

# **Nuclear Security Education, Research and Training at Texas A&M University**

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# Nuclear Security Education Begins at Texas A&M (March 2006)

RESEARCH PROGRAM

## A new nuclear security initiative is established at Texas A&M

**T**EXAS A&M UNIVERSITY recently established the Nuclear Security Science and Policy Institute (NSSPI) on the campus at College Station, Tex. Under director William Charlton and associate directors David Boyle and Warren Miller, NSSPI will promote graduate-level education and research that will focus on topics related to safeguarding nuclear materials and enhancing national security against nuclear terrorism.

The new program is expected to get off the ground in mid-summer with early activities on new courses, degree programs, and preparation for a national workshop, according to Miller. "NSSPI will be the first campus-based entity, with a higher education mission, focusing on the details of nuclear security science and the interface with national and international policy," he said.

"We are convinced that a new trend in nuclear engineering will be to establish programs to prepare students for careers in the vitally important arena of nuclear security."



NSSPI was approved by the university's Board of Regents on March 24, 2006. The new program will be a collaborative effort between Texas A&M's Department of Nuclear Engineering and its Bush School of Government and Public Service. The university is seeking base funding of about \$1.5 million each year from the Department of Energy. The goal is to obtain from various sources another \$1 million per year to support NSSPI's administrative, outreach, and educational activities, and \$5 million per year for research activities. The DOE may provide some of the additional funds, according to Miller, "because it is interested in supporting nuclear security science and policy activities." He added that the DOE's Lawrence Livermore National Laboratory,

*The new Nuclear Security Science and Policy Institute at Texas A&M University will focus on nuclear security education and research.*

Los Alamos National Laboratory, and Sandia National Laboratories have also expressed interest in funding some NSSPI research activities.

The mission of NSSPI is to work with national laboratories and other partners to develop and apply science and technology to detect, prevent, and reverse the proliferation of nuclear and radiological weapons and to educate the next generation of leaders in the field of nuclear security sciences. NSSPI will also study national policy implications of deploying new technologies. It is expected that most NSSPI activities will be unclassified, Miller said.

**Existing collaborations**

Texas A&M faculty and students have been active in the fields of nuclear nonproliferation, nuclear material safeguards, and international security for many years, Miller said. Activities have included scientific and engineering research projects with Los Alamos, Sandia, Oak Ridge, and Pa-

cific Northwest national laboratories. Faculty members have been involved in research related to proliferation-resistant nuclear fuel designs, proliferation resistance assessments for fuel cycles, nuclear material safeguards development and analysis, the development of portal monitors for detecting the illicit trafficking of nuclear materials, modeling of nuclear smuggling routes, post-event nuclear material attribution, compilation of reactor data for international safeguards and safety purposes, developing methodologies for verifying the history of plutonium production reactors both pre- and post-decommissioning, generating techniques for the identification of covert nuclear weapons programs, and studying nuclear terrorism pathways.

"Texas A&M is the leader in nuclear nonproliferation technical education and teaches some of the only engineering courses in the United States dedicated to addressing the technical aspects of nuclear nonproliferation," Miller said. He noted that

### Security Briefs

**THE SENATE FOREIGN RELATIONS COMMITTEE VOTED 16-2** on June 29 in favor of a bill that would renew nuclear commerce with India. President George W. Bush has been pushing a plan for a U.S.-India nuclear cooperation agreement. The Senate's vote followed a similar show of support two days earlier by the House International Relations Committee. The Senate committee's bill puts a ban on several nuclear exports to India, such as heavy-water production, spent-fuel reprocessing, and uranium enrichment.

**THE DHS IN JUNE CIRCULATED A DRAFT PLAN ON SECURITY** for nuclear facilities. Titled "Nuclear Reactors, Materials and Waste Sector-Specific Plan," the plan's intent is to identify government actions that would enhance the commercial sector's security efforts with the local, state, and federal governments. According to the Department of Homeland Security, the plan will be analyzed annually and reissued every three years.

**NSSPI**  
NUCLEAR SECURITY  
SCIENCE & POLICY INSTITUTE

Educating the Next Generation of Leaders in Nuclear Security Sciences

TEES TEXAS A&M ENGINEERING EXPERIMENT STATION

ATM NUCLEAR ENGINEERING TEXAS A&M UNIVERSITY



## MISSION

- Employ science, engineering, and policy expertise to:
  - Conduct R&D to help detect, prevent, and reverse nuclear proliferation and guard against nuclear terrorism
  - Educate the next generation of nuclear security leaders
  - Analyze the relationship between nuclear security policy and technology
  - Serve as a public resource for to reduce nuclear threats



**Richard  
Mac  
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(Bush  
School)**

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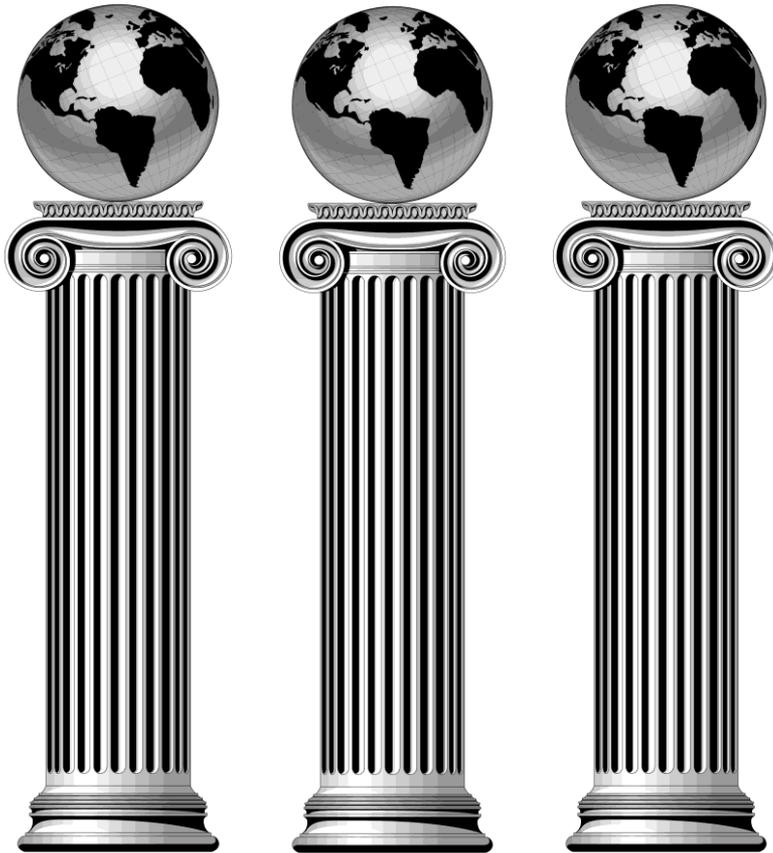
**Dr. Craig Marianno, Deputy Director**

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The Nuclear Security Science and Policy Institute (NSSPI) is a multidisciplinary organization focusing on graduate education, research, and service related to the safeguarding of nuclear materials and the reduction of nuclear threats. We work in collaboration with U.S. national laboratories, the International Atomic Energy Agency (IAEA), and other partners to address the problems associated with the malicious use of nuclear materials and to study policy issues related to nuclear security. NSSPI is a joint center of Texas A&M University and the Texas A&M Engineering Experiment Station, an engineering research agency of the State of Texas and a member of The Texas A&M University System.

## **NPT**

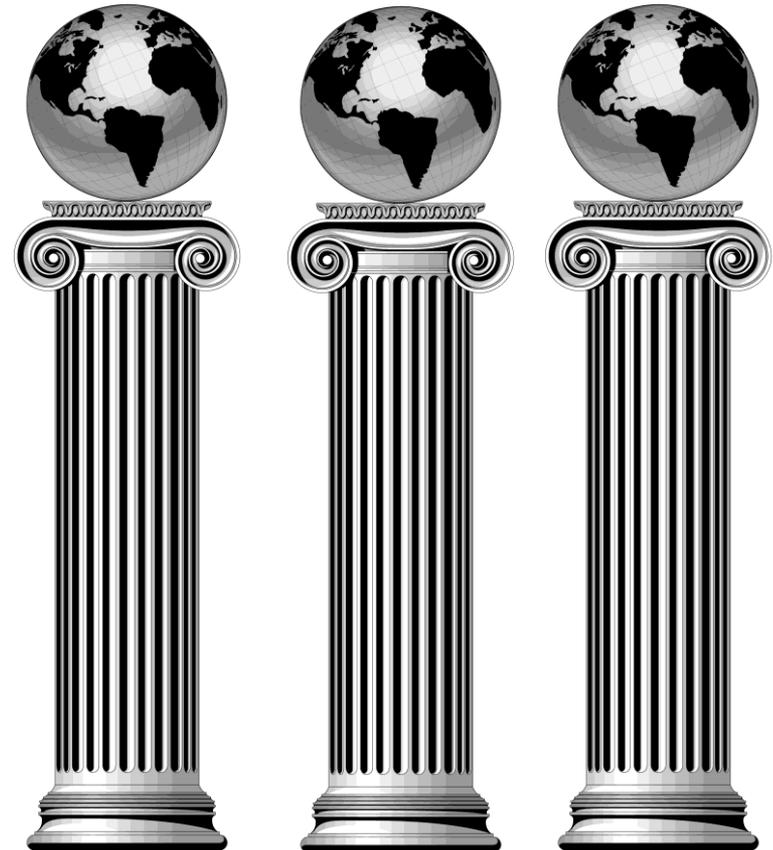
- 1. Nonproliferation**
- 2. Peaceful Uses of Nuclear Energy**
- 3. Disarmament**



**State Actors**

## **Nuclear Security**

- 1. Prevention**
- 2. Detection**
- 3. Response**



**Non-State Actors**

# Nuclear Security Education Features

- Program includes:
  - Graduate and undergraduate courses
  - MS degree in Nuclear Engineering with Nonproliferation track
  - Certificate offerings
    - Nuclear security certificate
    - Nuclear forensics certificate
  - Tabletop exercises
  - Field exercises at Disaster City
  - Nuclear facilities experience
- Other facts:
  - Currently 30 students in the program
  - Publications: **500+**
  - Theses/Dissertations: **91+**

**Total NSSPI Graduates: 76**

**Degrees in nuclear nonproliferation related topics:**

- **MS Degrees: 56**
- **M.E. Degrees: 5**
- **Ph.D. Degrees: 22**

**NSSPI has also supported students in many other multi-disciplinary research areas**

**Employment Status After Graduation:**

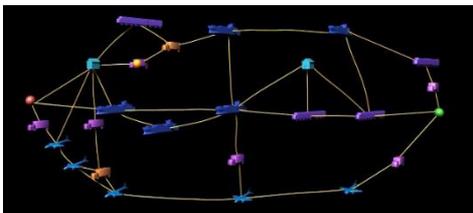
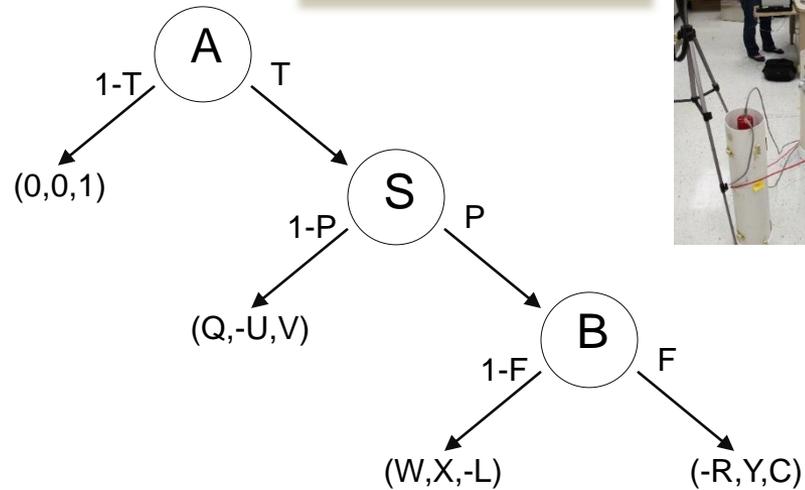
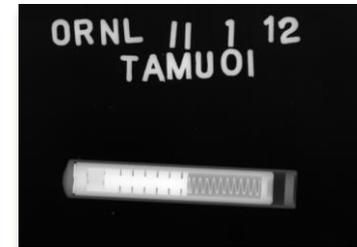
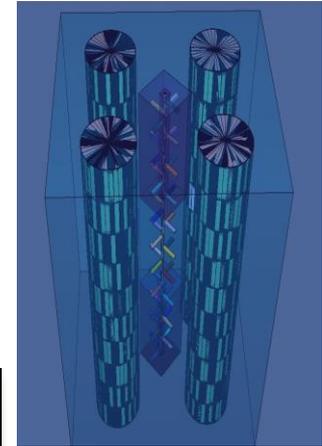
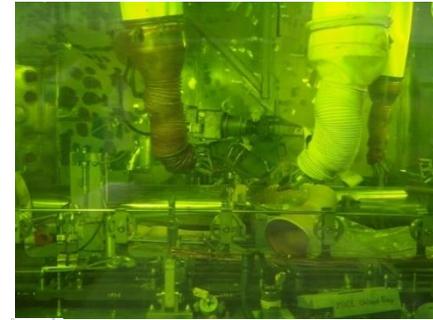
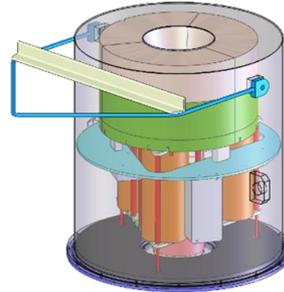


# Topics Covered

- Fundamental Nuclear Engineering
  - Interactions of Radiation with Matter
  - Radiation Detection
  - Reactor Physics
  - Radiation Transport
  - Nuclear Fuel Cycles
- Nuclear Safety
  - Radiation Shielding
  - Radiation Protection
  - Reactor Engineering
- Nuclear Nonproliferation
  - History and Policy Impacts
  - Proliferation Detection
  - Export Controls
- Nuclear Safeguards
  - Nuclear Material Quantification and Accountancy
  - Safeguards System Design
- Nuclear Security
  - Threat Assessment
  - Physical Security
  - Border Security
  - Nuclear Forensics

# Strong Research Focus

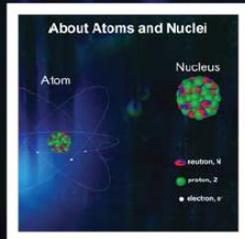
- Safeguards Instrumentation Development
- Novel Detection Systems with Robotics Support
- Nuclear Forensics
  - Pre-detonation and post detonation
- Reactor Analysis for Proliferation Detection
- Nuclear Security and Deterrence Analysis using Game Theoretic & Bayesian Network Models
- Proliferation Resistance Analysis
- Consequence Management



# NSSEP

Nuclear Security & Safeguards Education Portal

## ONLINE TRAINING IN



BASIC NUCLEAR SCIENCE



NUCLEAR SECURITY



NUCLEAR SAFEGUARDS

<http://nsspi.tamu.edu/nssep/>



3473 TAMU  
College Station, TX 77843-3473  
<http://nsspi.tamu.edu/>

## NSSEP Modules

### Basic Nuclear Science:

- Basic Nuclear and Atomic Physics
- The Nuclear Fuel Cycle
- Basic Radiation Detection
- Introduction to Statistics

### Nuclear Security:

- Threats to Nuclear Security
- Nuclear Security Culture
- Physical Protection Systems
- Insider Threats

### Nuclear Safeguards:

- Containment & Surveillance
- Nuclear Material Accountancy
- Spent Nuclear Fuel Safeguards

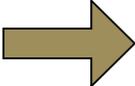
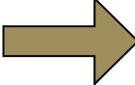
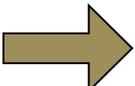
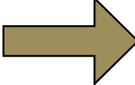
### Upcoming:

- Nuclear Security & Safeguards Basics
- Uranium Enrichment Safeguards
- Human Reliability Programs

- From October 2011 to April 2017, **over 84,000 unique users** accessed NSSEP.

Location	Number of NSSEP Users
USA	46,416
India	9,293
United Kingdom	5,105
Philippines	2,801
Canada	2,520
Nigeria	2,297

# Nuclear Security Certificate

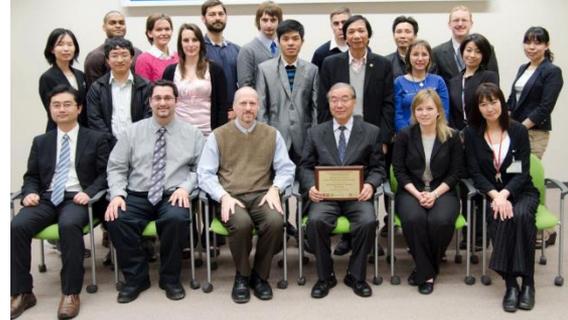
Relevant Nuclear Security Area	Course Developed
Applications of sensors/sources for radiation detection in nuclear security	 <b>NUEN 605</b> (Radiation Detection and Nuclear Materials Measurement)
Global nuclear security policies	 <b>NUEN 650</b> (Nuclear Nonproliferation and Arms Control)
Threat Analysis and Assessment	 <b>INTA 669</b> (Nuclear Security Threat Assessment)
Design and analysis of security systems for nuclear and radiological facilities	 <b>NUEN 451</b> (Nuclear Security System Design)

Students must complete 3 out of 4 courses to earn certificate

# International Engagement

**NSSPI is heavily involved in international activities**

- Observer status at the IAEA General Conference
- Research collaborations with Russia, France, India, and Japan
- Educational collaborations in UAE, Russia, India, UK, Japan, Malaysia, Indonesia, Jordan, Brazil, South Africa, UAE
- Nuclear Facilities Experience for students in Japan, UK, France

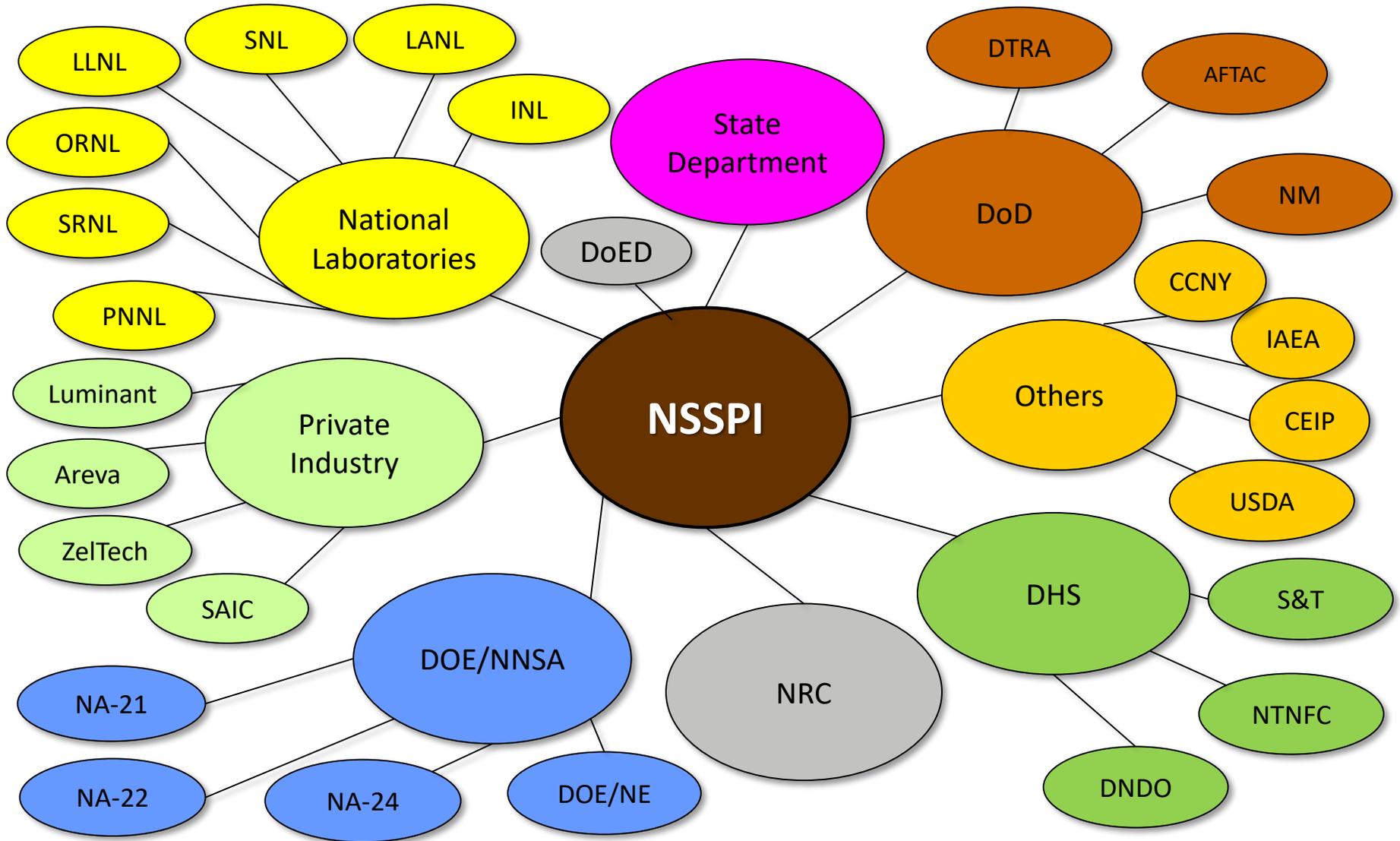


# NSSPI's Global Impact



Asia:6  
Africa:3  
Europe:8  
Middle East:2  
North America:1  
South America:1  
Total Visited:21

# NSSPI's Many Customers



IAEA Nuclear Security Series No. 18

Implementing Guide

**Nuclear Security Systems  
and Measures for  
Major Public Events**



**IAEA**  
International Atomic Energy Agency