Nonproliferation and National Security at Brookhaven National Laboratory

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My Background

• Grew up in Huntington (Elwood)
• Studied Civil Engineering at MIT
• Began at BNL in the Department of Nuclear Engineering’s Structural Analysis Division
• Moved to the International Safeguards Project Office (ISPO)
• Served as ISPO’s Liaison Officer in Vienna, Austria from 1994 to 1998
• Served as Head of ISPO from 1999 to 2010
• Became Department Chair in 2015
Definitions

- Safeguards – the activities undertaken to account for and control nuclear material
- Nonproliferation – preventing the increase of weapons
  - Horizontal
  - Vertical
- Arms Control
- Disarmament - reducing weapons
  - Global Zero
Setting the Stage

• International Atomic Energy Agency
  • Established in 1957 following President Eisenhower’s Atoms for Peace speech
  • Promotes the peaceful uses of nuclear power and prevents the spread of nuclear weapons
  • ~180 member states provide financial support
  • United Nations’ “Nuclear Watchdog” – safeguards inspectors
  • Monitoring agency
  • Reports to the United Nations Security Council
Setting the Stage

• Treaty on the Nonproliferation of Nuclear Weapons (NPT)
  • IAEA originally inspected facilities offered for safeguards in agreements with each member state
  • NPT opened for signature in 1968, entered into force in 1970
  • Enabled IAEA to perform Comprehensive Safeguards Inspections
  • Established nuclear weapons states and non-nuclear weapons states
  • Nuclear Weapons States: US, UK, China, Russia, and France
  • Non-signers: India, Pakistan, and Israel (threshold states)
Setting the Stage

• September 11, 2001
  • Increased attention on U.S. borders and domestic security
  • Inspired a generation of U.S. citizens to dedicate their lives to make the world a safer place
  • U.S. created the Department of Homeland Security to centralize domestic security efforts
Setting the Stage

• Iraq
  • Signatory of NPT that was found to be noncompliant after first Gulf War
  • IAEA was verifying states’ declarations
  • Led to an international effort to strengthen the IAEA’s safeguards program
    • Additional Protocol – strengthened safeguards and focus on undeclared activities
Setting the Stage

- North Korea
  - Signed and then resigned from the NPT in the 1990s
  - Agreed Framework – agreement to provide power reactors in exchange for shutting down their research reactor
  - Second agreement to shutdown its research reactor and reprocessing program in 2000s
- Recently:
  - US and DPRK leaders trading insults
  - 2018 Winter Olympics
  - Invitation from DPRK to meet with President Trump
  - Kim Jung Un crossed the DMZ to meet with Moon Jae-in
  - Planned Summit
Setting the Stage

• Iran
  • Ongoing questions about Iran’s pursuit of enrichment technology
  • 2015: Joint Comprehensive Plan of Action
    • The Iran Deal
    • Limited enrichment capability in exchange for the removal of sanctions
  • 2018: US is withdrawing – other parties vow to continue
International Safeguards Project Office

- Management of the U.S. Support Program to IAEA Safeguards
  - Transfers technology and services available in the U.S. to increase the effectiveness and efficiency of IAEA Safeguards

- Staff at BNL and in Vienna, Austria

- Network of national laboratory and private sector technology and technical service providers

- Provides instruments and integrated systems, training, software and data systems, statistical analysis, and technical services
International Safeguards Project Office

* National Labs  Analytic Laboratories - IAEA NWAL
International Safeguards Project Office

- Recruitment of US citizens for positions with the IAEA Department of Safeguards
  - Regular staff positions
  - Cost Free Experts
  - Junior Professional Officers
Radiation Detector R&D

• Capability to integrate across the development path from material synthesis, crystal growth and characterization, prototyping and testing

• Long-standing track record in development and optimization of CZT

• Synergy between Rad Detector Research Group and Instrumentation Division

• Emphasis on maturation of Frish-grid CZT detectors, which eliminate the use of large expensive crystals
Radiation Detector R&D

- Detector Commercialization
- Crossover to the medical field
- Instrumentation Testing
Training

- For IAEA inspectors
- For representatives of other member states
- U.S. government agencies
- Students/early career professionals
Radiological Assistance Program

- Region 1 Northeast covers the Northeast United States
- 3 full time members and 21 part time members
- Work with local and regional law enforcement agencies
- On call to respond to radiological incidents within 6 hours
- Planned assistance to cultural, sporting and political events
  - Pope Francis’ visit in 2016
  - Presidential Inauguration and Political Conventions
  - Boston Marathon
  - New Years Eve at Times Square
  - Super Bowl
  - U.S. Open Tennis Championship
  - United Nations General Assembly
Region 1 RAP Deployment at the Super Bowl
Region 1 RAP Team
**Students**

- Internships
- Nuclear Nonproliferation, Safeguards and Security in the 21st Century
  - Two-week short course held each June (cost free to participants)
  - For graduate students and professionals
- University courses – lectures and lab exercises
- Tour and lecture programs at BNL
- Opportunities to work with the IAEA
  - Established an internship program for U.S. students and recent graduates
Off-site Assignments

• National Nuclear Security Administration
  • Barbara Hoffheins, Office of International Nuclear Safeguards as a Safeguards Technology Expert

• State Department
  • Stephen LaMontagne, Bureau of Multilateral Nuclear Affairs
  • Josh Tackentien, US Mission Vienna as the ISPO Liaison Officer
Use of BNL User Facilities

• Nuclear Forensics
  • National Synchrotron Light Source II

• Equipment Testing
  • NASA Space Radiation Laboratory
  • Accelerator Test Facility
Sponsors

- US Department of State
- US Department of Energy
  - National Nuclear Security Administration
- US Department of Defense
- US Department of Homeland Security
- National Institutes of Health
Thank you!