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Developing the Next Generation of International Safeguards and Nonproliferation Experts: Highlights of Select Activities at the National Laboratories

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Developing the Next Generation of International Safeguards and Nonproliferation
Experts: Highlights of Select Activities at the National Laboratories

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Abstract:

With many safeguards experts in the United States at or near retirement age, and with the growing and evolving mission of international safeguards, attracting and educating a new generation of safeguards experts is an important element of maintaining a credible and capable international safeguards system. The United States National Laboratories, with their rich experience in addressing the technical and policy challenges of international safeguards, are an important resource for attracting, educating, and training future safeguards experts.

This presentation highlights some of the safeguards education and professional development activities underway at the National Laboratories. These include university outreach, summer courses, internships, mid-career transition, knowledge retention, and other projects.

The presentation concludes with thoughts on the challenge of interdisciplinary education and the recruitment of individuals with the right balance of skills and backgrounds are recruited to meet tomorrow's needs.

The Challenges of Nonproliferation and International Safeguards and the Role of the U.S. National Laboratories

The international safeguards system, as implemented by the International Atomic Energy Agency (IAEA), is a key component of the global nuclear nonproliferation regime, promoting the cooperation and transparency needed to allow states to reap the benefits of nuclear technology without fearing that this technology will be misused. The future of the international safeguards system and the global nonproliferation regime depends on the development and maintenance of a strong cadre of technical and political experts who understand the field's challenges and can develop innovative solutions.

Amidst growing demands, the pool of people available to work on these issues is diminishing. Many safeguards experts at the IAEA are nearing the mandatory age of retirement. This trend is mirrored at the United States National Laboratories. A draft internal study, analyzed data on the number of personnel working on NNSA Office of Nonproliferation and International Security (NA-24) safeguards projects at the National Laboratories and their types of expertise. Of the respondents who self-identified as international safeguards specialists, over 80% are over the age of 44, more than 40% are over the age of 55, and nearly 20% of the total are over the age of 60. This means that a

significant number of current safeguards specialists are already eligible for retirement, with many more becoming eligible in the next decade.¹ To build on the legacy of expertise, there is a need to bridge the skills, capabilities, and knowledge of current experts to the next generation. To that end, Secretary of Energy Steven Chu at the 2009 IAEA General Conference stated, “we are recruiting and training a new generation of safeguards experts and expanding our efforts to help other countries pursue nuclear power safely and securely.”²

Activities to Develop Human Resources

University Outreach

An important part of developing the next generation of safeguards experts will be to introduce students to the subject area while they are still exploring their educational and professional interests. To accomplish this, specialists from the National Laboratories provide guest lectures in relevant university courses or colloquia. These guest lectures cover a variety of topics including the IAEA safeguards system and compliance with nonproliferation agreements; safeguards inspections; safeguards techniques and technologies; the history of nonproliferation efforts and international safeguards; safeguards case-studies; careers in international safeguards and nonproliferation; and other related topics. Additionally, these lectures provide a vehicle for Laboratory experts to build relationships with universities and to identify students interested in further study of international safeguards and nonproliferation issues.

University outreach can also assist universities with developing safeguards and nonproliferation curricula. In August 2009, Los Alamos National Laboratory (LANL) organized a workshop for university faculty on safeguards and nonproliferation educational approaches. The workshop informed faculty about the resources available at the National Laboratories to build interdisciplinary approaches to safeguards and nonproliferation education. Additionally, National Laboratory experts, NNSA officials, students, and university faculty discussed the various needs and challenges related to safeguards and nonproliferation education.³

¹ The mandatory IAEA retirement age and the average U.S. retirement age are 62. Note, however, that a National Science Foundation report, “Science and Engineering Indicators 2008”, available at <<http://www.nsf.gov/statistics/seind08/c3/c3s3.htm>>, found that U.S. advanced degree holders tended to retire at an age above the national average.

² Delivered September 14, 2009. Available at <<http://www.energy.gov/news/8004.htm>>

³ The proceedings of this workshop are reported in detail in Doyle, James E., et. al., “University Collaborations for Safeguards/Nonproliferation Education: A Next Generation Safeguards Initiative Workshop Report,” September 2009, LA-UR 09-05711. Available at <http://www.lanl.gov/orgs/ndo/n4/documents/faculty_wkshp_laur09_05711.pdf>

This year, Oak Ridge National Laboratory (ORNL) and the University of Missouri INMM Student Chapter organized a “Multidisciplinary Workshop to Train the Next Generation Safeguards Advocate.” This workshop’s goal was to identify the needed skills and understanding for professionals in the field of nuclear safeguards and nonproliferation. In late 2008, ORNL conducted a workshop in partnership with the Y-12 National Security Complex and Savannah River National Laboratory titled “The Coming Nuclear Renaissance for the Next Generation Safeguards Expert – Maximizing Benefits While Minimizing Proliferation Risks.” That workshop emphasized the importance of nonproliferation in the nuclear fuel cycle and to identify opportunities for university-National Laboratory collaboration.

Interns, Graduate Fellows, and Post-Doctoral Fellows

One of the best ways to develop human capital is through internships that give students hands-on working experience. All of the laboratories host summer interns and post-doctoral fellows to work primarily on international safeguards and nonproliferation-related projects. For example, at Idaho National Laboratory (INL), each student accepted as a nonproliferation intern works directly on a funded nonproliferation project, and interns often fulfill the role of reviewer, red-teamer, and supporting specialist. This approach gives students the opportunity to generate or co-author conference or journal worthy papers. Students are paired with a mentor at the lab to guide their internship and to provide advice on next-steps should the student be interested in continuing to work on international safeguards and nonproliferation.

By combining internship projects with supplemental activities such as the inter-laboratory video teleconference (VTC) series, participation in the INMM Annual Meeting, and participation in special safeguards and nonproliferation focused courses and workshops, students gain a broad sense of activities across the National Laboratories.

In addition, there are several internship programs to develop a specific skill set. At Lawrence Livermore National Lab (LLNL) there is a program devoted to training students in the environmental sample analysis techniques used by the IAEA in safeguards verification. Also, LLNL hosts an international safeguards policy internship that explores the connections between technology and policymaking.

The NNSA NA-20 sponsored Nonproliferation Graduate Fellowship Program (NGFP) and administered by the Pacific Northwest National Laboratory (PNNL), provides graduate students one year of paid working experience at NNSA headquarters. Often these students, who are vetted for Q clearances, are employed by NNSA or a National Laboratory after their fellowship, therefore continuing to work nonproliferation or international security.

Safeguards Courses for Students

While there is considerable interest in nuclear security issues at universities, there often is no specific instruction in the area of safeguards. NNSA’s Next Generation Safeguards

Initiative (NGSI) sponsored summer courses can introduce students to this area and promote interdisciplinary learning by those already involved in some aspect of safeguards and nonproliferation. The National Laboratories in partnership with universities developed short summer courses in safeguards and nonproliferation. In 2009, LLNL, LANL, PNNL, ORNL, and Brookhaven National Laboratory (BNL) provided a range of summer course opportunities. In terms of course length, these range from the focused three-day ORNL non-destructive analysis workshop, to the broad three-week BNL course, “Nuclear Nonproliferation, Safeguards, and Security in the 21st Century.” These courses allow students or young professionals to explore aspects of safeguards and nonproliferation outside of their field.

Another example is the “Safeguards Policy and Information Analysis” course that LLNL co-hosts with the James Martin Center for Nonproliferation Studies at the Monterey Institute of International Studies (MIIS). The curriculum includes the historical developments that shaped the international safeguards system along with introducing the tools and techniques used in international safeguards information analyses. The course features guest speakers from several National Laboratories, the IAEA, MIIS, and private safeguards consultants. Students are encouraged to discuss and question complex international safeguards policy issues, and they benefit from the different experiences of lecturers and students. Additionally, students participate in an exercise simulating the IAEA State Evaluation process that requires them to assess the completeness and consistency of available information on a state’s nuclear program and to identify recommended follow-up actions. Planning is underway for the 2010 course, and several modifications are anticipated. The course agenda will be expanded to include additional topics of importance. Also, an exercise is being developed for students to simulate an IAEA Board of Governors meeting.

Inter-Laboratory Video Teleconference (VTC) Lecture Series

All of the National Laboratories have unique areas of technical expertise in international safeguards and nonproliferation. Interns resident at one laboratory benefit by learning the details of activities at their laboratory, but they often do not get exposure to related activities at the other laboratories. INL and LLNL sought to change this by developing a bi-weekly inter-laboratory summer safeguards and nonproliferation video teleconference (VTC). Lectures addressed safeguards technology, policy, history, and best practices to give students exposure to safeguards and nonproliferation issues outside the scope of their internship or academic discipline. For this upcoming summer, INL and LLNL intend to encourage greater participation in the series by including more interns and speakers across the National Laboratories, at Department of Energy headquarters, and at universities.

Recruiting for IAEA

BNL’s International Safeguards Project Office (ISPO) manages the U.S. Support Program to IAEA Safeguards. It has a special role in international safeguards and nonproliferation human capital development because it recruits and recommends U.S.

citizens for cost free experts, junior professional officers, and regular staff positions in the IAEA Department of Safeguards. BNL ISPO publicizes these positions through its website⁴ and by giving presentations at trade shows, career fairs, and conferences.

Recently, BNL enhanced its recruitment efforts to better reach its audience. A professional recruiter was hired in 2009 to manage that element of the ISPO portfolio. Professional society websites are being used for advertising, and Dice.com, a recruitment website for technology professionals, was selected as an alternative advertising outlet. Additionally, BNL is compiling a list of IAEA interview questions to help prepare future candidates for their own interviews.

Professional Networks

The community of developing experts will best be able to fulfill their mission if the connections between them are strong. In 2009, ORNL established a networking group for young professionals working on next generation safeguards issues. The Next Generation Safeguards Professional Network (NGSPN) seeks to build connections between the next generation experts who will see the international safeguards system into the future. NGSPN fills the gap between programs aimed at students and those programs aimed at mid-career professionals. The group is open to all young professionals in safeguards internationally and across the U.S. National Laboratory network, NNSA staff, academia, and industry. In only a few months, NGSPN has grown to over 50 members. About 60% of the membership is from the National Laboratories, while the IAEA has a local section. NGSPN has a public webpage⁵ and a LinkedIn group page.

The inaugural meeting of NGSPN was held at ORNL in October 2009. This meeting included participants from across the National Laboratories, the NNSA, and industry. Participants had the opportunity to learn about safeguards projects at ORNL, to get to know one another, and to discuss roles and responsibilities as the network moves forward. Future meetings will take place at the INMM Pacific Northwest International Conference on Global Nuclear Security, the INMM Annual Meeting, and at other DOE/NNSA National Laboratories.

Additional efforts are underway to develop connections within the community of experts. The National Laboratories are increasingly using local chapters of INMM to build networks between experts. Also, there has been some exploration of networking approaches using information-age outlets such as social networking websites, including Facebook and LinkedIn.

Mid-Career Transition to Safeguards

One of the best ways to build the cadre of international safeguards and nonproliferation experts at the National Laboratories is to fully utilize the existing talent at the

⁴ <http://www.bnl.gov/ispo/>

⁵ <https://ngspn.wikispaces.com/>

laboratories. Many technical skills used other nuclear related disciplines readily translate into the world of safeguards. Experts in fields such as stockpile stewardship, emergency management, and nuclear engineering may have a significant role to play in safeguards and nonproliferation, though some have not been formally introduced to the field. Many laboratories are building avenues to improve internal communication and cross-disciplinary learning to maximize the talent already present.

In the fall of 2009, LANL held a course on the nuclear fuel cycle geared toward existing laboratory staff. One hundred thirty seven participants representing 30 LANL divisions attended ten lectures highlighting the safeguards and nonproliferation concerns associated with all components of the nuclear fuel cycle. Also, discussions of export controls and material attractiveness were included to round out the course. Participant responses were overwhelmingly positive, and many showed interest in pursuing work in the field. Several have already transitioned into safeguards.

Capturing Institutional Knowledge

As noted earlier, many of the international safeguards experts who shaped the development of the international safeguards system and who responded to the challenges to that system are nearing or at the age of retirement. PNNL's international safeguards experts are engaged in efforts to capture some of the institutional memory of the field so that future safeguards experts can benefit from past experiences. They are filming interviews with individuals who were involved in key events over the past 40 years since the negotiation of the Nuclear Nonproliferation Treaty (NPT).

The first film series titled, "Foundations of International Safeguards" was published on DVD and web-streaming video in 2007.⁶ This series focuses on the negotiation of legal instruments fundamental to IAEA safeguards, including the NPT, the model comprehensive safeguards agreement (published in IAEA Information Circular 153), and the model additional protocol (published in IAEA Information Circular 540).

Two new interview series are now in production, with publication anticipated in July 2010. The first addresses the unique technical challenges encountered in the IAEA investigations of South Africa, Iraq, and the DPRK, and how those events shaped "strengthened safeguards." Interviewees include Demetrius Perricos, Jacques Baute, and Rich Hooper, with moderators Laura Rockwood, Jill Cooley, and Carrie Mathews.

The third in the series focuses on the evolution of the verification approaches used by the IAEA to fulfill its safeguards mission, covering destructive and non-destructive assay, containment and surveillance, and environmental sampling. Participants included Tom Shea, Shirley Johnson, Howard Menlove and Yusuke Kuno. These new videos will be useful in college courses, as background material for new entrants to the field, and as a means to retain institutional memory regarding advances in authority, technical capability, and safeguards approaches.

⁶ Available at <<http://pnwccgs.pnl.gov/fois>>

Observations and Conclusions

The field of nonproliferation and international safeguards is just one of several important areas where the National Laboratories make important contributions to U.S. and global security. The field is at once vital, dynamic, and small. The connections between experts across the laboratories help to reduce the burden of recruiting and training the next generation. Additionally, newcomers to the field, regardless of background, are generally motivated by a passionate interest in the field and wish to make a positive contribution to global society. Often individuals who participate in one of the human capital development activities at a laboratory seek out additional activities. Self-selection reduces the human capital development burden because passionate newcomers quickly become known throughout the National Laboratory system, which helps to place them in positions appropriate for their individual talents.

However, challenges remain for National Laboratory nonproliferation and international safeguards human capital development efforts. There is always room for improvement in inter- and intra-laboratory communication to ensure the best utilization of existing staff and the best placement of newcomers to the field. Also, project-specific funding does not incentivize individuals to explore beyond their current specializations.

Regarding the training of students, there are several challenges. Chief among these is the reality that nonproliferation and international safeguards are inherently a multi-disciplinary endeavor, and achieving the appropriate balance of skills can be difficult. There is general agreement that developing training programs that cross academic boundaries are important. However, some have noted the difficulty of integrating technology and policy components; students find the portions within their discipline too easy and the portions outside of their discipline too difficult. This suggests that efforts to get students of different backgrounds to effectively work together to solve interdisciplinary problems collaboratively could be a very productive teaching tool.

A related challenge is to ensure that individuals with the right balance of skills and backgrounds are recruited and developed to meet tomorrow's needs. One of the preliminary findings of an internal draft ORISE "International Safeguards Scientist and Engineer Workforce" study" was that a disproportionate number of the younger self-identified international safeguards specialists have backgrounds in international affairs. This may reflect several factors. First, the survey was an exclusive poll of individuals working on NNSA Office of Nonproliferation and International Security (NA-24) projects. The nature of those projects may lend themselves more readily to individuals in international affairs than projects sponsored by other offices, such as the NNSA Office of Nonproliferation Research and Development (NA-22). Also, individuals with a technical background relevant to safeguards may self-identify as a specialist in their technical discipline rather than as a specialist in the larger "umbrella" field of international safeguards.

Another alternative is that individuals with backgrounds in international affairs with a career interest in nonproliferation and international safeguards may be disproportionately attracted to government and National Laboratory positions given that there are few outlets for their interests in private industry. Students with a physical science or engineering background, who may be primarily interested in research and development work, may find ample opportunities for employment in private industry. As international safeguards and nonproliferation efforts at the National Laboratories and elsewhere increasingly focus on state-level evaluations and other policy-driven activities, and as long as technical students are recruited into the labs and made aware of nonproliferation and international safeguards, then there may not be an issue of disproportionate recruitment.

Individuals managing nonproliferation and international safeguards human capital development activities across the National Laboratories see remarkable enthusiasm for the field by those to whom they reach out. Reaching the right people and teaching essential skills remains a challenge, but once individuals become involved, their own passion often drives them to seek out development opportunities.

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