

JNMM

Journal of Nuclear Materials Management

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Mission Statement

The INMM is an international professional society dedicated to development and promulgation of practices for the safe, secure and effective stewardship of nuclear materials through the advancement of scientific knowledge, technical skills, policy dialogue, and enhancement of professional capabilities.

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A Time of Changes

By *Larry Satkowiak*
INMM President



Greetings!

Here in the northern hemisphere we are entering the season of autumn. I look forward to autumn and the changes it brings, cooler and drier days, the leaves changing color, harvesting fruits and vegetables. It's a time for reflection on the accomplishments of the summer and for preparations for the coming year. So change is also here at the INMM. Before our November Executive Committee (EC) meeting, the EC will be developing a budget, revising and updating our bylaws, developing strategies for expanding participation, and, because we are all volunteers, working our day jobs.

Annual Meeting

The Annual Meeting this year was superb. I want to thank and recognize the general chair, Corey Hinderstein, the technical program chair, Teresa McKinney, and all the staff of our headquarters management team. The technical program included 297 oral presentations, thirty-six posters, and fifty-two concurrent sessions that included three panel discussions. We had more than 630 in attendance representing twenty-nine countries. The Technical Program Committee once again pulled together an outstanding technical program.

Prior to the opening plenary, a brief awards and recognitions ceremony was held. The ceremony is covered in the report on the annual meeting that follows, however, I wanted to highlight and congratulate the four new Fellows of the Institute: Melanie May, Joe Rivers, Mark Schanfein, and Ken Sorenson. The

grade of Fellow may be attained only by advancement from the grade of Senior Member. Fellows are nominated by their peers and extensively vetted by INMM's Fellows Committee and Executive Committee. To be a named a Fellow is a high honor. It recognizes their long-term, dedicated service to the Institute. Congratulations to each of you!

The Opening Plenary Speaker, Rafael Mariano Grossi, Ambassador of Argentina to the International Atomic Energy Agency (IAEA), chair of the Nuclear Suppliers Group, gave a very captivating presentation titled, *The Nuclear Equation: From Fukushima to Teheran and Beyond—Challenges and Opportunities*. A transcript of his talk and of our Roundtable luncheon with him is presented in this edition of the *Journal*. Ambassador Grossi has had a stellar career and I expect to see him advance even further.

Welcome New Members-at-Large

Congratulations to Ken Sanders and Jill Cooley as our newly elected Executive Committee (EC) members-at-large. Their two-year term began October 1. Thank you to Brian Boyer and Joyce Connery for serving as members-at-large for the last two years. Jill Cooley began her term a couple of months early when Joyce had to step down upon receiving Senate confirmation of her nomination to chair the Defense Nuclear Facilities Safety Board. Congratulations, Joyce! Brian has recently taken a position at the IAEA. Good luck to both of you and we all hope you continue to stay active in the Institute in whatever capacity you can.

World Institute for Nuclear Security

This year is the tenth anniversary of an idea first proposed by a senior group of INMM Fellows—the establishment of a new international organization, the World Institute for Nuclear Security (WINS), whose role would be to share international best practices on nuclear security. With support of multiple organizations, both governmental and nongovernmental, WINS was established three years later under the leadership of Roger Howsley. WINS has been busy ever since, producing thirty-three International Best Practice Guides and publishing them in up to ten languages; delivering more than sixty International Best Practice Workshops in more than twenty countries; and launching the WINS Academy, the world's first international certification program for nuclear security management. WINS and the INMM continue this close relationship working together in many different areas. Ken Sorenson serves as our liaison with WINS.

Upcoming Events

January 11-13, 2016, the 31st Spent Fuel Seminar will be held at the Washington Marriott Georgetown in Washington, DC, USA. Sponsored by the INMM Packaging, Transportation, and Disposition Technical Division in partnership with U.S. Nuclear Infrastructure Council, this annual event specifically targets key issues in spent fuel management and is international in scope.

A Technical Meeting on Nuclear Energy and Cyber Security will be held in

Annapolis, Maryland, USA, April 17-19, 2016. This meeting is jointly sponsored by the INMM, the U.S. Naval Academy, and the American Nuclear Society.

And, of course, let's not forget INMM 57th Annual Meeting, July 24-28, 2016, at the Atlanta Marriott Marquis, Atlanta, Georgia, USA. Mark your calendars, submit your abstracts, make your reservations, and I will see you there!

For additional information on any of these events please check the INMM website at www.inmm.org.

INMM Ambassadors

As I had mentioned earlier, the EC is developing strategies to increase participation and membership in the Institute. In reality, professional societies succeed if they add value to the communities they serve. In the nuclear materials management community the INMM is the only

professional society that covers the breadth of technical and policy issues addressing the production, use, storage, transport, handling, protection, safeguards, security, accounting—essentially all aspects of the nuclear fuel cycle. People who are engaged in the INMM, give papers, attend the workshops and conferences, and become members, really understand the value of the Institute. By people, I mean all of you members. The membership is the Institute. In order to make the Institute stronger I want each one of you to become an INMM Ambassador. Reach out to your colleagues, employees, employers, funding agencies, etc., and talk to them about the value of the INMM. That is how I got engaged in INMM more than twenty years ago; my colleagues encouraged me to attend an annual meeting and present a paper. The rest is history.

2015-2016 INMM Executive Committee

President: Larry Satkowiak

Vice President: Corey Hinderstein

Secretary: Chris Pickett

Treasurer: Robert Curl

Immediate Past President:

Ken Sorenson

Members-at-Large:

Jill Cooley

Cary Crawford

Ken Sanders

Steven Wyrick



Providing Up-to-date Information

By *Dennis Mangan*
INMM Technical Editor



This issue of the *Journal* focuses on the 56th Annual INMM Meeting held in Indian Wells, California, USA, July 12-15, 2015.

INMM President Larry Satkowiak opens the issue with an informative column he appropriately notes as “**A Time of Changes.**” It’s a straightforward and brief discussion on recent changes in the INMM.

Teresa McKinney, chair of INMM Technical Program Committee, which has responsibilities for the execution of the Annual meeting, provides an excellent summary of recent Annual Meeting. It is worth reading to get a feeling for all the areas involved in the meeting. It also highlights the recipients of several INMM awards.

The **Opening Plenary Session** involved a speech by Dr. Rafael Mariano Grossi, Ambassador of the Argentine Republic to Austria and permanent representative to the international organizations in Vienna. Larry Satkowiak introduced Dr. Grossi, who gave an excellent talk on concerns resulting from events such as Fukushima. After the speech, Satkowiak and INMM Vice President Corey Hinderstein asked Dr. Grossi a couple

of questions regarding his speech. Ambassador Grossi’s speech was recorded, as were the questions and answers that followed. The transcription makes for interesting, informative, and excellent reading.

Following the Plenary Session, meeting’s technical program began. A lunchtime event involves a **Roundtable** discussion with the plenary speaker that involves a question and answer by many INMM members from members of the INMM Executive Committee, *JNMM* Associate Editors, who help with the development of issues of this *Journal*. (The list of the participants are listed on page 17. It is a broad group.) As with the plenary speech and the questions and answers that followed, the Roundtable discussion was recorded. Its transcription likewise reflects an interesting and informative discussion definitely worth reading.

The final event at the meeting that involved a question-and-answer atmosphere was the **Closing Plenary Session**. Three speakers made presentations on the topic of *Exercise—Not Just for the Gym*, which was followed by a question-and-answer session. This ses-

sion was very interesting, and this article reflects the transcription of the recording of the discussion.

Our regular features also appear in this issue of *JNMM*:

A Book Review by Mark Maiello, who did his usual excellent description in discussing the contents of *Command and Control*, by Eric Schlosser. He writes, in part, “We have never experienced an unplanned detonation either within the borders of the United States or in a foreign land that is over-flown with U.S. nuclear weapon,” and how fortunate we are. He captures a book that many of us would like to read, I’m sure.

In *Taking the Long View in a Time of Great Uncertainty*, Jack Jekowski does a beautiful job identifying and discussing a **World Full of Critical Uncertainties** and what can be done.

In closing, this is an excellent issue of the *Journal*. I trust you will enjoy reading it. If you have any questions or comments, please contact me. I can be reached at dennismangan@comcast.net



Report of the 56th INMM Annual Meeting Indian Wells, California USA, July 12–16, 2015

Teresa McKinney
Chair, INMM Technical Program Committee

We have all experienced many changes since our last annual meeting, but one thing remains the same—we had another great meeting! We experienced many modifications including a change in the INMM management company (The Sherwood Group merged with Kellen in early 2015) and changes in INMM administration (the addition of Executive Director Aaron Adair and Administrator Amy Lydic). But despite those changes, the staff once again contributed to an outstanding annual meeting. We were very happy to have Meetings Manager Kim Santos with us at the annual meeting as well as Conference Director Lyn Maddox and Marketing Communications Director Patricia Sullivan. Without all their hard work behind the scenes we would not have experienced such a special event. Thanks to each of you for your dedication and contributions.

The Executive Committee met on Saturday before the annual meeting to discuss details that occurred throughout the past year. This typically is our largest EC meeting since most members are also in attendance at the annual meeting. Sunday always proves to be a very busy day with all the extra events that take place: Containment and Surveillance Working Group, Destructive Analyses Working Group, and ANSI/INMM 5.1 Analytical Chemistry Laboratory Measurement Control Committee. Tom Bonner and his registration team opened the registration desk and were available throughout the remainder of the week. (Many thanks to Tom for stepping up



Louise Worrall receives the Early Career Award from INMM President Larry Satkowiak



Steve Bellamy receives the 2015 Edway R. Johnson Meritorious Service Award INMM President Larry Satkowiak



Michael Rosenthal receives the 2015 Vincent J. DeVito Award from INMM President Larry Satkowiak



Yung Liu receives the 2015 Vincent J. DeVito Award from INMM President Larry Satkowiak

to organize the registration committee this year!) All of the technical divisions met on Sunday afternoon before the President's Reception. The President's Reception provides an opportunity for all participants to meet-and-greet with our vendors and sponsors. We sincerely appreciate all our vendors and sponsors that participated throughout the week.

Monday morning began with INMM award presentations before the opening plenary speaker. The awardees were:

- **2015 INMM Early Career Award:** *Louise Worrall*, Oak Ridge National Laboratory
- **2015 Edway R. Johnson Meritorious Service Award:** *Steve Bellamy*, Savannah River National Laboratory
- **2015 Vincent J. DeVito Distinguished Service Awards:** *Yung Liu*, Argonne National Laboratory and *Michael Rosenthal*, NNSS Consulting LLC



Details regarding each of the awards can be found on INMM's website. Please take a few moments to read about the recipients' outstanding accomplishments. Congratulations to all!

The Opening Plenary Speaker, Rafael Mariano Grossi, Ambassador of Argentina to the International Atomic Energy Agency, and chair of the Nuclear Suppliers Group, gave a very captivating session titled, *The Nuclear Equation: From Fukushima to Teheran and Beyond—Challenges and Opportunities*. The Opening Plenary Subcommittee (Joyce Connery, Steve Mladineo, Larry Satkowiak, and Corey Hinderstein) once again suggested an outstanding plenary speaker. Keep sending the great suggestions! A transcript of the opening plenary session and the Roundtable Discussion with our plenary speaker are published in this issue of *JNMM*.

The technical sessions began immediately after the opening plenary. The full program included 297 oral presentations, thirty-six posters, during fifty-two concurrent sessions that included three panel discussions. We had more than 630 in attendance from twenty-nine countries. The Technical Program Committee once again pulled together a superb technical program. I heard many positive comments throughout the week. Thank you, technical division chairs, for your hard work on the technical program:

- Morris Hassler, Facility Operations
- Michael Whitaker, International Safeguards
- Mike Baker, Material Control and Accountability
- Mona Dreicer, Nonproliferation and Arms Control
- Tom Bonner, Nuclear Security and Physical Protection



New INMM Fellow Melanie May is congratulated by INMM President Larry Satkowiak



New INMM Fellow Joe Rivers is congratulated by INMM President Larry Satkowiak



New INMM Fellow Mark Schanfein is congratulated by INMM President Larry Satkowiak

- Jeff England, Packaging, Transportation and Disposition

Several brave souls gathered on Tuesday morning as part of the traditional unofficial early morning run. Everyone was back in time for the technical ses-

sions that continued throughout the day. The poster session began a little earlier in the day in order to accommodate a longer viewing opportunity for attendees. The poster presenters had great attendance during this session and were pleased with the challenging questions they were asked from attendees. The Annual Business Meeting was held on Tuesday evening and the results of the executive committee elections were announced. The results are Larry Satkowiak, President; Corey Hinderstein, Vice President; Chris Pickett, Secretary; Bob Curl, Treasurer, and Members-at-Large Jill Cooley and Kenneth Sanders. The outgoing Executive Committee Members-at-Large, Joyce Connery and Brian Boyer, were recognized as well.

Three Resolutions of Respect were read honoring our late INMM colleagues: Jeff Jay, Ruth Duggan, and Carl Bennett.

The new INMM Senior Members were announced during the Business Meeting. They are Kerry Dunn, Jeff England, Hironobu Nakamura, Ben Watts, and Steven Wyrick.

INMM recognized several new Fellows of the Institute. They are Melanie May, Joe Rivers, Mark Schanfein, and Ken Sorenson. Congratulations to you all.

The technical program continued on Wednesday and it was another busy day filled with papers and lunch meetings.

Closing Plenary

Thursday technical sessions were conducted throughout most of the day, and in the afternoon we featured our Closing Plenary Session: *Exercise— Not Just For the Gym: How to Strengthen Your Organization's Muscles Through Tabletop and Other Real World Exercises*. Panelists were Carla Boyce, Director of the National Exercises Division, Federal



Emergency Management Agency; Daniel Johnson, WINS Academy Manager, World Institute for Nuclear Security; and Rob Anderson, Counselor for Political Affairs at the Royal Netherlands Embassy. This was a very dynamic panel with different perspectives on how exercises can strengthen organizations. The Closing Plenary Subcommittee introduced this panel during the INMM 56th Annual Meeting with hopes to present a special INMM exercise during the 57th Annual Meeting. Stay tuned for details about this interactive experience during the next annual meeting.

After the closing plenary session, INMM President Larry Satkowiak and Vice President Corey Hinderstein announced the J. D. Williams Student Paper Award winners:

1st Place

Materials Control and Accountability Paper #109, *Simulation Study for Detection of Pin Diversion with Differential Die-Away Instrument Using Fresh Fuel*, by Alison Goodsell, Texas A&M

2nd Place

Materials Control and Accountability Paper #299, *Sensitivity Analysis of Neutron Multiplicity Counting Statistics Using First Order Perturbation Theory for a Subcritical Plutonium Benchmark*, by Sean O'Brien, North Carolina State University

1st Place Poster

Poster #369 *Nuclear Reactor Antineutrino Directionality via Elastic Electron Scattering in a Gd-doped Water Cherenkov Detector* by Daniel Hellfeld, Texas A&M

Division Winners

Education and Training – Paper #380, *Public Education During Commissioning and Operation of a Nuclear Power Plant in India*, by Dhaivat Mandavia, Delhi Technological University

International Safeguards – Paper #447, *Integration of Simulated Electrochemistry Data into a General Pyroprocessing Mass Accountancy Model, for Signature Based Safeguards Applications*, by Philip Lafreniere, University of New Mexico

Nonproliferation and Arms Control –

Paper #117, *Bilateral Nuclear Cooperation in the Post-Cold War Era and Its Implication for Nuclear Nonproliferation*, by Viet Phuong Nguyen, Korea Advanced Institute of Science and Technology

Nuclear Security and Physical Protection – Tie

Paper #221, *Large Volume Organic Liquid Scintillation Detectors as a Vehicle Radiation Portal Monitor Prototype at the 3rd SCINTILLA Benchmark Campaign*, by Marc Ruch, University of Michigan

Paper #361, *Game Theoretic Modeling of Physical Protection System Design Encompassing Insider Threat Analysis*, by Kyo-Nam Kim, Korea Advanced Institute of Science and Technology

Please continue to provide feedback regarding what you found most interesting or what you did not like about the annual meeting. We appreciate all your comments and can only improve if you provide feedback. Believe it or not, we are already working very hard on the 57th annual meeting, so mark your calendar to attend July 24-28, 2016, at the Atlanta Marriott Marquis. I look forward to seeing you there!



Opening Plenary Session: The Nuclear Equation: From Fukushima to Teheran and Beyond — Challenges and Opportunities

**56th INMM Annual Meeting
July 13, 2015**

The following is a transcript of the Opening Plenary Speech at the 56th INMM Annual Meeting, followed by some questions from INMM President Larry Satkowiak and INMM Vice President Corey Hinderstein.

Larry Satkowiak: I'd like to introduce our plenary speaker; Dr. Rafael Mariano Grossi is Ambassador of the Argentine Republic to Austria and permanent representative to the international organizations in Vienna. Ambassador Grossi holds a PhD in history and international relations from the University of Geneva, joined the Argentine Foreign Service in 1985 beginning a series of national and international positions. From 1998 to 2001, Dr. Grossi was representative of Argentina to NATO and SHAPE. From 2002 to 2007 he served as Chief of Cabinet in the office of the Director General of the Organization for the Prohibition of Chemical Weapons in The Hague.

Dr. Grossi has extensive experience in nuclear disarmament and nonproliferation affairs and diplomacy including as director general for political coordination at the Ministry of Foreign Affairs of Argentina from 2008 to 2009. In January 2010 he was appointed Chief of Cabinet in the office of the Director General of the International Atomic Energy Agency (IAEA) and from 2001 to June 2013 he was the Assistant Director General for policy of the IAEA.

From 2009 to 2010, Ambassador Grossi was Argentine Sous-Sherpa for the Nuclear Security Summit. Dr. Grossi



Opening Plenary Speaker Ambassador Rafael Mariano Grossi, INMM Vice President Corey Hinderstein, and INMM President Larry Satkowiak

has represented Argentina at a number of international meetings and summits including the first committee of the General Assembly of the United Nations, review conference of the treaties for nuclear nonproliferation, Sea Bed Denuclearization and Biological Weapons. At present he is the chairman of the Nuclear Suppliers' Group for the period of 2014 to 2015, and he has led as president the Diplomatic Conference to Amend the Convention on Nuclear Safety.

Ambassador Grossi will offer some prepared remarks and then Corey and I will have a discussion with him about the many areas of nuclear materials management in which his career has so far involved him. Please join me in welcoming Ambassador Rafael Mariano Grossi to the stage.

Ambassador Rafael Mariano Grossi: Good morning to all. It's a real pleasure to be here with you with this fantastic

conference, with this audience. It really humbles me to be talking to so many experts in areas where I have been working from a different angle, a different perspective perhaps. But basically the same issues. And from the title of my remarks, you may gather what my intentions are. My intentions are to try to highlight what I believe are the current challenges, the current issues that are shaping the nuclear agenda these days.

When I say from Fukushima to Teheran and beyond, I have in mind a number of things. Of course nuclear safety and all of the problems and the work related to it is one, and I hope to discuss this with you. The mention that is so obvious, especially on a day like this where an agreement might be announced on the issue of Iran's nuclear program, points to the strategic dimensions of these problems and beyond because it is quite clear that in spite of all the challenges, in spite of the problems, nuclear



Ambassador Rafael Mariano Grossi

energy continues to be and will continue to be a very important part of the international scene in the years to come.

People used to talk about — and it became a cliché in the past few years — a nuclear renaissance. Nobody ever defined clearly what that meant. But in any case what we know is that nuclear energy with more than 440 reactors in more than thirty countries continues to be a very clear part of the energy mix in many places. Whichever source or projection you may wish to look at, be it to the IAEA or any other think tank or academic piece that you may read, you will see that nuclear continues to present the triple advantage of lowering emissions, improving security of energy supply, and providing large-scale electricity at stable production costs.

So this means that nuclear energy is there to stay and this means for us, for you as practitioners, as experts for policymakers, that we need to deal with the challenges, with the problems associated with it, with the complexities that come with such an important industry. What I just said in terms of the continuity is proven by the fact that renaissance or not, the activity continues. We see it all

over the place. In this country, construction of new nuclear power plants continues and in Europe as well in spite of the problems associated and the debates associated with the post-Fukushima situation. Russia is a very clear case. China of course sited everywhere with twenty-eight units in construction as we speak. India, solid progress, six new builds at the moment. South Korea, still 20 percent of their national electricity production. In Latin America, my own region, plants continue. Argentina just started a new nuclear power plant, a fourth is being built. Two more are being considered in Brazil as well a third nuclear power plant has been completed and others may come later.

Then on top of this, we have of course a layer of what we know as the newcomers, those countries that have been aspiring some hope for many years to accede to the benefits of nuclear energy generation. And we see that happening. Clearly the United Arab Emirates building is well underway with four units. And in other countries including, in the Middle East, Saudi Arabia, Egypt having revived its plans to go for nuclear after a few years. So this very, very rapid, overview tells us that the situation that we have in terms of nuclear energy around the world is quite active.

We have three axes that I believe could help us in analyzing how this could evolve, what we should do as policymakers and where the challenges are. These areas in my perception are safety, security, and nonproliferation.

The first, in my opinion, is nuclear safety. It is in the nature, perhaps it's in human nature, but in particular in nuclear, that the safety equation evolves every time we have a problem or a crisis. Perhaps it is inevitable, perhaps it's impos-

sible to gather and master the political will to do something in the absence of what is perceived as a need to do it. But, of course, after Chernobyl, after Fukushima, and there were other smaller but still important instances like Goiania, like Toms, that we all know and are familiar with that prompted or facilitated a move in the tectonic plates, so to speak, of the nuclear safety equation.

Quite clearly, after the Fukushima accident we had one such moment. After that experience, there were a number of institutional and national reactions. I think that within hours many around the world knew more or less what the problems were and what needed to be done. Of course, institutions take a little bit more time to react. But the reaction did not wait for long. Already in June of that year a ministerial conference was convened in Vienna at the IAEA and an action plan was agreed. We are waiting for that. Many countries including the United States and some in other parts of the world started with back feeds and concrete action to improve the safety of nuclear facilities.

The IAEA in particular agreed on a plan that focused on a number of areas where the international community agreed there could be some collective action. Those referred to very general, generic issue areas like having more use of the peer review system that exists in the IAEA, working together better on emergency preparedness and response, looking at the safety standards. As you know, the IAEA through its committee on safety standards sets those and those are not binding but they do have more than a moral, a practical force and they are applied to the letter in many, if not all, countries. So, that was an area where work started also.



In some parts of the world like in Europe, a directive was approved clearly stating new obligations and objectives for countries in terms of the way in which nuclear power plants would be designed, sited, built, and operated. And introducing also the idea of more peer reviews at a regional level providing for safety assessments, more regular activity of this type. As we can see, there was some institutional reaction to what had happened and at the same time, as I said, countries started to work on what needed to be done.

One has to recognize that in the area of nuclear safety, we don't have in legal terms an instrument that would indicate in clear terms how nuclear facilities should be built or certain obligations should be laid out in an obligatory fashion. What we do have is something called the Convention on Nuclear Safety (CNS). This Convention on Nuclear Safety, painfully negotiated a few years ago, ended up being an incentive instrument. When I say incentive what I mean is that countries should do certain things, this is the legal and semantical way to put what the obligations are in terms of that instrument and that to make sure, or perhaps not to make sure, to see what's going on. Again, a peer review mechanism would be established to see to it that countries will be observing what would be happening.

Of course, after something so dramatic like the Fukushima accident, immediately all eyes were turned to this convention and the mechanisms to see whatever could be done to address the issues, to see what needed to be improved and try to do something about it.

In 2013 or beginning of 2014 Switzerland introduced a proposal for an amendment of that convention, mak-



Ambassador Rafael Mariano Grossi

ing this incentive instrument into an obligatory instrument. So changing, if you want, the nature of it and making it obligatory. Or making obligatory that states would make sure that in the way they would design and build nuclear power plants, radioactive releases would be avoided and so on and so forth. Of course for technical people like you, this raises lots of questions I'm sure and that was the case also in Vienna for the political technical mix that we have there. There were lots of questions about what needed to be done. I happen to be chosen as the president of the diplomatic conference that needed to look into this proposal and see what had to be done. And that was a very difficult moment, I would say, for our international safety community, if you allow me to describe it like this. Because what we saw immediately was that there was a very, very deep divide between those, of course, the sponsor of the initiative and some of our friends in Europe that believed that changing the instrument was the way to go, was the future, and the obligation

of the moment and those, including the United States, Russia, India, China, who believed that that would not be such a good idea, that changing the instrument would take us to an uncertain territory where we, until or pending the entry into force of any agreed language or provisions in the convention, we would have a very ambiguous, unclear regime where countries would not know exactly what applies to whom.

A little bit for those familiar with the situation around the area of nuclear security, what happens with the convention on the physical protection of nuclear materials task an amendment that has not yet entered into force because of the lack of the required ratifications. So we have a very difficult situation there. And I, as president of that process, saw it as an opportunity to move forward in a different way. Because what I felt in talking to colleagues, and let me remind you that this convention has only seventy-seven contracting parties, all the nuclear countries plus some others that follow these issues with interest. In this



community of seventy-seven what I saw were people telling me no, no, no, we are all convinced we have to do something about nuclear safety. The problem was there was a disagreement on what to do. In the end, as good diplomacy indicates, there was a middle ground that was the challenge of the president and, of course, with the help of the community. And that middle ground took the form and the shape of what we know in Vienna as the Vienna Declaration on Nuclear Safety which agreed on a number of principles that countries need to observe in designing and fabricating and constructing their nuclear power plants.

And on top of that this Vienna Declaration agreed on how to reinvigorate, how to give more meaning, and how to give real influence and real, I would say, importance to the review mechanism that we had. If you remember I mentioned that this was an incentive convention. So this incentive regime that we had to make it stronger and to introduce, if you allow me, an element of accountability. Perhaps you will still not have a legal obligation stemming from the legal text but we hope that in this process that we have started we will have improved the regime. There is going to be a followup meeting that we are organizing in Argentina. I felt it was my obligation as president to offer a venue to continue this discussion and we are aiming at a review meeting of the CNS in a year or so. So this is pretty much a work in progress.

The CNS is there. It has been shaken. We have to recognize that and we have to work better to make sure that we do have an international response to a situation like that of Fukushima. But that is not the only case. For example, and I was mentioning this issue of the

previous crisis as triggers for action. After Chernobyl two, not one but two, conventions were agreed at record-breaking time in Vienna: one on the early notification on nuclear accidents and the other on international cooperation after a nuclear accident, two conventions.

When Fukushima happened, I was in the Agency. I was assistant director general for policy. These conventions were not invoked. No one thought that these conventions had any use. On the contrary, if you allow me a personal comment, my impression was that people wanted them to be, I don't know, set aside, forgotten. There was nothing useful that in the face of something like Fukushima could be derived from that convention. Of course, if you have a convention on early notification, which was conceived at a time where the Soviet Union existed and now we were watching the accident unfold from the screen of your phone or your smartwatch. What's the use of having that convention?

The same for international cooperation. Another thing, a very disturbing thing, a very worrisome thing I saw is that in the early days after the accident, offers for help could not materialize because of issues like insurance, like logistics that were not there. When people and many countries were coming with help to assist Japan at the time of tragedy, we could witness incredibly ridiculous, I would say, bureaucratic problems in front of this.

As you can see, there is a lot in terms of the legal international cooperation apparatus that needs to be looked at after something like Fukushima. So my hope is that in the near future we will be able to tackle these things in a practical way and provide with better, I

think we owe it to ourselves and to the international community out there, if this industry is going to thrive and to continue in the way we all hope. So, nuclear safety is, I wouldn't say a pending, but an open issue. One that is ongoing, one that needs constant attention and we are far from where we could be given a bit more resolve. This is safety.

Security, and there are very distinguished colleagues here, Joyce (Conery) and others that are working on that. The nuclear security area I believe is one where we can look back a few years and say we are now at a much better place than we were before. And we owe this to the Nuclear Security Summit in Washington in April 2010. Let me say that in years past even the competence of the IAEA on security matters was challenged in the Board of Governors consistently and systematically. Not only that the issue was still a problem in itself, but the competence of our Agency was being put to the test. So I think the great, the enormous benefit that we took from that process was that an issue, a relatively obscure issue, that was left to practitioners was put really up in the agenda of politicians around the world. So I believe that this is an area where we must be grateful and take pride in the efforts that have been made.

Fifteen metric tons, I believe, of HEU (highly enriched uranium) have been either down-blended or eliminated around the world since then, perhaps it's more. And when you compare that with the figures, remember Iran, with the amounts that are so essential and so hotly debated on the negotiations with Iran, well this amount was enough for 500 nuclear bombs maybe. And thanks to this process we don't have that danger anymore. The process continued and I believe next



year it will come full circle when people meet again in Washington to close this cycle of high-level meetings.

The challenge there or the open question there is: what next? And we need to make sure that we provide the institutional channels to continue this process in the best possible way. In my humble opinion there is an awful lot of groupings and institutions dealing with nuclear security and perhaps too much law may confuse the countries that are dealing with this issue so we may need to refocus and take stock of this great political success we've had. This is the second area I wanted to talk about.

The third area has to do with non-proliferation. And I would like to do it using two axes. One is the issue of safeguards, we have many experts on that from the Agency or from the United States and other countries in the hall. I'm sure that this is something that will elicit some dialog. And the other is the one of export controls. These two in my opinion are the ones that we need to be looking at in the next few years.

In the area of safeguards, again as was the case for nuclear safety, the international community has had this practice of reacting in the face of a big problem. And this was the case in the area of safeguards where after the very traumatic experience of Iraq where the abuse of the safeguards system was put to evidence, the international community reacted and reinforced the safeguards systems and mechanisms through the adoption of the Additional Protocol and other things in terms of systems, in terms of the way safeguards were implemented in countries.

In the past few years there has been a debate going on in the Agency and in safeguards circles on the possibil-

ity to evolve yet again, to take another step forward through what has been—it has received different names—the last one has been the state-level concept of the implementation of safeguards at the state level. Meaning by this new approach to safeguards, whereby inspectors would not limit themselves to observing certain technical criteria having been agreed by countries, but also would try also to integrate other sources of information to have a bigger picture, so to speak. This issue I must say has been a bit controversial because of some legal implications that may derive from it because of deposition of certain countries that would not be sure of what the implications of this would be vis-a-vis their respective safeguards agreements. The discussion continues. What is encouraging is that one can see that there is a recognition that the safeguards system of the IAEA needs to be protected, needs to be reinforced, needs to be more efficient, and needs to deliver what we all need.

The way to do this may be the object of discussion in the years to come, but quite clearly there is an area that will require attention. For this I believe that is crucial, very important to have a very open dialog between the IAEA secretariat and member states. Every time the safeguards system improved or evolved, it was done as a collective effort. There is no way you can have an improvement in the safeguards area without the full involvement and conviction of those who are inspected. There is no way around it. We saw that in India and I don't want to get too much into the details of that, but let's say this issue had a rocky start and then it was improved. My hope, as a former staff member, now as a governor, is that this dialog will continue because there is a need.

And of course, God willing, we do have at the end of today or in the next few days a good agreement with Iran, there will be an enormous, a huge burden on the shoulders of the Agency that will have to adapt to that, that will have to take this without forgetting that Iran is but one country. There is a lot of nuclear material out there that needs to be taken care of. And the world can be a difficult place. So this will have huge consequences and yet again, a need for the Agency in the future to integrate this big challenge and this program that will come to it as we see and read in the papers, perhaps for ten years, perhaps more. In any case it is a program changer situation that will have to be looked at in India now.

The last point and one as in safety in which I had the privilege, and I do have the privilege of playing some role, is the issue of export controls. Quite clearly the work of the Nuclear Suppliers Group (NSG) becomes more and more relevant. Not the work of the group in itself. Export control: controlling what happens in the real world, irrespective of who does it or which is the grouping who does it. Incidentally this is what we have. The NSG is what we have. But this NSG that came out of I would say a very small group of countries back in 1974-75 in London known as the London Club, a very small group has grown into something that has almost fifty countries and has an Argentine chair, so a different world from what used to be in the '70s.

Quite clearly irrespective of the nuclear agreements and the safeguards that we may have in place, countries trade and countries may steal and will steal to try to circumvent the norms that are out there. And we see it every day in the Nuclear Suppliers Group. The big



Ambassador Rafael Mariano Grossi

challenge for this group is to continue to be relevant as a technical group. I was in a very interesting conversation yesterday in the sessions; I was addressing these issues of the interfaces between the technical and the political or diplomacy and science and I think the NSG and the way it operates is a perfect example of that where politicians and diplomats need to know exactly what they are aiming at, need to understand exactly what they need to be looking at. This is not easy because this is a multilateral group with different persuasions represented and consensus is not always easy. It's a group that operates on the basis of consensus.

We have for the first time a dedicated technical group that is working there with us trying to tell us what are the improvements that we need to introduce to the lists that we need to bear in mind when addressing nuclear trade.

There is also the very big and difficult challenge of including in the group countries that are not signatories or parties to the NPT (Nonproliferation Treaty). The question would be perhaps could be

put in a catchy phrase by saying, NSG: be legal or be real. Many people say how come the NSG does not include India. That is currently trading in more than 200 items in the lists. Of course, others with the same conviction and perhaps in their own right might say, no, no, no if we do this we are challenging the tenets, the pillars of the NSG, which were to reinforce the Nuclear Nonproliferation Treaty by providing technical definitions of what needs to be checked, not an easy question to be answered. But clearly one that will need to be answered.

So as we can see, a lot of issues in front of us. A lot of questions from Fukushima to Teheran and beyond and I hope you found these remarks interesting and perhaps worthy of further discussions with you. Thank you very much.

Corey Hinderstein: What we have now is some time where Larry and I will have a little discussion with Ambassador Grossi. He gave us a lot of food for thought, touching on really all areas of our Institute. I think there are a lot of issues that we can press him on a little more, some

challenging questions we can pose. And also just get his perspective. As he said, he's been not just an observer but really a participant in some of the major events that have occurred in our field on the international, political, and diplomatic level as well as in his work connecting to the technical community.

Larry Satkowiak: I think several times you mentioned the potential deal with Iran. What are the implications for the IAEA if a deal is reached and if a deal is not reached what are the implications?

Rafael Mariano Grossi: Thank you very much. I think the agreement with Iran quite clearly would not be possible if the Agency was not there. That is a first point that we need to bear in mind. The role of course, this is a political negotiation which is recognized of course by the Agency. The Agency is not part of these negotiations but the Agency will be and is the only credible guarantor of whatever is going to be agreed. Without it, you would not have a possibility of simply having it because you look at the configuration of the P5+1 group and you will easily recognize that there could not be an agreement within that group on how this could be agreed. You could not have a group of technical people from those countries as a detachment or something like that, that could be performing that role. So, everybody recognizes that that is there.

At the same time we shouldn't forget that there is a pilot in process to the P5+1 process where the agency and Iran have been working for a number of years on a set of separate issues. They have been grouped in what is called now the framework for cooperation. It has also received many other names in the past. And under this set of issues the Agency



has been working also in a dedicated manner, apart from this. So there are like three legs to this, apart from what is the normal day to day inspection effort going on in Iran.

You have these three things. On the day-to-day business I would say little will change. There will be technical adaptations of course because we are going to have facilities that if one has to believe what one reads in the papers, there will be dramatic change for example, in the reactor in Iraq. So you will have to look into that in a different way and the facilities will be operating at a different pace and with different configurations. So that will have a direct impact on the inspection effort out in the field. That is one.

On the framework for cooperation itself, there is a huge political question which even if implemented by the Agency, will be resolved at the political table and this has to do with the infamous possible PMD issues—possible military dimensions. And this is a bit, the group of issues that have to do with the past activities. And as we all know, this is not only about only what happened, but for many experts this also may give indications of ongoing activity or future activity. So there is, I wouldn't speculate, all we know is that this issue is also being discussed.

And on the agreement in itself, in my remarks I pointed to the vastness of the inspection effort that will descend upon the safeguards department when this materializes. Which will require, I'm sure, institutional adaptations and of course money. This is all part of the discussion that will need to be maintained in Vienna.

Hinderstein: I wanted to touch on another area and I'm glad that Larry jumped

in on the question of Iran because in my mind I had questions if the deal was reached and questions if the deal wasn't reached. I didn't know which to ask. You read the news this morning that there may be a vetted deal that was reached but we don't know what it is.

It touches on what you mentioned, which is this time of uncertainty. There's another area of uncertainty that is related to Iran but not directly to application of safeguards in Iran. And that is, looking back at what happened after Iraq in the early '90s and the recognition that the system needed to be improved and the evolution of the Additional Protocol out of that, are there lessons that we should be taking out of the Iranian situation, not for Iran but for how we think about the safeguards mission more broadly? I don't think we have as pivotal a moment in the sense of discovery of a lot of activity. But we have slowly seen this definition, for example, of Additional Protocol Plus and the application of Additional Protocols Plus in Iran. And some have questioned if we need to do that in Iran, do we need to do that more broadly. Can you tie that issue into what you were also talking about when you mentioned the evolution of safeguards with a state-level concept, etc.?

Ambassador Grossi: It's an excellent question but one that has many ramifications I would say. When you referred about Iraq, of course, in UN Security Council Resolution 687 scenario, everything is clear I would say. Of course, nothing is clear and it was awfully difficult. But in terms of the mandates, in terms of your capacity to move around, you have everything you need. Of course, challenges will be there and in some cases even danger. But you do

have a very clear set of measures and powers.

The Additional Protocol of course provides a broader tool for the Agency for international inspectors to integrate, to have more access to things, and to integrate more information.

In the case of the Additional Protocol (AP) class issue that you are referring to, this is a clear recognition of the fact that we did have moments like in 2009 where the revelation of lots of undeclared activity was that they had been doing things that they should have been declaring and that they should have been putting under their inspections regime. One may say yes, more is needed. At the same time we do have political realities and neither the Agency nor I think any country could have the ability to roam around countries around the world looking for the impossible.

As the Romans used to say, *summa ius, summa iniuria*. If you take the law to the extreme you get into a very difficult situation where you'll be, and I think Hans Blix said it much better than I said it now when he said, we couldn't simply go around looking for the impossible. What we need to make sure is that we have a system with the Additional Protocol or without for those countries that seem to be having a CSA, that will function well and that the safeguards department will have the ability to analyze as much information as it possibly can to have early warnings of situations.

My impression is that when you look at the safeguards, the way countries have been behaving, you will see that by and large the system has been functioning pretty well. In the cases that we know that put problems were cases with geostrategic challenges and problems where this issue while very, very disturbing did not come as



a total surprise. So I think one has to come in to combine these things in a reasonable way. To create a super-agency that will be looking under each table will be very difficult and would, as I say, distract from the main effort. But quite clearly cases like Iran and the Additional Protocol Plus (AP+) indicate that there needs to be a tailor made reaction. You cannot say, to be more clear, that because of what happened in Iran you will have to go for an AP+ system around the world. That would be excessive, costly and perhaps unnecessary. One has to be reasonable.

At the same time the international community needs to be reactive. The IAEA needs to be sharp and to come back to something which for me it's very obvious and it may sound even silly, but you need to talk. With the slightest doubt there has to be a very close interaction with countries and the board has to take full responsibility for what happens. And I see, if not a deficit, a need to do a bit more in that area.

Satkowiak: You had suggested perhaps an Additional Protocol Plus. I know it's prohibitively expensive to try to apply this worldwide. Would it be possible to negotiate where Iran is placed under a Protocol Plus regime for a short time period to demonstrate their acceptance of the international norm, put them on probation so to speak, then they're released from probation?

Ambassador Grossi: In Iran? I think this is the idea. I think this is the philosophy of what is being negotiated which is a very reasonable one. As you know there is this parallel system of inspection measures, the Agency corroborating the compliance

with them, and the lifting of sanctions, which has been the main driver of the whole process. I believe this is what we are going to see. We shouldn't forget that if this is happening, if we have something that goes beyond the Additional Protocol, it's not because this is something that is systemically necessary. It's because Iran was not observing their own obligations. So we, the international community, must go and look at those places and make sure that all those undeclared activities do not repeat themselves.

It's a fascinating situation. We'll have to see how it goes. But quite clearly one that will become at least for this country, a semi-permanent situation. When we talk about ten years or perhaps even more, there will be a very stringent regime imposed, which I hope will be a very, very powerful deterrent for others who may have the bad idea of cheating.

Satkowiak: Wouldn't you say that the whole situation in Iran is in a sense an example of a failure of the export control regime at that time? And how has it improved since then?

Ambassador Grossi: I wouldn't say so because what's happened, yes, the work elements of procurement in what happened. So in that sense you can say that the export control regime may not have served its purpose. But don't forget that many of the things that they may have obtained came from countries that are not part of the NSG, for example. And some others were domestically developed. So, I wouldn't say that it was the failure of the NSG as such, although I must say, through the NSG you could see many of the things that were ongoing and still.

This is, of course, not public information but for those working in that, that is very clear when you look at the figures and the trade.

Hinderstein: I'm going to ask one more question. I wanted to pick up on Larry's point, changing the topic to the NSG.

One of the biggest moments of strengthening of the NSG was the revision of the dual use approach. And I think that sustained the NSG relevance in a time when some were questioning whether they were missing an important element. So, my question is looking forward. Is the NSG well positioned, are the NSG members committed to thinking about the next challenge rather than the last one? You mentioned the power of catalyzing events to change institutions, whether it be Chernobyl or Fukushima. And without a catalyzing event, is the NSG in a position to look at things like different approaches to fuel cycles, new kinds of dual use commodities, additive manufacturing is one that is brought up regularly. What do you think about that?

Ambassador Grossi: Thanks for that question because it's something I could have mentioned and didn't. Like you said, this fundamental review was a very thought-out exercise. Took more than three years and no less than fifty-something amendments to the lists, especially the dual use list. But not all were agreed at technical level. As a result of that we were able to solidify the technical leg to the NSG which was nonexistent, again, because of political reasons. When we started this exercise we didn't have the capacity to process the things that needed to be done. Of course we were getting papers prepared by tech-



nical. But the technical side was not involved in the exercise so we had like an *ad hoc* thing, so countries would not be scared, in the form of a dedicated technical group. But now we were able to give continuity to this. And we have a permanent technical experts group. So work continues. You shouldn't forget that still it is a multilateral group and so the technical relevance of issues needs to be approved by all forty-eight countries, which is a bit of a challenge sometimes. Because, as we all know, there might be political reasons for countries not wanting to be very sharp about certain things.

But the process is there. So that is one part of the debate.

And the other one is this issue of expanding or not. The more political thing about the NSG, what I was describing as this "be legal or be real." Should we have all those who need to be there or should we adopt an approach which is more legalistic, no pejorative connotation to the word, in the sense that no, the NSG, one of your requirements, one of your obligations is to be a party to the NPT and if you are not, you are undermining the nonproliferation regime so you don't belong here. The thing is that you have countries there that if they are undermin-

ing, have been undermining it for many, many years and life goes on. And trade goes on. And the dangers are still there.

Of course, I as chair must be neutral and I'm providing for a dialog. I'm talking to these countries, India, Pakistan, and Israel, not to name them. And of course they have an aspiration to join or to be closer to the group and inside the group there is a huge political debate. What is good I think is that today and we see it in the work also of the 1540 Committee, of the MTCR (Missile Technology Control Regime), of the Australia group, and of others. I think there is a recognition that export controls are a necessity. Again, we are at a much better place from where we started when the issue of export controls was like a bad word and would trigger a very, very acidic discussion, whatever you would go for it.

Now, with the exception perhaps of one or two countries, I was there in New York for the much cited and suffered NPT Review meeting. I was focusing on the issues. I had an international hat like safety and NSG export controls. And you can see that the debate has changed completely. And this is a good sign. So people are not questioning them anymore with the exception of one country I

would say, or two. But in general people recognize that if you want to be in nuclear, that if you want to be serious in bio, that if you want to be serious in chemical, you need to be a responsible actor and you need to inform what you do and how you trade in these issues. So I think there is some hope even in that area.

Hinderstein: The hope is nice. I think recognizing that we have evolved, that security is a fundamental principle. That export controls are a required element of the regime. I do think we may be questioning how, but we are less often questioning whether we should be approaching those issues.

Ambassador Grossi: Yes, yes, yes. That's the right way to put it.

Hinderstein: Thank you. I want to thank Ambassador Grossi for his comments. I want to thank all of you for your attention and your engagement. That will conclude our opening plenary session for today. Please join me in thanking our plenary speaker, Ambassador Rafael Grossi. Thank you.



JNMM Roundtable

Opening Plenary Speaker:

Rafael Mariano Grossi, *Ambassador of Argentina to IAEA, Chair of the Nuclear Suppliers Group*

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The Journal of Nuclear Materials Management hosts a roundtable discussion with the opening plenary speaker of the INMM Annual Meeting each year. The discussion is moderated by *JNMM* Technical Editor Dennis Mangan and participants include the INMM officers and the *Journal's* associate editors.



Dennis Mangan:

Ambassador Grossi, thank you for coming. Your presentation this morning at the opening plenary session was very good. I think it fit right in with a lot of aspects of the INMM with regard to the technologies and the activities we conduct. I liked your breakout of the safety, security, and nonproliferation, topics with which I think a lot of us can associate.

When you mentioned Fukushima, I thought about how one of the big problems they had was the breakdown of the

backup generators. They lost cooling and it really went pretty bad. I could equate the protection of those things both under security and safety. I just wonder when people are thinking about this safety, security, and nonproliferation, do they consider putting them together in a nice little package where they look at something and say, it's not only security but we have to worry about safety and we have to worry about the nonproliferation. Do you have any feelings about that?



Ambassador Grossi:

Let me first thank you for the kind invitation to join this very select group. I mean it when I say that for me this is a very special occasion. It's not every day that I have the opportunity to speak in front of such a qualified audience. I'm really honored. It's one of the reasons I decided to stay despite having a pretty

busy agenda back home. As I was telling (INMM Vice President) Corey Hinderstein, I have three countries and seven international organizations under my responsibility but nuclear is in my heart so I am very glad to be here.

This issue is a very difficult and complex one. I mentioned it in passing because of course this theme is so rich, when I was talking about the merits of the security summit since nuclear security has proven to be a rather contentious issue at the International Atomic Energy Agency (IAEA) in the past. The first question was how to make it fit in within the mandate of the Agency. And there was no clear or easy answer because the Statute dates back to the '50s and in those days we used to say things in a more simple way, perhaps in fewer words than today. But we meant the same thing.

So the exact wording of the IAEA Statute does not reflect nuclear safety as we know it today, but the mandate



exists. It refers to safety only but clearly that has to be explained in the present context. The idea of nuclear security as a distinct issue was challenged by many countries. There was this idea that nuclear security, was sort of a red herring, something that was an invention, not a real, but an artificial problem. But today everyone recognizes that it's a very, very serious issue that needs to be dealt with.

In the beginning the Agency reflected this focused approach in a very gradual way. A small office was all it had to work on nuclear security, and it was only very recently and after long deliberation that it was updated to a division level. But this is still a bureaucratic change that does not necessarily reflect a fundamental change in terms of the institutional approach.

When one looks at the budget figures, it is even more startling since the entire budget of the IAEA for nuclear security is less than 6 million Euro. Voluntary contributions have also been forthcoming, but these are by definition unpredictable. There has been a relatively encouraging development in the establishment of a Nuclear Security Guidance committee where member states wishing and willing to send an expert can do so. This has been a useful instrument to start providing policy orientation but it is a first step and not all countries participate.

There are other areas where there is more specificity especially in the area of nuclear safety. Nuclear security is a wider concept, so anything can be assigned to it. It reminds me of the debates we used to have on chemical weapons (CW) about what is a chemical weapon. Where you have dedicated CWs but at the same time, if you throw chlorine at someone, it's a chemical weapon as well. It depends on the intention and on

the way you deal with things. The point I am trying to make is that nuclear security is at the border with common crime, trespassing, hence less related to the operation of facilities.



Joyce Connery:

Ambassador Grossi, I want to add my thanks to everyone else's for your willingness to come here and your openness this morning in your remarks.

The question I want to pose to you stems from a conversation we had last night about the convention on nuclear safety, which for the past year has been the bane of my existence with the diplomatic conference and how that proceeded, which you were the president of that meeting. The Swiss proposal for an amendment came out of a very real concern the Swiss had. And obviously within Europe, the proximity of reactors, some old and some potentially new reactors, are a grave concern to the surrounding countries and so they have a legitimate issue there. Of course, it's U.S. policy to oppose amending the convention because we just don't think that going through that diplomatic process would actually result in any additional reduction in risk or safety improvement.

But in your other hat you are also the chair of the NSG, which I know has a different purpose and it's not for safety reasons but it's for security reasons. And when we were having the debate there about enrichment reprocessing, the solution said, which I thought was quite novel, was to set up a criteria-based approach as to what criteria one would have to have in order to be the recipient of enrichment reprocessing.

So my question is rather hypothetical and I won't hold you to any of your answer, but would that be a model on the safety side, particularly for emergent countries, not necessarily established reactors, but emergent countries that are looking to build a nuclear reactor that in order to transfer that technology and to enter into a contract that there would be at least a minimum criteria for that country that's becoming a new entrance to alleviate some of these safety concerns and maybe take them to the next level?

Grossi: Well, I think it's a very interesting idea. In terms of the newcomers or new entrants, there is one inescapable reference that is the IAEA Milestones Document where different steps are identified from the intention to start a nuclear program to the operation of an NPP. Yours is quite clearly an attractive idea and the IAEA concept could mature into a phased process including something like that. In my experience as (IAEA) ADG (Assistant Director General) for policy when I was visiting some countries, I saw some serious problems they were having with the regulator. Even for established users. And there is always the issue of the independence of the regulator. Germany has one, also very strong. France has one. But in some important countries you don't have an independent regulator worthy of that name. You have a regulator or a regulatory function that is still sitting in the promotional institution, and it's a very, very serious problem.

This in a way goes back to my comment about a future agenda for the IAEA and how we can add some regulatory authorities, or some authorities to the Agency to help us move that process forward. I know there's a lot of concern when you talk about giving mandatory powers to an international entity.



But quite clearly, and coming back to your example, if you don't have a regulator, you cannot run a nuclear power plant. What assurances will people have about what is going on?

I think that approach might really work. One could think of the milestones "plus" by adding some practical requirement to have it in place early in the nuclear energy induction process. By way of example, when I was in the Agency, Jordan was very keen on us helping them establish the regulator. They were really pushing the Agency to give them some help. I don't know where the issue is now. Jordan has been in this category for many, many years. So hopefully they will be able to come to fruition in one way or the other. But quite clearly that's a pending issue. So thank you for the idea.



Leslie Fishbone:

Thank you for your remarks. If the IAEA were asked to verify a substantial new undertaking such as a fissile materials

cutoff treaty or some disarmament treaty, it would likely require a substantial increase in the number of inspectors and in the support staff at headquarters to do all the necessary work to support them. That would require a big increase in the IAEA budget. And it might require yet more increase in the budget because some countries might say that, if there is an increase in the safeguards budget, there has to be a big increase in the technical cooperation budget. My question is, do you think this is feasible?

Grossi: Quite clearly if we ever have a cutoff treaty, which I hope will come

at some point, you will need to verify it. That's the point in which there is no disagreement. I think it's a matter of running the models and see which one adapts better. I believe that it still makes sense to try to embed it in the IAEA. Maybe in a specific form, not simply having a bigger safeguards department. Perhaps some semiautonomous or bigger subunit might be needed because there could be specificities and peculiarities in technical areas that are more applicable to an FMCT (fissile material cutoff treaty) than to normal safeguards. But I think it's a matter of running the models and seeing what makes more sense.

Already you remember at the time of the CTBT (Comprehensive Test Ban Treaty) negotiation there was this debate about creating an entirely new technical organization or park the CTBT within the IAEA. At the end of the day there was a lot of logic in having it separated, given the long and still open entry into force period.

For an FMCT you have all these years of experience dealing with nuclear materials in the IAEA so it will be a bit difficult to explain to the taxpayer that you have that existing verification capacity sitting there and dealing with nuclear materials and still you want to create another one. I still believe first it's feasible and we really have to push for that. I don't think it's impossible at all.

In terms of disarmament, it depends on what we have in mind. Yesterday we had this very good presentation by Laura Rockwood reminiscing and recollecting what happened with the Tripartite Initiative. So I think it depends on the instrument we get. The Statute of the IAEA refers to it, so the legitimacy is there if the political will exists to use the IAEA in support of disarmament measures.

What the IAEA clearly cannot do, is to try and negotiate or create measures in the field. It simply does not have such mandate.



Jack Jekowski:

Ambassador, thank you for your thoughts and all of the information you shared with us today. That not only makes us think a lot about what's going on, but also worry about it.

In doing scenario planning looking at long range futures for organizations, one my favorite questions I like to ask is, sounds very simple but it really isn't. And that is, what keeps you awake at night these days?

Grossi: I think what keeps me awake at night is nuclear safety. It doesn't really, but if I need to answer in this way, this is my big concern. Maybe I've seen too much after Fukushima.

I believe we are at a very, very fragile situation. Something like that could happen again. I think there is an urgent need to move forward on nuclear safety, with more dedication, I think. With all its dramatic aspects, what happened has not really convinced the majority that we do have a problem. That's my honest impression.

When it comes to political crises, there are some political crises with nuclear connotations and some without. Those political crises with nuclear connotations like Iran, we have the instruments to deal with that.

So yes, peace in the world maybe would keep us awake, but that goes beyond our work here.

In the current circumstances, in my



view, we need to focus on nuclear safety, nuclear security, providing sound support advice and guidance to newcomers, update and strengthen safeguards. These are the real issues, and there is a lot to be done there.

I think those are the issues for the next ten years in the IAEA. We have the expertise. We have a fairly large amount of I would say agreement on the fundamental problems.

When we were dealing with this CNS, the Convention on Nuclear Safety, I presided over a diplomatic conference to consider a proposal to amend it.

It was a very difficult situation from the very beginning because of the widely disparate positions. My biggest concern was to fail to deliver an agreed outcome. Just imagine the scenario: nuclear safety against the backdrop of Fukushima, a diplomatic conference in Vienna about nuclear safety ending in failure.

I think it would have been a very, very bad message and a severe blow to the credibility of our activities around the world. The headlines would have been devastating: Nuclear industry is stubborn, the nuclear community is deaf; they don't understand, they simply don't get it. And I saw countries that were considering that quite seriously, "Well, we come, we vote, we go home. This amendment is a bad idea."

And I'm thinking, am I listening to what these people are saying? And in the end, I think, reason prevailed. We saw that we needed to come together from this. The Vienna Declaration on Nuclear safety was approved.

The results can be judged as modest. Somebody told me, "Well, you had a diplomatic success, and since you are an ambassador, you are happy. But this is a failure in terms of safety. Not hav-

ing amended this Convention is a failure. You are happy because you got an agreement. But it is not what we wanted."

Well, it could be the case, but I think we managed to keep the integrity of the regime. We managed to keep everybody aligned behind the mission. True, this Vienna declaration has some promises we have to keep up with. And we'll see if we are able to do that. This is why I said we decided to invite people to come to Buenos Aires and to continue this, to prove that we did not simply paper over a political difference.

To sum up, in my opinion in nuclear security, we are in a better position than we were before. It doesn't mean that we shouldn't be very, very concerned about nuclear terrorism and the possibility of a malign or hostile use of nuclear material. But I think, that there has been a realization that the problem needed to be treated in a radically different manner. It's political determination of the highest level involving our presidents, or prime ministers, or counselors, or chiefs of government. In my country the counselor is the foreign minister.

So that would be my answer. In security we're better, but in safety I don't see the same commitment and degree of political concern. And I think perhaps nuclear safety is not as sexy to convince President Obama or whoever his successor is, to bring people and try to launch a summit process.

And of course there are countries that see nuclear energy as an energy in transition or an energy in disappearance. You would simply not have the same determination, the same commitment.

But there is something that needs to be done at our level, at the working level, at the state level, and see what we can improve. I think that is the big question

mark for the Agency in the next few years and the Agency is not paying enough attention. These conventions, I mean the CNS or the Joint Conventions on nuclear waste, are the Cinderellas of the system while in my view they deserve more attention and dedication. In Vienna, the secretariat provides water and coffee and they go away. They don't really pay the necessary attention to that. That is where I see work to be done.



Markku Koskelo:

As I was listening to your very interesting talk this morning, you mentioned that the potential agreement with

Iran would involve special inspections and things beyond the additional protocol, at least temporarily. It reminded me of the many conversations that I remember hearing about the fairness of the inspections from one country to another. For example, the fact that you would treat a country like Iran the same way as you would treat a country like Germany or a country like Canada. And in fact the Agency spends an enormous amount of effort doing safeguards in Canada and safeguards in Japan, neither one of which is particularly viewed as a proliferation threat.

But the current agreement seems to be rather rigid in terms of how the safeguards can be applied. In listening to your answers right here and now, it occurs to me that perhaps the differentiator that could be applied to how safeguards is being applied is the security culture and the safety culture in a particular country. And if both of those are in good shape, then perhaps they could get some relief from the safeguards regime



because isn't the concern really nuclear security and safety, not really just about safeguards?

Grossi: An excellent point but a very difficult debate. I'll tell you why. Is it because you are a law-abiding citizen who pays taxes diligently every year, that you should get respite from the IRS after twenty years on the basis of your good record?

(Laughter)

But the point is still logical, and poses a legitimate question. It's a pertinent point when you translate this into the safeguards effort and the limited resources the Agency has. So it is very logical to say, "Why should I keep going to Canada with such frequency? Are the Canadians going to proliferate?" Of course not. But in terms of the law and in terms of the obligations, in terms of the legal commitments and comprehensive safeguards agreements you still need to verify and there is very little you can do.

If you start looking at arguments to try to justify a decreased inspection effort in certain states, as I said, on the basis of past compliance then you create a lot of problems in terms of criteria and quantitative reductions, to name but two.

But this does not mean that the system is completely impermeable to change. As you know, the introduction of integrated safeguards, the existence of a "broad conclusion" are all mitigating factors that have led to very concrete and substantive reductions in certain cases, but as I said even this has limits.

I also believe that through a sensible application of modern technologies and an agreed approach at the IAEA board of governors on how to evolve in the system, it would be possible, really possible to move to a place where some will

get fewer physical inspection perhaps or these types of burdens that are quantifiable since you have a commercial background and you are in the industry basically more than the institutions, you will understand this.

So my recipe for this is that I would not go for something that would expose a debate that you cannot win. It's not winnable. You cannot say "because I'm good, less inspections for me and more to..." to whom?



Chris Pickett: Ambassador, in today's world where we have the age of the internet, overnight delivery, and non-state actors, you

mentioned the Nuclear Suppliers Group and export control laws. There's technology like 3D printers that are dual-use technologies. Do the export control laws of today even make sense in this type of world?

Grossi: Thank you very much. I think the NSG is also something that needs to look at and support, the export control must come out of the shadows. I think it's essential that we move to a situation where export control is part of that world. We were able to move a little bit forward with (UN Security Council Resolution) 1540. Although 1540 has a bit of a problem of being the offspring of a UN Security Council resolution that is seen by the vast majority of countries as an imposition by the big powers. It's something that they accept of course; it's mandatory and we do it. But we know there are technology areas that are extremely challenging.

Even today it's really amazing and I know that through your activities you are able to get some sense of what I'm saying. There is a lot of space for export controls to be refined, made more effective, and widely accepted and implemented. I think we are in the infancy of these things. Just a few years ago it was a free-for-all basically, that was what we had. It's incredible the degree of liberty and freedom that people had in the past to do all sorts of things which obviously led to infamous proliferation cases.

Yes, the big challenge is that you have all these fast moving technologies. This has enhanced the necessity of equipping these export control regimes with adequate technical analytical capabilities. Making sure that they are they are up to date in their own norms, and always aware of the things that should be looked at.



Gotthard Stein:

Some years ago the U.S. government launched an initiative for further nuclear disarmament with a vision of a "Global Zero" for a nuclear weapons free world. What is your perspective and assessment on the realization and implementation of such an ambitious project?

Grossi: Well, I think it was very visionary on the part of President Obama to talk about this. It took a lot of courage from the United States' perspective to address that, to say that this is an objective that could be shared even by the United States. Because in the past you can imagine—and perhaps it was said, I would have to see the record—that nuclear weapons were there to stay in that



part of the equation. And there may be many people that still believe that.

I think that the international community is struggling with this. You see that, you see recurrent efforts to try to tackle this issue from different sides. In the 1990s, it was through an Advisory Opinion of the International Court of Justice, the ICJ. Countries went to the International Court of Justice to try to have the International Court of Justice say that there should be disarmament and to ban nuclear weapons.

Of course the International Court of Justice was divided and you can cite the advice or opinion of the ICJ either way.

And now you have the humanitarian consequences movement that has been spearheaded by Austria and others, like Norway and Mexico. They have been trying to push that from that angle, which I believe still doesn't solve the issue.

I think we all agree that the consequences are terrible. The consequences of nuclear weapons would be terrible. I don't think even the United States is against that. And they have attended the last meetings.

I believe that those are aspirational goals that we should never take out of the agenda. They are like international peace and security for the UN. It's our goal and it should be our goal. I tend, and this is my personal opinion, to be a pretty realistic person. I don't think I will see nuclear disarmament. I don't think even my children will see that. But the aspiration should be there, should always be there. And in everything we do we must remind ourselves that it's part of the complex that we have subscribed to, including through the NPT (Nonproliferation Treaty). It's there in the NPT, and we should not question that in any way. And

we should remember that impossible things sometimes happen.

We cannot be so cynical to drop all sense of idealism in what we do. That's also our responsibility. May sound paradoxical or contradictory, but it is a realistic responsibility to keep a space for a dream. Because it might just come true.

Mangan: Unfortunately we are out of time. Thank you very much, Ambassador, for joining us and giving good answers and opening our minds in some areas. We appreciate it very much and hope you enjoy the rest of your stay. We're probably not the only ones who are going to be asking you questions the rest of the week.

Grossi: Let's keep the dialogue. I think it's mutually beneficial. There's a lot of work for all of us to do. Thanks again.



56th INMM Annual Meeting Closing Plenary Session Exercise — Not Just for the Gym

The following is a transcript of the closing plenary session of the 56th INMM Annual Meeting. This session featured three speakers and a question and answer session.

Larry Satkowiak: Good afternoon. Thank you for attending our closing plenary. Today our closing plenary is Exercise—Not Just for the Gym. That is how to strengthen your organization's muscles through tabletop and other real world exercises. Today we have three presenters.

Daniel Johnson is the WINS Academy manager from the World Institute for Nuclear Security (WINS). WINS has a close relationship with the INMM. The genesis of WINS came out of the Institute and we've worked closely with WINS over the years. I'm so glad that Daniel is here.

Mark Ledbetter is a section chief, exercise policy and doctrine, National Exercise Division from FEMA (Federal Emergency Management Agency) of the U.S. Department of Homeland Security.

And finally we have **Rob Anderson**, counselor for political affairs at the Royal Netherlands Embassy in Washington, DC.

The first speaker today is Daniel Johnson. He joined the World Institute for Nuclear Security in October 2012 and is responsible for managing the WINS Academy, the world's first international certification program for managers with accountability for nuclear security. Mr.



INMM President Larry Satkowiak and Closing Plenary Panelists Daniel Johnson, Mark Ledbetter, and Rob Anderson

Johnson has worked in a variety of organizations involved with nuclear security, safeguards and nonproliferation. He previously worked at Brookhaven National Lab where he supported the U.S. National Nuclear Security Administration's international nuclear safeguards and engagement program or INSEP. He has also worked as a nonproliferation analyst at the U.S. Department of Energy's China office and as a research assistant at the Center for Nonproliferation Studies.

He holds a master's degree in international policy studies along with a certificate in nonproliferation studies from the Monterey Institute of International Studies, which now has a student chapter of the INMM by the way.

Daniel Johnson: Thank you for that introduction. The idea for WINS actually came out of INMM exactly ten years ago

and WINS was formed a few years after that so WINS is now six years old and its genesis started in INMM.

Thank you also for inviting me to speak at this closing plenary session. I think this is a really important topic and in honor of that I've prepared a very elaborate, long PowerPoint presentation. I've been slaving over it for days and days. I'm going to use a laser pointer. Can we have it pulled up please. So this is my presentation. (Laughter)

I think the whole point, of course, is to avoid that scenario, which is why this topic is so important. I think the of method of fifteen PowerPoints in a row for a training course, I think that's a little bit old news and I hope we move away from that paradigm. I don't mean to be too hard on PowerPoints. I use PowerPoints, we all use PowerPoints. But let's just try to minimize their use in a training course.



This topic also has me thinking about competency and specifically, what are we training for? Competency of the concept is very old. In the last thirty to forty years, it's come to be understood that competency encompasses the knowledge, the skills, and the attributes of the individuals that you are trying to train. I'm going to get up on a soapbox here, but when we're talking about the knowledge based piece, I don't think in-person training should be so much about the knowledge. I think it should be more about developing the skills of the participants. Something we've been doing at WINS is trying to develop online courses so people can go in advance of the training and learn that knowledge-based study themselves instead of sitting through a bunch of PowerPoint presentations and getting knowledge that they could get on their own time.

I think this is also really important because, at least in the international nuclear security training context, I've talked to many people who have attended these courses or have been the trainers at these courses and you have a very wide disparity of knowledge and experience among the people attending these courses. So you have people with a lot of knowledge and experience and some people with essentially no knowledge. This becomes a big conflict because the training has to kind of be dumbed down for the people with very little knowledge. Then the people with a lot of knowledge are bored out of their minds. They're seeing information that they already know. So we do as much as we can to bring people up to a level of knowledge before the training happens and so everybody has a baseline level of knowledge, I think that's a positive thing that we can do.

This is something that we've seen in our WINS workshops. WINS is six years old and we've held sixty workshops, so I think we know what we're talking about when I mention this. What WINS tries to do is match the knowledge and experience of the practitioners attending our workshops, and that makes for a much, much more successful event and dialog.

When I think about this subject, I think about four specific types of training. It's not a comprehensive list. The other speakers will be talking about more types of trainings and maybe as an audience you can think about what other kinds of real world exercises we can do for the discussion. But the four I think of is first, the good old PowerPoint, which can be used in the right fashion. We do it in our workshops. But that's just a method to develop an idea that can be interrogated in small group discussion and discussed further.

The second method I think about is tabletop exercises. And I saw that during the week there were at least a few presentations about people who were doing tabletop exercises. I think that's great. The one I'm most familiar with in my little parochial world of nuclear security is Oak Ridge National Lab runs a tabletop called EnSight that is essentially like a large board game for participants to role play out, actors trying to stop malicious actions at a facility. I think Rob will talk about the style of tabletop in more detail.

The third model or methodology I think about is simulation. There are a few different types of simulations from very low fidelity to high fidelity in terms of realism. As was mentioned in my bio, I went to the Monterey Institute. Monterey holds semester-long simulation courses of an international treaty negotiation. It's an incredible way to impart

knowledge to students, to actually have them do the simulation themselves of the treaty negotiation.

A second thing I've experienced is by Brian Boyer and his team from Los Alamos who put together a really great course that they did through Penn State on the international nuclear fuel cycle and safeguarding the fuel cycle. As part of that course they created virtual models of facilities. You actually play the role of a safeguards inspector and through your computer you would walk into the facility, you count fresh fuel elements, you look into the reactor fuel pool, the spent fuel pool. It's an incredible way of learning. Instead of just being told all of this information you actually go and apply it and do it yourself virtually. I learned a ton from that.

And the final simulation I'm familiar with is my former employer. Brookhaven National Lab runs a course for safeguards inspectors and they actually take the entire Brookhaven site and they take a number of the facilities on site and they turn them into mock inspection facilities with fake declarations. So the safeguards inspectors get a declaration for a facility on the site and they actually walk around the facility and Brookhaven tries to hide things from the inspectors and sees if the inspectors can detect the undeclared activities. A really great way of training with fuel-based exercises.

The fourth method I think about is case studies and scenarios. And the first I really heard about this was reading about it in the *Harvard Business Review*. The Harvard Business School runs semester-long courses entirely based on case studies. This model of having students role play a case over an entire semester and then the CEO or the person involved in the incident coming in and



saying what really happened. This model has really spread throughout the world and it is a very popular model now. It can be scaled down; it doesn't have to be a semester long. It can be a much shorter scenario as well.

Kind of a subset of this, and something I want to talk about that WINS has been doing, is something called theater-based training. It's something we've been doing for a few years now working closely with the Japan Atomic Energy Authority, JAEA. We're running another theater workshop in December. We also ran a one-off event at the 2013 IAEA Nuclear Security Summit and I think some of the people in the audience were at that event. We also ran one on the sidelines at the Global Partnership meeting.

This idea of using theater-based training is not new at all. It's been done for decades. They've been using it extensively in industries like aviation and aviation safety and security. They've also been using it extensively in nuclear safety. The organization we work with, the theater production company, AKT, is based in the UK. They've been doing nuclear safety training for Sellafield and the other sites in the UK for a very long time. So we've just adopted this same model.

How it works is our partner has professional scriptwriters and professional actors, people that actually work on West End, so they're very good actors, and we give them a scenario, a specific nuclear security incident or emergency response scenario. The scriptwriter will then write out a play for us. The actors will rehearse it and then they'll come to our workshop or events and actually play out the scenario in front of the audience, the participants. Gradually they'll stop the play and they'll ask questions of the participants about what they see. Even-

tually the audience will get sucked in and start to actually role play in parts of the theater production. It's a very powerful way of doing things. Everybody who has ever attended one of our theater events gives it unanimous praise. Everybody loves it. It's just really fun. That's the first benefit, it's just a fun thing to do.

The second benefit, I think, is this difference between show versus tell. In my mind, I think about stuff like this buzz word, nuclear security culture. People talk about nuclear security culture all the time. How do you train somebody on nuclear security culture? Do you tell them pedantically what nuclear security culture is? Is that effective? In my mind what's more effective is if you actually show the person what a good nuclear security culture looks like and what a bad nuclear security culture looks like. So theater is very effective at doing that.

Another benefit of theater-based training is you can overcome a lot of sensitivities that people have about discussing this topic. This is that something WINS has experienced since our foundation as people have said you can't talk about security issues because it's too sensitive. I think WINS has proven that that's not true. There are a lot of things you can talk about that are not classified, that are not too sensitive. But theater often brings people out of that shell and allows them to talk about things they might not otherwise feel comfortable talking about. This is really impactful in cultures with strong hierarchies, as well, where people are afraid of saying something that might be construed as criticizing their management. But when you're talking about a fictional yet realistic scenario, they're able to discuss their concerns and their issues more comfortably.

We do have another theater com-

ing up. It's based on the WINS Academy courses that we've developed. (It was held in Vienna on September 10-11 and is being supported by the U.S. Department of State.)

I'd also like to just conclude with a final remark, an idea, and I'd be interested to hear what everybody here thinks about this. It sounds like, from some of the discussions I heard this morning, that INMM is considering this. But for future INMM Annual Meetings I think it might be interesting if some of the sessions were completely dedicated to scenarios, exercises, multimedia, virtual reality, things where the audience would actually come in and, instead of sitting in chairs like you are now, actually participate in a scenario during an entire session. Just a thought. Maybe something that can be done at future INMM's. Thanks for listening.

Satkowiak: We're going to let each one of the speakers talk and offer their insights and then we will open up the floor to questions. I am now going to call up our second speaker, Mark Ledbetter.

Mark assumed the position as the National Exercise Division's Doctrine Section Chief in July 2013 following a twenty-three-year career in the U.S. Coast Guard as a marine environmental safety and security specialist. In his current position, he is responsible for the homeland security exercise and evaluation program that outlines the fundamental principles framing a common approach to the management of an exercise program and the conduct of individual exercises.

Prior to joining FEMA, Mr. Ledbetter was the Coast Guard's Exercise Policy and Budget Division Chief responsible for the coordination and development of



policy related to exercise design, development, execution, and evaluation. Mr. Ledbetter is a 1990 graduate of the U.S. Coast Guard Academy, is certified by the Emergency Management Institute's master exercise practitioner program, and is an adjunct instructor for the Coast Guard's contingency preparedness and response management school.

Mark Ledbetter: Thank you. My talk is going to be more generic today.

First, I want to talk a little bit about the national exercise program. How many are familiar with the top officials for the national exercise program? Raise your hands, I won't be offended. So the genesis of the top officials and exercise program started with WMD, weapons of mass destruction. We like to call it bad people doing bad things. However, we had a watershed event, Hurricane Katrina, that kind of changed the national exercise program. It had to evolve. It wasn't revolutionary that we evolved to help assess and improve the nation's preparedness.

If you think about an exercise and the national exercise program, it's here to foster coordination and build relationships. Those are the two things. I'd like to take away the first part is relationships and coordination across the nation. If you think of an exercise as a snapshot in time of a pixel, we're trying to get a whole preparedness picture, and we need a wide range of exercises across a gamut of activities. So we tie it back to the gym concept we have. You go to the gym, you work out, you're not going to do all arms or legs or backs because you'll end up looking like Popeye. You don't want to look like Popeye. So we want a well-planned routine that works across all of the muscle groups.

The same thing is for the national exercise program. We want to help examine and validate the core capabilities across the five mission areas of protection, prevention, response, mitigation, and recovery. Because again, as a nation and for any group out there, you want to be well balanced.

The next point I want to talk about is what I like to call the importance of the nontraditional exercise partners out there and the value they can bring to any planning and conduct with an exercise. So think of them as your workout buddy in the gym concept. They will help and guide you and push you to stretch your limits on the exercise. Some examples we like to think about are nongovernmental agencies, American Red Cross, faith-based organizations, and the private sector. For the federal government we don't have all the resources; we don't have all the answers. The private sector is the backbone of the nation. They have a lot of resources and they have the knowledge that needs to be brought to bear.

Another is the media. We like to push the media away but here's one challenge I would issue. Try to bring them into the exercise. Because when that incident occurs, because it will occur, you will need them to help get the correct information out. We spend a lot of time out there trying to correct misinformation versus trying to get the incident back under control.

And the last one I'd like to talk about is the citizens. They are our true stakeholders. Because if you think about it, you're trying to work on a public information messaging for an exercise for an event. We may think the message is clear, but to Aunt Sally it's not. I have to feel sorry for my wife. I bring stuff home

all the time for her. I say, "I need you to put on your blinders and tell me from Mrs. Ledbetter, does this make sense to you on the messaging?" So I challenge you to do those two things. Get the media involved and bring in private citizens into your exercises and into your discussions. That way they understand what's going on when something goes wrong.

What I just described to you is what (FEMA Director) Mr. (W. Craig) Fugate, calls the whole community. It's a concept, it's everybody. In the past emergency managers, we would bring like type in. We'd have fire, police, emergency managers. But again, broaden your perspective on that.

I have two more points. Another piece that Daniel talked a little bit about is helping exercise shape the policy and procedures. I don't have a gym or workout analogy. But here's an analogy: You wouldn't buy a car without test driving it. Has anybody bought a car without test driving it? I hope not. As you go out there creating those policies and procedures, go ahead and run them through an exercise, a discussion-based, a full-scale exercise. Refine them as you're going through. It's an iterative process. The last thing you want is to have a new policy or procedure you haven't test driven and you find it's wrong. Don't think about it as failure, think about it as a continuous improvement cycle.

And the last piece that Daniel talked about which I really like the concept is actually having role players, a theater group come in. I know Washington has a lot of great theater groups. Maybe we could get some of them to come in. That might be kind of fun. I enjoyed that one.

The piece about that is about a scenario. I think adding a scenario to discussion base adds a lot of realism for the



participants. We want to engage the participants, the players during the exercise and a scenario brings that to life. But the things you need to think about are it needs to be realistic and tied to the objective of your exercise. Sometimes we get caught up, we call it the Tom Clancy syndrome. You can write a great scenario, crazy things going on, but you forgot about what you're trying to exercise in your test. So bring that back to real life. Have your workout buddy tell you, "No, you're off base, bring it back into reality."

And the last piece I'd like to leave you with is documenting the exercise. In my world, if it wasn't documented, it didn't occur. So you've been to the gym for the last six months, you've been working out, you're ready to show off how buff you are to your family and friends. Same thing with an exercise. You need to let people know it occurred because it will help document some of the very important lessons learned, areas for improvement, and strengths that you have you need to share with everybody.

The one piece for Daniel I'd like to add onto is the training piece. We think of exercises a little differently than that. They help validate the training that Daniel puts on. So think about that, training and exercise. We don't know what comes first, the chicken or the egg. They're very important. We call it a symbiotic relationship. The whole idea that we're trying to do here and as we go out and talk about our role is get ideas. So talk with everybody out in the audience, talk about those exercises, what you learned. I love the idea of next year having the conference or the seminar being more exercised based. I think that would be a great way to spend three days, actually going through some very hard issues and getting to the resolution of some ideas. I look forward to con-

tinuing to work with the group and thank you very much.

Satkowiak: Our next speaker is Rob Anderson. Rob has been the Counselor for Political Affairs at the Royal Netherlands Embassy in Washington, DC, since July 2012. His portfolio includes Asia, Iran, and arms control and nonproliferation. In preparation for the Netherlands hosting the 2014 Nuclear Security Summit, he was responsible for coordinating the DC-based preparation activities and ran the media program during The Hague Summit.

Between 2008 and 2012 he was the First Secretary and Deputy Head of the Political Section of the Royal Netherlands Embassy in Beijing, China. Prior to his tour in China, he served at the Netherlands Ministry of Foreign Affairs in The Hague as the advisor to the Director-General for European Affairs from 2005 to 2008 and as the Policy Officer at the European Integration Department from 2003 to 2005.

Rob is an economist by training and holds a master's degree from Erasmus University in Rotterdam.

Rob Anderson: Thanks, Larry, for the kind introduction. Congratulations on a great conference. Congratulations to the organizers. I think a job well done.

What I'm going to do and I'm going to do it differently than the previous speakers because I have a presentation and a PowerPoint. I'm not going to bore you to death with that but I want to talk a little bit about a specific exercise that we did last year during the Nuclear Security Summit in The Hague and I think it's useful to show you a couple of things that we did that could help understand better what we did and why it was important. And why in the end it was fun, like Daniel said.

So in many ways our summit last year was not the average summit with world leaders. Yes, it contained all of the traditional elements: opening statements, speeches, national interventions, closing dinner, communiqués. But we also wanted to take the opportunity to have the fifty-eight world leaders in The Hague get to a point where they have a meaningful discussion and for that you need interactivity.

We did a bit of an experiment. I'm going to tell you a little bit about how we did that. Why bother, do you think? Isn't it better to organize a summit like all the other G7 and whatever because that's diplomacy, that's what diplomats do. But, our Prime Minister wanted to prevent exactly a situation that Daniel showed, namely, that we have a room full of people including the highest people in the world that are asleep while other people talk. He really pushed for this interactivity piece.

But for that interactivity we needed to have a clear plan. And we had to develop an exercise. That was a really big challenge. We needed to have clear aims, come up with a basic setting, develop a scenario and procedures. But at least as challenging was to get buy-in from other delegations because in the run up to the summit it wasn't sure at all that people were going to go ahead at this. In fact, I was at the Sherpa meeting in October 2013 in Ottawa in the run-up to the summit and there were a lot of critical questions, concerns by a lot of delegations why we should do this ranging from basic concerns like "but if we let our leader talk freely and have them vote on the button or give them an iPad, suppose he doesn't know how the iPad works and then everybody can see what a fool he is?" And there were some sub-



stantive issues as well. But we thought it was very important to have that substantive discussion with an exercise so we went through with that. And the key was to give the Sherpa community, the people who prepared for all of this, enough information in advance without disclosing the whole scenario.

What did we want out of it? First we wanted to raise awareness among world leaders. It's nuclear security. We were talking about preventing a nuclear terrorist threat. What are you talking about? And what is the threat? And why is this important to talk about at the world leader level. We wanted to provide the leaders with a realistic scenario and a realistic example of what could happen.

Second, wanted to provide them with an opportunity to give a little bit of insight into internal coordination processes. Whenever a crisis occurs, and the speakers know well, you've got to have your own house in order. You've got to communicate with your own agencies and a lot of people within your own government. Sometimes governments are not very well prepared for that. So we wanted to give them an example to show why it is important to have that internal coordination.

Third, discuss the benefits of international cooperation. Now as you all know, nuclear security is an exclusive right of national states, a responsibility. But in the case of an emergency, countries definitely benefit from coordinating their actions.

Last but not least important, and Mark also alluded to that, media. How do you communicate? Do you keep your public in the dark or do you disclose all the information you've got or something in between. This is very important for world leaders to think about.

How did we organize this? We didn't call this playing games or war games or whatever. We particularly called this a scenario-based policy discussion because leaders do not play games, at least not in public and certainly not while witnessing each other. So the focus should be on the discussion. But you don't get to get discussion instantaneously. You have to have something, especially when you ask leaders what if the unthinkable happens in your country. Therefore we need the scenario and convincing visuals that trigger such discussions.

On the basis of our goals, we formulated the setting that we wanted and we hired a consultant and actors to write the scenario for us and to produce supporting video. The setting was leaders plus three close delegates, a full conference table, no press, no other observers, and full interpretation in six UN languages. That resulted in an event where we showed scene-setter, a scenario on the basis of an escalating crisis in a country called Brenia, fictitious, of course, but realistic, where there was a terrorist cell with folks who wanted to steal nuclear or radiological material to attack key financial infrastructure in Brenia.

The video we showed, showed the cell, the ideology, and a fictitious national security team of actors who reported to the leaders. During that scenario and the evolving scenario, there were crisis updates and after each crisis update, leaders were asked questions about what do you do or what is your highest priority when something happens.

The first crisis update was the imminent theft or threat of a theft. And we asked the leaders, what do you do? Do you close up your borders? Do you make sure that all of your material is accounted for? Do you call somebody up? Do you

call the president of Brenia? We had the security team, and I would have loved to show you the whole video but unfortunately that wasn't possible. But this was the video with the actors where people were around the table discussing the priorities of the leaders.

So, the questions were multiple choice, there was no right or wrong, and the leaders could vote with buttons, anonymously of course. And they had to consult with their delegates about the choices they would make. Then afterward, we had a discussion where we summarized the answers, anonymously again, kicked off by our Prime Minister, and talked about that we see that nobody took the effort to call the president of Brenia. Why is that? Or we didn't inform the media. Why is that? We asked delegates around the room to respond to that and give their reflection on what they would think was their priority in the cases.

So, how did it work out? Well, our major concern was that a lot of leaders would actually leave the room. Up until an hour before the scenario-based policy discussion, we got signals from some delegations that their leader wasn't interested or their leader would have to do other things and would walk away when the scenario-based policy discussion would start. That was really a big concern. Our Prime Minister said, "You know what, forget about that. We'll go ahead anyway."

What happened was that everybody stayed in the room. In fact, there was a lot of enthusiasm. Everybody was engaged. They stood up. They conferred with their associates. They conferred with each other. We got a whole dynamic atmosphere there that actually led to a very successful discussion. So we're ac-



tually glad that we did it and it really paid off on all the investments that we made.

What did we take away from it? A couple of things. This was obviously not an exercise on an expert level. This was the highest political level you could get. In that case it requires a very different approach than some of the examples that Mark and Dan alluded to. So you've got to stick to broad concepts, don't talk about procedures. It's not an exam. The questions that you pose to world leaders are not right or wrong. They're very sensitive to that.

In terms of substance, there were a couple of teachable moments. Our scenario evolved actually about a radiological scenario, a radiological threat. There was a threat of people stealing some radiological material from a hospital. There was this uncertainty about radiological and, for instance, fissile material sources. I think the leaders became aware that when you talk about radiological you don't have millions of lives in danger. But at the same time the source could come from anywhere, differently so with fissile material.

International collaboration, a lot of leaders stressed the need for that. In case of emergency it is really crucial that you can actually call somebody, that you have human and legal relationships in place that help address the threat and help to respond firsthand. The Jordanians and Israelis, for example, alluded to that.

Then national inventories, in case of a threat or something goes wrong, leaders became aware that it's not that easy to do real-time material counting. It's good that they are aware of it and it's also good that they think about technological solutions to bridge that gap.

Now of course when you do this you have to carefully design your scenario

and most of all keep it simple but realistic. Obviously it's a fictitious scenario but do make it look like it's real. So you also have to be careful that you don't disclose too much information to the people who are preparing for it because if you've seen it a couple of times, you think there are some flaws and maybe it's not really realistic and you don't want to have that. Obviously you don't want to have your scenario associated with any specific country. And you have to keep the leading questions simple.

Suitable topics: terrorism, radiological, cyber. We did a cyber exercise during the global cyber security conference in The Hague in April. Health, pandemics, transboundary are also very good. Or natural hazards. Less suitable: political crises, especially those where it's not really clear who is to blame. You certainly don't want to have the situation where participants are starting to accuse each other. And you don't want a situation where only a few participants can influence the crisis.

We got tremendous positive feedback and in such a way that I understand that the United States was very enthusiastic to follow a model of that sort for the next summit in 2016. Obviously the Netherlands is very happy to work with the United States on that, and with that I will give it back to you, Larry.

Satkowiak: Thanks, Rob. Now we will open the floor to questions.

Joyce Connery: First of all, thank you all for doing this today. I think it was a really entertaining panel, and Rob, I'm glad you were so successful in the Netherlands because it sounds like a fantastic experience. My question is actually for Mark. I was wondering because you didn't talk

specifics when you gave your presentation, could you just give us an example of a national-level exercise scenario and how you worked together? Because it's very elaborate and I think the audience, if they're not familiar with it, would benefit from a two- or three-minute recap.

Ledbetter: They are now called capstone exercises. The last one we held was an earthquake scenario up in Alaska. Every two years, we have a capstone exercise or event. We have a two-year cycle, we try to go out there and solicit exercises from the private sector-states, regional, private, and nongovernment agencies and figure out how we want to look across those five mission areas I talked about: protection, prevention, response, mitigation, and recovery. We have a tendency to try to focus in on one of the five big mission areas. As I discussed earlier, we used to call them the top officials exercises or national exercises. They are typically terrorism based.

The focus was WMD, bad people doing bad things. But there is also someone else out there who is very mean, that's called Mother Nature. I think we realize that Mother Nature can wreak havoc on the United States and across the world. Earthquakes, tsunamis. It's not just the United States, it's around the world that that's a big issue. So we kind of balanced them back and forth between a manmade disaster and a natural disaster. So the last one we had was a big earthquake in Alaska on the fiftieth anniversary of the larger earthquake in Alaska of 7.8 right outside Anchorage.

It takes about eighteen months for us to build that exercise and what we do is at the National Exercise Division, it's really the states' exercise. We come in with technical assistance to help guide



and provide resources to conduct it. Our goal really is to bring those top officials, the senior levels, into the exercise discussion. Because the last thing we want to talk about is where they have to make a policy decision about resources. The federal government at our level is more about resource allocation. It's that scarce resources are out there and making decisions on what to move. We saw that in Super Storm Sandy about moving certain resources across the country. So the purpose really of the national exercise is to allow the state and local officials to play and meet their needs. But for us, it's to bring those senior officials across all the departments in the agencies and engage them because as we all know, they're all political appointees and they have a tendency to rotate in and out. So every couple of years we have to go, and that's the reason we're on a two-year cycle, that seems to be the lifespan of a lot of our appointees.

We've had earthquakes and terrorism. The next one we're scheduled for in 2016 is going to be a protection/prevention discussion. We've had a cyber exercise before. That was quite interesting. We haven't really nailed down the scenario yet. We're still looking to figure out. We like to ask, "What keeps the President and his cabinet up at night?" We want to help exercise that. That way they're better prepared when the event does occur.

Karen Richards: I'm the director of the Safeguards Division with the Canadian Nuclear Safety Commission for the nuclear regulator in Canada. I'm really intrigued by the concepts that you've all presented here today in terms of a training tool. The reality that we seem to be embracing and facing in Canada in Cana-

dian safeguards right now is a lot of turnover of staff in terms of we're no longer seeing necessarily career safeguards experts, but more the newer kind of next generation staff who are coming in and perhaps we're going to see larger turnover, so that the experience component is a really difficult one to tackle. Daniel, as you pointed out, it's the knowledge part, the kind of nuts and bolts of, in our case, safeguards is relatively straightforward to achieve. It's that experience piece that's very difficult to transfer and to train new people. So, my question is, the examples you're presenting here today obviously are on a national or international scale or in terms of the theater-based training, you have something that perhaps takes a lot of resources. I'm wondering, for any of the panelists, if you would have some advice for someone dealing with a much smaller scale of training needs. What kinds of guiding principles can you extract from these larger case scenarios that you would all be dealing with and just offer for someone like myself dealing with a small group of people in a very specific field?

Johnson: I'm not sure how closely related to the topic this answer is, but the recommendation I would have is first and foremost you need to understand what the competency framework is for your staff. Getting back to what I just said, what knowledge, skills, and attributes do they need to do their jobs better. Then your training needs to be targeted at them to make sure that the learning outcomes from the training fulfill the requirements of the competency framework.

Then also I would say there needs to be some evaluation process so that you actually know that those learning outcomes are being met and that people

are being trained against that competency framework.

WINS is actually working with Canada on the development of a national level nuclear security training strategy developing a competency framework for Canada and then designing training against that competency framework for all of the key positions in the government, the regulator, and industry. This can be scaled up for the entire country but for your department I think you need to take the same approach of who is your target audience, who is being trained, what competencies do they need developed, what's the job task analysis. Developing training designed with learning outcomes in mind that meet that job task analysis and competencies. And then evaluating it through examination or testing or something that you can quantifiably measure that people are learning something from the training that you're giving them.

Satkowiak: I have a question for Rob. When you conducted this scenario at the Nuclear Security Summit, you said it went well. What were the comments? At the end of the day, what did the world leaders like about it? What didn't they like about it? There had to be comments both ways.

Anderson: Well, for one everybody was listening to what they were saying. Nobody fell asleep. But truly I think what really helped them, what we really got back here after the exercise was that this was a very helpful way for a very sensitive setting on the world leaders' level to get a better understanding of what you're actually talking about and what the threat is of a nuclear or radiological scenario, and why it is important and why international cooperation is also



important. Because, like I said, everybody thinks of nuclear security as, “Yes, it’s my responsibility, but it’s certainly not your responsibility to talk about my nuclear security architecture.”

I’m from Holland so if something goes wrong in Belgium, you’re automatically responsible for the other things that are happening. Then in that case you need to be able to confer with your world colleagues on what to do. I guess despite having a long way to go to keep stressing why this is important. I think the scenario-based policy discussion helped a lot to make clear that this example could also happen in reality.

Satkowiak: Mark, when you hold those capstone events how far down do you go? I know you probably engaged the local politicians. Do you go down to the policemen on the street, the firemen, the first responders?

Mark Ledbetter: Yes, for the capstone in 2014 in Alaska we went down to about twenty individual boroughs up in Alaska with some of the tribal units and first Americans up there. It is a truly top to bottom exercise program. We try to get that because again, without the realistic input from the local responders, we can’t identify those true needs that need to be discussed. It all has to bubble up somehow. That’s the reason why it takes eighteen months to actually plan those exercises because you’re trying to coordinate multiple states, multiple regions, and private sector entities. So yes, it does go down to Barney Fife, the sheriff, and Mayberry, all the way up to the president.

We’ve had the president play in some of the previous capstones—and some of the cabinet too. President

Obama played in the cyber one for Alaska. He didn’t really play, I think something was going on. But the last time just before I joined FEMA, I was in the Coast Guard, he did play and was very involved. But the secretaries and the undersecretaries will be involved in the exercises. So again Barney Fife is also involved. He’s an important player to us because my true customers really are the state and local officials because in the emergency management world—95 percent of all emergencies are handled at the local level. And Washington, DC, has a tendency to muck things up. I have to remind myself that I once was a local responder and I need to keep that in mind as we plan these exercises.

Jeff Johnson: I’m from Oak Ridge National Laboratory. Diverse application across the panel for training and exercises so I don’t expect the same answer from each one of you. What is the most effective mechanism you’ve developed or studied for the after action report, the lessons learned, how to improve the process for the next time you do it? I would see that very different given the three applications that I’ve heard talked about today.

Ledbetter: I’ll take the first stab at this because that’s actually how I kind of got into the exercise world. I was the Coast Guard’s lessons learned manager. That was my last point and I left it for my last point on purpose. The corrective actions, the strengths that are identified are key. So the key to any, what I call, improvement plan is constant visibility with your senior leaders of what needs to be corrected and assigning those actions. And looking across all of the elements.

You may have an issue that’s iden-

tified. You may think it’s a very simple issue, but it will have a budget issue, a training issue, a new policy issue so when you go about that, you have to think about it in a holistic approach. We call it the POETE model, which stands for policy, organization, equipment, training, and exercises. So you have to look across all of those elements of a corrective action to help identify. The last piece is really to validate it in a future exercise or a future real world event. You may think you’ve solved the problem but again, you may have only exacerbated because you didn’t fully fix it.

We see a lot of corrective actions or improvement plans that talk about IT systems. They always identify it as a training issue. Well, it’s more than a training issue. It’s also a budget issue because we have to have the funds in place to allow staff members to go back be trained. Training is that very important piece that you have to have a plan for.

Johnson: I think for me the key and the question—what I took from it—is how do you evaluate the relative success of the training. And you can evaluate it immediately after by asking the participants, how did you feel about the training and they can tell you how they felt. But the most effective indicator I think is actually not losing track of that person but following up with them three and six months later and then asking them how has the training impacted you and how has it changed your behavior. Have you actually applied the training on your job? Has it made a difference at your organization?

Something that we’re doing at WINS is for everybody who goes through our training, we’re going to be inducting them to kind of an alumni network pro-



fessional society of all of our graduates. We're going to ask the people in our alumni network how they felt about the training months down the road. How it's impacted their career, how it's impacted the relationship with their organization, and how their organization approaches security. I think you really have to think about these things on a long-term basis. Because if you just ask the person right after the course and they say, it was great, that's not really a great metric of whether or not the training was effective or not.

Anderson: In our case it's a little bit more difficult to follow up with the world leaders given the political cycles of them. And they are a little busy, absolutely. I agree actually with Dan that we took the effort to kind of see right afterwards in that room right after the scenario-based policy discussion was coming to an end, you could tell that people actually had fun and did stay in the room. Because that was actually our major concern. It's not so much about the scenario, it's about people thinking that this is not important enough to do. And they stayed and they were enthusiastic. And it actually helps that the United States is now organizing the second one and that the United States was very vocal about doing this kind of exercise again, which makes it possible two years later to kind of tweak the scenario a little bit and see what other kind of threats you can make more clear.

In addition to the scenario-based policy discussion we also had an informal leaders' discussion which is really basically a room without a table, with only the leaders, without their staff and a free-flow discussion about what could be improved in the nuclear secu-

rity world. And how could we shape the future in such a way that this stays on the agenda and what is needed for that. I hope the things that came out of that discussion, and I know they are going to feed into the discussions we will have at the summit next year in Washington.

Satkowiak: I have a question for Daniel regarding your certification program. I know it's been going on now for a year. I want to find out how many graduates and do you use scenario-based training during the certification program and what type?

Johnson: We have about 500 participants from sixty-six countries in the program. And we've now had over 100 exams that have been taken with about a 75 percent pass rate. So we have about eighty participants that have passed their exams. And that's after one year. And we're seeing a pretty sharp uptake of people who are now registering and doing their exams.

And the other question was about how we use scenarios in cases in the training course itself. It comes back to this point I mentioned in my talk about show versus tell. And it applies to writing as well, it's not just in-person training. When you're writing a course, it's very easy to tell, tell, tell and if anybody here likes to read literature and writing, you can see the difference between a good writer who tries to tell, tell, tell versus somebody who shows what they're trying to talk about.

So as much as we can in our courses we use real examples of events that have happened to get the reader thinking about how it applies to their organization and to their situation. We have a number of case studies and scenarios

in the courses themselves. Now what we're doing, now that we've developed all of these courses, is we're creating in-person training materials using those cases and those scenarios.

So for the theater event we're having in September, we're actually pulling out some of the concepts and ideas from the courses to develop the scripts for the theater event. It's kind of in nascent stages now, we've been so focused on actually completing all of the courses. Once we have all the courses complete then we'll really focus on developing the in-person component of all the training courses. But we've designed the courses with that in mind, that these would be converted into in-person activities.

Satkowiak: What level of managers are participating in the training?

Johnson: The way we've focused it is we're trying to reach more senior managers in these organizations. It's been our experience at WINS that the most effective way to impact change at an organization is if it has senior level buy-in, especially when you're talking about security issues. You need the board to be involved, executive managers to be involved, putting out companywide security policy saying this is important just like as with safety. Safety is an organizational-wide responsibility, everybody thinks they're responsible for safety. Whereas in security it's a little bit more siloed so we're focusing on those senior managers who can then spread that message throughout the organization that security is everyone's responsibility.

We do have a course for scientists and engineers as well though, but we still are trying to focus more on mid to upper level managers who have the abil-



ity to impact change at their organizations. We're not focusing much on state level people who are the frontline people but kind of that middle layer in upper management.

Corey Hinderstein: I'm new to the exercise world and yet now I'm responsible with a lot of great support for putting on an exercise next year. So you can see that this panel is extremely self-serving for me. So I have a question about what is the biggest mistake that I need to avoid in planning an exercise scenario?

Anderson: I'm sure you're not going to make a mistake. I think if you look at kind of the phase that we're in now, really the crucial preparations for the summit next year, in my experience it's really all about the buy-in. Taking the concerns

of delegations seriously about their leaders or being very sensitive to cultural or procedural things. But also being very firm in what you want to do and communicate that very clearly. And give the Sherpa community as much information they need to be convinced or persuaded but without telling the whole deal.

Ledbetter: Rob and I both said the word realistic and I think the one thing I emphasize a little bit, it's got to be tied to the objective of what we're trying to do. My boss likes to talk about the space alien exercise. You can have a scenario, but is it realistic? Maybe. But it's got to be tied to something you're trying to accomplish. So again, not to beat a dead horse, but have it really be tied to what you want to accomplish out of the event. Keep it simple. As Rob said, the cultural

or the political sensitivities are key and we call it biting the scenario. That's one thing you want to stay away from.

Johnson: You took the words out of my mouth. I was going to say realism as well. If you try to put a scenario out there that there's been an improvised nuclear device that's been exploded in New York City, it's not that real, it's not that probable. I would suggest the scenario that is at least mildly probable and not too over the top, but also not too minor. If you're talking about a scenario with a radioactive source going missing, they're probably not going to care too much. You're going to have to find the right balance of realism versus something that's still engaging and interesting to somebody at that high of a level.



Book Review

By Mark L. Maiello, PhD
Book Review Editor

Command and Control

Eric Schlosser

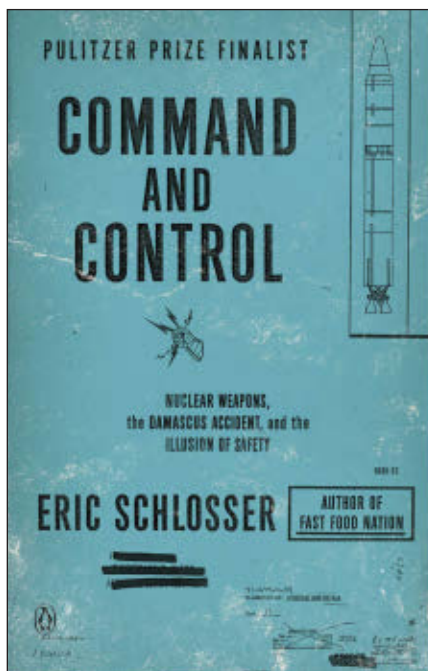
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How fortunate has mankind been that despite frequent and numerous mistakes, accidents, and misfortunes of varied kinds, we have never experienced an unplanned nuclear detonation either within the borders of the United States or in a foreign land that is over-flown with U.S. nuclear weapons or where they are stored? Damned fortunate indeed. Eric Schlosser admits that weapons safeguards have worked. But flaws in the system continue to exist. Nuclear weapons professionals have devoted and endangered careers fighting to point these flaws out. But here we are with nuclear weapons still on hair trigger alert; still reducing response, communication, and decision-making time to dangerously short periods that argue for a nuclear disaster and the creation of a “future history making event.”

Schlosser emphasizes the narrow margin we have traversed between disaster and self-preservation. It's the story of the battle between advocates of weapons safeguards and those who believed anything that slowed or undermined weapons response times was unnecessary and potentially detrimental to the nation's defense. It's also the story of the occupational dangers faced by U.S. Air Force personnel who routinely confronted aircraft crashes, fires,



hazardous fuels, and chemicals all involving or in close proximity to nuclear weapons. *Command and Control* is a historical journey covering the nuclear near misses and missed opportunities to safeguard weapons, from their inception to the present day. Schlosser's narrative includes the major nuclear weapons personalities from the past seven or so decades—dipping occasionally into their own personal historical accounts to yield their perceptions of nuclear weapons deployment, use and meaning. A message about the U.S. government's and in particular the military's lack of transparency about the dangers maintaining, securing, transporting, and flying missions with nuclear weapons becomes most obvious in the book's epilogue but is part and parcel of Schlosser's chronicle throughout. This secrecy and the associated

misinformation spawned the concentration of weapons decision-making power into the hands of the very few. The by-product of this policy and the lack of public scrutiny exacerbated the problems associated with nuclear weapons safety.

The book is also the story of U.S. Air Force personnel confronted with a disaster in the making at an underground Titan II missile complex a few miles outside of Damascus, Arkansas, USA. This story of young men and their superiors emphasizes the everyday occupational dangers they faced working with lethal fuels in remote underground silos compounded and magnified by the presence of the most powerful destructive force on the planet. Damascus was an unprecedented accident in 1980 that resulted in an explosion that popped a nuclear warhead out of its silo and fortunately caused only two Air Force personnel fatalities—all started by a fuel leak that was initiated by a dropped wrench during a scheduled maintenance call. This deftly personalizes the danger of nuclear weapons, putting the reader inside the silo with the men struggling with twentieth-century technology to understand and respond to the alarms and signals that confusingly indicated the potential for a lethal chemical explosion in the midst of nuclear weapon.

An investigative reporter who needs to reach a lay audience about a complicated a technological and domestic policy issue such as nuclear weapons is confronted with a mighty challenge. But Schlosser's writing is outstanding.

It is easy-going and sincere yet carefully crafted to be personal and human. He very effectively conveys the cataclysmic danger of the many formerly unknown or untold nuclear weapons mishaps. This is multi-layered storytelling. Schlosser periodically pokes into the Damascus arc throughout the historical narrative that focuses on other worldwide nuclear near-accidents and the geopolitics that prevailed at the time. The result: history becomes the landscape against which the Minuteman disaster is painted. But that landscape is itself so very rich and textured. It is replete with the important personalities who made nuclear history and the weapons policies that they championed. It runs deep with the efforts of those who perceived the fine line between nuclear catastrophe and nuclear security. It is in short a book about heroes and those driven by their convictions. Although there are many personalities—so many that one may need the twenty-page index and the “cast of characters” list he provides at the start of the book to occasionally reference them, the reader can feel empathy for all of those who battled the cultural intransigence of the military in a quest to prevent a nuclear cataclysm. These are not all well-known names. They were weapons lab engineers who recognized the safety vulnerabilities but whose voices were largely ignored—men like Bob Peurifoy and Bill Stevens of Sandia National Laboratories and their Los Alamos colleague, Harold Agnew. Here too the reader encounters the mission-driven and better known military leaders such as General Curtis LeMay and his successor General Thomas Power, both of whom were driven to create and strengthen the ultimate bulwark against Soviet nuclear attack—the nuclear-armed Strategic Air

Command and who sought to thwart any delay, compromise, or subversion of its mission to utterly destroy the enemy.

As we move through the post war decades, Schlosser uncovers and describes in horrifying detail the many accidents that nearly brought the nuclear house down. He describes everything from totally inadequate guarding of nuclear bombs in Europe (literally chain link fences and a single guard), all-consuming fires on nuclear laden B-52 bombers, and safety kill switches in bomber cockpits that were but the single barrier between arming a weapon or not. Delivery of the weapons was everything. In the years before and just after ballistic missiles were developed, bombers played pivotal roles in nuclear weapons conveyance. Yet, they repeatedly crashed (on the order of once every 20,000 hours of flight time), endangering not only their crews who readily accepted risk as part of their jobs but also U.S. citizens and allied populations who made no such covenant. These aircraft had been designed in an earlier time and not for carrying nuclear weapons. But they routinely toted nuclear weapons in and around friendly territory.

The Palomares, Spain, incident in 1966 is perhaps the most famous of these accidents. Four hydrogen weapons were spilled from the guts of a B-52 when the bomber bumped a refueling plane and broke apart on a flight from North Carolina to Spain’s southern coast. Three weapons were recovered quickly—the fourth required weeks to find in the half-mile deep Atlantic including two attempts to bring it to the surface. Plutonium was spilled from two of the bombs when they crash landed to earth necessitating an expensive clean-up and the shipment of 30,000 cubic feet

of soil to Aiken, South Carolina, USA, for burial. Despite the mitigation effort, the U.S. and Spanish governments denied that the plutonium posed a health threat. When it was said and done, the Pentagon had endured two and half months of bad press and the Spanish government prohibited the U.S. to fly nuclear weapons in its air space. Many other perhaps less famous but nearly as deadly accidents abound in Schlosser’s account. Schlosser describes another refueling mishap nearly as riveting as the Damascus incident. With its crew attempting to bale (two of the four perished in the crash), nearly every safety feature save one failed. Had this final ready/safe switch been in the wrong position, a four-megaton bomb would have deposited lethal fallout on Washington DC, Baltimore, Philadelphia, and New York City, and this not three days after President Kennedy’s inaugural speech vowing to “pay any price...to assure... the success of liberty.” And thus, this book is also about the courage and sacrifice of the dedicated military people who faced deadly circumstances routinely, flying missions in World War II aircraft, in support of the continuous airborne alert policy of General LeMay’s Strategic Air Command—often with deadly circumstances and too often a hair’s breath away from a domestic or allied nuclear catastrophe.

The story is also about dedication, persistence, and inquiry, perhaps no better personified than by the unheralded efforts of Fred Ilke, a RAND analyst who began a thorough investigation of the possibilities of accidental and unauthorized nuclear weapon detonations. His 1958 report, “On the Risk of an Accidental or Unauthorized Nuclear Detonation,” was the first well-researched independent



analysis of nuclear weapons safety in the U.S. It concluded that the risk wasn't negligible. It was exacerbated by the technical challenges of nuclear weapons and plagued by human error and possibly even sabotage. The risk of accidental war might have been low, but an accidental detonation might prompt an adversary to retaliate in mistaken conclusion that an attack had begun. The report coincided with the initiation of SACs airborne alert program. Spawned by the launch of Sputnik that instigated fear of ballistic missile attack and championed by General Power, it meant B-52s in flight around the clock carrying nuclear weapons. Keeping a portion of the air force in flight at all times meant that a missile attack could not destroy them all. But it also meant the probability of a nuclear detonation over friendly territory would rise.

Schlosser did not shy away from describing the engineering aspects of nuclear weapons. This is a book for popular consumption but he achieved a good balance between techno-babble and well constructed prose. Readers will be interested in the technology surrounding Minuteman silos, weapons firing systems, and weapons safety mech-

anisms, "common mode failures" and the "one-point safe" concept. Prompted by the development of sealed pit boosted tritium weapons, the concept of one-point safety meant essentially, that in an accident, an implosion of the weapon material would not occur thus preventing a nuclear disaster. When revealing the difficulties the responder to the Damascus incident faced, Schlosser does an outstanding job describing the pre-computer era technology that added to their misfortune. Explanations of the lack of adequate radio-communications, the cumbersome 1980s era personnel protective gear and the inability to properly analyze the conditions inside the compromised silo are handled deftly. A diagram of an underground Titan II missile complex accompanies his well-informed account.

Schlosser's book is a Pulitzer Prize finalist selection and it shows. He has taken a complicated subject and placed into a form for an easy and agreeable read. It is the type of book that once started is difficult to put down. Nuclear scientists of all disciplines and specialties will find it more than informative. They will find it engaging. As a bonus,

Schlosser provides recommendations for background reading on the subject in his nearly 100 page notes section. This is supplemented by a twenty-nine-page bibliography.

Human beings are imperfect. They miscalculate. They make poor judgments. They make mistakes. Yet Schlosser tells us, not one of the 70,000 nuclear weapons that the U.S. built has ever detonated by mistake. The supporting policies and safeguard technologies have worked thus far. However, as the author understates in his final chapter, even one accidental detonation would be "unacceptable." The long development of successful nuclear weapons management in the U.S. saw many mishaps and narrowly averted catastrophes over the past seventy years. Nations seeking nuclear weapons should think again about acquiring them. If Schlosser's book has any message beyond the shortcomings of human performance it is that perfection of nuclear weapons command and control is absolutely and unremittingly required—but in no uncertain terms is such vigilance eternally guaranteed.



Taking the Long View in a Time of Great Uncertainty

A World Full of Critical Uncertainties

By Jack Jekowski
Industry News Editor and Chair of the Strategic Planning Committee

The 56th INMM Annual Meeting held in Indian Wells this year had a special tension in the air as participants anticipated a possible announcement about the Iranian “nuclear deal,” now officially known as the *Joint Comprehensive Plan of Action* (JCPOA).¹ The “deal,” and whether it would be successfully culminated by one of the most intensive diplomatic negotiations in this generation, was a *critical uncertainty* the world was facing with respect to how a path to the future might play out, and was prominent in conversations during our meeting. On Tuesday morning, July 14, the news rippled through the meeting attendees like the wildfire in the San Jacinto Mountains that had threatened the Palm Springs area during our Annual Meeting in 2013. To have such an historic event occur during the INMM Annual Meeting made it a special time, with intense hallway discussions, information and idea sharing, and challenging questions for presenters during some of the technical presentations and panel sessions. The news was made even more pertinent because of the large number of international par-

ticipants who attended the meeting this year, including more than sixty international chapter members sponsored by the U.S. Department of State’s Partnership for Nuclear Security initiative.²

Yet, even with the announcement of a successful agreement, and throughout the subsequent debates on all sides, the actual implementation of the JCPOA is still uncertain, as is its ultimate “success.” This one issue touches on almost all facets of the Institute’s mission and engages many of our members and their institutions.

Critical Uncertainties — a Sign of Our Times

In the world of scenario planning, futurists will work with organizations and management teams to identify what is known as “*critical uncertainties*,” events or sequences of events that could result in a dramatic change for the path to the future, but at the current time are uncertain as to how they will play out. The classic example that is cited in scenario planning training is the U.S. presidential election. In November 2016 we know

there will be an election — that is a certain event. What the outcome of that election is, however, a critical uncertainty with respect to the future path the U.S., and perhaps, even the world, will travel. In particular, based on the early rhetoric in the run-up to the election, continued participation in the JCPOA by the U.S. might itself be in jeopardy with depending upon the election’s outcome.

In previous columns,³ I have identified and discussed “externalities,” a term that was used during the strategic planning activities of the Institute’s *Organizational Strategic Planning Working Group* (OSPWG) led by Ken Sorenson in 2009-2010 as the Institute reassessed its goals and organizational structure. The research into those externalities was intended to capture the issues, both domestically and internationally, that were impacting the Institute and its members, put them into strategic context, and then ask the question: “What do we need to do given this new environment to make the Institute as effective as possible for its membership?” The result of that work contributed to the strategic discussions that created the modified organizational structure for the Institute that exists today.⁴ These externalities, most of which are still valid five years later, form the basic knowledge through which discussions can identify the *critical uncertainties* of our time.

This column is intended to serve as a forum to present and discuss current strategic issues impacting the Institute of Nuclear Materials Management in the furtherance of its mission. The views expressed by the author are not necessarily endorsed by the Institute, but are intended to stimulate and encourage JNMM readers to actively participate in strategic discussions. Please provide your thoughts and ideas to the Institute’s leadership on these and other issues of importance. With your feedback we hope to create an environment of open dialogue, addressing the critical uncertainties that lie ahead for the world, and identify the possible paths to the future based on those uncertainties that can be influenced by the Institute. Jack Jekowski can be contacted at jjekowski@aol.com.



The Uncertainties of the World We Live In

In looking back at the “externalities,” issues, and “wildcards” that have been discussed in this column over the past four years, it is quite remarkable how many still exist today, and equally remarkable to see those that have emerged since the original strategic work done by the OSPWG. It is from these lists that we can identify those driving forces that are *most* critical and *most* uncertain as a starting point to develop future world scenarios which would engage the Institute’s membership in strategic discussions. A preliminary analysis of these uncertainties has captured the following “top level” *Critical Uncertainties*:

- **The proliferation of nuclear weapons technology.** The “genie is out of the bottle,” and the knowledge to build a nuclear weapon is now available not only to nation states, but also to non-state entities with evil intentions. The international community now must actively engage not only in the monitoring and control of nuclear materials, but also those specialized technologies and manufacturing processes that are leading indicators of undesirable activities. Can the scientific and diplomatic community employ the tools of the 21st century to accomplish this verification process, and at least control the “genie”? Where will this journey end? Will the path to the future be “global zero” or a nightmare scenario depicted in Hollywood movies?
- **The impact of the Fukushima nuclear event.** The tragic natural disaster of March 11, 2011, that triggered a sequence of nuclear events at the Fukushima nuclear power plant shook the confidence of much of the

world in the safety of nuclear power, much like the previous incidents at Chernobyl and Three Mile Island, negatively impacting the burgeoning “nuclear renaissance.”⁵ How will those events continue to impact the advance of nuclear power internationally, and will another future event sound the death knell for nuclear power as we know it?⁶

- **The rise of nationalism amid the modernization of nuclear forces.** From Crimea to the Senkaku Islands to the economic and military interest in the newly opened Arctic, there is a growing push by major powers, including the nuclear weapons states, to exert their influence in the world, while prominently modernizing nuclear aging stockpiles and delivery systems.⁷ Where will these new and threatening actions take the world during a time when perhaps memories are fading about the horrors of global conflicts?
- **The resolution of the Iranian nuclear issue.** As described in a previous column, the significant multi-national diplomatic effort to resolve the Iranian nuclear issue, strongly supported by the U.S., will be a “litmus test” for the Obama administration’s efforts to elevate diplomacy as “...*fundamental to our national security as our defense capability.*”⁸ As difficult as the negotiations were leading up to the final agreement, the path forward to successful implementation is fraught with challenges.
- **Geopolitical turmoil in the Middle East following the Arab Spring.** It was uncertain where the tumultuous events of the *Arab Spring* that began in Tunisia in December of

2010 would lead, and now, more than four years later, where they ultimately will end. These events also showed the world a new face of the power of social networks and the technology-enabled millennial generation.⁹ Will a stable and functional governing force emerge, or will we see the breakup of nation states during these difficult times?

This, of course, is not an exhaustive, nor a detailed list of uncertainties that we face today—in fact the development of driving forces and critical uncertainties in scenario planning typically engages many perspectives looking at social, technology, economic, and political events to characterize the environment that is influencing paths to the future. Readers are encouraged to submit their thoughts about the critical uncertainties that face the Institute in the coming years to the author for inclusion in a broader discussion. The ordering of those into the most critical and uncertain groups allows the scenario planner to begin to focus on a small subset of future worlds that are both challenging, yet feasible, leading to important strategic discussions of how to influence, or at least prepare for them.

Constructing the Scenarios

In its most useful form, an orthogonal construct using the two most distinctly different and impactful *critical uncertainties*, provides a landscape for creating four distinct and challenging future worlds.¹⁰ We will explore such a construct in future columns as feedback is obtained from the membership on the *critical uncertainties* we are facing. To whet the appetite of readers, a set of scenarios created by the author in 1998, looking at an otherwise potentially optimistic turn of the millennium, in the



context of the underlying critical uncertainties of the proliferation of nuclear weapons technologies and the theft or diversion of nuclear materials, painted one future world where the “*The Dominos Fall*.” This characterization, posited by Dr. Sig Hecker, former director of the Los Alamos National Laboratory, looked at a troubling time when more and more nations joined the “nuclear club.” In a later development for the INMM Southwest Chapter’s Annual Technical Meeting in 2002, the author created a new set of scenarios titled, “*The Future of Global Security*,” that addressed the dramatically changed environment of a post-9/11 world.¹¹ Both of these developments were used in their time to develop strategic discussions within the U.S. national security environment to prepare for future alternatives that were previously unimaginable.

And so it is with the times we live in...how shall we enter them: naively, or prepared, but uncomfortable? This is the underlying exercise necessary to address the answers to the question “what keeps you awake at night?”

Endnote

1. The Joint Comprehensive Plan of Action full text, and five Annexes can be found at: <http://www.state.gov/e/eb/tfs/spi/iran/jcpoa/>
2. See “Turning the Corner” *Journal of Nuclear Materials Management*, Volume 43, No. 1, pp. 65-67 for a more detailed discussion on this special initiative that is working with the INMM to create greater international involvement in the INMM, including student chapters.
3. See “Taking the Long View in a Time of Great Uncertainty” columns in *JNMM*, Volume 39, No. 1, pp. 39-41; Volume, 40, No. 4, pp. 148-149; Volume 41, No. 3, pp. 20-22; and Volume 42, No. 3, pp. 71-74.
4. See the following link on the INMM website for the most current functional organization chart for the Institute: http://www.inmm.org/AM/Template.cfm?Section=Organizational_Chart1&Template=/CM/ContentDisplay.cfm&ContentID=5037
5. See “A Strategic Inflection Point? The Nuclear Crisis in Japan” *Journal of Nuclear Materials Management*, Volume 39, No. 4, pp. 23-24, for a more detailed discussion on the early days after the March 11th incident.
6. In a recent paper, “Of Disasters and Dragon Kings: A Statistical Analysis of Nuclear Power Incidents & Accidents,” Wheatley, et al., Cornell University Library, <http://arxiv.org/abs/1504.02380>, the authors conclude: “*With the current model and in terms of dollar losses, there is a 50% chance that (i) a Fukushima event (or larger) occurs in the next 50 years, (ii) a Chernobyl event (or larger) occurs in the next 27 years and (iii) a TMI event (or larger) occurs in the next 10 years. Further, smaller but still expensive (≥ \$20 M in 2013 USD) incidents will occur with a frequency of about one per year.*”
7. For discussions on the modernization of nuclear stockpiles, see <http://thebulletin.org/modernizing-nuclear-arsenals-whether-and-how7881>, “Modernizing nuclear arsenals: Whether and how”; and <http://thebulletin.org/2015/may/how-approach-nuclear-modernization-russian-response8290>, “How to approach nuclear modernization?: A Russian response.”
8. See “As the World Turns...Toward a More Dangerous Place” *Journal of Nuclear Materials Management*, Volume 41, No. 4, pp. 111-11 for an excerpt from the U.S. National Security Strategy on this issue; and “International Collaborations Amid a 21st Century Test for Diplomacy” *Journal of Nuclear Materials Management*, Volume 43, No. 2, pp. 51-53 for a discussion on the strategic link between the Iranian diplomatic negotiations and role of the IAEA and the INMM.
9. See “Preparing for Social Chain Reactions” *Journal of Nuclear Materials Management*, Volume 39, No. 3, pp. 28-29 for a more detailed discussion on the early days of the Arab Spring and the uncertainty associated with regime changes that were occurring during that time; and “A Strategic Inflection Point? — The Nuclear Crisis in Japan” *Journal of Nuclear Materials Management*, Volume 39, No. 4, pp. 23-24, for an excerpt from a U.S. State Department presentation on the power and influence of the social media.
10. The seminal work of creating useful scenarios was presented in Peter Schwartz’s book “The Art of the Long View: Planning for the Future in an Uncertain World,” which can still be obtained on Amazon.
11. See <http://itpnm.com/inmm-post-9-11-scenarios.pdf> for this paper.



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