2009 NGSI SAFEGUARDS COURSES AT DOE NATIONAL LABORATORIES

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OUTLINE

■ INTRODUCTION: NGSI – BUILDING HUMAN CAPACITY
■ COURSE DESCRIPTIONS IN TERMS OF:
  • Enrollment
  • Curriculum
  • Exercises
■ PRELIMINARY EVALUATION/CONCLUSIONS
A major focus of the Next Generation Safeguards Initiative (NGSI) is to ensure that there is sufficient “human capital” to meet present and future challenges of safeguards and nonproliferation.

Enough people are needed with both the right skills and the motivation to staff national laboratories and research centers, IAEA, government agencies, non-government organizations, colleges, and universities.
INTRODUCTION: NGSI – BUILDING HUMAN CAPACITY FOR SAFEGUARDS

First steps:
- support laboratory-based courses at BNL, LANL, ORNL, and PNNL;
- concomitantly, develop course materials;
- Support university based program at Monterey

Second steps:
- support summer internships focused on safeguards and nonproliferation at the national laboratories; and
- concomitantly, motivate graduate student research in these areas.
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STUDENT UNIVERSITIES

- Brookhaven: Rensselaer Polytechnic, Penn State, Columbia, Seton Hall, Michigan, George Washington, Johns Hopkins, New York, MIT, Louisville, Virginia, Georgia, Missouri, Yale, Ohio

- ORNL: Alcorn State, Clemson, Georgia Tech, Michigan State, Mississippi State, North Carolina State, North Dakota State, Ohio State, Oregon State, Prairie View A&M University, Rensselaer Polytechnic, Cincinnati, Florida, Illinois, Maryland, Missouri, Nevada, North Carolina, South Carolina, Tennessee, Utah, Wisconsin, Vanderbilt, Virginia Tech


COURSE FACULTY

- BNL: BNL, Sewanee, DOE, DOS, IAEA, LANL, ISIS, Stony Brook
- ORNL - ORNL, Y-12, NRC, SRNL, Texas A & M, University of Florida, University of Michigan, University of Wisconsin, University of Missouri
- LANL: LANL Staff
- PNNL:
  - Interns: PNNL, LANL, IAEA,
  - WSU: Tom Shea, PNNL, Energy NW, Areva
## GENERAL COURSE CHARACTERISTICS

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SPECIAL COURSE FEATURES

BROOKHAVEN NATIONAL LABORATORY:

- Course readings on a Wiki web site
- DIV exercise at the decommissioned Brookhaven Medical RR
- NM handling and measurement demonstration
- Simulated PIV exercise
- Random sampling exercise
- Tutorial, including demonstrations, on detecting nuclear and other radioactive materials
- International safeguards crisis role-playing simulation exercise
- Social events
SPECIAL COURSE FEATURES

- Los Alamos National Laboratory
  - Tours of the Waste Isolation Pilot Plant and Nevada Test Site
  - Participation in 2009 INMM Conference
  - Laboratory Practicum
  - Safeguards Exercise with LLNL
  - Spent Fuel Project
  - Participation in NGSI Curriculum Development Workshop
  - Social Events
SPECIAL COURSE FEATURES

■ OAK RIDGE NATIONAL LABORATORY

• Tours of ORNL and Y-12 Facilities, including the High Flux Isotope Reactor, Spallation Neutron Source, and the Safeguards Integrated Technology Center

• Safeguards Laboratory demonstrations

• Additional Non-Destructive Assay (NDA) Summer Institute for 17 students over three days

• Summer Seminar Series of 20 nonproliferation and safeguards topics for summer interns

• Containment and Surveillance demonstrations

• Social events
SPECIAL COURSE FEATURES

PACIFIC NORTHWEST NATIONAL LABORATORY

- Tour of B Reactor
- Tour of Areva Fuel Fabrication Plant
- Radioactive material detection exercise at the HAMMER Facility
- Social events
LECTURE TOPIC SELECTION

- Nuclear fuel cycle
- Nuclear weapons and radioactivity dispersal devices
- Domestic safeguards
- Nonproliferation Treaty and nonproliferation regime
- International Atomic Energy Agency
- IAEA safeguards based on INFCIRC/153
- IAEA safeguards based on Model Additional Protocol
- Country assessments: Nonproliferation successes and failures
- Recent threats and responses
- Next Generation Safeguards Initiative
BNL Course Evaluation Results

- Overall organization generally very good (~4 on a scale of 5);
- Individual presentations generally very good (~4);
- Role-playing simulation very good (~4);
- DIV and PIV exercises very good to excellent (~4.5);
- More physics introductory material desired by political science students;
- Students valued their mix of graduate disciplines;
- Coordination among lecturers needs improvement to avoid repetition.
PNNL Course Evaluation Results

- Positive reaction to facility tours
- Students value work in teams with other interns
- Social events/interactions important
LANL Course Evaluation Results

- Would like to see Safeguards training lectures incorporate more policy background on nonproliferation regime
- **Laboratory Practicum**
  - Instructors were knowledgeable and enthusiastic
  - Very valuable hands-on experience
  - Would like to include environmental sampling
- **Staff and students did a great job organizing outings, tours, and activities**
CONCLUSIONS

- Demonstrate significant interest in area with high degree of interest in courses:
  - Many more applications and expressions of interest from well-qualified applicants than could be accommodated.

- Courses appreciated; high degree of satisfaction with participation and lectures from “practitioners,” i.e., individuals with direct working experience with safeguards and nonproliferation at IAEA and USG agencies.
CONCLUSIONS

- Mix of technical and non-technical students successful:
  - Worked well together and learned from each other;
  - Enhanced value of class discussions.

- But makes planning lectures and syllabus more complex:
  - Easy to challenge “scientists” and non-scientists with policy issues (some not solvable)
  - Harder to challenge class with technical problems in ways that address both groups’ technical backgrounds; what’s too hard for political scientist may be far too easy for nuclear engineer.
CONCLUSIONS

- Evidence already that courses have enhanced students' interest in field or enhanced ability to pursue careers in area:
  - One student plans to offer a university seminar on safeguards and nonproliferation next year
  - Students highlight participation in courses on resumes.
- There remains a need to identify and train experienced, mid-career professionals who may wish to enter a career in international safeguards, for example, from a natural science.
CONCLUSIONS

■ Communication/relationships are key:
  • Students must know about opportunities;
  • Bring information on NGSI programs together to overcome program isolation.

■ Communicate directly to students, but how?
  • through student services/career centers;
  • provide funding for students to attend workshops.
  • Use Facebook, Twitter?
CONCLUSIONS

- Who should be target audience(s)
  - Traditional nuclear engineering departments?
  - Nuclear specialists?

- But "one-size-fits-all" doesn't work any more:
  - IF IT EVER DID!!

- Safeguards is now information driven, not radiation driven:
  - Satellite imagery
  - Forensics
  - Open source information
  - State level evaluations
  - Etc.
CONCLUSIONS

- Need metrics for success on both growth and sustainability.
- Lab-University partnerships: Need to build networks and find "Faculty Champions."
- Need opportunities (research funding) to encourage faculty champions.
- But faculty buy-in may not translate to university buy-in.
- Need "University" programs: need to talk to deans, presidents, etc., not just professors.