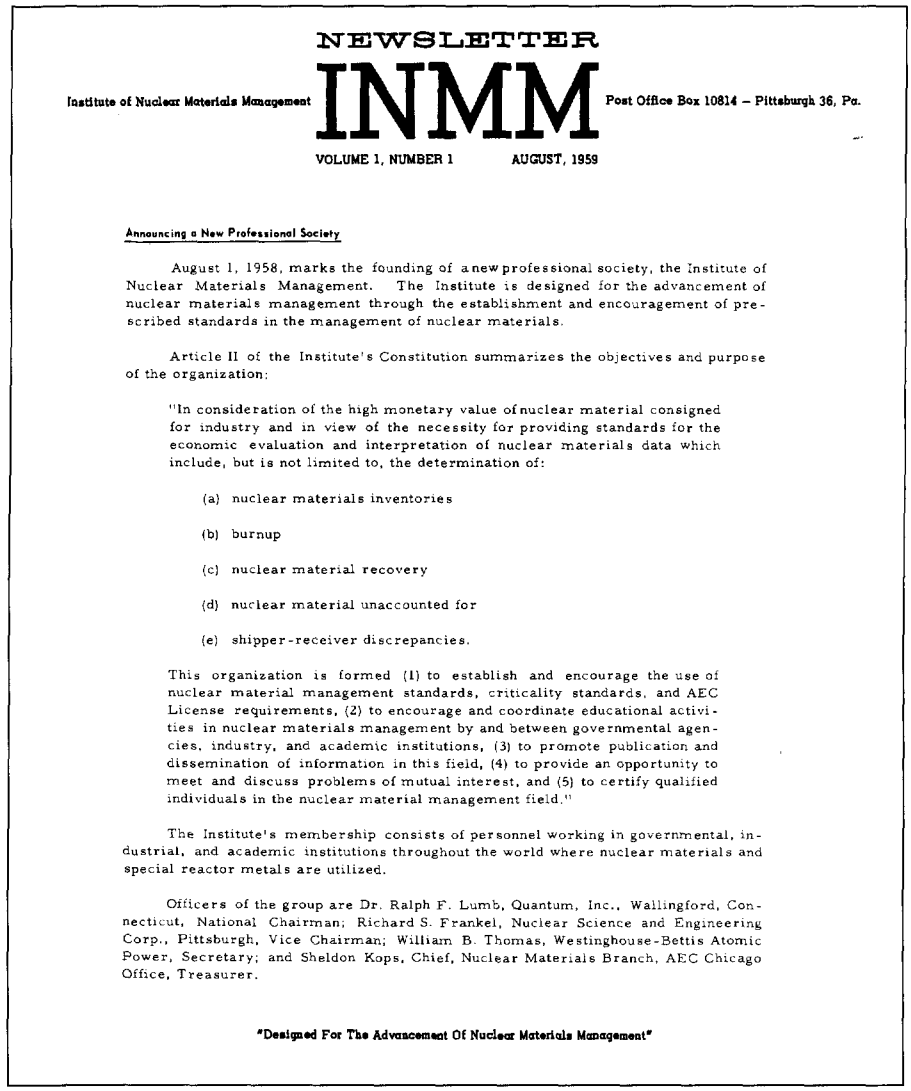
From the very beginning of INMM's activities and continuing through the 1960s and 1970s, Mr. Toy was one of the principal contributors to the existence and subsequent growth of the Institute. He was appointed the Institute's first program chair in April 1959. Additionally, he was given the responsibility for the publication and distribution of the first membership directory and the first *INMM Newsletter.*

When the Institute was a fledgling operation in the 1960s, Mr. Toy obtained and maintained support from Battelle at the highest management level. This allowed the Institute not only to survive, but to grow as well. He remained an active participant in the Institute's affairs, participating in its various committees and serving on the Executive Committee. Mr. Toy was appointed member-at-large to the Executive Committee in 1961, remaining in that position until July 1962 when he was elected secretary. He served as secretary until July 1970 when he was elected vice chairman. In July 1972, he was elected chairman of the Institute for fiscal years 1973 and 1974, and continued as immediate past chairman for the subsequent two years.

During all those years, Mr. Toy was instrumental in achieving harmonious resolution of the many controversial issues that arose in the Institute. He was successful in this because he had no personal agenda or need for recognition, and had only the welfare of the Institute as his objective. He worked tirelessly on behalf of the Institute, sacrificing much of his own personal time, not just that which was paid for by Battelle.

When we marvel at the growth and accomplishments of the INMM over the years, we should remember that without Harley Toy this might not have been possible. For that, we all owe Harley Toy our sincere thanks and respect.

Submitted by
E.R. Johnson



NEWSLETTER

Institute of Nuclear Materials Management **INMM** Post Office Box 10814 – Pittsburgh 36, Pa.

VOLUME 1, NUMBER 1 AUGUST, 1959

Announcing a New Professional Society

August 1, 1958, marks the founding of a new professional society, the Institute of Nuclear Materials Management. The Institute is designed for the advancement of nuclear materials management through the establishment and encouragement of prescribed standards in the management of nuclear materials.

Article II of the Institute's Constitution summarizes the objectives and purpose of the organization:

"In consideration of the high monetary value of nuclear material consigned for industry and in view of the necessity for providing standards for the economic evaluation and interpretation of nuclear materials data which include, but is not limited to, the determination of:

(a) nuclear materials inventories

(b) burnup

(c) nuclear material recovery

(d) nuclear material unaccounted for

(e) shipper-receiver discrepancies.

This organization is formed (1) to establish and encourage the use of nuclear material management standards, criticality standards, and AEC License requirements, (2) to encourage and coordinate educational activities in nuclear materials management by and between governmental agencies, industry, and academic institutions, (3) to promote publication and dissemination of information in this field, (4) to provide an opportunity to meet and discuss problems of mutual interest, and (5) to certify qualified individuals in the nuclear material management field."

The Institute's membership consists of personnel working in governmental, industrial, and academic institutions throughout the world where nuclear materials and special reactor metals are utilized.

Officers of the group are Dr. Ralph F. Lumb, Quantum, Inc., Wallingford, Connecticut, National Chairman; Richard S. Frankel, Nuclear Science and Engineering Corp., Pittsburgh, Vice Chairman; William B. Thomas, Westinghouse-Bettis Atomic Power, Secretary; and Sheldon Kops, Chief, Nuclear Materials Branch, AEC Chicago Office, Treasurer.

"Designed For The Advancement Of Nuclear Materials Management"

The first issue of the INMM Newsletter, edited by Harley Toy. Provided by INMM Secretary Vince DeVito.

Preparing the Next Generation Nuclear Stewards

Jack Jekowski
Innovative Technology Partnerships LLC
Albuquerque, New Mexico U.S.A.

Abstract

The world has "harnessed" the power of the atom for more than five decades. As we enter the new millennium, the knowledge of the atom continues to mature, offering the world the hope of new discoveries and significant benefits. But five decades of a Cold War arms race has also left a legacy of significant concerns. How will the environmental issues associated with large stockpiles of weapons-grade materials be safely managed? How will proliferation issues created by an increased dependence on nuclear power, particularly in Third World countries, be addressed? The first generation of nuclear stewards, educated and employed by the nuclear-weapons states and countries using nuclear energy are rapidly approaching the end of their careers. Even with the end of the Cold War and the subsequent downsizing of the Russian and U.S. nuclear stockpiles, there is as great a need today for scientists, engineers, and technicians, to steward our nuclear stockpiles, materials, and facilities as there was at the peak of the Cold War. An alarming trend, however, has surfaced over the past decade—university nuclear engineering programs in the United States have declined in number and scope, and the market for nuclear workers has become less attractive for young adults, as other, more challenging and less controversial technologies emerge in the world marketplace. On a more global basis, other countries are experiencing similar trends, driven by many factors, but nonetheless, raising the frightening specter of a global shortage of nuclear materials management expertise. The INMM, recognizing an alarming trend in the aging of its own membership, has been looking at these issues and developing strategies to encourage student membership. As efforts to address the more specific problem for the Institute have moved forward, the author, along with many others[1], have raised the question of what appears to be a quiet ***global crisis***[2] with respect to the nurturing of the next generation of nuclear scientists and engineers to provide the stewardship of our nuclear legacy.

Introduction

During the inaugural meeting of the newly formed Southwest Chapter of the INMM, April 14, 1998, in Albuquerque, New Mexico, then-INMM President Obie Amacker challenged the gathering to help the Institute increase its student membership. This call had been prompted by a strategic planning activity of the Executive Committee that raised concern about the aging of the membership, as seen in the statistics of the organization. The author, along with other attendees, including Pamela Dawson of Los Alamos National Laboratory and Brenda Swindell of the Department of Energy Amarillo Area Office, agreed to work the issue on behalf of the Institute in the context of activities in which they were currently engaged.[3] At the INMM Annual Meeting in Naples, Florida, that July, a special breakout session was held to announce the new educational/student initiative and seek those who might be interested in working on the issue for the Institute. Immediate past-president Jim Tape attended this session and acquainted the group with the Institute's Memorial and Educational Outreach Fund and how it might be used to assist with student initiatives.[4] Rick Hartley, at the time with the ANRC[5] and now with BWXT Pantex, and Cindy Murdock, DOE/AL, chair of the Southwest Chapter, also participated in this first meeting. Subsequently, work in this area has continued at Southwest Chapter meetings and INMM Annual Meetings. This year the author made a presentation titled "Preparing the Next Generation Nuclear Stewards" to the Executive Committee in Indian Wells, California, before the Annual Meeting. The presentation evoked significant discussion among members throughout the week. Scott Vance of Shaw Pittman, now chair of the Membership Committee, also introduced a new student membership policy at the Executive Committee meeting, which was approved by the Executive Committee and the Membership Committee.[6] As discussions during the week demonstrated, the problem indeed is not restricted to the United States but, for a variety of different reasons, is one that worries members from many non-U.S. chapters as well. Although this paper will focus on U.S. data and activities, it behooves the Institute to open discussions on an international basis to address this truly global crisis.

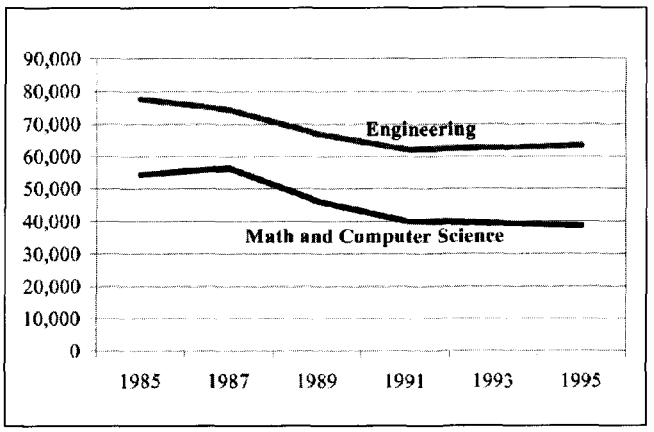


Figure 1: *Decline in U.S. math and science degrees since 1985*

An Idea Whose Time Had Come

As the initiative for the Institute had just started, the Chiles Commission Report was issued in March 1999,[7] raising the issue of the loss of critical technical skills within the Department of Energy community. With data that showed an alarming trend of declining math and science degrees in the United States (see Figure 1), and an equally alarming trend in job market demand away from nuclear fields to other technology areas, along with other issues, the commission concluded that a crisis in critical skills was in the offing. Subsequently the Foster Commission[8] and the Stockpile Stewardship Program 30-Day Review[9] echoed the urgent need to ensure the preparation of the next generation of nuclear stewards. More recently,[10] research has shown that the U.S. university research capability in nuclear engineering programs has declined from forty campuses in 1988 to only twenty-eight today, with more being considered for closure by their administrations. *Aviation Week and Space Technology* in two separate articles this year raised the concern of lack of next generation aerospace engineers,[11] and in a front-page story, discussed nuclear weapons and the "Graying of Deterrence."[12]

The Real Issue

As a result of Section 3161 of the National Defense Authorization Act of 1993, the Department of Energy created a network of community-based organizations to mitigate the economic impact of the downsizing of the weapons-complex sites. Located in communities that were suffering large reductions in force, the community reuse organizations (CROs) helped create new economies to hire technical staff leaving the contractor and DOE sites. The dramatic impact of the reductions in force is shown in Figure 2.

Although these reductions have stopped, other effects raise the specter of a continuing slide in employment across the complex. Not the least of these is the alarming picture of retirement-eligible critical skills identified by DOE (see Figure 3).

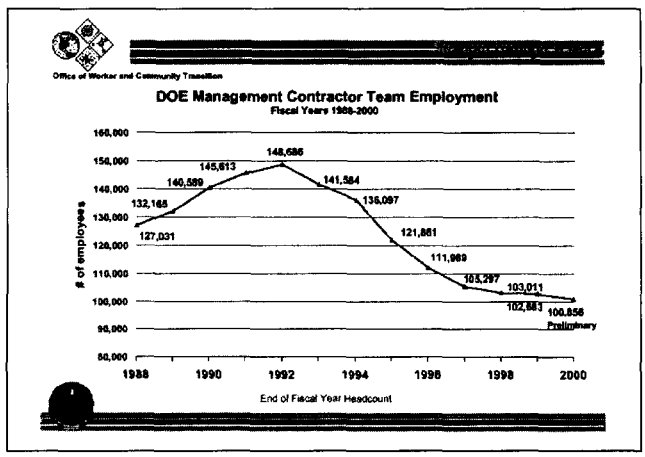


Figure 2: *Reduction in force across the DOE Complex*

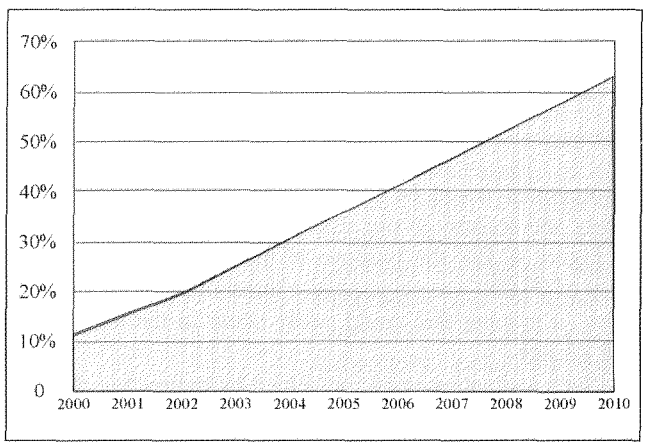


Figure 3: *Retirement-eligible critical skills, cumulative*

By examining the available data within the strategic framework of driving forces that negatively impact the recruitment and retention of nuclear workers, an alarmingly clear picture emerges. Some of the external driving forces that are working in opposition to the rebuilding of the workforce include:

- Decline in society's interest and support for science
- Negative publicity and constant public and Congressional criticism
- Decline in math and science achievement
- Reduction in workforce across the complex
- Nuclear environmental issues
- Lie detector tests and other morale issues
- Growing bureaucracy
- Declining infrastructure
- Nuclear power decline (United States)
- Competition with private sector
- Absence of testing
- No new exciting science

Framing all of this data in a strategic perspective, it is possible to extrapolate a scenario where a critical level of

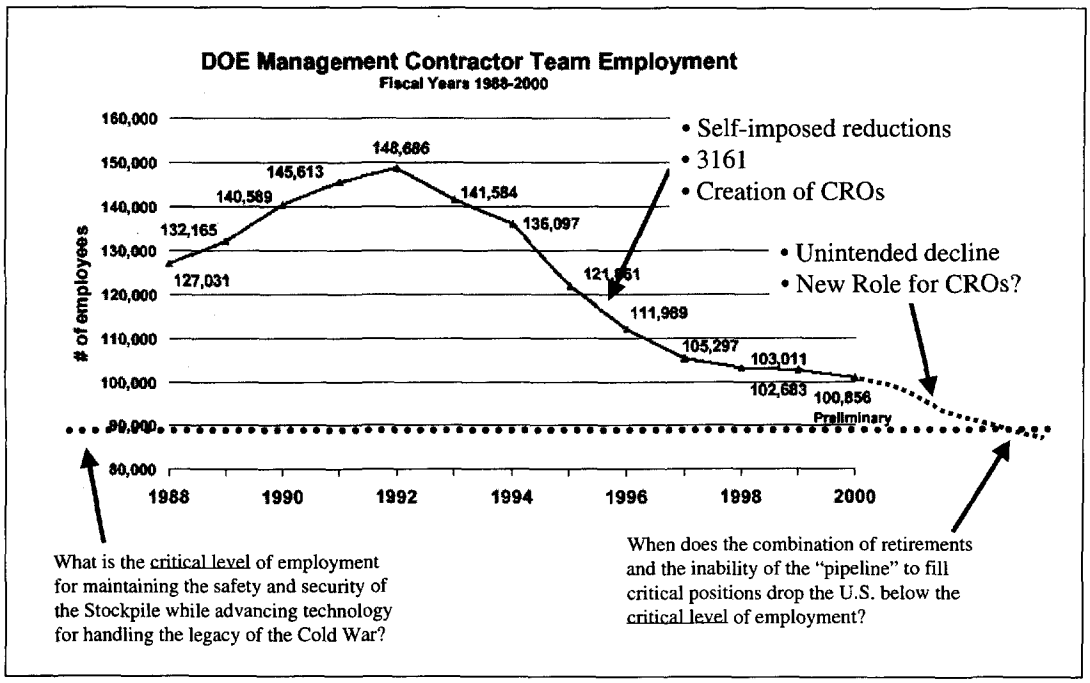


Figure 4: *A speculative chart that raises the question: when will we fall below a "critical level" of employment to ensure the safety and reliability of our nuclear materials and weapons?*

employment might be reached that would jeopardize the safety and security of our stockpile, as shown speculatively in Figure 4. For the purpose of this discussion, a critical level of 90,000 was selected as a threshold of an impending crisis, a number that could easily occur in the first half of this decade.

Such a situation might be helped by redirecting the mission of the already established CROs to one of intermediaries with the local education systems and the private sector to fill the pipeline of engineers and scientists. Such an initiative has been implemented in New Mexico with the linking of the newest CRO, the Next Generation Economy, to a DOE-initiated math, science, and technology partnership to create a continuous education system focused on math and science in K-12, with linkages to community college and university programs.

Some Recent Activities

Many organizations are aware of these issues and are working to have an impact. Listed below is a sampling of initiatives that the team has identified in their journey to assist the Institute.

Federal Legislation

Three senate bills, S.242, University Nuclear Science and Engineering Programs at the Department of Energy; S.472, Nuclear Energy Electricity Supply Assistance Act; and S.597, Comprehensive and Balanced Energy Policy Act (Section 1601)—Workforce Trends and Traineeships Grants have been introduced in this congressional session. New Mexico's U.S. Senators Domenici and Bingaman have been active in sponsoring this legislation. All of these are designed to address the shortages in specific skills related to our nuclear engineering programs. The Elementary and Secondary Education Act also has language from both houses to significantly enhance math and science education, and partnerships between business and education to ensure the needs of industry are met. This language has been created to address the findings of the Glenn Commission Report,[13] issued in September 2000, warning of the serious decline in math and science education in the U.S. Recently, President Bush's nominee for the Office of Science and Technology Policy, John Marburger, stated in confirmation hearings: "Our children carry our hopes for the future, and preparing them for the 21st century is one of the most important national priorities...the degree to which our nation flourishes in the 21st century will rest upon our success in developing a well-educated citizenry and workforce able to embrace the rapid pace of technological change." In an unnerving harbinger of events to come, the U.S. Commission on National Security (Hart-Rudman Commission), in its final report issued in February, *Road Map for National Security: Imperative for Change,*[14] identified "securing the national homeland" and "recapitalizing America's strengths in science and education" as the top two strategic issues threatening our national security.

Human Capital Initiative

The federal government has recognized the critical shortage of skills that will result in the retirement of the Baby Boom population in the next decade, and has launched the "Human Capital Initiative." Prompted by a series of GAO and IG reports[15] in the past year, this initiative has picked up momentum and has driven new requirements in contracts, as well as a renewed focus for long-range strategies.

ANRC

The Amarillo National Research Center has been working this issue for many years, creating some of the most insightful perspectives and strategies for implementation, but has suffered from inadequate funding to accomplish its mission. One of the most significant perspectives provided by this effort is the concept depicted in Figure 5, which shows how an integrated plan for math and science education with a focus on nuclear fields can be created to ensure a consistently filled pipeline of talent.

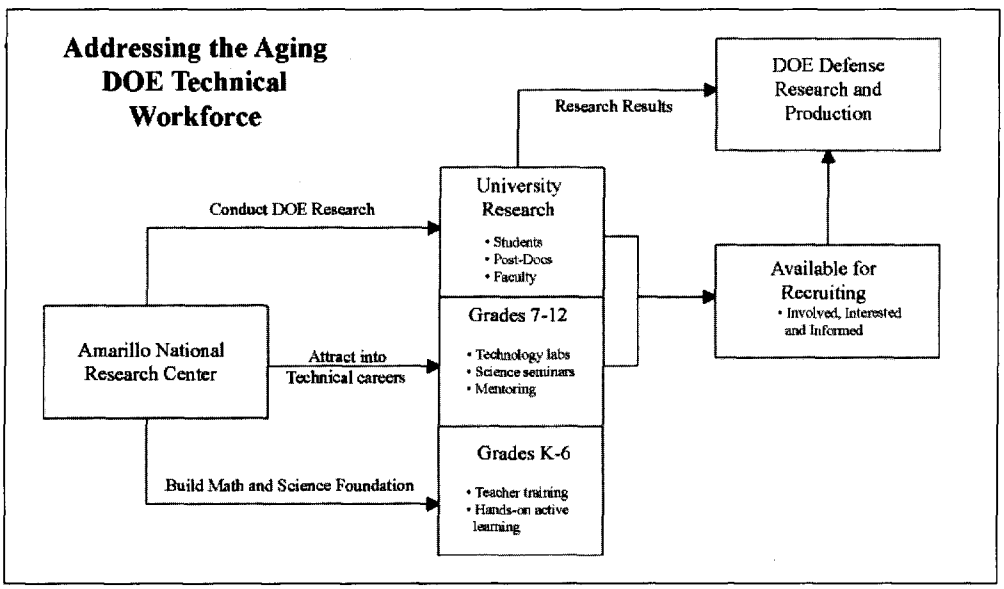


Figure 5

INMM

As mentioned earlier, the INMM has implemented a new student membership policy, which will encourage greater participation by universities and the involvement of chapters in local communities. As a result of this new policy, and the discussion at the Annual Meeting, several of the U.S. chapters, including the Northeast and the Southwest chapters have already implemented programs to encourage student participation in local events.

MSTP

The Albuquerque Public Schools Math, Science, and Technology Partnership[16] is a unique private-public sector effort initiated by Rick Glass of DOE/AL to create an entirely new model of education in K-12 for math and science. Linking with the local CRO, the Albuquerque Technical Vocational Institute, University of New Mexico, and other entities, the effort will create a model that can be replicated across the state.

ORISE

The Oak Ridge Institute for Science and Education, with a long history of education and training in the DOE community, has proposed a "Knowledge Preservation Program" that will work with the DOE sites and various universities across the United States to create undergraduate, graduate, and dissertation programs to ensure the flow of scientists and engineers.

NSSE

The Network of Senior Scientists and Engineers is a group of individuals from the DOE production facilities who are exploring issues of knowledge preservation, critical skills inventories, and recruiting.

University of California—DOE Appendix O

The new contract between DOE and the University of California, which includes Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and the Ernest O. Lawrence Berkeley National Laboratory, includes a special management section called Appendix O. Section 4, Critical Skills, Knowledge, and Technical Capabilities Initiative, provides performance standards for the university to ensure "...that workforce critical skill replenishment is managed in a sound and systematic manner to assure that future mission needs of the nuclear-weapons program are effectively met." Through contract performance metrics such as this, DOE has been able to focus resources on this issue.

Monterey Institute

The Monterey Institute's Center for Nonproliferation Studies[17] provides graduate certificates in nonproliferation fields of study. Arranging internships at various international venues, the Institute is focused on training the next generation of nonproliferation specialists and disseminating timely information and analysis to combat the spread of weapons of mass destruction.

ANS Report

The American Nuclear Society compiles a *Nuclear Engineering Sourcebook*[18] that can be used to better understand the scope and capabilities of university nuclear programs worldwide.

DOE Nuclear Engineering Programs

The Department of Energy has also continued to award grants to universities for nuclear engineering research under the department's Nuclear Engineering Education Research (NEER) initiative. This year, nineteen grants were awarded to fourteen universities.

International Issues

Other nations have also indicated their own dilemmas associated with ensuring the next generation of stewards is available. In a recent interview with journalists, Russian Education Minister Vladimir Filippov spoke about the need for Russia to train new scientists. According to RFE/RL's Moscow Bureau, Filippov noted that the Academy of Science is aging: the average age of a Russian scientist is 60 years old and 52 percent of all doctors of science are already of pension age. In order to replenish the ranks, Filippov announced on August 1, 2001, that the ministry planned to create scientific-scholarly centers at educational institutions and scientific research institutes, in which 1,200 new jobs would be created. The centers would be located in large cities as well as remote regions. Representatives of other countries at the INMM Annual Meeting in Indian Wells this year also indicated concerns about the aging of their workforce and the lack of interest by the younger generation in following nuclear fields of study.

No Overarching Strategy

Despite all of the attention being given to this issue in a variety of venues, there appears to be no overarching national or international strategy. Available data seems to paint an impending crisis, but this has not been sufficiently publicized to mobilize the education, government, and private sectors to work together to address this strategic issue with global security and safety implications. The Glenn Commission and the Hart-Rudman Commission reports have both attempted to raise the level of this issue to a national priority. The original concept conceived by the Amarillo National Research Center (see Figure 5), still paints the best perspective of how systemic the strategy must be across all levels of our education system. It is also important to integrate a government supported plan with the private sector to bridge generations.

Conclusion

The quiet crisis that appears to be growing on an international basis should give organizations such as the INMM pause. Founded in 1958 as a scientific and educational organization committed to advancing quality nuclear materials practices worldwide, the INMM itself must now reassess its role to ensure that the legacy of our founders is maintained, and the future of the world is in knowledgeable hands. Let us all hope that because this is a quiet crisis we do not wait until a tragic event plays out before our eyes before we take the appropriate actions.

Jack Jekowski is a principal partner with Innovative Technology Partnerships LLC in Albuquerque, New Mexico, a technology consulting and manufacturing company. He is a thirty-four-year veteran of the nuclear weapons complex, working in Boston, Los Alamos, Albuquerque, Nevada, and Kansas City during his career that included management of nuclear test diagnostics and effects, transportation safeguards, nuclear security, and atmospheric monitoring. He is active in the education, economic development, and public policy arena in New Mexico, sitting on nineteen boards, including the Next Generation Economy, the APS Math, Science and Technology Partnership, Connect New Mexico, Technology Industries Association, and the Los Alamos Committee on Arms Control and International Security. He has been an active member of the INMM since 1988.

References

1. The author would like to acknowledge all of the individuals who continue to work in support of the Institute's initiative, and who have contributed ideas, data, and input for this article. These include: Obie Amacker, Debbie Dickman, Jim Tape, John Matter, J.D. Williams, Pamela Dawson, Brenda Swindell, Rick Hartley, Ed Walters, Paul Nelson, Bill Desmond, Don Cook, Eileen Beaulieu, Rick Glass, Cindy Sundblad, Cindy Murdock, Chad Olinger, Chris Baumgart, Pete Lyons, Norm Roderick, and many others.
2. Joseph Nye, dean of Harvard University's John F. Kennedy School of Government calls government hiring a quiet crisis: "The problem with a quiet crisis is you can't get anyone to do anything about it." Nye is helping organize a series of meetings to address the overall problem of the aging U.S. federal workforce.
3. The author at the time was working an initiative with the University of New Mexico (Dr. Ed Walters) and AlliedSignal (now Honeywell) FM&T to develop a U.S.-Russian Bilateral Educational Initiative; Dawson was working with the Nonproliferation and National Security Institute (NNSI-formerly the Central Training Academy) on MPC&A curriculum; and Swindell had worked with the Amarillo National Research Center (ANRC) on educational outreach programs.
4. The INMM Memorial Educational and Outreach fund was established to allow members and others to give financially to the Institute, particularly in memorial to deceased members. The fund supports travel to meetings and workshops for deserving advanced undergraduate students or professionals from regions of the world with economies in transition; scholarships in fields of study related to nuclear materials management; and chapter outreach and public educational activities to further general understanding of nuclear materials management.
5. Amarillo National Research Center, http://www.anrc-research.org.

6. The primary features of the new policy include reduced membership fees, opportunities for scholarships, and an effort by the Institute to encourage participation by universities through invitations to deans of nuclear engineering programs, and encouragement of chapters to engage their local education communities.
7. Commission on Maintaining United States Nuclear Weapon Expertise, March 1, 1999, Report to the Congress and Secretary of Energy, Pursuant to the National Defense Authorization Acts of 1997 and 1998: "Following a period of significant downsizing of the nuclear-weapons complex, recruitment of a new generation of employees, especially critically skilled employees that constitute the essential workforce addressed in this report, has resumed slowly. Yet it has not resumed at the pace nor the scope needed to reverse the demographic trends...unless this is changed the complex will face a crisis of talent within the next fifteen years."
8 FY 1999 Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile, November 8, 1999: "A major challenge will be to attract, educate, and train the next generation of stewards, who will be responsible for assessing, maintaining, manufacturing, and certifying these weapons of the future. They will not have the same kinds of experience as the current generation of stewards, and new ways will be needed for them to earn the trust of national leaders."
9. U.S. Department of Energy Stockpile Stewardship Program 30-Day Review, November 23, 1999: "Readiness is required in three areas. First, it is essential to have high-quality, motivated people with the correct skills to carry out stewardship, resolve unanticipated technical issues, and resume design, development testing, and production if it becomes necessary."
10. Matthew L. Wald. June 28, 2001. Nuclear Programs Are Losing Ground on Campus. *The New York Times.* "If we do build new nuclear plants...we're going to need people who understand the technology and can operate the plants safely, and the places that train those people are beginning to disappear. It's very depressing." (Marvin M. Mendonca, NRC)
11. William B. Scott. April 23, 2001. Worries Deepen Over Dearth of Technical Talent. *Aviation Week and Space Technology,* pp. 32–33. "The fundamental bottom-line problem is America is not producing enough people who want to be engineers and work in the aerospace industry."
12. William B. Scott. August 20, 2001. Aging Weapons and Staff Strain Nuclear Complex. *Aviation Week and Space Technology,* pp 58–68. "But the real problem is in twenty years...when we will have nobody who ever designed nuclear weapons...it's a very long apprenticeship. A new Ph.D. really needs ten years of intense study and classified schooling before we think one is ready to begin original work." (C. Paul Robinson)
13. "Before It's Too Late." A Report to the Nation from the Commission on Mathematics and Science Teaching for the 21st Century, September 27, 2000, http://www.ed.gov/americacounts/glenn, "We as a nation must take immediate action to improve the quality of math and science teaching in every classroom in the country. If we delay, we put at risk our continued economic growth and future scientific discovery."
14. Road Map for National Security: Imperative for Change, the Phase III Report of the U.S. Commission on National Security/21st Century, February 15, 2000, http://www.nssg.gov, "Education is the foundation of America's future...education in science, mathematics, and engineering has a special relevance for the future of U.S. national security, for America's ability to lead depends particularly on the depth and breadth of its scientific and technical communities."
15. IG Reports:
    - DOE/IG-0512—Recruitment and Retention of Scientific and Technical Personnel, July 2001
    - DOE/IG-0504—Performance Measures at the Department of Energy, May 2001
    - DOE/IF-0491—Management Challenges at the Department of Energy, November 2000

    GAO Reports:
    - GAO-01-965T—Human Capital—Taking Steps to Meet Current and Emerging Human Capital Challenges, July 2001
    - GAO-01-509—Federal Employee Retirements—Expected Increase Over the Next 5 Years Illustrates Need for Workforce Planning, April 2001
    - GAO-01-236—Managing for Results—Human Capital Management Discussion in Fiscal Year 2001 Performance Plan, April 2001
    - GAO-01-357T—Human Capital—Meeting the Government Wide High-Risk Challenge, February 2001
    - GAO-01-246—Major Management Challenges and Program Risks, January 2001
16. http://www.aps.edu/aps/mstweb
17. http://cns.miis.edu
18. http://www.ne.ncsu.edu/Source/sourcebook.html

Reducing the Nuclear Threat in the 21st Century

Charles B. Curtis
Nuclear Threat Initiative
Washington, D.C. U.S.A.

This paper was presented at the International Atomic Energy Agency Symposium "International Safeguards: Verification and Nuclear Material Safety," which was held in Vienna, Austria, October 29 through November 1, 2001.

It's an honor to be here with so many who have devoted their lives and their expertise to the study and practice of nonproliferation. We have come together to discuss a great global challenge—how to reduce the threats posed by nuclear weapons, stop their spread, and, especially, how to make sure nuclear weapons and nuclear-weapons materials never fall into the hands of those who would do us harm.

Before I get too far into my remarks, I would like to offer congratulations to Dr. ElBaradei on his re-appointment; his leadership both before and after the events of September 11 has confirmed the wisdom of asking him to serve a second term as director general of the International Atomic Energy Agency.

It is, as always, a pleasure to be here in Vienna—the site of so much historic international diplomacy. It was here in Vienna, forty years ago this summer—at the height of the Cold War—that U.S. President John Kennedy and Soviet Chairman Nikita Khrushchev met for a very difficult and contentious summit which increased world anxiety about nuclear security. We made it through the peril of the Cold War. But today we face a new nuclear danger, which in many ways is more complex and insidious. It is no exaggeration to say today that what the people in this room do, and are able to persuade their governments to do, may shape our nuclear future every bit as much as any summit ever held in this city.

The world is now united in the fight against terror. We all have our role. It will fall to others to find terrorists and bring them to justice. It falls to the people in this room, in a significant way, to prevent terrorists from acting out an even greater horror by acquiring nuclear weapons or the materials to create them.

Nearly three years ago, Osama bin Laden told an interviewer from ABC News that acquiring weapons of mass destruction is "a religious duty." That ought to alarm us, because the attacks of September 11 give us little hope that if these terrorists had them, they would hesitate to use them. They showed their willingness to take innocent lives is unbounded; their capacity for killing is limited only by the power of their weapons. And so we are now in a new arms race. Terrorists and certain rogue states are racing to get weapons of mass destruction, and we are racing to stop them. The outcome of this arms race will define global security in the 21st century.

When I last came to an IAEA conference, I came as an official of the U.S. government. Today I speak as the president of the Nuclear Threat Initiative—a newly formed charitable organization dedicated to reducing—as urgently and comprehensively as possible—the global threat from nuclear, biological, and chemical weapons. By scope and scale, the nuclear danger is the greatest of these threats, thus it is our Initiative's primary focus. But we recognize that a global security initiative, to be effective, must also address the dangers posed by chemical and biological weapons—as the events following September 11 demonstrate.

This urgent task united CNN founder Ted Turner and former U.S. Senator Sam Nunn, who co-chair the Initiative. And they, in turn, have recruited an experienced, distinguished board of directors who come from a wide range of nations and backgrounds. On our board are:

- Two sitting U.S. senators, Pete Domenici and Richard Lugar;
- A current member of the Russian Duma, Andrei Kokoshin;
- Susan Eisenhower, president of the Eisenhower Institute and a well recognized expert in U.S.-Russian relations;
- Rolf Ekeus, who led the UN Special Commission on Iraq, which was responsible for eliminating the Iraqi infrastructure for nuclear and other weapons of mass destruction, and now leads the Stockholm International Peace Research Institute;
- Gene Habiger, retired U.S. Air Force General and former commander-in-chief of the U.S. Strategic Command;

- Dr. Amartya Sen, a Nobel Prize winning economist and master of Cambridge University;
- William Perry, now at Stanford University and a former U.S. Secretary of Defense;
- Dr. Nafis Sadik, special adviser to the UN Secretary-General, and former head of the UN Population Fund, and
- Dr. Jessica Mathews, president of the Carnegie Endowment for International Peace.

In the next year, we intend to add other international perspectives to our board and grow the number of directors from thirteen to twenty-one.

Those of us who have been in the public sector understand how difficult it is—while in government—to step back from handling day-to-day crises to take a strategic view, design fresh concepts, or consider new approaches. So part of what NTI offers is fresh thinking on long-standing problems. But we also aim to do more than think. We mean to match our thought with action. So we are taking steps we hope will help:

- Reduce the quantities of nuclear, biological, and chemical weapons materials, and bring them under secure control;
- Restrict the spread of weapons know-how;
- Reduce the risk of intentional or accidental use of weapons of mass destruction;
- Develop better strategies and means to guard against the emerging threat from biological weapons;
- Bring about changes in nuclear forces to enhance safety, security, and stability; and
- Increase public awareness, encourage dialogue, catalyze action, and promote new thinking about reducing the danger from weapons of mass destruction on a global basis.

Public education is a priority for NTI because:

- Most people do not know, for example, that large quantities of fissile material exist in civilian nuclear reactors and research facilities around the world, all defended with different levels of security.
- Most people do not know that global inventories of separated plutonium are growing by many tons a year.
- Most people do not know that Russia alone has enough uranium and plutonium to make more than 60,000 nuclear weapons—some of it stored in locations that have no surveillance cameras in the facility and no detectors at the door.
- Most people do not know that Russia is dismantling its nuclear arsenal and reducing its weapons, but as it does so, it is increasing its stock of fissile material.
- Most people do not know that the rising *supply* of weapons materials greatly multiplies the threat from these materials. And yet, funds to reduce this threat have not kept pace with the dangers. This has created a growing and increasingly dangerous gap between the threat and our response.

It is one of NTI's fundamental missions to make the public aware of these gaps between the dangers we face and our response because we believe that if the public understood them, they would not stand for them.

Since September 11, the public in many countries has become intensely aware of the clear and present danger of terrorist sabotage of nuclear power plants. Much has also been said in the press about the possible threat of radiological "dirty bombs." Surely we must do more worldwide to address both of these threats—and the IAEA will have a critical role to play in that effort. But I want to focus my remarks today on another issue of rising public concern—the threat of terrorism and the threat from poorly protected nuclear weapons materials. Since September 11, people are coming to understand that these threats are not separate, but interrelated and reinforcing, and if joined together, become our worst nightmare.

The people in this room are keenly aware of the gap between the threat and the response, and many have long been urging the world to increase its efforts to prevent the theft, trafficking, and smuggling of nuclear material. Until now, too few have listened. But one of the greatest obstacles to addressing the threat is gone now. And that is the view that there is no threat—or rather, that addressing the threat is important, but somehow, not urgent.

That view is finished. *The threat is serious, it is immediate,* its remedy is urgent, and more and more people know it. As an example—I recently ran a search in major world newspapers for news stories about terrorism and nuclear weapons. In the month before September 11, there were fifty-seven stories about terrorism and nuclear weapons. In the month following, there were 1,106.

As people are suddenly ready to support far stronger action to keep nuclear weapons out of terrorist hands, we have to make sure people understand that the IAEA is the only international institution of global scope devoted to controlling access to weapons-usable material. There is little hope that we can build an effective global system to secure nuclear material from terrorists without an effective and well-financed safeguards system at its foundation. We all need to be able to make the case for the work of the IAEA. As we do so, we must call attention to its funding gap. It is no longer fiscally prudent or rational for an organization whose mission is so important to be asked to do so much, with so little, for so long.

Governments, the press, and the public need to understand that the IAEA is responsible for monitoring more than 900 facilities to make sure no nuclear materials at those facilities are diverted to military use. They need to know that during fifteen years of zero real growth in the IAEA's safeguards budget, the number of states who are part of the nonproliferation regime, the number of safeguarded facilities in

those states, and the amount of plutonium and HEU requiring safeguards have all increased dramatically. Fifteen years ago, there was some "fat" in the Agency's budget. But we have long since passed the point where adding more safeguards responsibilities without adding more budget is trimming out fat—we are cutting into the bone.

The IAEA's safeguards system is facing a "quiet crisis." There is already a gap between the nuclear threat and our global response. Zero growth budgets at IAEA widen the gap. Governments, the press, and the public need to know that the entire global safeguards budget for preventing one of the world's greatest security threats is less than 100 million U.S. dollars a year (20 percent of which derives from voluntary contributions). This total budget is less than 10 percent of the cost of building a single nuclear power plant—and a tiny fraction of the economic cost of the non-nuclear terrorist strikes of September 11. They need to know that there is a growing danger that budget constraints will force decisions that could irrevocably weaken the safeguards regime. The time has come, instead, for member states to agree to a substantial real increase in the IAEA's regular safeguards budget.

The discovery in Iraq in 1991 of a substantial covert nuclear weapons program led to the establishment—for the first time—of an Additional Protocol with wide-ranging new inspection authorities and information access that will give the IAEA what it needs to help ensure that there are no covert nuclear activities in states subject to the protocol. The adoption of this Additional Protocol is a great advance in nuclear security. But governments, the press, and the public need to understand that the board has approved Additional Protocols for only fifty-eight member states, and only twenty-two of those have entered into force or are being provisionally applied. A decade after the Iraq discovery of the weakness in its safeguards regime, the IAEA does not yet have the full authority it needs to detect and expose covert nuclear programs that may be underway in some parts of the world.

They also need to understand, as the people in this room do, that safeguards—even where they are fully in force—offer no assurance against theft, seizure, or unauthorized acquisition of nuclear material inside the state.

When U.S. President Eisenhower made his 1953 speech to the United Nations promoting the peaceful use of atomic energy and proposing the creation of IAEA, he said: "The Atomic Energy Agency could be made responsible for the impounding, storage, and protection of the contributed fissionable material. The ingenuity of our scientists will provide special safe conditions under which such a bank of fissionable material can be made essentially immune to surprise seizure."

In fact, almost half a century later, that vision is far from realized for the hundreds of facilities that have or store fissionable material around the world. Preventing a "surprise seizure" of these materials must be one of our most urgent missions.

Yet governments, the press, and the public need to understand that there is no international standard or requirement for the physical protection of nuclear material within a state. There is a Convention on the Physical Protection of Nuclear Materials, but as the people in this room know, it covers only transport of materials across international borders. It does not cover transport, storage, or use of nuclear materials within a state—leaving nations to select whatever level of security they may choose. This state of affairs poses a danger to all nations.

The worldwide system of security for nuclear materials is no stronger than the system of security at the weakest, worst-defended site, which in many cases amounts to no more than a poorly-paid, unarmed guard sitting inside a chain link fence. The theft of nuclear materials anywhere is a threat to everyone everywhere. If terrorists want nuclear materials, and they do, they are going to go where it's easiest to get them.

As the people in this room know, the theft of potential bomb material is not just a hypothetical worry, but an ongoing reality. This includes the attempted theft—by a conspiracy of insiders—of 18.5 kg of HEU from a weapons facility in the Urals. It includes nearly a kilogram of HEU in the form of fast reactor fuel pellets seized last year in the Republic of Georgia. The IAEA illicit trafficking database has recorded more than 550 reported incidents of trafficking since 1993. The great majority do not involve weapons-usable material, but sixteen cases have involved plutonium or enriched uranium. Sixteen cases is a disturbing number, but it also may not tell us what we really need to know: what percentage of the actual thefts do we uncover? Is it close to one hundred percent—or closer to five or ten percent? We simply do not know. Nor can we ever know with absolute certainty. But we can considerably narrow the window of vulnerability by strengthening physical protection as we strengthen diversion safeguards.

There is now momentum to take more serious action in this area. A May conference in Stockholm called for a comprehensive approach to security of material. The General Conference last month passed a resolution calling on the Agency to review all its programs to enhance security of nuclear material and facilities. This December, Director General ElBaradei will convene an open-ended group of experts to draft an amendment to the Convention. The Convention needs to be toughened, deepened, broadened. We must do all of these things and speed the resulting amendment's adoption and entry into force. That states are not obligated to meet any standard of security for their facilities is a gap in the global security system that must be rapidly closed. Whatever the experts may have recommended before September 11, after September 11, it seems clear that an amended Convention should include a binding commitment to meet high security standards—such as those set out in the IAEA's recommendations—along with a

requirement for each nation to report regularly on its procedures, regulations, and standards for securing and accounting for its nuclear material.

Right now, it is not possible even to learn which facilities are in the greatest need of upgrades. The only insight the Agency can get into the security of a specific facility comes when the country in question invites the Agency to help review security there. And even then, there are not the resources to answer every call as it comes. The IAEA has fewer than three full-time staff working on physical protection of nuclear materials and preventing illicit trafficking. The regular budget expenditure for this program in the last year was less than $1 million total.

This staff and resource investment is grossly inadequate to address the dangers we face. In many facilities around the world, this material is not guarded as one would guard something of such value or that could have such catastrophic consequences if it should get into the wrong hands.

Binding international standards should be created for physical protection of material, for the same reason safeguards were instituted as an international obligation more than thirty years ago—to make sure the material isn't diverted to a destructive purpose. Significant security improvements could be made for costs that would be quite small when judged against what societies routinely spend for military security, or when judged as a percentage of the cost of nuclear generated electricity. A good start would be investing more immediately in the existing IAEA voluntary program for nuclear materials security as we move toward binding international safeguards for the security of nuclear materials.

Earlier in my remarks, I discussed with you the role of my organization, the Nuclear Threat Initiative. Promoting public awareness of the threat is a priority of overarching importance. But we also intend to take direct action where we can to meet urgent and immediate needs.

That's why I am pleased to announce today a three-year grant from NTI to the IAEA in the amount of $1.2 million dollars to expand the Agency's ability to review security for nuclear facilities worldwide, identify needed security upgrades, and organize contributions from member states to carry out the upgrades. We are intending this contribution to be matched—and more-than-matched—by member states. We see this as an early installment in what we hope will become a wave of new contributions to this important work.

While there is a great deal that the IAEA must do, let me state emphatically there is also a great deal that leading nuclear weapons states must now do—to reduce and control weapons of mass destruction and their essential ingredients and technologies. The attacks of September 11 and the subsequent realignments of international relationships create a new unique moment that calls for a new initiative of similar scale. At their upcoming summit, President Bush and President Putin should commit their countries to a course of action that would ensure that any nuclear, chemical and biological weapons and materials are safe, secure, and accounted for—with reciprocal monitoring sufficient to assure each other, and the rest of the world, that this is the case.

The United States should develop, with Russia, a plan to secure or neutralize all of Russia's potential bomb material as rapidly as possible; appoint a senior official to take charge of getting the job done; and dedicate substantial additional U.S. resources to accelerate and strengthen these efforts. Leading states in Asia and Europe must increase their contributions to these efforts as well—not only in Russia, but throughout the former Soviet Union and wherever proliferation vulnerabilities exist.

In the end, we need to ask: is keeping nuclear weapons out of terrorist hands a priority or an afterthought? If it's an afterthought, after what? What comes before it? If it's a priority, do our effort and investment reflect that?

Thanks to the IAEA, the vision of its founders, and the stamina of its leaders, the world today has an organization ready, capable, competent, and well positioned to meet these challenges. However, that organization needs strengthening and greater financial support. As I noted earlier, Dr. ElBaradei and his fine staff have for too long been asked to do too much with too little. We need to invest more energy, more resources, and more diplomatic muscle—*now*—to make more nations more accountable to one another, and more willing to minimize the risk they may create for one another.

In summary, that means we need an even stronger and better-financed safeguards system. We need many more nations with comprehensive safeguards agreements in place. We need many more nations with the Additional Protocol in force. We need to integrate the new safeguards measures with the traditional ones in a way that strengthens the safeguards system—not weakens it. We need a dramatic increase in national and international efforts to ensure that all potential bomb material worldwide is secure and accounted for. We need an amended Convention on Physical Protection of Nuclear Material that creates international norms for security that are not a matter of choice or a question of convenience, but a binding requirement arising from a shared commitment to our common security. In short, we need to make the most of this moment and the attention it brings to widen, deepen, and strengthen IAEA efforts—and send the world a proper and reasonable bill for the priceless work the IAEA does to harness the power of the atom for peaceful purposes and provide for our nuclear security.

Albert Einstein once famously said: "The release of atom power has changed everything except our way of thinking ... the solution to this problem lies in the heart of mankind." Einstein has a point, but we cannot wait for a solution in the heart of humankind. We have to forge a solution from what we have at hand. Throughout these remarks, I have identified what governments, the press, and the public need to know

about the shortcomings of the existing system. I have stressed this because they do not know and if they did—I am confident—they would act to close these dangerous gaps in the global shield against proliferation. I am an optimist but also a pragmatist. So I end these remarks with a sincere request. The insight of people in this room cannot stay in this room. What you know and understand must be known and understood by those in the highest circles of the governments you serve. We need nothing less than a rededication to the founding principles of the IAEA and a sustained international commitment to reduce toward zero the risk that the power of the atom will ever be employed for an evil purpose. Much will depend on your skills and the strength of your voice. Thank you.

Charles B. Curtis is the president and chief operating officer of the Nuclear Threat Initiative. Previously, Curtis served as the executive vice president and chief operating officer of the United Nations Foundation where he continues to serve as a senior advisor. Before joining UNF, Curtis was a partner in Hogan & Hartson, a Washington-based law firm with fifteen domestic and international offices. Curtis served as Under Secretary and, later, Deputy Secretary of Energy from February 1994 to May 1997. He was the chief operating officer of the Department and, among other duties, had direct programmatic responsibility for all department science, technology, and national security programs.

Curtis is a lawyer with more than fifteen years practice experience. He also has held positions on the staff of the U.S. House of Representatives and with the U.S. Treasury, the Securities and Exchange Commission, and the Federal Energy Regulatory Commission, which he chaired from 1977 to 1981. He is a current member of the Department of Defense's Policy Board and the Council on Foreign Relations.

Curtis has B.S. and B.A. degrees from the University of Massachusetts—Amherst and a J.D. (with honors) from the Boston University Law School where he served as an editor of the Law Review.

The IAEA and the Future of Nuclear Power—A View from Industry

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This paper was presented at the International Atomic Energy Agency Symposium "International Safeguards: Verification and Nuclear Material Safety," which was held in Vienna, Austria, October 29 through November 1, 2001.

The security and safeguards' challenges of the future will depend to a large extent on the type and scale of the nuclear power industry that exists and the prevailing public and political opinion towards it. So it is important to look at the current position and the trends on which to base our projections.

Nuclear power currently provides 16-17 percent of global electricity, very comparable in scale to gas, oil, and hydroelectric sources. Only coal produces significantly more than other sources.

Twenty-four of the most economically significant countries rely on nuclear power for at least 10 percent of their electricity needs. The majority of these are located in North America, Europe, and Asia. But critics of our industry would argue that these reactors are relics, dinosaurs of the past, built in haste in response to the 1970s oil crisis. In their eyes, nuclear power has been in steady decline for some years.

The facts show otherwise.

Data for the year 2000 published by the oil industry (bp) show that nuclear power "enjoyed another year of strong growth (up 2.7 percent) with nuclear generation increasing in all areas of the world." But cynics might say that the explanation is easy; uses of other fuels, to meet rising demand for electricity, increased even faster so that nuclear has experienced "relative" stagnation.

This is not the case either.

Over the last decade, nuclear power has achieved a greater global growth rate than any other electricity source, with increases of 30 percent. Oil and gas have also increased (by a much smaller amount), in order to meet the ever-growing demand for electricity and it is only coal that shows a steady and significant drop in use.

In some areas of the world the extra production is because of new reactor building (at present there are thirty-six reactors under construction and 438 operating reactors worldwide) but in the United States, for example, the 30 percent increase over the decade has been achieved entirely by increasing the efficiency of existing reactors. Nuclear power output in the United States has increased by the equivalent of building twenty-three new reactors, each of a gigawatt capacity, quite an extraordinary achievement by the utility operators.

With that extra productivity came economic advantages. Nuclear power has been the cheapest way to produce electricity in the United States for almost the entire decade and the trend is for further cost reductions. It is becoming increasingly apparent that when the true external costs of producing electricity are included in the overall economics of power production, nuclear power becomes ever more competitive.

A European study, published by the European Commission three months ago, clearly shows the hidden, additional costs of producing electricity with fossil fuels. This is because of the economic impact of global warming and the significant health effects on the general public from burning heavy hydrocarbons such as coal and oil that together account for 50 percent of global electricity production. If these costs were included, it would double the cost of electricity from coal and increase the cost of gas-generated electricity by 50 percent. By contrast, the cost of nuclear and renewable electricity sources would remain largely unaffected.

And the adverse consequences of global warming are becoming ever more apparent and serious, both in terms of human misery and the potential economic impact on global society.

Under these circumstances, it is not surprising that politicians and the stock markets around the world are beginning to refocus on the economic and environmental benefits of nuclear power.

The renaissance was led by the United States early in 2001 with increased media coverage in support of the nuclear option, followed by the supportive remarks of U.S. Vice President Dick Cheney, the subsequent U.S. Energy Review, and the recent nuclear-friendly legislation approved by Congress. And, one month after the devastating suicide attacks of September 11, a record number of Americans favor the use of nuclear energy and consider nuclear power plants safe.

Equally encouraging is that there are growing signs of political, institutional, and public interest in the UK to replace the Magnox generation capacity which will all have closed down by the end of the decade, so that nuclear energy can continue to be an important component of a balanced energy mix.

Elsewhere there are also signs of a nuclear renaissance, not least in Russia where President Putin has signed into law what could be one of the most significant pieces of civil nuclear legislation for years. The plan, to import and take over ownership of foreign spent fuel for storage, and possible reprocessing, and to encourage fuel leasing, has major implications for the global nuclear industry and for security and international safeguards. This is because the United States has an effective veto on 90 percent of the potential market with an estimated value of $20 billion. Russia will only be able to realize the market potential when it provides meaningful assurances to the United States and as importantly to its customers, over nuclear security, nonproliferation and export policies. That will raise important issues for both the United States and Russia but, if they can be resolved, increased trade possibly involving fuel leasing will help establish safer, verifiable, and better managed nuclear programs in Russia and elsewhere. Increased investment in the international civil nuclear market, a more effective network of nonproliferation measures and a contraction in military nuclear investment have mutually supportive goals and should be encouraged. We certainly believe that the civil nuclear industry, in the right context, has a significant role to play in helping transform excess military material into reactor fuel subject to full international safeguards.

Overall, I believe that the nuclear industry can look forward with a sense of confidence. Obviously, economics, safety and environmental performance will be central to the future success of the industry as will essential regulatory changes but it is also important that we continue to address the safeguards and security challenges of the future.

The single most important issue is to ensure that the IAEA receives proper and sustained levels of state funding because the progress that has been made to establish an effective global nonproliferation regime must not be jeopardized. The fact that the IAEA is only able to conduct its work through additional voluntary contributions by member states clearly demonstrates that the budgetary processes are badly in need of reform.

Nuclear power will only succeed in the future within the clear boundaries of peaceful use and there must be a complete separation of civil and military activities within the nuclear-weapon states. We would very much welcome the successful negotiation of a fissile material cut-off treaty.

There has been a resurgence of interest in the proliferation resistance of nuclear technology as an alternative to verification. However, given the current range of nuclear technologies, their lifespan, and the lack of fundamentally new technologies on the horizon, it is unlikely that technical fixes will provide the answer for decades ahead.

It is more important, in my view, for commercial operators to recognise the political significance of nuclear safeguards and to work constructively with the safeguards' authorities to achieve effective verification regimes. The future is very much about partnership and a shared vision.

In many parts of the world, safeguards verification, in all types of fuel-cycle facilities, is already routine and the future priority must be to share that operational experience for the wider benefit and, simultaneously, to find more economical ways of achieving safeguards' goals. In our experience, the capital and operating costs related to safeguards are each typically under 1 percent of our total expenditure but on large fuel-cycle facilities that can still amount to many millions of pounds and is too high. We must find ways that allow the safeguards' authorities to make better use of operators' instrumentation and data in a timely and verifiable way. In turn, there is a clear obligation on the IAEA and Euratom to find new ways of collaboration that reduce the verification resources deployed in the European Union—it cannot be right for the majority of the global safeguards budget to be spent in the member states of Europe.

Clearly, remote monitoring and unattended verification could be powerful and cost-effective tools and it is perfectly possible to use secure data links and other available technology to transmit, process, and analyze safeguards' relevant information. In this respect, geographical-based information systems, so-called GIS, have a really important contribution to make to the management of otherwise complex and voluminous safeguards' data.

We also believe that the traditional method of reporting accountancy transactions (ICRs), many weeks after the transactions have occurred, is outdated and reduces the effectiveness of and opportunities for safeguards' verification measures. It is entirely possible for operators to provide the necessary information in a more timely way and to generate accurate information within hours or days of transactions occurring. This, coupled with methods of providing the data to the IAEA in a secure, authenticated way, provides a new and exciting prospect for randomized inspections that would have strong deterrence value and a lower inspection resource requirement.

Overall, we want to see a partnership with the safeguards' authorities; we have nothing to hide but we do have to find more cost efficient ways of operating. Perhaps now is the time for operators, under the auspices of the World Nuclear Association, to establish a code of practice for our interactions with the safeguards authorities. We should be prepared to make public declarations in which we clearly state our attitudes and commitments to International safeguards. For example, the fact that we will:

- Facilitate inspections by making sure that suitably trained escorts are available on a timely basis;

- Reduce time delays for inspectors accessing our facilities to the minimum, commensurate with safety;
- Respond positively and quickly to any reasonable request for data;
- Help find more efficient ways of achieving safeguards' goals through the use of technology;
- Provide training opportunities for IAEA personnel; and
- Participate constructively in national support programs to the IAEA.

We want the safeguards' authorities to have complete confidence in our activities that in turn allow the IAEA to use its discretion under Integrated Safeguards to reduce the burden of safeguards' inspections. This would be to our mutual advantage.

I should now like to make some remarks about nuclear security, recognizing that the Conference has been extended by one day to consider such matters following the tragic events in the United States.

Reading the media coverage over the last month, one could almost believe that nuclear facilities had been the subject of attack or that nuclear materials had been involved in the attacks. The media thirst for sensational stories has been supported by the usual group of people who claim to be nuclear experts, ready to share their thoughts on how to attack nuclear facilities, which buildings to attack, and how easy it is to build nuclear weapons from stolen materials. Presumably, the media pay for the "best" stories and the "best" stories are the most shocking, sensational, and, on occasions, grossly irresponsible. So a sense of perspective at this difficult time is more important than ever.

Society, all of society, faces some stark choices.

In the face of extreme terrorism, we either return to pre-industrial times and rid the world of any building structure that if attacked could lead to significant loss of life, rid the world of any social or sporting event that brings tens of thousands of people together in one place, depopulate our cities, and close down mass transport systems. The list of actions required would be virtually endless.

Or, governments work to eradicate terrorism wherever it occurs in the world and defend freedom and democratic, multicultural societies.

For our part, the nuclear industry continues to work closely with national security and safety regulators and agencies to enhance further our security arrangements that by any industrial, commercial standard are already very high. We support the public statements of the World Nuclear Association, the European Nuclear Council, and the Nuclear Energy Institute and would refer you to their Web sites.

So, if I may conclude, the future challenges can be summarized as follows:

- Our industry is growing, becoming increasingly competitive, and the trend will continue as concerns over fossil fuels and the true environmental and economic costs of burning them are fully appreciated.
- Increasing international nuclear trade, including fuel leasing, will help establish safer, verifiable, and better-managed power programs.
- Increased investment in the civil nuclear market, more effective nonproliferation measures, and contractions in military nuclear investment are mutually supportive goals.
- Proper funding of the IAEA is essential and the budgetary process requires reform.
- The global nonproliferation framework will continue to rely on verification rather than proliferation-resistant fixes because the current range of nuclear technologies will dominate for the foreseeable future.
- Safeguards arrangements are now routine in many parts of the world but they are still too expensive; we should harness modern information technologies to offset the financial burden, improve timeliness, and encourage random inspections, which can all be done without compromising the effectiveness of these measures.
- Operators should develop and commit themselves to a code of practice that defines acceptable standards and attitudes in dealing with the safeguards authorities. The future vision of the civil industry should be based on collaboration, support and commitment to the IAEA.

Thank you for your attention.

Dr. Roger Howsley holds a first-class honors degree and doctorate in life sciences from the University of Liverpool in England. He joined BNFL in 1981 at Sellafield and later joined the International Safeguards Department at BNFL Head Office. He was appointed Head of Security, Safeguards and International Affairs ten years ago and is responsible for those policy areas across the BNFL group of companies. He has extensive international experience in working with the IAEA and Euratom and with national police forces and security organizations. He has recently been invited to serve on the IAEA's Standing Advisory Group on Safeguards Implementation. He also has a strong professional interest in the climate change debate and the contribution that can be made by nuclear power to mitigate increases in atmospheric carbon dioxide.

Transcending Sovereignty in the Management and Control of Nuclear Material

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This paper was presented at the International Atomic Energy Agency Symposium "International Safeguards: Verification and Nuclear Material Safety," which was held in Vienna, Austria, October 29 through November 1, 2001.

Effective control of nuclear material is fundamentally important to the credibility and reliability of the nuclear nonproliferation regime. Under the Nuclear Non-Proliferation Treaty (NPT), international safeguards are applied to non-nuclear-weapon state parties for the purpose of verifying compliance with their undertakings not to seek to acquire nuclear weapons or explosive devices by assuring that safeguarded nuclear activities and material are not diverted from their intended peaceful use. Reflecting the sovereign state basis upon which the international system rests, the control and protection of nuclear materials within the state are the responsibility of the national authority. This division of responsibility between international verification of non-diversion on the one hand and national responsibility for material protection on the other has worked quite well over time but it has not created a seamless web of fully effective control over nuclear material. It has been said repeatedly during the course of this symposium that we are living in a new world characterized by a terrorism whose appetite is bounded only by the capabilities available to it. Nuclear capabilities are among those to which terrorists aspire as indicated by Osama Bin Laden's reference to acquiring weapons of mass destruction as a religious duty. To this might be added access to radiological sources and the threat of nuclear sabotage. This access must be prevented. The question is how.

To begin with, we need to think beyond the boundaries between the sovereign state and the international system within which we have lived from the outset of the nuclear age; in particular to balance the traditional demands of sovereignty and the legitimate demands of the international community to be assured that all states are protecting nuclear material adequately. Recognizing that nuclear material is the key element in access to nuclear weapons or explosive devices, and the most difficult to acquire, and that it can also serve as a source for radiological terror, we need to think systematically, comprehensively, and wholistically about the management and control of nuclear material. This means thinking vertically in terms of integrated material control structures from the global regime at one end to the local operator of a nuclear facility at the other. To be optimally effective, barriers against unauthorized access to nuclear material need to be inclusive. We need to explore how to accommodate traditional state sovereignty with the demands of an evolving transnational, globalizing environment so that we can maximize the effectiveness of tools available to us to prevent unauthorized access to dangerous materials, whether by states or by subnational actors, and where necessary craft new ones. Diversion safeguards, physical protection of nuclear material, and control over illicit trafficking of nuclear material and preventing sabotage at nuclear facilities or locations are all parts of this seamless web.

The IAEA was sharply criticized for failing to spot Iraq's extensive clandestine nuclear program, which only became known in the aftermath of the Gulf War. This led to efforts to significantly strengthen the safeguards regime as codified in the May 1997 decision of the IAEA Board of Governors to approve a model Additional Protocol (INFCIRC/540) to safeguards agreements. On the positive side, the Additional Protocol provides the IAEA with important new capabilities including significantly greater access to information regarding all state activities related to the use of nuclear material, greater inspector access at nuclear sites, very short notice inspections, advanced surveillance technologies, and environmental sampling. On the negative side, the rate of accession to the Additional Protocol has been slower than anticipated and disappointing. Whether as

a result of inertia, bureaucratic impediments, concerns about intrusion on national sovereignty, or for other reasons only twenty-two of the 187 parties to the NPT (not yet including any of the five nuclear weapon states all of whom have voluntary safeguards agreements with the IAEA under the NPT regime) have ratified the protocol and entered it into force. Only two of these are states with significant nuclear activity.

There are a number of verification-related measures that can and should be considered that would strengthen the IAEA—the preeminent international nonproliferation institution—and in doing so, contribute to international security, stability, and predictability. There are other measures that relate to physical protection of nuclear material that also should be pursued with deliberation. What follows is my view of what should be done in both of these areas, always having in mind the importance of seeking greater coherence and integration in the matter of controlling and managing nuclear material. Radiological and sabotage scenarios are not considered in depth for the moment.

Measures Regarding International Safeguards

Insofar as safeguards are concerned, six points are to be made:

1. INFCIRC/153 agreements. Completion by all NPT parties of the required safeguards agreements with the IAEA. As we have been reminded this week, fifty states party to NPT still have not entered into treaty-obligated safeguards agreements with the agency. This not only leaves gaps in the system, but it undermines the normative strength of the international safeguards regime. There is an additional consideration: in concluding a safeguards agreement with the IAEA under INFCIRC/153, states undertake to establish a state system of accounting and control (SSAC), reports from which serve as a basis for independent verification by the IAEA. Even in situations where only very limited nuclear activity is present, that is to say where the small quantities protocol applies, these SSACs, as small as they may be, could play a role not only in ensuring a full understanding of nuclear-related activity in the state, but also in contributing to efforts to ensure physical protection of nuclear material and to thwart its illicit trafficking.

2. Adherence by all full-scope safeguards states to INFCIRC/540. As noted, very few states have thus far negotiated and implemented the strengthened safeguards arrangements. Until all states under comprehensive safeguards have brought an Additional Protocol into force, the gains made by agreeing to the principles it embraces will remain unfulfilled. The objective should be rapid completion of the appropriate protocols by all states, including the nuclear weapon states pursuant to and consistent with their voluntary safeguards arrangements with the IAEA, [and the noncomprehensive safeguards states with respect to their more limited safeguards undertakings]. We should also keep an open mind on whether still further measures might need to be considered in the interest of sustaining a robust safeguards regime that enjoys the confidence of the international community. We all know that safeguards are a dynamic, not a static system, and that we must be ready and willing to take necessary and appropriate steps from time to time to adjust to changes in the environment in which they operate if they are to continue to fulfill the purposes for which we established them. We know it, but we don't always assimilate it.

3. United Nations Security Council action to take its compliance/enforcement related 1992 assertions on proliferation and safeguards a step further. In January 1992, the president of the Security Council, speaking on its behalf stated, "The proliferation of weapons of mass destruction constitutes a threat to international peace and security. The members of the Council commit themselves to working to prevent the spread of technology related to the research for or production of such weapons and to take appropriate actions to that end.... On nuclear proliferation... the members of the Council will take appropriate measures in the case of any violations (of safeguards) notified to them (by the IAEA)." Given the importance of compliance and enforcement measures to state confidence in the dependability of the regime to support national security objectives, reaffirmation by the UN Security Council of its pronouncement whether by resolution or in some other form would be an important regime-reinforcement measure. Prompt collective reaction to reported safeguards violations would be even more important. Wouldbe proliferators must be made to understand that the option of exploiting differences among the permanent members of the Security Council is not possible because on this issue, there will be no differences.

4. Non-NPT party support for international safeguards. India, Pakistan, Israel, and Cuba are not parties to the NPT. Each has determined for one or another reason that the NPT does not meet their political-security needs. But there is little evidence that they favor nuclear proliferation elsewhere, and they have largely followed the practice of not assisting, encouraging, or inducing proliferation in other states. There is a case for urging their more direct support on the principle that action speaks louder than words. The main areas in which they could help reinforce the regime involve safeguards and export controls. With respect to safeguards, each, but primarily India, have nuclear facilities and locations not related to their weapons programs that are outside of international safeguards. Voluntarily submitting these facilities to IAEA safeguards (similar to the concept of voluntary offers of the nuclear weapon states which themselves vary) would send a positive message that they value safeguards, and would help to reinforce the importance of the principle of having effective means of inspection to ensure compliance with undertakings. Insofar as export controls are concerned, they could be strongly urged to adopt the practices

of the vast majority of nuclear exporters with respect to supply conditions and restraints even to the extent of notifications of exports to the International Atomic Energy Agency to increase knowledge of national nuclear profiles wherever the agency conducts safeguards. Both actions by the non-NPT states should entail establishment of national regulations that could help to tighten controls over nuclear material more generally and thus contribute to the objectives of enhanced physical protection of nuclear material and control over potential illicit trafficking. There is precedent for this in French nonproliferation policy prior to joining the NPT. NPT states should seek to influence the non-parties to take steps along these lines.

5. Safeguards financing. One of the most serious impediments to international safeguards effectiveness and therefore to the confidence that they provide is resources. Since the mid-1980s, the IAEA regular budget, which is the primary source of safeguards financing, has operated on the basis of zero-real-growth; in recent years suggestions have been made by some that we move to zero nominal growth. At the same time the number of states under safeguards has more than doubled, including states with substantial nuclear programs such as Argentina, Brazil, South Africa, and the republics of the former Soviet Union. The amount of nuclear material to be safeguarded has increased correspondingly. By way of example, the number of significant quantities of nuclear material (the amount of nuclear material the IAEA estimates to be required to produce an explosive nuclear device) to be safeguarded has effectively doubled in the past six years alone. The shortfall in resources available under the regular budget has largely been compensated for by voluntary contributions, the bulk of which comes from the United States and one or two others.

But each year increases the strain on the IAEA to fulfill its safeguards mission and to contribute to the confidence-building that is so essential to sustaining and strengthening non-proliferation. There is a need now to focus our attention on revising the zero-real-growth policies. The notion of continuing to rely on voluntary contributions to make up shortfalls is deficient in three respects: First, voluntary contributions are just that—voluntary. There is no legal obligation to make them, no certainty as to their availability and no way to predict with confidence that they will be there to meet the demands that they are intended to fulfill. They do not allow the agency to conduct coherent internal planning with full confidence.

Second, increased and disproportionate reliance by the IAEA on a single or very limited source of support gives rise to the opportunity for some states to question the independence of judgment and objectivity of the agency in carrying out its responsibilities. Whether this is factually based or not is not the point—we should remember that in international politics perception is often nine-tenths of reality.

Third, safeguards serve the common interest of all states in guarding against the diversion of nuclear assets from peaceful to non-peaceful purposes and all states should share equitably in providing the level of support necessary for safeguards to fulfill their purpose credibly and with confidence. It is an ominous sign when the director general feels compelled to report to the Board of Governors, as Mr. ElBaradei has done, that the agency is conducting "class B" safeguards and that the risk of having to report the inability to confirm that accountability objectives have been met, or even report a failure of safeguards, is increasing. All of us need to internalize the understanding that nuclear safeguards are national security and that their failure could threaten not only that security but in certain circumstances, national survival.

6. IAEA access to export license information. Finally, increase the IAEA's access to information on export license actions in two ways. First, take steps to provide the agency with information about exports not only of trigger-list items (as provided for under INFCIRC/540) but also of dual-use items. Second, take steps to reach agreement that export license denials with respect both to NSG trigger list items and dual-use items, will be provided to the agency. It is precisely this kind of information that can arm the agency with information that can substantially improve its ability to develop comprehensive profiles of overall state activity in the nuclear and nuclear-related field. Legitimate proprietary interests and concerns would need to be taken into consideration in moving in this direction. Ensuring the confidentiality of any such information would be a necessary first step to meeting this concern. This is done with respect to safeguards and it should be equally feasible in regard to nuclear and nuclear related exports.

Measures with Regard to Physical Protection of Nuclear Material

1. Global adherence to Physical Protection Convention. There is a need to strive for universality of participation in the convention so that any gaps are closed and there is c ontinuity in the application of standards and in domestic laws and regulations related to the convention obligations. Sixty-nine states is 122 short of what our goal should be. Compliance with the convention requires, as a practical matter, the creation of structures and legislation that cover nuclear material, a matter that may be less well defined and addressed in the case of non-parties.

2. Modification of the Physical Protection Convention. to reach more comprehensively into domestic state practice, law, and regulation. We have been made aware by a number of participants during the course of this symposium that active consideration of the expansion of the convention is already underway. The focus is on extending the convention's provisions to cover physical protection of nuclear material for peaceful purposes in domestic use, storage, or transport and to prevent sabotage of such material. A universally adhered to and expanded physical protection

convention would be a significant step in the direction of closing current fissures in the web of global nuclear material control.

3. INFCIRC/225/Rev. 4. Commitment of all states to the proposition that although INFCIRC/225 is recommendatory in nature, they will consider the recommendations as tantamount to binding obligations and take appropriate steps to that end both internally and with respect to all international nuclear transactions. This is already the case in some states, but it should be the policy and practice of all, and states should take this into account when deciding whether or not to enter into cooperation with others. Ideally, it should be considered a condition for cooperation.

4. IPPAS. Enlargement of IPPAS, the Agency's International Physical Protection Advisory Service. I must confess that I was totally unaware of the existence of this program when the thought crossed my mind that the IAEA should start a program for physical protection assessment similar to the OSART (operational safety of reactors) program that had been in place for some time. The program has been described by other speakers. My point is that we should seek agreement among all members of the IAEA to invite IPPAS reviews, including the nuclear weapon states, due attention being given to the need to ensure that facility- or location-specific sensitive information which could provide a roadmap for a terrorist or any other unauthorized persons seeking to access nuclear facilities or to acquire nuclear material, is fully protected and not accessible to anyone other than the appropriate national authorities. The objective should be to establish a database of protection strategies, methodologies, and practices, drawing on the most thorough and advanced that can become a basis for the recommended improvement of state programs everywhere.

It is not beyond reason to contemplate the possibility that standards or procedures may be endorsed as measures that states should individually adopt as if mandatory with the potential for ripening into a convention-based system. There are examples in other fields including the International Civil Aviation Organization. ICAO is based on the Chicago Convention that provides that safety standards contained in annexes to the convention are mandatory and failure to meet them could result in restrictions on air navigation. ICAO's oversight program (Universal Safety Oversight Audit Program, USOAP), created in 1996, operates on a voluntary basis—member states are free to request the audit or not, the purpose of which is to verify compliance with the underlying convention. The audit results in a confidential report to the state which then prepares an action plan to remedy deficiencies. A final audit report, which is also confidential, is accompanied by a non-confidential summary available to all ICAO contracting parties. My thought is that focused attention should be given to considering whether if states were, on a voluntary basis to endorse the recommendations of IFCIRC/225 as mandatory, the IPPAS program could be mobilized to systematically review and recommend improvements in the implementation of physical protection practices.

The payoff for all would be increased security. In addition, a fund could be established to support efforts to bring physical protection programs to a higher level in cases where the state is not able to do this entirely on its own. The upgrading of security at facilities is a common interest. The United States is participating in MPC&A efforts in Russia and this could serve as an example for upgrading security at facilities elsewhere as well. The cost of IPPAS itself is now divided between assessed budget allocations and additional voluntary contributions. Further consideration should be given to how to ensure adequate resources for an effective and sustained IPPAS program.

5. Conventions on Notification and Material Assistance. In the aftermath of Chernobyl, the international community negotiated two conventions, one that deals with notification and the other with mutual assistance. These concepts are directly relevant to the threat of nuclear terrorism. If an act of nuclear terrorism occurs, early notification is essential if other states are to avoid any transboundary radiological releases and/or have time to take appropriate additional security measures to minimize risk to their populations. In the event of significant radioactive releases, rapid mutual assistance may be required. To provide guidelines for notification and a framework for mutual assistance (perhaps through the IAEA in both cases) conventions modeled on the post-Chernobyl conventions should be very seriously considered. The notification guidelines would have to provide for the prompt transmission of clear information, while protecting operational and national security. While states are unlikely to commit in advance to assistance, a framework for providing it with key points of contact and the like could be instrumental in ensuring rapid effective responses in the event of an accident. Conventions along these lines would help to reassure the international community that action is being taken at a time of anxiety as well as providing a sound basis for responses in the future.

Concluding Remarks

Three points need to be borne in mind: first, the need for a conceptual shift in managing and controlling nuclear material to include verification safeguards, physical protection, illicit trafficking, and sabotage. The latter relates in particular to radiological source material that can be turned into a weapon of mass effect. Second, recognize and build on the interfaces of these different aspects of the nuclear material control challenge. Third, recognize and base policy choices on the understanding that strength or weakness in any one of the sectors is not easily isolated and has the propensity to spill over into other sectors. Only a wholistic and integrated approach will be sufficient to manage the long-run challenge of nuclear material.

In presenting the United States' plan for dealing with the atomic age to the United Nations in 1946, Bernard Baruch said "We are here to make a choice between the quick and the dead." That observation applies as much if not more today in light of the environment in which we now live, where the neatness of the Cold War with the disciplines it imposed on regional and other conflicts, and where identification of defined adversaries set in motion the development and application of deterrence and mutual assured destruction, is gone. In its place is a world that includes adversaries that have no clear return address, no frontline to tackle head on, no defined assets against which to retaliate, and, based on recent experience, apparently no compunction about how to wage the war it feels compelled to pursue, including suicide attacks. The challenge we face is immense, the time to address it potentially short, the need to transcend the traditional barriers great. Withdrawing behind sovereign boundaries will not suffice. A collective strategy of response, drawing upon our positive experience with a multilaterally-based approach in nonproliferation is what we need. The question is: Do we have what it takes?

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The NNSA: Its Mission and Goals

42nd INMM Annual Meeting
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July 16, 2001

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Robert Kuckuck
Deputy Director
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Washington, D.C. U.S.A.

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Ladies and gentleman, as J.D. Williams has already said, John Gordon is unable to attend. John was personally requested by Secretary Abraham to participate in the Human Capital Summit, an initiative endorsed by our president, geared toward effectively improving the department's management of its human capital. John strongly believes, and I share this belief, that people are our most valuable assets in the NNSA and our highest priority. Only an activity of the highest priority would prevent John from personally delivering this keynote address. He was looking forward to discussing the many diverse NNSA activities with recognized leaders in nuclear materials management in industry, government, academia, and international organizations throughout the world. However, that pleasure is now mine.

As many of you know, the National Nuclear Security Administration (NNSA) was established in March 2000, pursuant to legislation passed by a Republican congress and signed into law by a Democratic president. Early this year, the outgoing Democratic president and then the incoming Republican president submitted NNSA budget proposals for fiscal year 2002 to a Republican congress. Now, the new Republican administration is conducting a strategic review of U.S. national security matters to include the NNSA programs and budget and will probably soon submit revisions stemming from the review to a Democratic Senate and Republican House of Representatives. Fortunately though, I can report to you that, throughout this period of exceptional political change, our newly established organization has covered a lot of ground and our compass point has remained remarkably steady.

That has been so largely because NNSA has enjoyed bipartisan support and bipartisan agreement on the direction it must take and the strategic importance of its work. All the key players, for example, tout the vital nature of NNSA's mission: to strengthen national security and reduce the global threat from weapons of mass destruction through the application of science and technology.

One of the most important initiatives the NNSA undertakes to maintain and strengthen our national security is the Stockpile Stewardship Program.

The Stockpile Stewardship Program (SSP) was established in response to the fiscal year 1994 National Defense Authorization Act, which called on the Secretary of Energy to "establish a stewardship program to ensure the preservation of the core intellectual and technical competencies of the United States in nuclear weapons."

In the absence of nuclear testing the Stockpile Stewardship Program must:

1) Support a focused, multifaceted program to increase the understanding of the enduring stockpile;
2) Predict, detect, and evaluate potential problems due to the aging of the stockpile;
3) Refurbish and remanufacture weapons and components, as required; and
4) Maintain the science and engineering institutions needed to support the nation's nuclear deterrent, now and in the future.

As the civilian steward of the nation's nuclear-weapons complex, the Department of Energy (DOE) is responsible to the nation for the safety, security, and reliability of the nuclear arsenal. The Department of Defense (DoD) is the military customer for the nuclear stockpile and partners with the DOE in setting requirements and establishing production goals. The Secretary of Energy represents and is obligated to the United States public to ensure that the nuclear arsenal remains safe, secure and reliable. A key challenge of the Stockpile Stewardship Program is to balance military weapon performance goals against civilian and military surety and safety concerns.

The highest priority of the SSP is to ensure the operational readiness of the U.S. nuclear weapons stockpile. The

SSP program is organized into three focus areas:

1) Directed Stockpile Work (DSW), designed to ensure that stockpiled weapons meet military requirements;
2) Campaigns, designed to provide the science and engineering capabilities needed to meet the ongoing and evolving DSW requirements; and
3) Infrastructure (Readiness in Technical Base and Facilities (RTBF)) that is required for stockpile work and computational and experimental research activities.

During the last year, DOE's Office of Defense Programs (DP) has undertaken a major shift in program management strategy, which has resulted in significant changes to the supporting planning, budgeting, and organizational structure of the SSP. The change in approach responds to important drivers that DP presently faces. These include weapon refurbishments starting in fiscal year 2006, an aging workforce in the nuclear weapons complex, and an aging stockpile that must be maintained. It also responds to the need for intensive internal and external review to ensure that the program will achieve its goals, while preserving the institutional viability of the laboratories, production plants, and the test site.

Another business practice introduced this year by DP was the establishment of a rigorous planning process that clearly lays out programmatic milestones to be achieved within each element of the SSP. The complete Stockpile Stewardship Program is now defined by a series of program plans that have a five-year planning horizon, each with an accompanying annual implementation plan. The five-year program plans describe the goals and objectives of the program elements, and the annual implementation plans provide detailed sets of milestones that allow for accurate program tracking and oversight.

The changes made to the Stockpile Stewardship Program are expected to provide an increased level of focus and integration within the program, and a much greater level of resolution of program activities. Because of the increased focus, this approach will significantly improve the laboratories' and production plants' ability to support, maintain, and build an excellent work force with the skill mix needed to ensure success of the SSP. This approach also is key to sustaining the laboratories as premier scientific and engineering institutions, supporting the manufacturing activities necessary to maintain and modernize the stockpile.

While our activities in direct support of national defense are critical, it is widely recognized that they must be complemented by robust nonproliferation and arms control initiatives.

In its recently published report, the bipartisan Baker-Cutler Task Force concluded that "The most urgent unmet national security threat to the United States today is the danger that weapons of mass destruction or weapons-usable material in Russia could be stolen and sold to terrorists or hostile nation states, and used against American troops abroad or our citizens at home. This threat is a clear and present danger to the international community as well as to American lives and liberty."

At a hearing he chaired in March on the Department of Energy's nonproliferation programs, Senator Richard Lugar stated, "No issue better illustrates the new challenges, complexities, and uncertainties faced in the post Cold War era than the proliferation of weapons of mass destruction. American efforts to slow or stop proliferation are perhaps the most important foreign and national security policies our government is implementing today."

Senator Joseph Biden, in a speech some of you heard him give last month in Washington, said, "Nonproliferation works. It isn't fun; it isn't easy; it isn't quick—but it works. So we must increase our efforts, rather than giving up hope or fixating on the difficulties."

And yes, there have been difficulties. From the beginning, there was bipartisan agreement that much work had to be done. John Gordon assumed his job, for example, at a moment when the whole enterprise was struggling—struggling with security concerns, fundamental questions about its own future, and confused lines of authority and accountability. The morale of our people was at an all-time low. We are all familiar with the often-voiced concerns about the need for an overarching strategy, the adequacy of funding for our nonproliferation programs, the percentage of that funding that goes to Russian scientists versus Americans, the effectiveness and possible duplication of effort involved in some of our programs, and the performance of the Russians and the access they provide us. Before addressing such concerns, however, let me provide some basic points of reference by briefly outlining NNSA's principal nonproliferation programs.

The NNSA is a key player in U.S. nonproliferation programs and in large measure this is due to its unique expertise in nuclear weapons and nuclear power, including the world-class expertise of the national labs. Our goal is to ensure the close integration of technical talent and policy expertise with the efforts of other U.S. agencies working in the nonproliferation arena. Within NNSA, the Office of Defense Nuclear Nonproliferation (NN) is responsible for the nonproliferation mission. NN's mission is to support U.S. national, bilateral, and multilateral efforts to reduce the threat posed by the proliferation of WMD through programs that:

1) Detect the proliferation of weapons of mass destruction worldwide;
2) Prevent the spread of WMD material, technology, and expertise, and;
3) Reverse the proliferation of nuclear weapons capabilities.

The threefold threat of unsecured material, widely available technology, and underemployed expertise combined to make an urgent case for actions following the breakup of the Soviet Union. The NNSA is addressing this complex, multifaceted issue in a comprehensive way, with specific, realistic goals for each part of the program. NN's efforts address different types of problems, and they are designed to do different things, while working to achieve the same overall

goal of reducing the threat of proliferation of weapons of mass destruction.

The NNSA programs together offer a synergy of effect resulting in a sum greater than their parts. For example, the Nuclear Cities Initiative and the Initiatives for Proliferation Prevention are two programs that are helping to address issues related to Russian nuclear complex downsizing, including the human factor. Each has its unique strengths and together are a more comprehensive way to address the problem. On the material side of the equation, the MPC&A program and the Second Line of Defense program work hand in hand to help prevent the theft or diversion of weapons useable material—one at the site and one is at the borders. Together they form a more effective means to prevent "loose nukes" or nuclear material. As for eliminating excess fissile material, the HEU Purchase Agreement transparency program is ensuring that weapons HEU is being blended down into LEU and a relatively new project within the MPC&A program called the Material Consolidation and Conversion program is working with the Russians on a site-by-site basis to reduce the overall amounts of non-weapons HEU that exists, and to store the material in fewer more secure sites. As you can see, NNSA has a wide variety of programs, but what I want to do next is show how they all fit into overall U.S. government national security interests with regard to Russia.

The Russia Programs

I will begin with five broad objectives of our overarching U.S. government threat reduction efforts with the Russians and discuss NNSA contribution to these efforts:

1) Reduce the threat from nuclear delivery systems.
2) Reduce the potential for diversion of Russian nuclear warheads to countries of concern or terrorist groups.
3) Reduce the potential for diversion of Russian weapons-usable nuclear materials.
4) Reduce the potential for reversibility of downsizing.
5) Reduce the potential for diversion of nuclear-weapon/dual-use technologies and expertise (or brain drain).

The first objective—reducing the threat from nuclear delivery systems—is the primary goal of the Department of Defense's Cooperative Threat Reduction program. As most of you know, that program has enjoyed myriad successes and continues to make substantial progress.

In terms of the second objective—reducing the potential for diversion of Russian nuclear warheads to countries of concern or terrorist groups—both the Department of Defense and NNSA have programs for working with the Russian military to improve the safety and security at nuclear weapons storage sites.

One NNSA program is with the Russian Navy and grew out of cooperation on securing HEU reactor fuels on Russian ships. We have excellent cooperation with the Russian Navy on this program to help them better protect their nuclear warheads and are making good progress.

Another DOD and NNSA program is the U.S.-Russian Warhead Safety and Security Agreement. Under this Agreement, the United States and the Russian Federation have exchanged unclassified information to increase the safety and security of nuclear warheads and fissile material. This agreement was extended for an additional five-year period at the U.S-Russian Summit last June and last fall additional topics were approved by the WSSX Steering Committee to significantly expand our cooperation in this area.

The central effort on our third objective—reducing the potential for diversion of Russian weapons-usable nuclear materials—is the flagship of NNSA's cooperation with Russia, the Materials Protection, Control and Accounting (MPC&A) program. Since 1993, MPC&A has anchored the first line of defense by working with the Russians to improve security at ninety-five weapons-usable material storage sites, both civilian and military. We have completed rapid security upgrades for thousands of Russian Navy warheads and 220 metric tons of HEU and plutonium in Russia and other newly independent states—enough material to make roughly 20,000 nuclear devices. One of our goals for fiscal year 2002 is to complete security upgrades at an additional thirteen sites, bringing the total number of completed sites to fifty. Our strategic plan estimate is that we will complete security upgrades on approximately 4,000 Russian Navy nuclear warheads, as requested by the Russian Navy, as early as 2007 and for over 600 metric tons of weapons-usable nuclear material by 2010.

An integral part of our MPC&A mission is promoting sustainable security improvements. We want the security systems we help install maintained and effectively operated over the long term, which entails preparing Russians to maintain and operate these systems on their own. Consequently, we are establishing training centers, identifying reliable Russian suppliers of MPC&A equipment, helping draft Russian regulations and security force procedures, and establishing an information accounting system to track all of Russia's nuclear materials. We are also consolidating Russian materials into fewer buildings at fewer sites and converting some materials to forms less attractive to potential proliferators. The Material Consolidation and Conversion project is active at two downblending sites: the Scientific Production Association (Luch) located in Podolsk, and the Research Institute of Atomic Reactors located in Dimitrovgrad. Thus far, this project, still in the pilot phase, has downblended nearly 2.2 metric tons of weapons-usable High Enriched Uranium (HEU).

Through the Fissile Materials Disposition program, NNSA is responsible for disposal of U.S. weapons-grade plutonium and HEU and for efforts to secure reciprocal disposition of surplus Russian weapons-grade plutonium.

The goal of the plutonium disposition program is to

prevent the spread of weapons material through the elimination of stockpiles of surplus Russian weapon-grade plutonium. Under an international agreement signed late last year, the United States and Russia have committed to dispose of 68 MT of surplus weapons-grade plutonium in Russia and the United States (34 MT in each country) either by irradiating the material as mixed oxide fuel or by immobilizing the plutonium, at a rate of at least two metric tons per year. We are also going to work to identify additional reactor capacity to at least double the disposition rate in each country. Along with this agreement, we committed ourselves to develop and implement an effective monitoring and inspection regime for plutonium disposition. Our goal is to begin operating industrial-scale plutonium disposition facilities beginning in 2007. However, in order for this program to succeed, we need to identify significant international financing for plutonium disposition efforts in Russia.

The current fiscal year 2002 budget request would fund completion of the mixed-oxide fuel-fabrication facility design with related MOX fuel qualification activities. We plan to continue design of the pit disassembly and conversion facility at a reduced rate and suspend design of the plutonium immobilization plant. These changes are necessary to reduce the future-year peak funding requirements for building three plutonium disposition facilities at the Savannah River Site. Our plans will enable us to meet the requirements of the U.S.-Russia Plutonium Management and Disposition Agreement.

Our work with Russia to convert highly enriched uranium from the Russian military stockpile into a non-weapons-usable form is progressing well. The 1993 U.S.-Russia HEU Purchase Agreement remains one of the most impressive nonproliferation achievements of the last decade. Our associated transparency program is designed to provide increased confidence that HEU from dismantled Russian nuclear weapons is down-blended to low enriched uranium (LEU) in Russia and made into power-reactor fuel to be used here in the United States. As of May of this year, more than 117 metric tons of HEU—enough material to make roughly 4,700 nuclear devices—had been removed from the Russian military program. Our goal for 2001 is to convert another 30 metric tons.

In the second line of defense program, we work with the Russian Customs Service to improve Russian capabilities to detect and interdict nuclear materials at border checkpoints and airports. Radiation detectors have been installed at the international airports in Moscow and St. Petersburg and at a port on the Caspian Sea. Ninety customs officers have been trained and training manuals widely distributed. We plan to expand to half a dozen other critical transit points in the next year. While we have made some progress in this program, it is a huge job. Russian borders are thousands of miles long and some are with countries of proliferation concern. We may need to increase our effort in this program or develop feasible alternatives.

In addressing our fourth objective—reducing the potential for reversibility of downsizing—NNSA shares responsibility with the Department of Defense. A key concern here is with the size of the Russian nuclear weapons complex. While the U.S. complex has been reduced significantly, the Russian complex remains basically unchanged since the Cold War. However, the Russian government has stated that it intends to close two of the four production facilities in the next few years, but they have asked for our help. It is in the national security interest of both the United States and Russia that the Russians reduce their production complex to a size consistent with the much lower stockpiles currently foreseen. We recognize the Russian concern about the human costs of such downsizing. The Nuclear Cities Initiative (NCI) is being developed to help reduce the size of the Russian weapons complex along with the associated human costs. Last year, NCI scored an historic achievement when the Russians moved the concrete fence at the Avangard weapons facility inward to create an open Technopark for commercial businesses. This was the first time the footprint of a nuclear weapons facility was reduced as part of the downsizing to which Russia has committed itself.

Of course, some of NNSA's programs are applicable to several of the U.S. objectives. The U.S.-Russia HEU Purchase Agreement, for example, with its plan to down-blend 500 metric tons of Russian HEU, helps reduce the potential for diversion of Russian weapons materials, and we also monitor the agreement for its contribution to downsizing the Russian nuclear weapons complex. Likewise, while we view NCI primarily as part of the effort to reduce the size of the Russian weapons complex, that program can make significant strides toward accomplishing our fifth objective—reducing the potential for diversion of nuclear-weapon/dual-use technologies and expertise.

This objective involves two separate but related needs. The first is to work with the Russian government on limiting the export of technology and equipment that might help countries trying to develop nuclear weapons. Such exports, in our view, are not in the interest of the United States or the Russian Federation and, for that matter, the world. Developing ways to mitigate the economic incentives that seem to propel the Russians in the wrong direction would help both countries achieve their goals.

The second need involves the "brain drain." Thousands of Russian scientists from nuclear, chemical, and biological weapons programs have been unemployed, underemployed or unpaid since the breakup of the Soviet Union. It is clearly in the interest of the United States to help reduce the threat posed by the proliferation of talented scientists. Lacking the resources necessary to care for their families, such talented scientists may well be tempted to sell their expertise to countries of proliferation concern. As former Senator Sam

Nunn says, "We dare not risk a world in which a Russian scientist can take care of his children only by endangering ours."

NNSA and the State Department have a number of programs in place to try to develop alternative employment to as many of these scientists as possible and integrate them into the international scientific community. The State Department program is the International Science and Technology Centers (ISTC), which was created in 1992 and became operational in 1994. The ISTC is a multilateral organization and has strong support from the international community and the Russian government. It focuses on jobs in the basic sciences and exploring potential commercial applications of basic technologies.

NNSA programs work in close cooperation with ISTC in attempting to accomplish the fifth objective. For example, our Initiatives for Proliferation Prevention (IPP) program focuses on the commercialization of Russian technologies in partnership with U.S. industry. The IPP program is designed to reduce the spread of weapons of mass destruction technologies and expertise by engaging former Soviet weapons scientists in non-military activities. It funds self-sustaining joint R&D projects involving commercial applications for weapons-related technologies. A rigorous interagency project review process has been established to ensure that no projects have dual-use potential.

We are pleased with the progress the IPP program has made over the past couple of years. Its commercialization efforts have begun taking off. Eight IPP projects are now commercially successful, providing about 300 long-term, private-sector jobs in Russia and more than $17 million in annual sales revenues. There are another twenty IPP projects poised for commercialization over the next year. IPP projects are successful due to U.S. private sector involvement from the beginning and the requirement for businesses to match NNSA funding. On average, U.S. industry contributes almost $3 for every $2 provided by the U.S. taxpayer. This year we have also started to see infusions of substantial venture capital in IPP. Two U.S. companies, for example, have attracted over $40 million in private sector investment, as a result of technologies developed through IPP projects. We know that the long-term solution to the problem of unemployed Soviet weapon scientists, as well as our exit strategy, lies with the private sector and commercial self-sustainability. We have generated substantial momentum in the U.S. industrial community, with roughly 30 million private-sector dollars ready for investment in new IPP projects. A good example of this success is the project for soilwashing remediation for contaminated sites, with the U.S. company Pulse Technology Systems and the Russian Bochvar Institute. Annual sales are $2 million and so far 110 Russian are employed. The units are manufactured entirely in Russia and two units have been sold to Mexico and France. The Mexicans are using it at a gold mine for cleaning (or recovering) additional gold from mine tailings.

Nonproliferation Programs Outside Russia

NNSA is involved in nonproliferation and arms control projects in many other countries. We provide the technical base for much of what the U.S. government does in developing new technology to detect chemical and biological weapons, to monitor nuclear testing worldwide, to implement export controls on nuclear technology, to support international nuclear safeguards, and to strengthen the safety of Soviet-designed nuclear reactors.

One case in point is our joint effort with Kazakhstan. Kazakhstan's BN-350 fast breeder reactor is part of a state atomic energy complex. In 1997, the Department of Energy and the Republic of Kazakhstan established a joint program for the long-term secure and safe disposition of the BN-350 spent fuel. Located in close proximity to the Caspian Sea and Iran, the BN-350 has in its spent-fuel assemblies enough weapons-grade plutonium to make hundreds of nuclear weapons. DOE MPC&A upgrades were completed in 1999. The previous year, the packaging of the assemblies in 1.5-ton, stainless steel, welded, and evacuated canisters began. The packaging campaign for nearly 3,000 assemblies in 477 canisters was completed in June 2001.

To date, including the MPC&A costs, NNSA has invested about $58 million at the BN-350. We are currently discussing our role in the dry storage phase of the project with the government of Kazakhstan. This is a major nonproliferation accomplishment that establishes international safeguards measures and security for transportation and long-term storage of the nuclear materials and makes the world a safer place.

NNSA experts are also working in North Korea to reverse and prevent nuclear weapon proliferation. They are helping secure weapons-grade plutonium contained in spent reactor fuel. They have packaged 8,000 assemblies in canisters and placed them under IAEA monitoring, and maintained packaged spent fuel in a safe condition, appropriate for future shipment.

NNSA supports several projects targeted at reducing the amount of fissile material that could be available to potential proliferators. In the Reduced Enrichment for Research and Test Reactors (RERTR) program, for example, NNSA works to reduce international commerce in civil HEU by developing technologies to convert foreign and domestic research and test reactors from HEU to LEU.

NNSA is also active in strengthening regional security and nonproliferation, not only on the Korean peninsula, but throughout East Asia, South Asia, and the Middle East. We help promote regional security dialogues, and share with key states in these regions the expertise of our national laboratories on technical measures involved in nonproliferation.

The NNSA plays a vital role in providing support to the International Atomic Energy Agency. This support covers a broad range of technical areas. Many of you in this room are directly involved in this important work and certainly know the work better then I do, but I will highlight a few examples.

The NNSA has provided technical experts, training and/or equipment to the International Atomic Energy Agency and the United Nations Monitoring, Verification, and Inspection Commission (UNMOVIC) for inspections in Iraq.

NNSA is providing technical advice and support to the IAEA for development of strengthened safeguards methods. This technical support and the understanding of the methods developed will be critical as the United States prepares to meet our responsibilities for declarations and on-site inspections at DOE facilities while protecting our national security equities.

Under the Trilateral Initiative, the NNSA has been working closely with the IAEA and the Russian Federation to develop a verification regime that will enable IAEA verification of U.S. and Russian excess weapons materials while these materials are still in classified forms.

NNSA provides physical protection technical assistance to countries with which DOE has bilateral agreements and to the IAEA's International Physical Protection Advisory Service (IPPAS) in order to prevent theft, sabotage and nuclear smuggling.

International Nuclear Safety and Cooperation

Another strategy for enhancing nuclear security is to improve operational safety at and safety systems at nuclear facilities of concern. NNSA is working to reduce safety risks at the sixty-six operating, Soviet-designed nuclear power reactors in nine countries, through the International Nuclear Safety and Cooperation program. We plan to complete safety upgrades for these reactors by 2006. Three reactors in Russia are to be shut down in 2006 as part of DOD's program to eliminate production of weapons-grade plutonium. They are the oldest operating reactors in Russia and have not received any safety upgrades to date under foreign cooperation. Safety upgrades at these production reactors are among our highest priorities.

We are encouraged by our progress in addressing safety at operating reactors and by the early closure of older reactors as well. The Ukrainian government shut down Chernobyl's sole operational reactor in December 2000 as planned. Our efforts to support construction of a replacement heat plant at Chernobyl, for decontamination and decommissioning purposes, are also proceeding well. We were also pleased that Kazakhstan made the decision to shut down its BN-350 reactor and we are working with them to safely decontaminate and decommission that reactor. We plan to complete one full-scope, nuclear plant training facility in each of three countries—Russia, Ukraine, and Slovakia, and will strive for completion of operational safety improvements at all plants in Russia and Ukraine.

Research and Development

Our Nonproliferation Research and Development program is a one-of-a-kind program that enhances U.S. national security through needs-driven R&D with an emphasis on developing technologies to detect nuclear, chemical, and biological proliferation and to monitor for nuclear explosions. NNSA is proud of achieving a significant milestone last year in one of our key R&D programs. The Multispectral Thermal Imager satellite was launched in March 2000. This small research satellite, designed and built by a team of laboratories and industry partners, has already achieved most of its design objectives. It will develop and test remote-sensing concepts and add to our country's ability to monitor nuclear proliferation. The Proliferation Detection and Deterrence program will develop the required technologies to detect nuclear proliferation. Our unchallenged lead responsibility for nuclear nonproliferation technology derives from the expertise and knowledge base resident in our national laboratories and the nuclear weapons complex. This program provides a technology template for the detection of weapons of mass destruction activities.

Our experts are building robust deterrence capabilities that include technical means to detect lost or stolen nuclear devices or fissile materials. Our forensic capability to identify the origin of fissile material associated with a nuclear threat is second to none. In fiscal year 2002, we will continue to develop innovative technologies needed to improve the detection of the early stages of a proliferant nation's nuclear weapons program and the tracking of foreign special nuclear materials.

The Nuclear Explosion Monitoring program is designed to provide the United States with the technical capability to detect nuclear explosions. We are working to develop and deploy sensors that allow the United States to detect, locate, and identify nuclear explosions. In fiscal year 2002, the Nuclear Explosion Monitoring program will continue to develop enabling technology, operational hardware and software, and expertise to detect, locate, identify, characterize, and attribute nuclear detonations through both ground-based and satellite-based systems. The ground based systems portion of the program delivered high-sensitivity radio-nuclide detector systems, calibration information needed to implement regional seismic methods, and an infrasound prototype. The satellite-based systems portion of the program delivers an average of three nuclear detonation sensor payloads to the Air Force every year for integration onto global positioning systems and defense support program satellites.

The goal of the Chemical and Biological National Security Program is to develop, demonstrate, and deliver technologies and systems that will lead to major improvements in the U.S. capability to prepare for and respond to chemical or biological attacks against civilian populations. We are the primary agency developing non-medical technical solutions for this challenge. Our experts are involved in a broad interagency program to develop sensors that could detect the terrorist use of a biological agent at a large outdoor event, such as the Super Bowl or the Olympics. Some

of the successes of this program includes the development and live-agent testing of a prototype hand-held chemical and biological toxin detector, completion of DNA sequencing of B. anthracis (which causes anthrax), an extensive field experiment in a major U.S. city to model flow of a simulated airborne agent release, and development and live-agent testing of a decontamination foam effective against all classes of chemical agents as well as high-priority biological agents.

Where Are We From and Where Are We Going?

You can see from the above that NNSA's nonproliferation plate is full of weighty national and international security matters, each with its own challenges and controversies. As I indicated earlier, NNSA itself was birthed amidst such challenges and controversy. Congress legislated the establishment of NNSA largely out of concerns regarding Department of Energy security, and lines of authority, responsibility, and accountability. Department personnel at that time were uncertain of their future, and their morale was shot.

While standing up NNSA has proceeded more slowly than we would have liked, I can report now that we are fulfilling our mission every day in our laboratories, production facilities, test site, and the remote areas of the world where we pursue our nonproliferation goals. General Gordon and I have traveled to these locations and are very impressed with the dedication the members of our team bring to their work and our mission, the intelligence they apply to the highly complex scientific problems that confront them, and the technical skills they use to maintain the safety, security, and reliability of this nation's aging nuclear weapons stockpile while addressing the risks of proliferation and use of weapons of mass destruction.

While hard to quantify, I sense, and I believe my colleagues at our laboratories and other sites would agree, that morale has begun to improve. Our people are starting to feel better about themselves, their work, their institutions, and the direction they see the NNSA moving, especially at the laboratories.

It certainly helped that, last year, our overall budget saw its first real growth in many years. That tangible commitment to our mission on the part of Congress sent a powerful signal to all our people that our mission is important and enduring, and has allowed all of us to really begin to look confidently to the future. With these additional funds, we have begun to make improvements and will continue to do so. These funds will make it easier to attract and retain the all-important next generation of scientists and engineers, continue to build the necessary experimental and computational facilities, and begin to correct for our aging infrastructure at production sites and laboratories.

As we discuss budgets, programs, and projects, it is imperative that we not lose sight of the fact that the success of the NNSA depends on the talented and dedicated people—the technicians, scientists, engineers, administrative staff, guards, maintenance crews, managers, and all the others—who apply their skills to our programs. One case in point in the context of this conference: NNSA's active role in the U.S. nonproliferation interagency community derives, in large measure, from our experts found in the national laboratories. NNSA managers must continue to demand their very best and give them the very best in terms of support and advocacy.

That said, the NNSA is still fragile, and much more remains to be done. We are making aggressive, proactive management decisions to improve our mission accomplishment and stewardship of the resources provided us by Congress.

As I have enumerated, there remain many important challenges regarding the management of nuclear material. I have committed through NNSA to see that all our material, whether excess to or required for national security, is handled, stored, or disposed of in the safest, most secure manner possible. I am sure the same could be said for our MINATOM colleagues. The best way to ensure our ability to do this is to have access to the most advanced technology and best ideas of the technical experts. I look to the INMM as the primary professional society for such experts to continue to provide the necessary fora that allow the exchange of ideas that guarantees maintaining the expertise and sustaining the highest possible professional standards in this crucial area. I think that INMM can, should, and will provide leadership in several critical areas.

- Promoting the value of materials control for nonproliferation internationally
- Continuing to set the highest standards
- Facilitating international trust and transparency
- Serving as an important communication channel
- Contributing and stimulating technical innovation
- Inspiring the next generation

Your meetings and workshops produce papers and discussions that both enhance the science and enable negotiators to address real and important issues. I encourage you to continue to bring together the best talent in the world to address the best practices technology of safeguards, disposition, and monitoring.

Conclusion

I think we all agree that we face no greater challenge than preventing weapons of mass destruction or weapons-useable materials from falling into the hands of those who might use them against our citizens. We live in a dangerous world. The NNSA nonproliferation team is working with a sense of urgency to reduce the dangers and, I believe, we are on the right course.

In a number of areas, we've built a basis for mutual confidence with Russian scientists, military officers, and plant managers that has permitted us to work together toward common security objectives in ways that probably were not

imaginable only a few years ago. Ultimately, we recognize that the resources required to transform and safeguard Russia's weapons establishment are beyond the scope of any conceivable U.S. assistance program. Fundamentally, this transformation has to be a Russian responsibility. But, we can show the way. We can be a catalyst. We can demonstrate what is possible. It is clearly in our national interest to do so.

The NNSA's nonproliferation programs address unique proliferation challenges that arose with the end of the Cold War, but they do so by means of the same types of functional activities we pursue for other nonproliferation challenges. These are all vital functions for core nonproliferation activities, and they are no different in the Russia case than for the rest of the world. NN programs are integrated with each other as well as with other U.S. government agencies. Each program on its own can only do battle with part of the problem, but taken together, they are a comprehensive blanket to smother the flames of potential proliferation that can threaten U.S. national security. If one of the threads is pulled, the whole blanket may unravel.

It is the right idea to bring together the national security missions of the Department of Energy, and to focus on clear goals and plans, sharp lines of authority and responsibility, and a strong vision of the future. We are making steady, albeit somewhat slow, progress toward the goal of having an efficient and effective organization to lead and manage the national security enterprise that has been entrusted to us. I'm not particularly satisfied with where we are and what we have been able to accomplish thus far, but we are moving forward, and we've made some remarkable progress when measured against the barriers and the bureaucracy that we confront.

I believe the strategic review being conducted by the White House will reinforce that we are on the right course and contributing significantly to our national security. I believe it will also help instruct our comprehensive strategy, identify the most effective efforts on which we will build and the least effective programs that we need to improve.

I will conclude with a final comment on the men and women of NNSA. They have long been the stewards of our nuclear arsenal and are making tremendously important technical and policy contributions to the efforts to control, detect and deter the proliferation and use of weapons of mass destruction. NNSA's unique contributions in this arena result from the caliber of personnel working on these complex, interrelated threat-reduction programs. I am very proud of our people and of the national security and nonproliferation programs to which they devote their efforts.

Thank you.

16th Annual INMM Roundtable

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42nd INMM Annual Meeting
Indian Wells, California U.S.A.

■

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National Nuclear Security
Administration

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Dennis Wilkey
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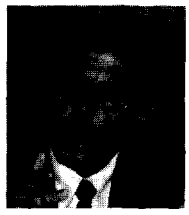
Materials Control and Accountability

J. D. Williams
INMM President

Dennis Mangan: I thoroughly enjoyed your presentation and I found some of your comments interesting. There's one question though that I'd like to ask. I've always wondered why things haven't moved more progressively in the formulation of new organizations. You commented on how your agency was born in an era of security concerns and issues, etc. But you made the comment that General (John A.) Gordon has been going on his own since basically the inception of NNSA until you arrived five weeks ago. That's over a year in which General Gordon's been working on his own. How come it's been a year that the environment has existed like that?



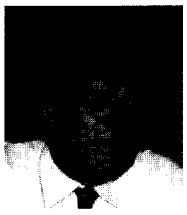
Robert Kuckuck: Well, let's see. I don't know that General Gordon has been there a full year yet. I think the agency has been in place for a year but that he came aboard in August. I think that the General came in at a time when there was a lot of controversy around the laboratories and the Department of Energy so I think there was probably more difficulty than you might expect in just getting the organization on a firm basis within the department itself.

Once John came in, I think he encountered all sorts of institutional barriers that would be expected under any similar circumstances of wholesale institutional change. He's been deliberately developing what he thinks is the right leadership team and organization. In order to fix something you first have to

see what's broken. So I sort of count John's tenure as beginning at the start of this calendar year.

That aside, there's a fundamental problem that I see in building an organization like this and that is how does the government attract qualified, strong people to come into some of these positions and take off running. I know that many people at our laboratories have been approached to come help General Gordon out. For them to leave their laboratories, if they're going into a position that is really going to help get the organization going, they can't go on an IPA (interagency personnel assignment). They need to go and be a Fed so they can really take responsibility, supervise people, sign commitments. But the salary difference and leaving their retirement plans are big problems. So I think that has been a tremendous hindrance to the General because I know that he's talked to many people to try to get them. Coincidentally, I had just retired so in my case I didn't have such a problem.

In fact, we are interested in looking at ways that we can work with nonfederal personnel. The fundamental issue will be a conflict of interest issue. But we would like to find ways to be able to bring people from various industries or universities and so forth and find a reciprocity so that they can return to their retirement systems after they've spent time with us. That way they can make critical decisions while they're with us without violating some conflict of interest. We have a little effort going in that direction to improve the situation because I think it's not a short-term thing. I think we'll get a few people on board and get it going now, but I think we'll continuously face this problem of how do we bring folks in who really know the system and have been in the system. So that would be my response to what's been going on.



Gotthard Stein: I would like to ask a question that is related to global change and energy issues and has a strong security link. We all know that in this area major controversies between European and U.S. positions exist. In this context it is to me important to remember that former Vice President Al Gore in a 1992 book mentioned that two major global problems exist: global change and nonproliferation. I am convinced that this is still true today. We have just seen in these days in Bonn the negotiations on the implementation of the Kyoto Protocol. One important element in this implementation process is the CDM (Clean Development Mechanism) and whether nuclear energy will be on the list of this mechanism. My question is: How do you see the future role of nuclear energy as a clean CO_2 energy technology? How do you see the perspectives for nuclear energy as a part of the CDM and what does it imply for nuclear nonproliferation?

Kuckuck: OK. Again, I'm not from the nonproliferation world in my career so I'll give you my perspective from a person who was in the weapons side of the business. I'm very pro-nuclear energy. I personally think it's inevitable at some point that nuclear energy will play a role in the energy supplies of the world; that's just my own view. I think that it is clean and that it will help the global warming problem that some people are concerned exists. I think that the nonproliferation issues are going to continue to provide an inertia. I think there's a greater inertia to nuclear energy and I think that's just the innate anti-nuclear energy feelings of so many people. Whether that it is because it was born of "The Bomb" or whether it's the fear of radiation or both, I think that's probably the biggest hurdle it will have to go over. I believe that America will change as quickly as we have California's blackouts coming to the rest of the country. I think we'll hear the middle voice speak up, the folks who are just silent about it. So I think it's inevitable, I think it's coming. Nonproliferation is a little more sophisticated fear though. I don't know that the average person thinks of nonproliferation when they think of nuclear energy. I think they think of the other fear. So I think that inertia will come from a more sophisticated group would be my guess. I'm sort of thinking out loud here.

Can you make proliferant-proof reactors? I'm not an expert on this area. I'd leave it up to you folks to have those comments. But I would assume that you and your community would be challenged with making them proliferant-proof, proliferation proof, so that you can deliver the capability.

James Tape: If I could ask a follow up to that that actually links the questions about the role of NNSA within the Department of Energy and this question of renewal of nuclear energy and proliferation-resistant fuel cycles. It would seem to me that within the Department of Energy broadly it is nuclear energy programs, which are outside of NNSA, that will lead the development of new reactor technology and associated fuel cycles. It is people within NNSA in the defense/nuclear nonproliferation part of your responsibilities who understand the proliferation problem. And so the question is what are the mechanisms that are available to work this interface, one within DOE, the other within NNSA—between NE and NN, to use the respectively organizational symbols?

Kuckuck: One thought that comes to mind is the very specific tactical effort that hasn't become strategic yet. There are meetings that have taken place between General Gordon, myself, and Bob Card, the new Undersecretary of Energy. Both Card and Gordon are committed very strongly to keeping the synergy, the relationship going between DOE and NNSA. We are talking about the protocols of what used to be called the lead program secretary officer—the LPSO concept—in which one program officer would be responsible for a laboratory even if the laboratory is a multipurpose laboratory—how are we going to continue that protocol or organizational paradigm so that someone is still looking after the well being of the laboratory as a whole, but the mechanisms are open and the barriers are reduced for other programs to come in and use those laboratories.

That's the discussion that we've just started with Card, with the assumption from both Gordon and Card that it will work, that it will continue working as well as it has, and will perhaps even enhance it. So I would think as NN brings its expertise to the problem and NNSA to the problem, the barriers will not be there and the synergism and the encouragement to work together will be there.

Charles Pietri: Bob, following up on that same question, is there any plan in place to solicit input from the laboratories and the DOE field into this overall plan or is this being structured at a top high level?

Kuckuck: This plan that Gordon and Card are doing?

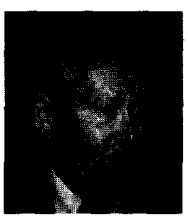
Pietri: Yes.

Kuckuck: I think as it starts to move, it will take on even more input from the laboratories. However, even now, frankly, it's probably driven by input from the laboratories. The laboratories have expressed their fears and said, "Look this is very important to us. We need to assure that we don't end up not having access to each other, and so forth." And I think that's probably very important to John and Bob. I know the weapons laboratories have expressed very strongly to Gordon that they want to keep that synergy and interaction.

Scott Vance: I have a question about the Nuclear Cities Initiative. You presented numbers in your talk this morning, and actually in another meeting I attended this weekend I saw similar numbers, saying that it's on the order of 150,000 people that we need to be concerned with. And I don't know the details of that, but I relate it to my own experience working for a while at Hanford. If you look at the size of the city there, Richland (Washington), say, there's 50,000 people. The question is how many people there actually have information that's crucial, and you get down to a much smaller number. When I see the number of 150,000, it seems overwhelming. Is it possible, in fact, to identify a much smaller group that we really need to be concerned about and prioritize in that manner?

Kuckuck: Sure it is. It's a much smaller number than 150,000 if I do a mirror model of the Lawrence Livermore National Laboratory—a much smaller number. I know that in the early days of these efforts, it may not even have been called the Nuclear Cities Initiative. It was still the lab-to-lab interactions that began a while back. That very issue was the heart of the discussions—where to focus the energy. I don't know which was the cart and which was the horse, but when the lab-to-lab intereactions first started, the weapons scientists gravitated to the areas of expertise that they knew and so their focus was almost automatic because they sought out their colleagues. A lot of that was in basic science as opposed to commercialization; we were looking at pulse power technology and things like that, so we could focus on areas where we knew the colleagues. And so just naturally the focus was on the core.

Now, as the Nuclear Cities Initiative has grown more broad, and as you go toward commercialization, I suspect that focus has been and will continue to be expanded. In fact, to continue to use the analogy of a laboratory such as Livermore, often the industrial spin-offs aren't coming out of the hard weapons designers; they're coming from other scientists. So your point is a very good one. It may be a smaller number, but how do you know how comprehensively to focus and get that smaller number. It's not necessarily an easier problem just because it's smaller.



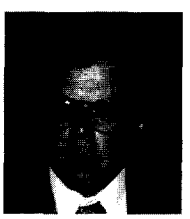
Dennis Wilkey: Going back to the domestic side, and the interface between DOE and NNSA, I work about half time in both the Russian program and the domestic side of materials control and accountability. And I've noted at least two issues, and I think there are more that I don't know about, where issues were raised in material control and accountability and because NNSA's role is still being defined, answers weren't given. Basically, the answer was "We're still working on this question." Two of them involved how much protection for a specific type of material. And the policy

has not been defined by NNSA whether they're going to accept what traditionally DOE has or if it will be something different. I'm wondering, specifically, there's a scrap declaration that was sent to (garbled) from Idaho and there was an essay, I lose track of what the names of the inspection organizations are, but an inspection at Argonne West—I don't know what you're doing at Idaho Bob—where it was a question of protection and material based on the (garbled). But the more general question is how quickly are we going to get back to the point where we know what the rules are?

Kuckuck: We are encouraging and pushing our senior managers. By the senior managers I mean the DP and the interim deputies in the Facilities and Operations and Management and Administration groups. We are pushing those folks toward an approach that John informally calls ten times simpler and ten times clearer. To look at what kind of directives, what kind of standards and requirements are imposed on our folks, for example we stopped security directives for six months—I shouldn't say we, I wasn't there yet—but he stopped security directives. So we're encouraging people to attack the whole gamut of rules and requirements with the 10/10 approval.

There are three difficulties I can think of. One of them is how do they know how to prioritize, which one to hit first. Because unless someone comes forward and says, "This one is getting us," then it's kind of dealt with on an ad hoc basis. That's one thing. The second is who attacks it. And the only people onboard in this system were raised in the old system just like I was, and we have to force ourselves to think outside the box. So it takes creative leadership to help these folks get outside the box and really solve these problems, even once you have prioritized things. And then the third issue that I don't know just how to deal with yet is to try to go faster, and to try to get our arms really around that problem. It probably requires more people than we have now and certainly requires more people than we'll have or want in the long run. I just went through this with a congressional committee the other day. They wanted to see in the '03 budget a significant budget cut because we're not streamlining under NNSA. And I tried to point out that the volume of stuff we're going to try to streamline is not going to be done by the fall.

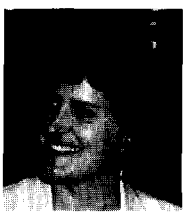
The long answer to your question is our intentions are great. Our hopes are great. Prioritizing and thinking outside the box are the things that we just have to continually work on. So I would encourage all of you then who are in the system to certainly give us the feedback as to "don't be working over here, think about this thing first." This is where we need some guidance and clarity. And just be aware that some of this will be hampered for a while by not having the right people on board yet. We're still waiting for our deputies.



John Matter: Following up on some of the funding issues, in your summary this morning of the NNSA nonproliferation activities, you cited quite a litany of programs and projects and you also noted, particularly while you were talking about the disposition activities, the difficulties in planning and scheduling them so that you could have a budget that would be approved in Congress.

I wanted to tie that in, or see if there is a tie to the Nuclear Threat Initiative (NTI) that was announced approximately a year ago by Senator Sam Nunn and Ted Turner where they have expressed interest in funding some activities in the nonproliferation arena. I wonder what relationship NNSA has been exploring with them, or what kind of relationship you would like to see evolve with that organization that would hopefully complement what you do and perhaps even be synergistic.

Kuckuck: Sarah, would you comment on that?



Sarah G. J. Lennon: In my role as communication and outreach director for NN, I'm the official liaison into the NNSA, and we are working very closely with NTI. I talk to various people over there probably several times a week. They have been having informal consultations with a variety of programs—the MPC&A program, the Nuclear Cities Initiative, a host of different programs—trying to find out where there are areas that we would like to work where we haven't yet or we can't for whatever reason. They are trying to identify specific projects that they can start: good, concrete, discrete programs that would complement what we're doing in the government. They could do more but not do so much that it would take the funding away from government programs. We are working very closely with them.

Pietri: Can we explore the area of your science and technology assisting NNSA with reducing the global threat and the graying or diminishing workforce? I mean you have a very significant point there that maybe you'd like to expand on. You're going to have a strong science and technology backing your ability to reduce global threat from proliferation of nuclear materials, you need a very strong science and adminis-

trative force, and then we've got this gap where we've downsized over the years, and we're talking about the graying of the technical as well as the management source for at least twelve years, there have been several plans that have been developed. But I don't see very much happening.

Kuckuck: Let's see. I see it the following way and it's not unique to nonproliferation. It's pervasive in all of the NNSA mission, I think, in every thing we do. Our reason for being here, our source of expertise in this field, are the national laboratories. And those laboratories are graying. Worse than that, or what exacerbates the graying is the whole nation is experiencing that the numbers of future scientists, mathematicians, people that we're after are diminishing. But what exacerbates it for the labs is that probably 50 percent or less of the Ph.D. graduates are U.S. citizens and our laboratories require U.S. citizenship to get into these programs. So we've now cut our source down significantly. It's been further exacerbated over the past couple years because of the incredible paranoia and perceptions that have arisen around foreign nationals, around security, around racial profiling. So quite honestly, the laboratories are facing a serious problem in recruiting. At Livermore, our proximity to Silicon Valley almost decimated our ability to bring in computer scientists, and I suspect Los Alamos can make the same argument being remote from Silicon Valley. So maybe it works both ways.

So the problem is intense. Now what is being done about it? We have our normal efforts of trying to reach out and partner with universities in the undergraduate world and trying to grow and nurse our own pipeline. We have reached out to women's groups, to minority groups. So it's the standard kind of premier folks we're trying to reach out for. I personally believe it's a more fundamental problem than that. I think the Chiles Commission said some things I relate to in that area. That is, it seems to be that until our mission is perceived by the nation to be a real priority so that this is where people want to work, we're going to continue to struggle. Those scientists we can get in the door—and we bring them in by fellowship programs, by post-doc programs and so forth—a large number of those scientists end up working in weapons programs or in nonproliferation and so forth. So it strikes me that getting them in the door is key. And so is a national priority of stable funding. Funding issues scare off some of these folks. At least that's what they tell us on their interviews. So if we can see a stable, longer term funding and see a national priority coming in, and then if we can work at cleaning up our own images with respect to acceptance of a diverse workforce, then I think we can make an impact.

Pietri: You are. You make a significant point that it's not just a DOE or an NNSA issue. It's a national issue. And I guess my follow-up question is do you know of any legislation being proposed even to get that kind of visibility? Because that's the kind of thing that's really needed.

Kuckuck: Do you think that it's a legislative issue? It seems to me more like almost a national commitment or something. If you pass a law that said that this is going to be our number one priority, that doesn't work.

Pietri: But money usually follows the law.

Kuckuck: You're right and I think money is a key thing. It seems crass, but it's money that builds facilities. You know the discretionary research capability in the laboratories has almost disappeared compared to where it was back in the days when I was growing up and it was wonderful.

When we analyze that, and again, I'm giving you a Livermore basis because that's my history, but when we analyzed our discretionary funding for research we found that it's gone down dramatically.

Let me ask you. Do you know of something that we should be jumping on?

Pietri: Nothing specific. There are answers out there. And maybe this is an initiative that INMM should take up strongly. There are a lot of smart people in this organization. Maybe we should put together a white paper on this.

Kuckuck: That would be welcomed. I think there's a recognition in Congress to some level because they'd cut the LDRD, and now they brought that back up. I think they recognize that there's some point at which they have to nurture that research dollar but I don't think they have it quite yet.

James Lemley: Maybe the question has been exhausted by this time, but morale at the laboratories has been mentioned as a problem and it's certainly one that NNSA has to address. Certainly stability would help. We've talked about getting more young people into the workforce. It seems to me that one way to do that is to have some sort of job security or more funding going in there, which is certainly in contradiction with the cuts that have happened, reductions in force at various places. I guess I'm asking if you have other views on how to improve morale at laboratories. Or whether you've seen evidence that it is improving?

Kuckuck: Yes, I think we've seen evidence. It's hard to measure morale. "The floggings will continue until morale improves." (Laughter.) We can measure it in some ways. We can have the laboratories do surveys. You can measure grievances. There are indicators of where the morale is. And a couple years ago morale really was just plummeting. And part of that was we were just getting beat up every day in the newspaper over some issue. That adverse publicity has slowed down, and so morale comes up a little bit.

I think that Gordon has the personality and style, as he's gone around to the laboratories, that people kind of resonate with. He's kind of a soft-spoken guy who listens well. And seeing him, hearing him, and folding that into their perceived optimism that "NNSA is going to do what the Congress intended and simplify the orders, that life's going to be pretty good again," I think all of that has begun to build it back up. The funding has been strong. Little things like the system knowing that the Secretary and Gordon briefed President Bush on the program, that Secretary (of Defense Donald) Rumsfeld calls on the Secretary and John Gordon to attend the strategic review meetings on Saturdays. Those things really get out to the employees. So I think we see it coming around.

Now there's an issue that still hangs in the balance and that's that polygraphing thing; that's a difficulty at the labs. We have worked with the counterintelligence community and we think we have a proposal that would meet the intent of Congress and meet the spirit of what needs to be done to use polygraphs in an appropriate manner. I'm hoping personally that we'll see a delay in the polygraphs until the National Academy of Science concludes the study they're doing and when the Hamre Commission gets done. When those two things are done I think we'll have a basis with which we can go forward.

Morale is coming back. But we have to deliver. We can only wait so long. The organization's going slowly. I think they're wondering when some of the clarification of rules is going to come out. I don't know how long they're going to wait. I think our clock is ticking too and if we can get this thing better defined, communicated and march on morale will continue to improve.

Lemley: I think it's very constructive that they've put that much priority on it.

Kuckuck: Yes.

James Griggs: We've been talking about the morale, and the floggings, in the U.S., but at the IAEA, salary remuneration, for example, has decreased substantially over the last few years. I left the IAEA about seven years ago as sort of a mid-grade P4 in their rating system. And a mid-level P5 now makes about 20 percent less than when I left seven years ago. So they're having a very hard time attracting replacement qualified technical staff, not only from this country but from other advanced countries. And there's been some discussion of perhaps the U.S. offering some sort of compensation for cost-free experts who might go over to provide assistance to the IAEA or American staff members with the IAEA. Do you think there can be any case built for that and what mechanisms might be pursued to provide some relief?

Kuckuck: I'm going to say something first and then ask my colleagues here if they could comment in more depth. From a philosophical point of view, I would support such a thing strongly. I think it's very valuable. I know we do provide some so-called cost free folks there now. We provide incentives within our own government to bring people from the laboratories to Washington and so forth. We can't make them federal employees. But we use that mechanism very effectively to bolster certain areas and I would think that there is no reason why that same concept couldn't apply to an international agency. But I would ask if people know of activities that are going on in that?

Whereas the market drives the laboratories. Why have salaries gone down at IAEA?

Griggs: In part it's tied to the exchange rate. The U.S. dollar is stronger and the people in Vienna are paid at more or less a constant Austrian shilling rate. And so Americans who ten to fifteen years ago were making a certain dollar equivalent are now making fewer U.S. dollars than they were. If they're living in Austria and using their money only in an Austrian economy, that's one thing. But if they have children in universities in the U.S. or other expenses here, then they need the same number of dollars as they did before. And I've heard from a number of people who have inquired about positions in Vienna until they found the compensation rates that were offered and they're having a very difficult time finding qualified candidates.

Kuckuck: You would be the expert voice with respect to how these things play in the nonproliferation world. You can have your own Chiles Commission or something. You ought to take that up.

Mangan: We certainly don't want to weaken the dollar to solve this problem. (Laughter.)

Stein: In this connection I have a question related to the budget situation of the IAEA and how this situation can be

resolved. On the one hand, there are needs to introduce new technologies like satellite imagery and environmental monitoring and, on the other hand, there are trends to reduce safeguards efforts and costs and finally save taxpayers money. Now we have to recognize that the CTBT organization is also establishing similar verification measures like environmental monitoring in parallel and independently, but not using, for example, the powerful tool of satellite imagery to detect undeclared activities. It seems to me that here are fields where coordination and synergy can reduce overall budget and costs in international organizations.

Kuckuck: I was involved in the 1970s, I guess it was, and the early 1980s, with the CTBT negotiations in Geneva. And the illogic of what you could use and what you could not use for verification means was absurd to a scientist. We had to use LORAN position systems even though GPS was coming along because it would be too accurate and you'd really get where you wanted to go. So, part of your question strikes me as being caught up in that: to begin to introduce satellite imagery which we may have in our national technical means runs into those kinds of potential problems if we try using them in our joint protocols. So how you would then take some technology that exists elsewhere, put it into the CTBT in order to save the international taxpayer money is a political problem I would get.

It has struck me it would be nice if we somehow as a world community could take this opportunity to say "Let's look at things again. Let's kind of refresh ourselves." I'm not advocating getting rid of the ABM Treaty or anything like that... But let's look at some of these new technologies. Maybe we have a different relationship with each other now and we'd be willing to introduce these things. So how you get those kinds of intiatives moving, I don't know.

I think in your question though there were some comments about building a parallel system. Is that the same problem? Did I address that?

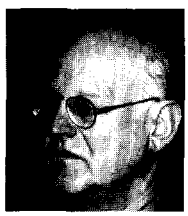
Stein: Yes.

Kuckuck: It seems like it's a political issue because there clearly are better ways of doing a lot of these things that just weren't allowed to be put into the system. Do you agree?

Stein: Yes, sure. Absolutely.

Mangan: I think Senator (Pete) Domenici (R-New Mexico) would agree with you also with regard to let's open that debate on nuclear energy. Let's continue that dialogue. Times are different. Things are different. He's been a proponent of that for years.

Kuckuck: I don't know if that would help the U.S. get the CTBT passed because we do have a lot of those verification capabilities that we can't use in the regime of the treaty. But I don't know if there'd be a motivation from that side of the argument as well as a motivation to save international taxpayers money.



Steve Dupree: A month or so ago, the Russian Duma passed a law authorizing Russia to receive spent fuel from foreign sources for long-term storage. This is an idea that Professor Suzuki at the University of Tokyo proposed years ago and it has been discussed repeatedly since that time. Since some of the spent fuel that might be stored in Russia could conceivably go to the nuclear cities such as Krasnoyarsk (or Zheleznogorsk) or somewhere to perhaps boost the economies in those cities, is that an area that NNSA is watching or is interested in? Is it something that might lead perhaps to improvements in safeguarding the spent fuel once it gets centrally located?

Kuckuck: I'll comment to the level I understand, then I'll turn to my colleagues. The Duma, as I recall, passed three bills; the higher house passed one of them and passed the other two on without voting. It's about bringing spent fuel in. A lot of the spent fuel they're talking about is U.S. obligated and the third counties will have to have U.S. permission to send it to Russia. So it seems to me that this issue is fraught with an awful lot of political interaction. Am I on your wavelength?

Dupree: Yes, I think it's going to be both fuel of U.S. origin and non-U.S. origin. Some of it will be safeguarded fuel. Some of it will potentially include fuel that is not currently safeguarded so it could be a real hodgepodge of stuff.

Kuckuck: Where I was going is I was thinking that a vast majority of it would take some sort of U.S. permissions. So it takes agreements beforehand with Russia about transparency.

Dupree: I'm not sure to what extent that's true.

Kuckuck: The rest of the hodge-podge, I guess you're right there is an issue there. And I would hope that would come out in our other transparency efforts with Russia at this point. Do you folks want to comment on?

Lennon: It's an issue that NNSA is definitely watching. At this point, I think President (Vladimir) Putin approved it only last week but before, during, and

after President Putin approved it, there have been significant demonstrations and rallies against bringing this spent fuel into Russia. The environmentalists, the Greens, are very much against this, saying it will turn Russia into the world's dustbin, and things like that. So we really haven't taken a position on this. I think almost 90 percent of the spent fuel out there is U.S. obligated and so certainly before they could bring most of this fuel in, we would have to work out some things, as Bob mentioned. We just haven't gotten that far.

Dupree: Such agreements could be reached if there's no objection in principle to stop it from happening? It may indeed be a source of income for the Russian nuclear cities and their communities.

Lennon: The first stumbling block is that we do not have an agreement for cooperation with Russia, and that agreement is a requirement for sending U.S. obligated fuel to Russia. And the U.S. has made it very clear that we will not conclude an agreement for cooperation as long as Russia continues its nuclear cooperation with Iran. How the revenue would be spent is an internal Russian decision. There are things that we would be involved in regarding what happens to the fuel, ultimately. It's just a very sensitive issue. There are some people who think it would be great for that reason, that it would bring employment into the cities. The level of confidence that some folks have in how that money would be spent, if it would actually go to the closed cities, is pretty low. This is also linked to the larger strategic issue of the U.S.-Russian relationship.

Dupree: Then there's the level of confidence that other countries might have in Russia's ability to protect and safeguard and provide security for such fuel.

Kuckuck: Those are all understandable controversies. But I don't know of a fundamental principle or policy that would prevent any of that.

Wilkey: Politically for nonproliferation, it would seem this is more a cosmetic concern. It isn't that Russia would need any more plutonium for whatever they want to use plutonium for. But the environmental issues may be real because Russia does not exactly have a great record on the environmental side of nuclear.

Lennon: The Russians have said that they would reprocess the fuel once they brought it to Russia. Right there, you have a fundamental disconnect where the United States would not approve any U.S.-obligated spent fuel going to Russia if they were going to reprocess it. There have been sort of informal discussions ongoing for several months, or probably longer, about how the U.S. might feel and if it could possibly be a carrot to trade off on other activities that we're working with the Russians on. A package of cooperation or activities that they would like. It's a lot of different things up in the air.

Lemley: Bob, you referred this morning to international financing of plutonium disposition. I thought in the context of your remarks that you were referring to Russian plutonium and international financing on disposing of that. But you didn't elaborate and I wondered if you would do that. There have been some very imaginative ideas for doing that, debt restructuring and that sort of stuff. And I wonder what NNSA and DOE's role or if you'd care to express your own views on what should be done on a broader scope.

Kuckuck: I don't feel that I am knowledgeable enough to pick a particular way in which this should be done. The only thought I have, to the extent that I understand the issue, is we're looking at $6 billion to deal with excess plutonium over twenty years or something like that. Clearly there's going to be a bill on the Russian side that we can't support. So we're hoping, we're assuming that it's going to take some international support or something—restructured debts or whatever—to see this keep going on both sides. That was the only point I was making.

Tape: I gathered from your answer that the National Security Council review of Russian programs is either not complete or not public. If that's the case, there's probably a short answer to this question. But the question would be, what is your expectation of impacts on NNSA programs that might come out of that review?

Kuckuck: The review has been presented to the Administration. The Administration is now debating some of the issues and recommendations and concerns with Congress, and has not decided yet how it's going to respond to the recommendations. It's a little more than saying it's not a public answer yet. It's not a public answer, and it's not even a private answer that I know. I guess my personal view is there will be some recommendations for perhaps consolidating or improving some efficiencies.

Mangan: I have a related question. In your presentation this morning I found your comments about NCI and the Fissile Materials Disposition Program to be encouraging. I remember when the NSC undertook the study of the Russian programs, I think the first news that hit was the desire on the part of the NSC to kill NCI and the Fissile Materials Disposition Programs. You actually floored me with your positive comments.

Kuckuck: The question about nuclear cities was how do I reconcile my enthusiasm with a rumor that NCI is going to be canceled. And my answer, what I intended it to mean is, I can still think it's a good program even if the program is canceled. I don't have to reconcile it. It wasn't intended to present any undue optimism. So no, I don't think I know anything you don't know. I support the fundamental principles of downsizing the nuclear weapons complex and of mitigating the human costs so we also reduce the potential for diverting the expertise. I think that's a strongly bought-into principle. If we hear back that there are issues with how NCI is being carried out or how it differed from IPP and it's suggested that we should combine them, well it's already been suggested to us to combine them and the General said he would look at that. And he has been looking at it. So that's one of the things I can imagine could be a high probability. I don't see any of that as being negative in the sense of NCI. In the case of plutonium disposition, I don't think I feel any optimism or lack of optimism. I believe that the Russians would like to see us do a MOX program. Other people would like to see us do an immobilization program. We're trying to satisfy all those desires and concerns at this time but we're going to have to stretch them out.

I have optimism that we'll still carry out the objectives of the NCI in some way. And I think the disposition program will continue.

Lennon: May I clarify one thing?

Kuckuck: Oh! I said something wrong. (Laughter.)

Lennon: The GAO report recommended that the department examine the possibility of combining NCI and IPP. It did not recommend that we actually combine them. It is a small point.

Kuckuck: No, it's a good point.

Lennon: It is worth noting. And General Gordon has directed us in NN to look at how we can save the important missions of the two programs while improving the parts of NCI that have drawn the most criticism. And one thing that we keep telling people on the Hill is that IPP had very similar problems a few years ago. A GAO report came out, we took all the recommendations, and pretty much turned the IPP program around. The man who was running the IPP program at the time is head of the NCI program. So we are working very closely to improve NCI in similar ways.

Just one other point. Steve Hadley, who is the deputy national security adviser, spoke at the Carnegie nonproliferation conference last month and someone asked him about the review. He said, that the Administration was very much supportive of scientific cooperation with the U.S. and Russians in cooperative ventures with the possibility of commercialization. I turned to someone and said that sounds like NCI. So I think there's been somewhat of a change of heart in some parts of the Administration at least for the concept of NCI if not NCI in its current form.

Lemley: You had also mentioned that making the size of the Russian weapons complex more consistent with that of the U.S. is a priority. It seems to me that many of these programs that we've been talking about from the nonproliferation point of view could very well accomplish that and are, in fact, consistent goals. I just wondered if you had anything else in mind in order to equalize the sizes of the weapons complexes? To make theirs more consistent with ours.

Kuckuck: Clearly, America's driven by economics so it isn't that the Cold War ended and therefore, as a humanitarian gesture, we downsized our nuclear complex. When we built our weapons, America built a very fragile on the margin nuclear arsenal because we continually optimized weight to yield so we wouldn't have to spend a lot of money on delivery systems. So now here we are in a science-based no-testing world wishing we had made wooden bombs and massive rockets. We went up the scale right on the margin of efficiency and economy and we're coming down the same way. Russia is facing similar problems because they are being driven by their economy.

They have said they were going to take two of their four production plants out. They have asked for our help. We intend to give them as much help as we can and it will be in the context of the current programs that I'm aware of. I think these are all consistent goals.

Lemley: Sort of let economic wisdom prevail in some cases and help it along where possible.

Kuckuck: Sure.

Rebecca Horton: My question is a little more related to domestic programs.

This morning I heard your comments about looking out into the future from 2005 to 2010 and developing a plan for the Russian programs. Related to recruiting and infrastructure, I thought I had heard that on the horizon there is a five- to ten-year type plan, forward looking for the domestic programs in the complex. Could you comment on what efforts are underway or current activities so that we have the same kind of look toward 2010 for infrastructure in the United States?

Kuckuck: Are you referring to the weapons complex?

Horton: Yes.

Kuckuck: Yes, there are several things going on there. First of all, our future planning is tied up in the strategic reviews that are still underway under Secretary Rumsfeld. We will be driven by the nuclear posture review. Our defense program activities have been laying out five-year plans for look-aheads now. And this is all about where our complex goes. Forgetting the people for the moment, the next biggest problem in trying to lay out what our complex looks like is the aging infrastructure and terrible shapes that plants and laboratories are in. Certainly some of them are in need but the plants, particularly Y12, those folks really need help.

The Senate has a budget mark of $300 million for facilities and infrastructure, so to what degree the Senate budget mark prevails in conference this summer, I don't know. But I'm optimistic that we'll see the impact of dollars starting to go toward this facilities initiative. So yes, I think there are five-year plans out there that are major infrastructure revitalization plans on the books. The one thing that I think that we will benefit from is if we can get our arms around it. Right now that plan is around the existing infrastructure that is out there and how to refurbish and revitalize what we need to do these programs. We need momentum toward what is the complex of the future 20 years from now. I don't know to what degree we have that problem under control yet. I guess I'm telling you I don't know that we have it under control.

Amy Whitworth: There are efforts at Y-12. The plans go out to 2020 for reducing the footprint of the facility, reducing the security areas, making a new storage facility that's amenable to both domestic safeguards as well as international arms control regimes. So there are definite plans for the future for Y12. But they've also got to be integrated into the overall NNSA plan.

Tape: If I could just follow up. Amy made a point that has been on my mind. And that is the rejuvenation of the infrastructure. What are the plans for improving safeguards and security? One lesson we have all learned over and over again in our careers in this business is that safeguards and security measures are often a last minute add-on. And we have been preaching for many years that that's a mistake, that when you design a new facility or you refurbish an existing facility, plan to do safeguards and security. So is there a formal part of the planning in the infrastructure rejuvenation for safeguards and securities technologies and procedures.

Whitworth: Yes, we have been more integrated in the process, more so than ever. It's hard for us to retrofit our facilities. For all new facilities we do have an integration factor that we have John Todd working on. For example, we've been working closely with the plutonium disposition people, MOX project, to understand what requirements are out there. Not only integrating in our safeguards and security requirements but also integrating the potential international regimes' requirements, and NRC safeguards requirements because we will be NRC licensed. For example, the HEU building complex, the "factory of the future," Y-12, we're looking at what structures or what systems can be addressed by physical structures, how do we build in the physical protection. That has been one of the mistakes that we've made continually throughout our history is retrofitting physical protection features. So we are quite involved in the design process right now. It's going very, very well. John Todd is very good at designing those things. He designed security features for several facilities when he was over at Naval Reactors, and he's bringing that expertise along.

Mangan: The NPT Review Conference is going to be coming up in 2005 and at the last review conference, which was last year, there was a commitment on the part of the U.S. government to do something with regard to demonstrating the commitment to Article VI, which addresses disarmament. In particular, I believe the NPT Review Conference basically endorsed, "Go forth and do good things with regard to the Trilateral Initiative." Does NNSA have the same commitment to demonstrating what was signed up to with regard to last year's NPT Review Conference where something positive will happen before the NPT 2005 conference that will demonstrate the seriousness of the United States to put excess material under IAEA verification?

Kuckuck: This is out of my realm.

Lennon: As far as I know, NNSA remains as committed as before for the Trilateral Initiative. I know there are folks within NN who are just as eager as you and Jim Tape are, if not more, to get the Trilateral Initiative off the ground, running, implemented. As for specific suggestions or plans on how to get the Trilateral Initiative off the ground or get the model agreement signed, I'm not aware of any, but there is the commitment. That has not changed. From NN, we're certainly pushing it and whenever possible put that on the agenda. When (IAEA Secretary General Mohammed) El Baradei just came in a couple of weeks ago, we put this front and center on the agenda, saying how important the Trilateral Initiative is.

Whitworth: We're looking to the Administration as well to look at related aspects of international safeguards. During a tutorial that we taught on Sunday, the question came out loud and clear: Where does the Administration want to go with strengthened safeguards? The commitment remains the same, but we want to know what emphasis the Bush Administration will place on having additional excess material placed under international safeguards under the Voluntary Offer Agreement.

Mangan: Mr. Kuckuck, I think you've done an excellent job. It's been enjoyable. Thank you for your time and comments.

Robert W. Kuckuck is deputy director of the National Nuclear Security Administration. Before joining NNSA, Kuckuck was deputy director of Lawrence Livermore National Laboratory from 1994 through 2001. He worked at Lawrence Livermore throughout most of his career, serving as associate deputy director, associate director for nuclear test and experimental science, deputy associate director for nuclear design, and program leader for treaty verification research.

Kuckuck has a master's degree in physics from Ohio State University and a Ph.D. in physics/applied science from the University of California, Davis.

Summary of the Closing Plenary Session of the 42nd INMM Annual Meeting

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

Amy Whitworth, Vice Chair
Nonproliferation and National Security Administration
Washington, D.C., U.S.A.

Again this year the Closing Plenary concluded four full days of technical sessions at the 42nd Annual Meeting. In this session, organized each year by the INMM Government-Industry Liaison Committee, planning and policy issues affecting government and the nuclear community and of general interest to Annual Meeting participants are addressed at a broader level than in the regular technical sessions. This year's Closing Plenary brought together presentations that emphasized new directions in three important areas. The management of the U.S. Nonproliferation and National Security Agency will be emphasizing field-developed initiatives and responsibility to improve the effectiveness of safeguards and security as well as morale at the facilities it serves. As a nongovernmental, not-for-profit organization, the Nuclear Threat Initiative is defining the contributions it can make toward reduction of the threat presented by weapons-usable nuclear materials in many parts of the world. The U.S. Nuclear Regulatory Commission is preparing to respond to increasing interest by the nuclear industry for the licensing of new nuclear power plants and other facilities.

The first speaker, John C. Todd of the U.S. National Nuclear Security Administration, emphasized that management in his organization would be expecting field organizations of the Department of Energy (DOE), in partnership with headquarters, to contribute strongly to the development and implementation of more effective safeguards and security programs for DOE facilities. He promised a proactive approach to improve morale and, through a professional development program, to provide incentives for young professionals to join the nuclear materials management profession.

Laura Holgate, representing the Nuclear Threat Initiative, explained the activities that her organization is planning that will contribute to effective management and control of weapons-usable nuclear materials and reduction of their quantities, thereby reducing the threats related to these materials. She indicated that her organization would soon begin to fund the projects that are being planned.

The third and concluding speaker was Diane Jackson from the New Reactor Licensing Project Office in the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). Jackson outlined the restructuring and other activities that the NRC is undertaking to be able to respond to the serious interest that the industry is showing for licensing of new nuclear power plants and other facilities. The activities described by Jackson suggest genuine interest in nuclear power that transcends the rhetoric associated with the new administration's energy policy.

To attain the desired objectives successfully, the initiatives described by each speaker require the dedicated professionalism of knowledgeable nuclear material managers. The INMM and its members look forward to working with our speakers and their organizations to realize the many benefits of nuclear science while at the same time effectively managing, controlling and reducing the threats associated with nuclear materials.

Safeguards and Security and the NNSA

Remarks by John C. Todd, Chief, Defense Nuclear Security
National Nuclear Security Administration
Text submitted by John C. Todd

John C. Todd joined the National Nuclear Security Administration as chief, Office of Defense Nuclear Security, in August 2000. Before that, Todd was the Director of Security for the Naval Nuclear Propulsion Program for more than twenty years. In that position, he was responsible for development and implementation of all aspects of safeguards and security policy. Since the Naval Nuclear Propulsion Program

is a dual agency organization (Department of the Navy and Department of Energy), he is familiar with the security requirements of those agencies. In addition, he has had experience dealing with the Nuclear Regulatory Commission, the Department of Defense, and the State Department on issues related to safeguards and security.

During his career, Todd has led many review teams of the security of numerous DOE and Navy facilities, as well as being part of comparability reviews of safeguards and security policies between agencies. He has had continuing experience in development of cyber-security policy for the protection of both classified and unclassified systems. He has been in charge of the classification program for the Naval Nuclear Propulsion Program and has been responsible for issuing and interpreting the classification guidance for the Navy. Todd has initiated a number of new security programs in information and physical security areas within the Naval Nuclear Propulsion Program and has emphasized cooperation between agencies.

I appreciate the opportunity to speak to this group as to where the NNSA S&S program is currently and where we are headed. One of the main challenges that NNSA faces is communication; informing people of our mission and explaining our fundamental shift in how we carry out business.

Almost a year ago, I met with John Gordon and we talked about the job of the NNSA chief of Defense Nuclear Security and discussed the effort to move the S&S program in a positive direction. At this time, S&S has the attention of senior departmental officials and outside entities. This is a great time to be in security. If the S&S community wants to change how we do business, then this is the time to make those changes. You can use your experience and your knowledge to be able to give us the direction of where we want to go. The NNSA is here to make a difference. The NNSA, as you know, was created, in part, due to the security problems that existed.

General John A. Gordon has a very strong view on safeguards and security and clearly wants to ensure S&S issues are addressed. So you've all been here many times and you've seen a different speaker up here who said "OK, I'm now in charge." What's the difference? Why do we think in the NNSA that we can make a difference today versus all of the review groups and all of the efforts that you have seen? I believe the answer to that question turns out to be a very fundamental difference in approach that we use in the NNSA versus what I've seen in the past. The difference that we make is instead of trying to bring in a team from the outside and trying to analyze what's going on and then direct DOE on how to fix it, our approach is to go to the people in the job, who perform the work today, and ask them to tell us what is wrong and ask them how do we fix it? That means that we've got to communicate. I've spent a significant portion of the last year in the field doing just that; trying to ensure that we open up the lines of communication. The only way we're going to do that and the way the NNSA is going to be different is to be working with the people in the field. Hopefully you've seen that. We're about to finish a six-month review of S&S policy with the field fully engaged in the process. We believe in a small headquarters security group. We are in the process of finishing the reorganization. Those of you who are somewhat familiar, the job I hold right now is chief of Defense Nuclear Security, that's basically a staff advisor to John Gordon. I have a staff of six people supporting me. The line function, however, is in an organization called Facilities and Operations. I am the acting director of the Nuclear Safeguards Security Program, which is where the line function will reside. That office is not going to be enlarged; it will only have individuals who currently work in S&S. That means that we are going to rely heavily on the field to do the work.

Security is a very interesting job. Part of the problem with security is that a security program is successful when nothing happens. The only time a security program gets attention is when something goes wrong. When the problem is fixed and nothing happens, then the security program doesn't receive the attention, and commensurate with that attention, funding. Then eventually something goes wrong. This is the vicious cycle of security. This is not the way we want to do business. We need to identify what is necessary to sustain the program and fight for the funding and I am prepared to go fight in Washington. What I need is: "What's the right way to do security?" And although I have been in this business for a long time and I've got some great ideas I fully recognize I don't have them all—they come from you. But in order for me to expect ideas from you, I've got to outline our fundamental philosophy for you.

This is the NNSA security philosophy. Those words have been chosen very carefully, and we are going to talk about each one as we go through.

"Provided NNSA-wide security." What does that mean? Ensuring equivalent protection for equivalent material—validating graded safeguards and security. Understanding the relative importance of all the materials and information is fundamental to graded safeguards and security. One of our efforts is to obtain a true listing from the most attractive target to the least attractive target. This has not been done, but we're doing it. Once finished, security can be graded accordingly. This philosophy applies whether it's information security, cyber security, MC&A, or physical security, the most important protection for the most important assets. That also means less important protection for less important materials. This leads to a defined threat.

It is time to expand the Design Basis Threat. Three major organizations, DOE, NRC, and DoD protect nuclear materials today. If both DOE and DoD have identical materials, the threat should be the same. An effort is ongoing as we speak, to try to ensure comparability in a cost effective manner. The cost of security is real and it should be balanced. This will

be more challenging as the years move on.

I'd like to talk about five activities that are currently underway—most of which you will have heard about, or at least know about, or see soon along the way. The first activity is a review of S&S policy. The second activity concerns implementation—how do we take policy and apply it in the real world. The third activity is budget and what it means to have a dedicated S&S budget. The fourth is communication, and the last is personal and professional development.

With regard to the S&S policy review, there was a six-month hiatus on the issuance of new S&S policy. During that time, teams from all the S&S topical areas were formed to review the policy and make recommendations as to how to improve the policy. The six months was divided into three two-month periods. The first two months were used to identify issues, the second two months were for convening the working groups, and the last two months were for assembling the implementation piece and briefing high-level departmental officials in Washington and to ensure their agreement.

Fifteen working groups, led by the field, basically took all the major issues and identified where we thought the problems were. They worked for a little more than sixty days and provided us reports. We had a little more than 200 pages of reports. The working group reports are in the final report going to the deputy secretary, as written. The issues identified by the working groups were divided into three categories. The first category is implementation—those are ones the program office can solve with implementation. The second category are very focused specific issues which were policy issues which really need to be changed and in most cases SO already agrees, but we have to go through the formal process. The field management council has agreed to turn all of them around in ninety days and get them out. The last category is issues where fundamental differences have to be resolved and cannot be resolved by my level, by the working level, and can only be identified.

I identified implementation as the second item. I identified that as different than the policy piece because even though there's implementation, one of the positions I have taken since the day I walked in is that we in the NNSA are going to implement all the DOE orders with NNSA implementation procedures. We're going to take every DOE S&S order and detail how NNSA will implement that order. The OA organization has agreed that inspections will be accomplished based upon the NNSA implementation bulletin.

As for budget, we now have a direct funded budget. That means we have to account for every dollar used for S&S. Many people have differing views on the direct funding of S&S. It doesn't make any difference whether people think it's a bad idea or a good idea—it's what the law says and we will follow it. The problem is when we got the direct budget it was based on the S&S crosscut budget and we were $82 million short. So we spent November and December of last year refining our budget. We anticipate it will take three years to get our budgeting process on an even keel.

The next issue I want to discuss is communications up and down the chain. It hasn't been as good as it should either way. There need to be clear lines of authority and responsibility. In the NNSA the communication chain is straight up and down. Contractor, field office, into headquarters, into the NNSA. The law basically says if you're outside the NNSA, you cannot direct anyone inside the NNSA. And we are holding very strong and fast to that. I think that what we've seen over the last year is an attempt to make sure that chain of command holds and it will continue. Now does that mean that a contractor can't communicate with headquarters? No. It basically means that if you've worked the proper chain of command but you feel your concerns have not been addressed you can talk to me, but recognize my first question will be if you have talked to the field office, have you talked to the program office? If the answer is yes, then I will be happy to meet.

Communications are mandatory and important. What about a group like this? Where do you fit in the communication chain? And the answer is well, you're not the one I just talked about, which means you have all the options that can possibly exist. And in fact, this is one of the places where we need to have the interchange. Where you take this group of people and you say, "I have a good idea" and as a group you say it's a good idea, you'll have a good impression on me. So communication includes this and that's one of the reasons I'm happy to be here. Your efforts are worthwhile, they can help us move forward and help us solve problems.

There's one other issue I wanted you to talk about, which most of you see, and in fact if you look around the room you're going to recognize. We're getting older. The problem is, where are the young people to replace us? Where's the professional development program that is going to take us into the future? Show me where the talent is and show us how we are recruiting that talent and bringing them into the system so that they can use it. Whether it's federal or contractor makes no difference to me, I've got the aging infrastructure problem with both. So, my office is creating a professional development program. Our first step is with federal employees because that's the one for which I have a more immediate need. We are going to invest some money in an intern program, education, and keeping track of talent.

In conclusion, the NNSA is trying to make a difference. We can only make a difference with people's help, your help and the rest of the people in the field. Do I believe we've made progress? Yes. I keep a list of accomplishments as we have worked through the last year. The six-month policy review is a large effort; over two hundred people devoting significant time and energy. What I need to demonstrate to you is that we'll be successful.

Public-Private Partnerships for Nonproliferation

Remarks by Laura S. H. Holgate, Vice President for Russia/NIS Programs
Nuclear Threat Initiative
Text Submitted by Laura S. H. Holgate

Laura S. H. Holgate joined the Nuclear Threat Initiative in February 2001 as the vice president for Russia/NIS Programs. The Nuclear Threat Initiative is a charitable organization devoted to generating a national and international consensus to take the necessary steps to sharply reduce the risk that nuclear, biological, or chemical weapons will ever be used, and to prevent their proliferation. Founded in January 2001 by Ted Turner and Senator Sam Nunn, the organization has been provided $250 million over five years.

Prior to joining NTI, Holgate directed the Department of Energy's Office of Fissile Materials Disposition from August 1998 to January 2001, where she was responsible for consolidating and disposing of excess weapons plutonium and highly enriched uranium in the United States and Russia, a key nonproliferation goal. She served as special coordinator for Cooperative Threat Reduction at the Department of Defense from August 1995 through August 1998, where she provided policy oversight of the Cooperative Threat Reduction "Nunn-Lugar" program of U.S. assistance to Russia and other former Soviet states in eliminating the weapons-of-mass-destruction legacy of the Cold War. She also oversaw Department of Defense policy on U.S.-Russian cooperation on a wide range of fissile material activities. Holgate served for two years as special assistant to Assistant Secretary of Defense for International Security Policy Ashton B. Carter. She spent six months at the Arms Control and Disarmament Agency (ACDA), working on the Clinton Transition Team, and as special assistant to the Acting Director of ACDA Thomas Graham.

I'd like to thank Amy Whitworth and the INMM leadership for offering me the chance to talk with you today about a new and increasingly important strain in the nonproliferation field: the growing engagement of the private sector in implementing U.S. national security and nonproliferation policies. This trend goes beyond the traditional approach of hiring contractors to execute programs, but has expanded to include the use of commercial mechanisms to power nonproliferation projects.

The granddaddy of this category of effort is the U.S.-Russian HEU purchase agreement, designed to achieve national goals of reducing the quantity of Russian highly enriched uranium through sales of resultant LEU on the commercial market. This approach was intended to operate without U.S. taxpayer funding. In a strictly commercial sense, it has done so, but that fails to take into account the significant time, attention, expertise, and political engagement required of senior U.S. government officials to keep the agreement on track and to monitor Russia's adherence to its commitments, and it has also required occasional "one-time" infusions of appropriated funds. Balancing commercial interests with national security interests has proven a real challenge.

Other similar principles are at work in the Initiatives for Proliferation Prevention and Nuclear Cities Initiative, where business interests in Russian technology and expertise are being harnessed to provide pro-social employment for weapons scientists. In plutonium disposition, some are seeking a way to defray expenditures associated with the national security benefits of transforming weapons plutonium into less attractive forms by developing commercial schemes to extract value from the energy potential of the plutonium. The Russian initiative to create economic benefits from spent-fuel storage also falls into this category.

This trend has been joined by a new type of private sector actor in nonproliferation activities: the Nuclear Threat Initiative. Representing the largest private contribution to national security, the Nuclear Threat Initiative more than doubles the foundation funding available for nonproliferation and seeks to go beyond the traditional foundation focus of analysis, education, and consensus-building to physically reduce the proliferation threat.

The Nuclear Threat Initiative is a new foundation working to close the growing and increasingly dangerous gap between the threat from nuclear, chemical and biological weapons and the global response. NTI is a place of common ground where people with different ideological views can work together to make real and significant progress to reduce the risk of use and prevent the spread of nuclear, biological and chemical weapons.

The focus of NTI is to contribute to policies and activities that:

- Bring nuclear, chemical, and biological weapons materials under secure control and reduce their quantities;
- Restrict the spread of weapons know-how;
- Reduce the risk of intentional or accidental use of weapons of mass destruction;
- Develop better strategies and means to guard against the emerging threat from biological weapons;
- Bring about changes in nuclear forces to enhance safety, security, and stability; and
- Increase public awareness, encourage dialogue, catalyze action, and promote new thinking about reducing the danger from weapons of mass destruction on a global basis.

NTI was established by Ted Turner who has pledged at least $250 million over five years to the organization—the largest sum any private individual has ever invested in these security issues. Former U.S. Senator Sam Nunn and Turner co-chair the foundation, and Senator Nunn also serves as chief executive officer.

NTI's board of directors, which determines the overall direction of the foundation and is global in scope, also includes:

- President and Chief Operating Officer Charles B. Curtis
- U.S. Senator Pete Domenici
- Susan Eisenhower, president of the Eisenhower Institute
- Rolf Ekeus, a former ambassador, and chair of the Stockholm International Peace Research Institute
- Eugene Habiger, retired U.S. Air Force general and former commander-in-chief of the U.S. Strategic Command
- Andrei Kokoshin, a current member of the Russian Duma and former Deputy Minister of Defense
- U.S. Senator Richard Lugar
- Jessica Mathews, president of the Carnegie Endowment for International Peace
- William Perry, a former U.S. Secretary of Defense, currently at Stanford University.

NTI's mission is "to strengthen global security by reducing the risk of use, and preventing the spread of nuclear and other weapons of mass destruction and to work to build the trust, transparency, and security which are preconditions to the ultimate fulfillment of the Nonproliferation Treaty's goals and ambitions."

The foundation is global, concentrating not just on the United States, Russia, and other nations of the former Soviet Union, but also on those regions of greatest proliferation concern in Asia and the Middle East.

NTI pursues its goals by serving as a catalyst for new thinking, by encouraging governments to act and transform public policy, and by developing start-up, pilot, and model programs that the government and private sector could replicate on a larger scale. NTI is working to find niches, fill gaps, and leverage resources by taking advantage of our ability to act with greater speed and without the regulatory restrictions and policy constraints of government. All activities of NTI will be conducted with full transparency with the national governments. As a general rule, NTI will not undertake activities that are inherently the responsibility of government.

In making decisions about program activities, the foundation considers a project's potential to:

- Influence significant change in policies and postures
- Address significant high-risk situations
- Leverage action and funding by governments or other actors
- Promote core objectives of NTI, and
- Generate additional funding for threat reduction.

Finally, NTI is working to promote dialogue, build common ground, and increase public awareness of the gap between the threat and the response—a gap in the way governments are organized to address the threat, a gap in resources and a gap in thinking. Public education is a central responsibility of NTI.

The Nuclear Threat Initiative is currently exploring initial activities in five key areas:

U.S. policies and programs

The goal in this area is to generate greater public support and governmental attention to the need for threat reduction; to bring greater resources to bear on the problem both in the United States and internationally; and to provoke a fundamental review of the role and purpose of nuclear weapons in the aftermath of the Cold War. Specifically, this could include an examination of options for consideration by governments on the operational force posture of U.S. and Russian forces, the prevention of accidental launches, and further arms reductions. Projects under consideration and review include the development of:

- Specific proposals to increase decision time for launching U.S. or Russian strategic nuclear systems and the impact of the proposals on overall strategic stability; and
- Complementary means for monitoring implementation of unilateral arms reductions between the United States and Russia to achieve with unilateral reductions some of the benefits of traditional arms control—predictability, stability, and transparency.

Biological Programs

NTI is developing a framework for actions to reduce the threat posed by biological weapons. The focus is on:

- Increasing education, awareness, and communication about the scope of the problem among the health/medical/scientific community and policymakers/elected officials;
- Supporting efforts to enhance global infectious disease surveillance—a fundamental building block of effective preparedness against infectious disease threats (whether naturally occurring or deliberately caused) enabling rapid detection, investigation, and early response to a potential threat;
- Engaging the scientific community to reduce access to dangerous pathogens and establish normative standards for research and transparency to prevent the development/proliferation of biological agents as weapons; and
- Facilitating the conversion of Russian bioweapons facilities and know-how and securing biomaterials for peaceful, commercial purposes, and improving security for dangerous pathogens.

Regional Activities

NTI seeks to advance thinking about how to approach regional proliferation challenges in areas such as Asia and the Middle East. Initial activities focus on launching an aggressive pro-

gram of international consultations, working to increase public awareness, and strengthening (or in some cases creating) international NGOs, and promoting international dialogue on ways to reduce tension in key conflict areas.

Russia/New Independent States

The proliferation threat from Russia and the new independent states stems from Cold War legacies of excess quantities of weapons and weapons materials, poorly secured and accounted for; oversized nuclear weapons infrastructure, from design bureaus to production facilities to military bases; serious economic problems; and unemployed and underemployed nuclear experts. The work in this area is high priority both because of the immediacy of the direct threat posed by insecure weapons materials and know-how and because of the enormous impact that Russian behavior can have on the broader problem of proliferation in the rest of the world.

NTI will initially focus on two primary areas of action:

(1) securing, consolidating, and reducing nuclear weapons materials, especially highly enriched uranium (HEU), and

(2) leveraging increased volume and efficiency of cooperation from governments and private entities toward reducing threats from nuclear weapons, materials, infrastructure, and know-how.

I will spend a bit more time on the initial projects under consideration and review in this area since this is my own focus:

- **Accelerated HEU blend-down**—Can the rate at which weapon material is irreversibly converted to safe forms be increased without disrupting the fragile nuclear fuel market?
- **Return of vulnerable HEU stocks to Russia**—Can unsecured stocks of weapon-usable material be consolidated and secured, and perhaps blended down?
- **A European program for cooperative threat reduction**—Can Europeans be convinced to increase their contributions to nonproliferation efforts in Russia?
- **A pilot-scale "debt-for-security" swap**—Can the Russian government be encouraged to invest, in a transparent way, more of its own resources in securing and reducing the quantities of weapon materials by reducing its debt payments to the West?
- **A venture capital investment to create jobs for weapons technologists**—Can a relatively modest investment in one or two businesses both employ weapons workers in pro-social commercial enterprises and demonstrate effective business models for other investors?
- **A business accelerator concept**—Can legal, consulting, and other business support for Russian entrepreneurs create greater employment opportunities for weapons technologists?
- **Renewal of the U.S.-Russian nonproliferation consensus**—Can informal conversations among current and former U.S. and Russian officials and experts recreate the shared sense of the proliferation threat and at least tacitly coordinated responses to proliferators that prevailed during the Cold War?

Education and Outreach Activities

The public perception of the threat from weapons of mass destruction is low. The reality of the threat is high. NTI's public outreach and education activities are focused on closing the gap between the threat and the response. NTI is designing outreach and education activities to take these issues beyond the small club of policymakers and experts who work on them. Initial projects include development of a comprehensive nonproliferation information clearinghouse, sponsoring community dialogue and education initiatives, and exploring the potential to support academic training to establish a more lasting capacity and ability to address the threat from WMD.

These five program areas offer many opportunities for fruitful activities to reduce the threat from proliferation of weapons of mass destruction, many more opportunities than we will have funding to support. I therefore encourage you, as nonproliferation practitioners, to continue your search for creative approaches within your own realms of action to address these central national security challenges. There is plenty of work to go around, and plenty of work to do together. I thank you for your attention, and for the commitment of INMM to nonproliferation, as reflected in the substance and diversity of this year's conference.

New Reactor Licensing Activities

Remarks by Diane T. Jackson
U.S. Nuclear Regulatory Commission
Text submitted by Diane T. Jackson

Diane T. Jackson is project manager for the pebble bed modular reactor design in the Future Licensing Organization of the Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission (NRC). Jackson has been with the NRC since 1993 and has had a variety of responsibilities, including technical review, project manager for the AP600 reactor design certification review, commissioner technical assistant, resident inspector, and enforcement specialist. Jackson earned a bachelor's degree in nuclear engineering from University of Maryland and a master's degree in environmental engineering from Johns Hopkins University.

In response to renewed interest in building nuclear power plants, the NRC has created organizations within its major program offices to prepare the NRC staff for new applications

(e.g., early site permits (ESPs), design certification and combined licenses) and to manage special task groups and pre-application reviews of new reactor designs. Activities planned in fiscal year 2001 and fiscal year 2002 include (1) evaluating the ability of the NRC staff to support future application reviews under 10 CFR Parts 50 and 52; (2) performing ESP reviews and pre-application reviews of the AP1000 (a light-water reactor design with passive safety systems), pebble bed modular reactor (a high-temperature gas-cooled reactor design), and gas turbine-modular helium reactor (a high-temperature gas-cooled reactor design); (3) initiating and/or performing related rulemakings that will update 10 CFR Part 52 to reflect lessons learned from certifying three nuclear plant designs, update Tables S-3 and S-4 of 10 CFR Part 51 to address higher burnup fuel considerations and non-LWR advanced design, and address alternative siting considerations; (4) reactivating the construction inspection program, and (5) interacting with stakeholders to ensure there is a clear understanding of upcoming activities related to future applications and to solicit stakeholder input.

In fiscal year 2002 and fiscal year 2003, expected activities include (1) managing the reviews of five new applications resulting from the pre-application reviews (including one design certification, one combined license, and three ESP reviews), (2) managing two pre-application reviews (IRIS and GT-MHR), (3) updating regulatory and review guidance for new applications, i.e., Standard Review Plans (SRPs), Regulatory Guides, and referenced codes and standards, and identifying where enhancements are needed, (4) developing independent codes to analyze the safety of non-LWR-designs, with supporting validation testing, and (5) addressing regulatory infrastructure issues, including a proposal by the Nuclear Energy Institute on a generic regulatory framework and NRC regulations governing financial issues and operator staffing.

New NRC Licensing-Related Activities

The NRC has many activities underway in response to industry's increased interest in licensing new nuclear power plants. Within the U.S. NRC, the Office of Nuclear Reactor Regulation has recently created the New Reactor Licensing Project Office. This replaces the temporary organization, which was the Future Licensing Organization. The Office of Nuclear Regulatory Research has formed the Advanced Reactor Group. The Office of Nuclear Materials Safety and Safeguards is performing work within its existing infrastructure. NRC activities include the agency's readiness assessment for future licensing and inspections, preparation for review of ESPs and combined licenses, restart of deferred plants, reactivation of construction inspection, performing pre-application reviews, and an assessment of the regulatory infrastructure for new reactor licensing.

The agency has many challenges ahead for licensing new reactors in the United States. The new generation of plants can be licensed using many alternatives to the traditional two-step 10 CFR Part 50 licensing process, which had separate construction and licensing approvals. In 1989, the NRC developed 10 CFR Part 52, which combines the approval for construction and conditional operation, called a combined license (COL). The new rule also allows applicants to apply for only a site permit for a potential future COL application, called an ESP, or a vendor to apply for only a certification of a reactor design that could be referenced later in a COL application, called design certification. The goals of the 10 CFR Part 52 process are to provide a more stable and predictable licensing process; reduce financial risks to COL holders; resolve safety and environmental issues before starting construction, and enhance standardization.

The Future Licensing and Inspection Readiness Assessment (FLIRA) is a program to assess the agency's readiness for new reactor applications. The FLIRA is assessing postulated licensing scenarios, review durations, resources estimates, and critical skills needed to perform the reviews. The FLIRA will provide recommendations on staffing, training, contractor support, schedules, rulemakings, and guidance documents. The assessment will be completed in late September 2001.

ESPs allow an applicant to "bank" a site for future use for ten to twenty years. An ESP consists of a site safety review, environmental protection review, and emergency preparedness review. The site safety review includes areas such as seismology, geology, hydrology, meteorology, geography, demography, and site hazards evaluation. The environmental protection review includes areas such as alternative sites, ground water and air quality, threatened and endangered species, land use, and uranium fuel cycle and waste management. The emergency preparedness review evaluates either a proposed emergency plan or emergency preparedness information and includes issues such as population distribution, ingress and egress routes, and local emergency response infrastructure. The ESP regulations and guidance have already been developed. The regulations are defined in 10 CFR Part 52, Subpart A and the regulatory guides, standard review plan (SRP), and Environmental SRP to support the regulation have been written. However, this portion of 10 CFR Part 52 has yet to be implemented. Based on industry's interest, the agency is planning its resources to review the first application in mid-2002, two applications in 2003, and one application in 2004.

The agency is looking at several construction and ITAAC issues and activities. ITAAC are inspections, tests, analyses, and acceptance criteria that form a program for verifying that the facility has been constructed and will be operated in conformance with the COL or design certification that has been issued. Current activities include the reactivation of the Construction Inspection Program; developing guidance for inspection of critical attributes, initiating the development of training for inspection staff, reactivation of construction per-

mits, and the resolution of programmatic ITAAC. The agency is seeking public comment on whether ITAAC should address operational programs (programmatic ITAAC), such as security, training, and emergency preparedness. The agency issued a notice in the Federal Register on June 25, 2001, and the public comment period was open until August 8, 2001.

The agency's Advanced Reactor Policy Statement encourages early interaction with staff on new reactor designs. These early interactions are called pre-application reviews. They are not required for licensing but are used for early identification of issues that could require Commission policy guidance or staff technical resolution during the COL or design certification review. The staff is currently performing two pre-application reviews. The AP1000 is a 1000 MWe advanced passive light-water reactor. The pre-application review is scheduled to be completed in early 2002. Pending a satisfactory conclusion of this review, Westinghouse expects to submit a design certification application in mid-2002. The pebble bed modular reactor (PBMR) is a set of up to ten 115 MWe modular high temperature gas-cooled reactors connected as one facility. The pre-application review began in May 2001, and is expected to be complete near the end of 2002. The agency expects two other pre-application reviews. The General Atomics' Gas Turbine Modular Helium Reactor (GT-MHR) is a set of (possibly four) modular high temperature gas-cooled reactors connected as one facility. General Atomics has informed the staff that they expect to request a pre-application review in September 2001. The International Reactor Innovative and Secure (IRIS) design is an advanced light water reactor design being developed by an international consortium led by Westinghouse. They met with the staff in May 2001, and expressed interest in interacting with the staff but have not requested a pre-application review at this time.

In the area of regulatory infrastructure, current activities include rulemaking to update 10 CFR Part 52, that will include lessons learned from the three design certifications; rulemaking on alternative site reviews; rulemaking on 10 CFR Part 51, Tables S3 and S4, which will update the fuel cycle environmental impacts and may address gas-cooled technology; and review of the agency's financial-related regulations, such as Price-Anderson. Information on proposed rulemakings and any petitions for rulemaking can be found at the Web site below. Future activities include assessing a proposal by the Nuclear Energy Institute on a generic regulatory framework and assessing the development of an NRC licensing approach that is more design-neutral, rather than geared to light-water reactors.

The agency's expected activities in fiscal year 2002-2003 include: managing the reviews of five new licensing-related applications resulting from the pre-application reviews, including one design certification, one COL application, and three ESPs; managing two pre-application reviews (IRIS and GT-MHR); updating regulatory and review guidance for new applications; developing independent codes to analyze the safety of non-light water reactor designs, with supporting validation testing; and addressing regulatory infrastructure issues, including Nuclear Energy Institute's proposal on a generic regulatory framework and regulations governing financial issues and operator staffing.

More information or updates on these activities can be found at the NRC new reactor licensing Web site: http://www.nrc.gov/NRC/REACTOR/FLO/index.htm. From the main NRC Web page (www.nrc.gov), it can be accessed by choosing: Nuclear Reactors, What's New on this Page, New Reactor Licensing Activities.

INMM Panel Discussion in Recognition of Twenty-five Years of MSSP

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Abstract

January 2002 marks the twenty-fifth anniversary of the establishment of Member State Support Programs (MSSPs) in support of the International Atomic Energy Agency's Department of Safeguards. Over the past twenty-five years, more than seventeen member states have established MSSPs and contributed extrabudgetary resources to increase the effectiveness and improve the efficiency of IAEA safeguards.

During the 2001 INMM Annual Meeting, two special sessions were organized to recognize the contributions of the MSSPs over the last twenty-five years. The first session featured seven papers on MSSP efforts in specific technical areas. The second session included papers on the administration of several of the MSSPs and a panel discussion in which MSSP representatives discussed their views on the contributions made to safeguards in the past and the challenges facing the MSSPs and the IAEA in the future. This paper provides a summary of the panel discussions and the issues it addressed.

Introduction

During the 2001 INMM Annual Meeting, two special sessions were organized to recognize the contributions made by the Member State Support Programs to IAEA Safeguards (MSSPs) over the last twenty-five years. The year 2001 is the twenty-fifth year of the U.S. Support Program and the Canadian Safeguards Support Program (CSSP), the 24th year of the German Support Program and the twentieth year of the European Commission's Support Program, just to highlight a few of the milestones reached by the MSSPs.

The first session was held on Tuesday morning, July 18, and consisted of presentations related to contributions and experiences related specifically to the U.S. Support Program.[1-7] The second session was held Tuesday afternoon and had a more international flavor. Susan Pepper spoke on the U.S. Support Program, Gotthard Stein spoke on the German Support Program, Richard Keeffe spoke on the CSSP, Russell Leslie spoke on the Australian Safeguards Support Program, and Sergio Guardini spoke on the European Commission's Support Program.[8-12] The papers from these sessions will be published in the proceedings of the Annual Meeting. In addition to the presentation of papers, the second session included a panel discussion of issues related to the role of MSSPs.

Panel Discussion on Member State Support Programs

The panelists were Matti Tarvainen (Finnish Support Program), Richard Keeffe, Sergio Guardini, and Michael Rosenthal (U.S. Department of State) and the moderator was Bill O'Connor (U.S. Department of Energy and chairman of the U.S. Support Program's Subgroup on Safeguards Technical Support). The panelists were each given approximately five minutes to make a statement of their opinions and insights regarding the MSSPs. Afterwards, the audience was invited to ask questions.

Tarvainen based his statement on his experiences working with the Finnish Support Program since 1988. The objective of the Finnish program is to support the IAEA in research and development and implementation needs. He believes that important elements for ensuring successful tasks are 1) the support provided addresses the needs of the IAEA, and 2) the IAEA must be capable of receiving the support. The Finnish program is focussed on areas where the Finnish have expertise and where they have national interests, e.g., spent-fuel verification activities, environmental sampling, and final disposal of spent fuel. Tarvainen emphasized that the agency must contribute to support activities by submitting requests that represent genuine organization needs, investing sufficient time and interest, and fostering good communication. He stressed that good communication results in mutual understanding. He recognized that the IAEA's new approach of assigning project managers to topical areas already shows an improvement in task management. A future challenge to the IAEA will be implementing safeguards at new types of civil facilities, such as that for final disposal of spent fuel. The IAEA, the member states and the regional systems will

need new safeguards approaches and new thinking. He concluded his remarks with the statement that to improve the contributions made by MSSPs, the agency should concentrate on improving how it receives support. He believes that by avoiding internal development activities, experts within the agency can better focus on working with external MSSPs' experts.

Sergio Guardini stated that coordination and harmonization among MSSPs is a way to increase effectiveness by capitalizing on synergies and preventing redundancy. The European Commission (Joint Research Centre and Euratom Safeguards Office) is an observer in IAEA meetings with the UK Support Program and other MSSPs sponsored by countries in the European Union. This enables the programs to learn more about each other's activities. He noted that the IAEA needs tools to meet challenges. These tools will often reflect new technologies and will help the IAEA make decisions. In classical safeguards, decisions are based on statistics, but in integrated safeguards, the IAEA will need new criteria. MSSP research and development can lead to new criteria for new, non-quantifiable types of data, which could be contradictory, incomplete, fragmentary, vague, biased (purposely or not), or deficient pieces of information. A new IAEA R&D program that is continually updated is needed to link the IAEA's needs to the MSSPs' tasks.

Richard Keeffe sees a need to reduce the number of different types of equipment employed by the IAEA. The IAEA should identify common use equipment that can be used for more than one task. However, he recognizes that sometimes the IAEA wants more than one supplier or model to choose from so that competition will control prices and ensure availability of equipment over the long term. Equipment reliability must be improved through better and independent testing. He also addressed the issue of staff turnover and warned that it would lead to a loss of institutional knowledge. He opined that cooperation among MSSPs could address both of these issues. He recommended that MSSP cooperation be given careful consideration because although joint tasks generally go well, they require special effort. The objective, scope of work, schedules, and responsibilities must be clearly defined. Communication must be effective so that all parties understand and know what to expect.

Michael Rosenthal identified common themes among the presentations and panelists' statements: rapidly changing technology, introduction of new technologies, and a changing political environment including new legal documents. Challenges facing the IAEA include problems in defining requirements, assimilating and receiving MSSP contributions, coordination between the IAEA and MSSPs, an aging Secretariat, and IAEA budgets. He could offer no comprehensive solutions but he suggested that steps can be taken to address individual issues. The MSSPs should be more flexible and provide support in new ways that improve assimilation of the new product into the IAEA's tools. He challenged the MSSPs to find innovative ways to make contributions to the IAEA that minimize the burden the contributions can place on the IAEA.

Questions from the Audience

Following the panelists' statements, the audience was invited to raise questions. The first question asked for more information concerning problems that exist in receiving support from the MSSPs. Tarvainen used the example of the Finnish spent fuel repository. The design has been mature for some time and Finland is seeking a safeguards approach from the IAEA. Feedback from the IAEA has been inconsistent. The audience member opined that the IAEA needs input from the member state and the operator and he recommended that Finland provide input. At the Rokkasho Reprocessing Plant, the Japanese provide input to help the IAEA develop the safeguards approach. Tarvainen responded that Finland has provided input but they are being careful not to steer the IAEA to a conclusion.

An IAEA representative in the audience said that the perception that the IAEA is inundated with equipment is somewhat exaggerated. He indicated that although the Agency uses more than 100 different types of equipment, many are variations of the same instrument. Therefore, the amount of training required for inspectors and the maintenance requirements for the equipment are not as great as it may seem. He further stated that the Section for Safeguards Training gets support from many MSSPs and together with internal capabilities the Section can meet the agency's training needs. Keeffe responded that he did not mean to suggest that the situation with equipment or training was critical, but he believes that staff turnover will exacerbate the situation and that this will place additional demands on the IAEA and the MSSPs.

Another IAEA representative observed that some MSSP contributions have operational costs associated with them that must be borne by the IAEA and MSSPs should consider this when making the contribution. For example, the U.S. Support Program provided funding for the construction of a clean laboratory at Seibersdorf. The expense of maintaining the laboratory is a burden on the IAEA and assistance is needed. Rosenthal responded that this is a good example of an assimilation issue. The usefulness of a safeguards tool is dependent on the IAEA's ability to fully incorporate it into the organization's culture. If budgetary or technical constraints prevent the IAEA from assimilating the tool, the MSSP contribution is not complete. Keeffe acknowledged that gifts have associated costs. The agency has to consider the life-cycle costs before the item is accepted.

Up until this point, the discussion focussed on problems associated with IAEA utilization of support provided through the MSSPs. This negativity prompted an audience member to ask, in jest, why the MSSPs have survived so long when there appear to be so many problems associated

with them. He suggested that the MSSPs' longevity indicates that they have, in fact, been very successful. He noted that in 1987, and again just recently, the agency reinvented and restructured the management of its research and development program and its interaction with MSSPs to ensure that agency needs are met. This shows that while problems may occur from time to time in the administration of the support programs, steps can be taken to correct these problems and ensure that MSSPs provide necessary support in an effective and efficient manner. Tarvainen said that MSSP representatives are looking for continual improvement. A U.S. Support Program representative agreed, saying that the MSSP participants are dedicated to the process of increasing the effectiveness and improving the efficiency of safeguards. They want to make the MSSPs as effective as possible, and this may be the reason that they dwell on the negative.

A U.S. national laboratory representative addressed the vulnerability assessment of equipment and recommended that equipment approved for routine use be periodically reassessed. He said that new vulnerabilities emerge as technology advances. Keeffe agreed that vulnerability assessments have to be repeated. But what interval is appropriate? The IAEA should consider the encryption algorithms in use and keep potential vulnerabilities in mind.

Keeffe used the remaining minutes to observe that the IAEA's Research and Development and Implementation Support Program should be used by the IAEA to provide direction to MSSPs. The R&D and IS Program has not been used effectively in the past. However, the MSSPs are aware that the IAEA is making changes that will improve the usefulness of the program.

Session Overview

The INMM sessions, and particularly the panel discussion, provided an opportunity for representatives of the MSSPs to meet with other interested parties, including the IAEA and contractors, in a public forum to discuss issues of mutual importance. The MSSP representatives had the opportunity to raise issues of personal interest and receive advice from the other participants. There were also cases, such as the issue of training required for the operation of equipment, where the IAEA and the MSSPs obviously had differing opinions. The sessions provided an opportunity to discuss these issues and understand them better. The participants found the sessions to be very worthwhile and many participants wished there had been more time to continue the discussion.

It is true that MSSP representatives tend to focus on the areas where MSSP/IAEA cooperation should be improved. The wide range of objectives of the various parties can lead to frustrations. Both the IAEA and the MSSPs must clearly communicate their objectives for each task. For its part, the IAEA should recognize that MSSPs have national objectives, and it is up to the IAEA to take these into consideration in reaching the overall goal of effective international safeguards. Because of its severely constrained budget, the IAEA must stand strong against MSSPs that want to sponsor tasks that are not useful to the IAEA. The IAEA does not have sufficient internal resources to expend on managing MSSP tasks that are of questionable benefit to it. On the other hand, if the IAEA has a particular need for support, as is the case with the clean laboratory, the need must be communicated to the MSSPs or support will never be obtained. Of all the issues facing the MSSPs, communication between the various parties remains the key to effective cooperation.

Despite the need for improvements to the MSSP/IAEA interaction, the cooperation has led to many advances for the IAEA Department of Safeguards. Twenty-five years ago, before the MSSPs began, there was no Section for Safeguards Training, no unattended monitoring systems in use by the IAEA, no personal or portable computers in use by IAEA staff, and no information systems for in-field data collection. These tools were obtained by the IAEA, at least in part, through contributions from the MSSPs.

One does not have to look back twenty-five years to see strong evidence of MSSP contributions. Only ten years ago, prior to Programme 93+2, IAEA safeguards was very different from today. As a result of MSSP contributions over the last ten years, the IAEA now has established programs in remote monitoring, environmental sampling, and open source information collection and analysis. These programs were endorsed by the member states and their implementation was sponsored by the MSSPs.

Looking ahead to the future, the MSSPs can perceive needs of the IAEA. An aging inspectorate will require training at an increased rate in order for new inspectors to help maintain the organization's institutional knowledge. New safeguards tools are so complex that staff will require increased training to use and maintain them. New facilities placed under safeguards in a fixed budget will require that the IAEA implement more efficient methods of conducting inspections. New facility types being placed under safeguards will require the development of new safeguards approaches. An environment in which the IAEA must question member states' declarations requires that the IAEA maintain high quality operations to ensure that its conclusions are based on irrefutable data. The MSSPs are ready to help with these needs and others defined by the IAEA.

The MSSPs have a long history of cooperation with the IAEA, and look forward to many more years of cooperation in the future. It is necessary for representatives of the MSSPs, their contractors, and the IAEA to continue to communicate with one another to ensure that the ultimate goal of strengthened safeguards is met.

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Advanced Approaches to the International Oversight of Neptunium: Challenges and Opportunities

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Abstract
Recently, the International Atomic Energy Agency (IAEA) moved to place neptunium under international oversight in certain circumstances. The goal of this action is to provide the IAEA Board of Governors with timely notification of any steps taken to separate substantial quantities of neptunium from spent fuel or other matrices. This action was brought about by the recognition that neptunium can be used to produce nuclear explosive devices. Upon notification, the Board could take further action, such as declaring neptunium to be a special fissionable material and requiring measures like those applied to plutonium and highly enriched uranium. In this paper, we examine the occurrence and flow of neptunium in the nuclear fuel cycle and describe work being done at Los Alamos National Laboratory to generate novel ways of minimizing the cost of oversight.

Introduction
In September 1999, the Board of Governors of the International Atomic Energy Agency (IAEA) approved action by the secretariat to initiate a program of international oversight of neptunium (^{237}Np) and, indirectly, americium (Am). This action is based on the recognition that these are nuclear-explosive-usable materials. The board placed greater emphasis on the regime for ^{237}Np because of its greater utility in nuclear explosives.[1]

A major concern of the board was that the new oversight program be implemented in a cost-effective manner that would not detract from current safeguards on plutonium (Pu) and uranium (U). In this paper we will examine the occurrence and flow of ^{237}Np in the nuclear fuel cycle and look at possible approaches for the oversight of these materials. We will then suggest implementation options that offer the possibility of effective oversight at little additional cost. Finally, we will describe the research that still must be done if we are to achieve our desired goal of generating international awareness of the role of ^{237}Np in the nuclear fuel cycle, thereby minimizing the financial impacts on either facilities or the IAEA.

Background

Production of Neptunium
As shown in the reactions listed below, ^{237}Np is produced in the normal operation of nuclear power reactors. The primary production route is from ^{235}U by the successive capture of two neutrons to form ^{237}U, which subsequently decays into ^{237}Np. Uranium-237 is also formed by an (n,2n) reaction on ^{238}U. Because ^{237}U has a half-life of only 6.75 days, almost all of the short-term formation of ^{237}Np will have taken place by the time the spent fuel is discharged from the reactor. However, long-term formation (tens to hundreds of years) also occurs through the alpha decay of ^{241}Am, which has a half-life of 433 years. The following are reactions involved in the formation of ^{237}Np:

$$^{235}\mathrm{U} + {}^{1}\mathrm{n} \rightarrow {}^{236}\mathrm{U}$$
$$^{236}\mathrm{U} + {}^{1}\mathrm{n} \rightarrow {}^{237}\mathrm{U}$$
$$^{238}\mathrm{U} + {}^{1}\mathrm{n} \rightarrow {}^{237}\mathrm{U} + 2\ {}^{1}\mathrm{n}$$
$$^{237}\mathrm{U} \rightarrow {}^{237}\mathrm{Np} + \beta$$
$$^{241}\mathrm{Am} \rightarrow {}^{237}\mathrm{Np} + \alpha$$

In light-water-reactor (LWR) fuel with normal burnups (40,000 MWd/Mt HM [megawatt-days/metric ton of heavy metal]), the spent fuel contains approximately 350 g/Mt HM [grams/metric ton of heavy metal] of ^{237}Np. Further grow-in of ^{237}Np from the decay of ^{241}Am can result in concentrations of over 1,000 g/Mt HM of this isotope after a period of hundreds of years.

Occurrence of Np in the Fuel Cycle

Neptunium remains in the spent fuel with Pu as long as the fuel stays intact. If the fuel is reprocessed, these materials follow different paths in the usual PUREX process, as shown in Figure 1. After the fuel assemblies are sheared at a reprocessing plant, the contents are dissolved in nitric acid and chemicals are added to adjust the oxidation state of Pu, allowing extraction of Pu into an organic phase composed of tributylphosphate in a hydrocarbon diluent. In this first extraction step 237Np is partially extracted into the organic phase with the Pu and U. The extraction is usually incomplete because the change in oxidation state of 237Np is quite slow. The balance of the 237Np follows the fission products into the high-level waste tanks. The 237Np that remains with the other actinides may either be separated or allowed to stay in the Pu or U product streams. The separated Np is either stored (probably as an oxide) or transferred to the high-level waste tanks for eventual disposal with the fission products.2, 3, 4, 5

Because ^{237}Np requires high-energy neutrons to fission, it is not destroyed in the usual thermal reactor, such as an LWR. Rather, in the presence of its precursor, U, it will continue to accumulate.[6]

Disposition of Neptunium

In a once-through fuel cycle, essentially all of the ^{237}Np produced remains in the spent fuel through final disposal in a geologic repository. Because of ^{237}Np's long half-life relative to most other reactor products (2.1 million years), ^{237}Np and Pu are responsible for the bulk of the long-term radiotoxicity of the spent fuel.[2] Over time ^{237}Np will continue to build up because, as noted above, ^{241}Am (formed from decay of ^{241}Pu) decays to ^{237}Np. In high-level waste, ^{237}Np is vitrified along with the fission products for disposal in a geologic repository. As with spent fuel, ^{237}Np is one of the principle sources of long-term radiotoxicity of vitrified high-level wastes. Any ^{241}Pu or ^{241}Am in the waste will ultimately be transformed into ^{237}Np. For this reason there is considerable incentive for facilities to remove ^{237}Np in addition to other actinides for separate disposition. As noted above, ^{237}Np is not destroyed at any reasonable rate in thermal reactors. This is also true for ^{241}Am. Their destruction by transmutation would require specialized fast reactors or accelerators.

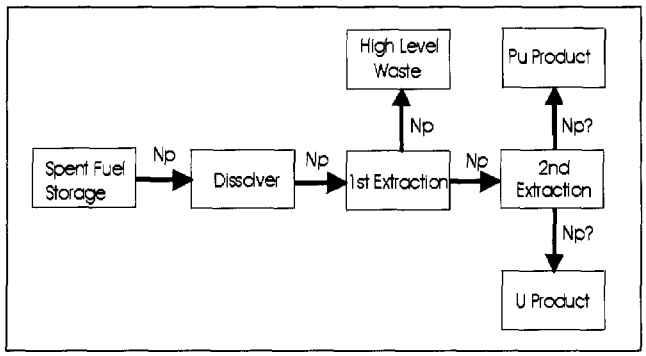

Figure 1

Oversight Options for Neptunium

The normal approach to both the domestic and international safeguarding of nuclear materials, such as Pu and U, is based on materials balance accounting. In this process measurements are made of the amounts of material flowing into and out of a facility over a certain period of time. At the end of this period, measurements are made of the quantity of material left in the facility and compared with expected inventory to assure that no material has been lost. Because all measurements have a certain amount of associated error, this results in a level of uncertainty regarding the amount of accountable material. For large facilities with high material flows, minimization of this uncertainty requires very careful and usually expensive measurement programs.

To avoid costs deemed unnecessary, the IAEA chose a novel approach in its plan to supervise Np use in states with comprehensive safeguards agreements. This approach, called flow sheet verification (FSV), does not have the usual objective of detecting the diversion of nuclear material. Rather, FSV is designed to ensure that facilities with the capability of separating purified Np streams are not so doing. FSV relies heavily on design verification and containment/surveillance technologies to reduce sampling and analysis. It is expected that most sampling and analysis would be limited to input and output streams.[1, 4] The determination of detection of separation may be based on the values of ratios of elements or isotopes in the various streams in a reprocessing plant rather than on the absolute value of the ^{237}Np concentrations.

In Search of a Cost-Effective Approach to Neptunium

Los Alamos National Laboratory has been investigating approaches to ^{237}Np oversight that would save resources by taking advantage of current technologies for protection of Pu in nuclear facilities. It is believed that these techniques can use current practices to provide adequate levels of protection of ^{237}Np at little extra cost. The technologies under investigation include the substitution of nondestructive assay for destructive assay, the determination of easily measured surrogates for ^{237}Np measurements, and the use of

statistically based sampling techniques to minimize the number of samples that must be taken for analysis.

The use of nondestructive assay techniques in nuclear safeguards is a well-established technology for Pu and U.[7] The desire is to extend these applications to the measurement of Np. In particular, it would be ideal to use instrumentation already in use by the IAEA. Work to date indicates that hybrid X-ray fluorescence and k-edge absorption techniques may provide a good way to determine the ^{237}Np content of solutions in a reprocessing plant.[8] The extension of high-resolution gamma-ray-spectroscopy techniques is another promising approach for the determination of ^{237}Np in solids.[8] In each case, the principle effort for implementation is in the development of analysis software. In the long term, it may be possible to take advantage of recent advances in calorimetry to measure separated Np with high precision.[9]

Determining the amounts of ^{237}Np by either taking advantage of measurements already being made or making new measurements that are cheaper than directly measuring Np and Am would result in significant cost savings. Using carefully calibrated reactor models, it has been demonstrated that, in the case of LWRs, there are a number of easily measured candidate surrogates for Np in spent fuel.[10,11] It has been found that the total Pu, the ^{240}Pu/^{239}Pu ratio, the ^{148}Nd/^{238}U ratio, and the level of ^{137}Cs can be used to reliably predict ^{237}Np concentrations. Total Pu and its isotopes are already measured as part of normal Pu safeguards, and the ^{148}Nd fission product concentration is measured to calculate fuel burnup at some reprocessing plants.[5] Another fission product is ^{137}Cs. Measurements of the strong gamma-ray emissions from ^{137}Cs in either the intact spent fuel before dissolution or in the dissolver of a reprocessing plant may be possible.

If measured in the input accountability tank, a statistical analysis of the surrogate-based estimation of Np input[12] suggests that total Pu is the best surrogate of the four candidates considered (total Pu, ^{240}Pu/^{239}Pu, ^{148}Nd/^{238}U, and ^{137}Cs activity in assemblies). However, ^{137}Cs activity measurement of individual assemblies might have a slight advantage over Pu in the input tank, depending on the typical burnup and Np mass for each assembly for each campaign. One component of this analysis involves the fact that if several assemblies are present in the input tank simultaneously and if the function relating ^{237}Np to the surrogate is nonlinear, then the use of the average surrogate concentration in the input tank will introduce measurement error. Those ^{237}Np-to-surrogate relations that are most linear among the four candidates would suffer least from this source of error.

As with Pu or U safeguards, the measurement requirements will depend on the plant size if we adopt typical loss-detection probability goals. Large throughput facilities require higher-quality measurements to achieve the same measurement error standard deviation for either an absolute concentration (σ_a) or a ratio-based detection of separation (σ_{ratio}). An advantage of a ratio-based FSV method is that, assuming that there is no loss of tracer material, detection of separation based on a ^{237}Np ratio will not be impacted by any volume measurements. Because volume measurements can be a large component of the σ_a, the σ ratio can be substantially smaller than σ_a. Based on work to date, it is anticipated that either absolute FSV or ratio-based FSV will provide an objective basis for choosing the number and quality of measurements required.

Recent work on statistically based sampling and analysis procedures indicates adequate estimation of the flows of ^{237}Np in a reprocessing plant from a limited number of samples taken at random intervals from a facility's input and output streams[13] instead of having to measure all batches. If proven with real facility data, this would provide a strong rationale for use of random sampling techniques in either a ratio-based or absolute approach to FSV.

Work to Be Done on Neptunium Oversight

While the studies to date are promising, there is still a tremendous amount of research to be done in developing a cost-effective oversight system for ^{237}Np. Some of these challenges are listed here:

- Conduct comprehensive studies of the utility of hybrid K-edge measurements in all of the streams of a reprocessing plant.
- Develop a better quantitative understanding of the production, occurrence, and fate of ^{237}Np in fuel cycles. This is particularly true in fuel cycles using MOX in thermal reactors and in fuel cycles using fast reactors to breed Pu.
- Using real data, validate the use of measurement surrogates for ^{237}Np in light-water reactors.
- Extend the surrogate technique to reactors burning MOX and to breeder reactors.
- Study the behavior of ^{237}Np in advanced reprocessing systems such as those that use molten salts.
- Determine the viability of statistical sampling techniques in real reprocessing plants, including a method of defining and detecting a "defective batch."
- Realistically estimate the variability in ^{237}Np flows in real facilities.
- Develop improved cross sections for calculating the behavior of ^{237}Np in reactors.
- Improve measurement techniques for ^{237}Np in vitrified wastes.
- Implement ^{237}Np oversight for advanced disposal options, such as actinide-burning reactors, and accelerator transmutation of waste.

Conclusions

Applying oversight to ^{237}Np in a cost-effective manner is an exciting challenge. This is true for traditional light-water-reactor-based fuel cycles, and it is even more true when considering more advanced fuel cycle concepts. The limited

work completed to date suggests that novel techniques can significantly impact ^{237}Np oversight if the necessary research resources are applied. Radiation-based, nondestructive analysis has long been used to make nuclear materials control more cost-effective. Extension of these techniques to ^{237}Np oversight will continue this success story. The recognition of easily measured surrogates for ^{237}Np in the front end of a reprocessing plant can significantly reduce sampling and analysis burden. This is even more the case when the results of the statistical studies of the sampling process are applied to reduce the number of required measurements from streams both entering and leaving a facility.

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International Target Values 2000 for Measurement Uncertainties in Safeguarding Nuclear Materials

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The International Target Values 2000 for Measurement Uncertainties in Safeguarding Nuclear Materials, published by the International Atomic Energy Agency, is available in its entirety on the Institute of Nuclear Materials Management Web site at http://inmm.org/topics/publications.htm, as a downloadable file. This issue of the *International Target Values* (ITVs) is the fifth revision. The ITVs were initially released in 1979 by the ESARDA/WGDA.

International target values are uncertainties to be considered in judging the reliability of analytical techniques applied to industrial nuclear and fissile material, which are subject to safeguards verification. The tabulated values represent estimates of the state-of-the-practice that ought to be achievable under routine measurement conditions. The most recent standard conventions in representing uncertainty and reliability data have been considered, while maintaining a format that allows comparison with the previous releases of the ITVs.

The report explains why target values are needed, how the concept evolved, and how they relate to the operator's and the inspector's measurement systems. *The ITVs 2000* is intended for use by plant operators and safeguards organizations, as a reference of the quality of measurements achievable in nuclear material accountancy, and for planning purposes. The report suggests that the ITVs can be used with benefit for statistical inferences regarding the significance of operator-inspector differences whenever valid performances are not available.

To access the complete ITVs 2000, go to http://inmm.org/topics/publications.htm. Please call INMM Headquarters or e-mail psullivan@inmm.org if you have any questions regarding accessing a copy of the ITVs.

The introduction section of the ITVs is published on the following pages.

International Target Values 2000 for Measurement Uncertainties in Safeguarding Nuclear Materials

1. *Introduction*

Safeguarding nuclear material involves a quantitative verification of the accountancy of fissile materials by independent measurements. The effectiveness of these verifications depends to a great extent upon the quality of the accountancy measurements achieved by both the facility operator and the safeguards inspectorate. For this reason a typical model of Safeguards Agreements[1, 2] stipulates that:

> *"The Agreement should provide that the system of measurements on which the records used for the preparation of reports are based shall either conform to the latest international standards or be equivalent in quality to such standards".*

Although the above requirement was directed to the facility operators, it indeed applies equally well to the safeguards inspectorates.

In the absence of relevant international standards of measurements, the International Atomic Energy Agency (IAEA) had defined in the 1970s a set of international standards of nuclear material accountancy[3], which lists the "expected measurement accuracy associated with the closing of a material balance" at five different types of nuclear facilities. However, these values have never been reviewed despite numerous technological changes since their adoption by consensus by a group of experts designated by their Governments. Safeguards officials and evaluators but also plant measurement specialists need more current and informative references regarding the performance capabilities of measurement methods used for the determination of the volume or mass of a material, for its sampling, its elemental and isotopic assays. Such information is needed for the various nuclear materials encountered in the nuclear fuel cycle.

The Working Group on Techniques and Standards for Destructive Analysis (WGDA) of the European Safeguards Research and Development Association (ESARDA) pioneered the way in 1979 by presenting a list of "Target Values" for the uncertainty components in destructive analytical methods[4] to the safeguards authorities of Euratom and of IAEA. Revised estimates were prepared in collaboration and published as the 1983 Target Values[5] after four years of extensive discussion and consultation with and within operators' laboratories and safeguards organizations. The international acceptance of the concept grew further with the next review, which involved, besides the ESARDA/WGDA and IAEA, the active participation of the members of two specialized committees of the Institute of Nuclear Materials Management (INMM). The 1987 Target Values, published as a result of this review[6], defined, like the previous editions, the values of "random" and "systematic" error parameters to be aimed for in elemental and isotopic analyses of the most significant types of materials using common destructive analytical methods. The same groups took a new step when they agreed to define with the 1988 edition[7] the values of the random error parameter to be met in the elemental assays as a result of sampling. Unfortunately, it was not possible at this time to include values for sampling uncertainties arising from systematic effects.

Following a 1988 recommendation of the IAEA Standing Advisory Group on Safeguards Implementation (SAGSI), the IAEA convened a Consultants Group Meeting in June 1991 to provide expert advice on international standards of measurements applicable to safeguards data. A concept of International Target Values (ITVs) was proposed on the model of the 1988 ESARDA Target Values and included estimates of the "random and systematic error" uncertainties originating from the measurements of volumes or masses of nuclear materials. The scope of ITVs was also extended to include a consideration of the non-destructive assay methods (NDA) which had won acceptance as accountancy verification tools.

Specialists from four continents took part in the discussion of the proposed concept. The ESARDA/WGDA held joint meetings with the ESARDA Working Group on NDA methods (ESARDA/WGNDA). The IAEA organized a series of Consultants Group Meetings with the participation of a representative from a large European reprocessing plant, of Brazilian and Japanese nuclear national authorities along with representatives of ESARDA, INMM, the International Organization for Standardization (ISO), the European Commission (EC) and IAEA inspectorates. The result was the publication of an IAEA Safeguards Technical Report in March 1993, titled "1993 International Target Values for Uncertainty Components in Fissile Isotope and Element Accountancy for the Effective Safeguarding of Nuclear Materials"[8]. Articles in the ESARDA Bulletin[9] and in the Journal of the INMM[10] widely publicized the IAEA technical report. The report itself was translated into Japanese[11].

International experts and panels have now reviewed the experience gained with the use of the 1993 ITVs and the progress made since 1993 in accountancy and safeguards verification measurements. These include ESARDA/WGDA, ESARDA/WGNDA, the Institute for Nuclear Materials Management (INMM), the Japanese Expert Group on ITVs 2000, Working Groups of the International Standardization Organization (ISO) dealing with analytical measurements in nuclear fuel industry and the Brazilian/Argentinean Agency of Accountability and Control of Nuclear Materials (ABACC). This report contains the changes made in the presentation of the ITVs and in some of the target values to reflect the latest recommendations of the experts.

An effort was made to bring the nomenclature in line with the latest recommendations of ISO[12], the National Institute of Standards and Technology (NIST)[13] and the European Association of Chemical Measurements (EURACHEM)[14]. A clear distinction for example is made between the meaning of the term "error" and the term "uncertainty". The ITVs 2000 indeed represent target standard uncertainties, expressing the precision achievable under stipulated conditions. These conditions typically fall in one of the two following categories: "repeatability conditions" normally encountered during the measurements done within one inspection period; or "reproducibility conditions" involving additional sources of measurement variability such as "between inspections" or "between laboratories" variations.

As in earlier publications the values listed in the present document have been derived from an evaluation of actual measurement data. Four sources of information were considered. The most relevant and complete set of measurement data still comes from the information gathered by safeguards inspectorates during the statistical evaluation of the results of the measurements reported by the facility operators and the results of independent measurements performed on the same materials by the inspectors[15,16]. This approach will be referred to as the "top-down" approach. These data were complemented and confirmed by "bottom-up" assessments of measurement uncertainty components published by measurement specialists[17-26] and derived according to the ISO[12] , NIST [13] and EURACHEM[14] guides. In addition and whenever possible, it was verified that the proposed ITVs were consistent with the results of laboratory intercomparisons[27-33] or measurement quality evaluation programmes[34-48]. In cases where little or no statistical data was available (particularly for sampling uncertainties), some values were defined on the basis of expert opinion.

The ITVs 2000 bear a date like the ESARDA Target Values and 1993 ITVs issued previously. This reflects the experience that the quality of measurements may improve with the development of newer methods and instruments. ITVs also reflect the current understanding of the structure

of the uncertainty components in nuclear material accountancy measurements. Changes can also occur in the future as this understanding improves or varies.

As with the previous lists, the ITVs 2000 should be achievable from today forward under the conditions normally encountered in typical industrial laboratories or during actual safeguards inspections. They do not represent the measurement uncertainties, which would only be achieved under exceptional or ideal laboratory conditions, or with most recently developed methods, which have not yet found wide use for daily and routine measurements.

Significant changes in the application of instruments and techniques have taken place since the previous edition. Measurements with instruments like high level neutron coincidence counters (HLNC), K-edge X-ray absorptiometer and fluorescence analyzers (HKED) are used routinely at the plants by inspectors with great success, not only to detect partial defects but also to verify the flow and balance of nuclear materials. This has allowed to decrease strongly the fraction of items, which need to be verified by chemical analysis. The latter methods are used now mainly for verifying the quality of operators' measurement systems and the absence of small but measurable biases in the closing of the material balances. Here, improvements were also observed with the combined use of Large Size Dried Spikes (LSD) and thermal ionization mass spectrometers with multidetectors and total sample evaporation for the verification of the uranium and plutonium content in spent fuel solutions and U/Pu fuel materials by isotope dilution mass spectrometry (IDMS).

It is expected that the ITVs 2000 will continue to be a motivating goal for beginner laboratories and a reasonable reference for experienced laboratories and safeguards evaluators. With the growing acceptance of modern quality assurance concepts it is suggested that the ITVs 2000 can also constitute a good reference against which analytical laboratories would validate their measurement system.

A complete copy of the International Target Values 2000 for Measurement Uncertainties in Safeguarding Nuclear Materials *is available on the INMM Web site at http://www.inmm.org/topics/publications.htm.*

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A Message from the New INMM Membership Chair

This is the space that the *Journal* devotes each issue to you, our members. If you have recently been promoted, retired, or experienced any other professional change of note, we would like to hear about it so that we can let the rest of the membership know. I encourage you to keep your colleagues informed by contacting either me at scott.vance @shawpittman.com or our *JNMM* Managing Editor Patricia Sullivan at psullivan@inmm.org. Please include photographs when possible.

Committee Notes

Look for several new membership initiatives to begin this next year. The Membership Committee plans to develop a comprehensive approach to encouraging university students to join INMM. (See Jack Jekowski's article on the graying of the nuclear workforce on page 10 for related information.) A new program to encourage students to submit papers for presentation at the Annual Meeting is also underway. If you see ways in which INMM can more effectively promote the benefits of membership to nuclear materials management professionals who are not currently members, contact a member of the Membership Committee. Your input is encouraged and appreciated.

In Appreciation

My sincere thanks go to Nancy Jo Nicholas for her dedicated years of service as Membership Committee chair. She leaves a huge void to fill, but remains active on the Executive Committee as a newly elected member-at-large. I anticipate calling upon her expertise often over the coming year.

A Commitment to the Members

INMM is a completely membership-driven professional society and I take the responsibilities associated with the position of Membership Committee chair with a strong sense of accountability to you, the members. The purpose of this organization is to promote development in all aspects of nuclear materials management, but this development will not occur if we do not have the active participation of our membership. If you are not currently involved in your regional chapter or technical division, seek ways in which you can become involved. Make suggestions. Attend the meetings. Use the INMM Web site as a tool to stay in contact with INMM, the Executive Committee, the committees, technical divisions, and the chapters. Most of all, use your own personal knowledge of nuclear materials management to encourage others in the field to strive for excellence. Remember, individuals outside of the nuclear industry do not know how to define "quality nuclear materials management," but they are quick to recognize the opposite. It is our job to make sure they never see the opposite.

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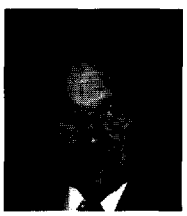
Meet the Member: Charles Pietri

Meet the Member is a new feature of the Journal of Nuclear Materials Management. *In each issue, we will feature a different INMM member, their contributions to the field of nuclear management and their contributions to the INMM. In our debut column, we feature Charles Pietri, INMM Annual Meeting technical program chair, and long-time INMM member.*



Name: Charles Pietri
INMM Annual Meeting Technical Program Chair
INMM Member Since: 1968
Technical Division Affiliation: Materials Control and Accounting, but also International Safeguards and Nonproliferation and Arms Control

Anyone who's attended an INMM Annual Meeting in the last ten years has benefited from Charlie Pietri's efforts. He is a tireless worker who has invested years of effort and thousands of hours into making the INMM Annual Meeting the premier event for nuclear materials management professionals.

His standards are high, and he expects the best from himself and everyone around him, including the hundreds of authors who present their papers at the INMM Annual Meeting each year. He takes his responsibility as technical program chair seriously and he expects all those who commit to presenting papers at the Annual Meeting to take that responsibility seriously as well—meeting deadlines and keeping commitments are important to Charlie Pietri.

When Pietri took over as Annual Meeting technical program chair ten years ago, the meeting consisted of about thirty-five papers, two sessions per day, and about 200 attendees. Since then, the meeting has grown dramatically: More than 300 papers are presented in forty-seven sessions with six to eight concurrent sessions each day and more than 600 attendees. Pietri's efforts are a big reason for that growth. However, he claims that "if Annual Meetings are successful it's because speakers and attendees are taking a more active role as full partners in making the meetings their meetings."

Pietri's first job in the nuclear field was with E. I. Dupont de Nemours & Co., Inc., first training at the Oak Ridge National Laboratory, Oak Ridge, Tennessee, in anticipation of the startup of the Savannah River Plant in Aiken, South Carolina, in 1951. He was transferred to the Savannah River Plant in 1953. "I was an analytical chemist and shift supervisor in the Purex separations and hot cell area, and later in the plutonium purification sector," Pietri reports.

In all, Pietri worked for the U.S. Department of Energy, and its predecessor agencies, the U. S. Atomic Energy Commission (AEC) and the U. S. Energy Research and Development Administration (ERDA), for thirty-six years. "During that AEC-ERDA-DOE period, I worked for the New Brunswick Laboratory for twenty-six years and ten years for the Chicago Operations Office," he said. He still lives in the Chicago suburbs.

He "retired" in 1996. But, Pietri continues to consult on laboratory and institutional management matters. He is a consultant to the New Brunswick Laboratory on analytical measurements and reference materials, and to the Office of Biological and Environmental Research on the protection of human subjects in research. He is the chief executive officer of HITECH Consultants, a consortium of individual scientists with a variety of technical expertise. In addition, he chairs the External Review Committee for the Savannah River Technology Center and has consulted for the Analytical Laboratory Department at the Savannah River Site. He was a member of the DOE Award Fee Performance Evaluation Board for the Midwest Research Institute and National Renewable Energy Laboratory from 1991-1996 and in 1998.

He is chair of the ANSI N15/INMM 5.1 Analytical Chemistry Laboratory Measurement Control Committee that develops guidelines for nuclear materials management, and for nuclear materials control and accountability in support of nonproliferation efforts. He is also the U.S. Expert (delegate) to the International Organization for Standardization (ISO TC85/SC5/Working Groups 3 and 12) on Accountancy Analyses in Nuclear Spent Fuels Reprocessing, and Measurement Methods for MOX Pellets; a consultant to the International Atomic Energy Agency on nuclear materials safeguards and quality assurance; chair of the IAEA Consultants Group that developed the 1993 International Target Values (ITV) and a contributing participant for the ITV from 1978 to 2000.

Despite his considerable and impressive list of accomplishments, Pietri says his greatest accomplishment as a professional is mentoring bright young professionals in the nuclear materials measurements community to take a prominent and active role in nuclear safeguards and materials management.

In his personal life, Pietri's commitment to young people is evident as well. He is active in the Boy Scouts of America as a national council representative, a past council president, and a past council commissioner. He is a recipient of the Silver Beaver Award, District Award of Merit, Wood Badge, and a 1990 Eagle Scout Honoree.

September 11 Attacks "Wake Up Call" on Nuclear Security

In the IAEA annual report before the United Nations General Assembly, the Director General of the International Atomic Energy Agency, Dr. Mohamed ElBaradei, on October 22 in New York City, termed the September 11 attacks on the United States a "wake up call" that more can and must be done to bolster security as an integral part of the management of national nuclear programs.

"The Agency is engaged in a variety of activities relevant to combating nuclear terrorism—including programs to ensure physical security, to help prevent and respond to illicit trafficking of nuclear material and other radioactive sources, to promote the safety of nuclear materials, to safeguard nuclear material against non-peaceful uses, and to respond to emergencies," ElBaradei told the General Assembly.

Each of these programs was being reviewed indepth to identify additional measures that need to be taken in light of recent events. In particular, expansion of the scope and reach of many of the IAEA's security and safety services was being considered. Existing conventions and guidelines, including the Convention on Physical Protection of Nuclear Material, would be examined to ensure that they were comprehensive and effective, and efforts would be redoubled to ensure their universal application, he said.

The IAEA is exploring the feasibility of establishing a fund for protection against nuclear terrorism, ElBaradei said. He said that he believes that the development of an effective global system for protection against nuclear theft, sabotage, and terrorism will be given priority particularly in light of current threats.

The full text of the director general's speech is available on the IAEA Web site at www.iaea.org/worldatom.

Secretary of Energy Advisory Board Executive Director Named

Secretary of Energy Spencer Abraham in November 2001 named Craig R. Reed executive director of the Secretary of Energy Advisory Board (SEAB), the highest external advisory board in the Department of Energy (DOE) that reports directly to the secretary.

The advisory board was chartered in 1990 to provide the secretary with timely, balanced, independent advice on the department's laboratory operations, energy, and national security policy issues, and other topics as directed by the secretary.

Reed joined the department as a senior policy advisor in the Office of the Secretary in June 2001. In this role, he has been principally responsible for coordinating the Department of Energy's implementation of the National Energy Policy. He will continue to serve as a senior policy advisor in his new capacity.

Before coming to DOE, Reed worked for seventeen years in the aerospace industry, in a number of business development and governmental relations positions. His most recent position was director of Space Systems Business Development for Lockheed Martin Astronautics in Denver, Colorado. Earlier in his career, he served as a legislative assistant in the New York State Assembly, and as a national security policy analyst in the Office of the Secretary of Defense and the State Department's Arms Control & Disarmament Agency.

INEEL STAR Fusion Facility Designated National User Facility

In November 2001, U.S. Secretary of Energy Spencer Abraham declared the Idaho National Engineering and Environmental Lab's Safety and Tritium Applied Research (STAR) facility a "national user facility," opening the facility's resources to increased scientific research from around the world.

The STAR facility houses specialized systems for investigating the consequences of accidents in fusion reactors. Learning to safely harness fusion reactions is a tremendous challenge. The facility is designed to host a number of experiments to determine how tritium, the "fuel" in a fusion reaction, interacts with other materials used to produce a fusion reaction. Currently, the STAR facility is hosting a collaboration between the United States and Japan to explore a number of fusion safety research initiatives.

In addition, Abraham said that the department's Environmental Management Science Program has awarded INEEL $1.5 million in grant funding over the next three years for research to support the department's Environmental Management cleanup program. The grants, which are to fund research initiatives to develop new approaches to dealing with the disposition of high level waste and the deactivation and decontamination of facilities, are part of forty-five research grants totaling $39 million.

NRC Sends Inspection Team to TMI

A Nuclear Regulatory Commission special inspection team was sent in late October 2001 to the Three Mile Island nuclear power plant to review the circumstances surrounding the separation of a steam generator tube. The Middletown, Pennsylvania, plant is operated by Amergen Energy Co. LLC.

During an in-service inspection of the steam generator tubes at TMI in October, as part of the refueling outage, Amergen found that a plugged tube had separated from the tube-sheet and caused wear on several adjoining tubes. During the previous period of operation, there was no indication of a problem. The cause of the separation is under investigation.

continued from page 71

Steam generators are components that transfer heat from the reactor systems to the power-generating portion of a nuclear power plant.

The four-member NRC team will develop an understanding of the separation and review the company's root cause determinations and corrective actions. The team will also perform an independent risk assessment and will ensure that appropriate corrective actions are taken before the plant restarts from its refueling outage.

An inspection report will be issued about forty-five days after the close of the inspection.

Japan Proposes 'Path to Total Elimination of Nuclear Weapons'

The government of Japan proposed a draft resolution, "A path to the total elimination of nuclear weapons," to the First Committee of the United Nations General Assembly on November 5.

A statement released by Japan's Ministry of Foreign Affairs said, "The government of Japan welcomes the adoption of the draft resolution on 'A path to the total elimination of nuclear weapons,' that it submitted this year to the First Committee of the United Nations General Assembly November 5 with overwhelming support by a vote of 124 in favor to two against, with twenty abstentions."

Each year since 1994, Japan has "submitted draft resolutions on nuclear disarmament and has enjoyed overwhelming support of the international community. This year Japan has also submitted a draft resolution indicating a practical 'path' to the total elimination of nuclear weapons in accordance with a progressive and practical approach, taking over last year's draft resolution in principle," the statement said. "This draft resolution was adopted by a majority vote as having basic principle to strong call for the total elimination of nuclear weapons, as well as incorporating measures to deal with the recent terrorism issues.

"The government of Japan intends to redouble its diplomatic efforts for nuclear disarmament and nonproliferation, in line with the adopted draft resolution," the statement concluded.

Calendar

April 14–17, 2002
NEI Fuel Cycle 2002, Westin River North, Chicago, Illinois, U.S.A. Sponsored by the Nuclear Energy Institute. Contact: Suzanne Phelps, Nuclear Energy Institute, 1776 I St. NW, Suite 400, Washington, DC 20002; phone, 202/739-8119; fax, 202/785-4019; E-mail, srp@nei.org

April 18–20, 2002
12th Annual International Arms Control Conference, Albuquerque, New Mexico, U.S.A. Sponsored by Sandia National Laboratories. Contact: Evangeline Clemena, conference coordinator, Sandia National Laboratories, P.O. Box 5800, MS 1203, Albuquerque, NM 87185-1203; E-mail, edcleme @sandia.gov.

April 30–May 1, 2002
North America Young Generation in Nuclear, The Ritz-Carlton at Tiburon, Naples, Florida, U.S.A. Sponsored by the Nuclear Energy Institute. Contact: Sonja Simmons, Nuclear Energy Institute, 1776 I St. NW, Suite 400, Washington, DC 20002; phone, 202/739-8042; fax, 202/785-4019; E-mail, sss@nei.org.

May 1–3, 2002
Nuclear Energy Assembly, The Ritz-Carlton at Tiburon, Naples, Florida, U.S.A. Sponsored by the Nuclear Energy Institute. Contact: Lisa Steward, Nuclear Energy Institute, 1776 I St. NW, Suite 400, Washington, DC 20002; phone, 202/739-8006; fax, 202/293-3056; E-mail, lis@nei.org.

June 23–27, 2002
43rd INMM Annual Meeting, Renaissance Orlando Resort at Seaworld, Orlando, Florida, U.S.A. Sponsor: Institute of Nuclear Materials Management. Contact: INMM, 60 Revere Drive, Suite 500, Northbrook, IL 60062; phone, 847/480-9573; fax, 847/480-9282; E-mail, inmm@inmm.org.