PURDUE UNIVERSITY

College of Health and Human Sciences
School of Health Sciences

IAEA

INSEN
International
Nuclear Security
Education Network

# *Initiatives to Integrate Nuclear Security with Radiation Protection Education and Training*


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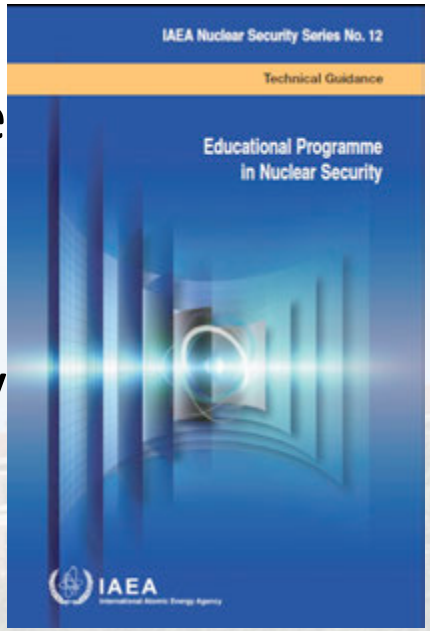
# Introduction

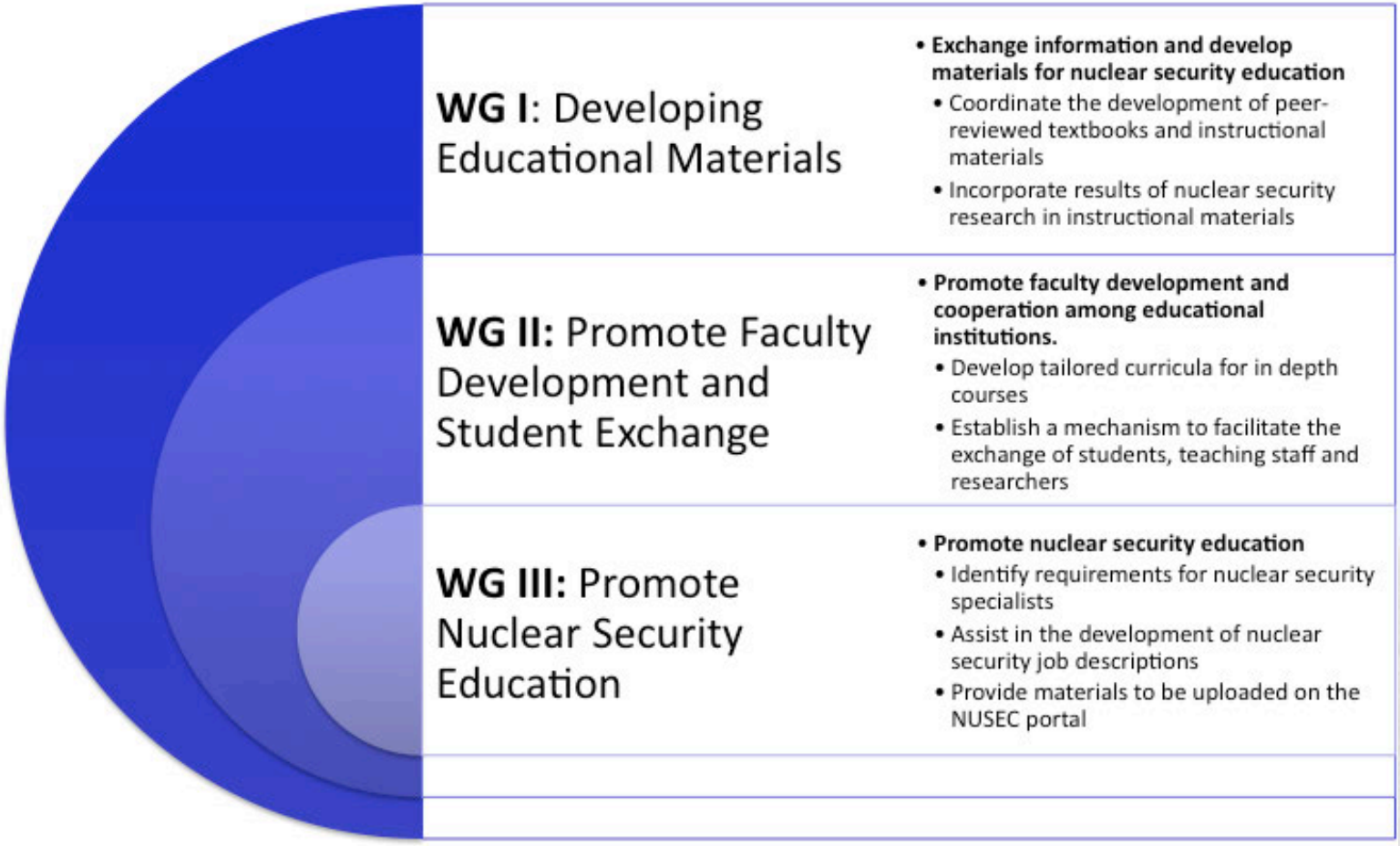
- Increased interest in nuclear energy and nuclear security globally
- IAEA's Board of Governor's meeting in September 2009 recognized importance of nuclear security education
- IAEA Nuclear Security Series No 12 - Educational Program in Nuclear Security was published in April 2010
  - Master of Science
  - Certificate Program
  - Revision currently underway



# International Nuclear Security Education Network (INSEN)

- The INSEN is defined as a partnership between the IAEA and educational and research institutions, and competent authorities.
- Mission – to enhance global nuclear security by developing, sharing, and promoting excellence in nuclear security education.
- INSEN Membership
  - 151 members from 54 member states (1 Oct, 2016)

# INSEN Structure



# Background

- Nuclear Security education integration in areas of overlap with related disciplines has been slow or nonexistent
- Integration with Radiation Protection (RP) is crucial
- Waller and van Maanen discuss the advantages that health physicists would have in a nation's overall nuclear security programme
  - Threat assessment, design basis threat, informed risk management, response force strategies in light of potential radiation exposure, dose guidance, training, communications of the radiological component of an event
  - Integration of nuclear security and safety (radiation protection) culture
- First phase - developing and presenting professional enrichment courses to introduce RP professionals to nuclear security

# Motivation

- Health physicists are a motivated group for professional development, and courses in nuclear security that cover both nuclear and radiological material management are desirable.
- Continuing Education required for credentials
  - American Board of Health Physics (ABHP) offers the Certified Health Physicist (CHP)
    - ABHP requires 80 continuing education credits (CEC) be obtained over a 5 year recertification cycle
  - World Institute for Nuclear Security (WINS) Certified Nuclear Security Professional (CNSP)

# Methods – Professional Development Courses

**TABLE I: Summary of Nuclear Security Courses Offered to Radiation Protection Professionals from 2014-2016.**

| COURSE TITLE | VENUE, LOCATION, YEAR | DURATION (HR.) | COURSE PARTICIPANTS |
|---|---|---|---|
| 1 Introduction to Nuclear Security I & II | 47th HPS Midyear Meeting, Baton Rouge, Louisiana, USA, 2014 | 4 | 20 |
| 2 Introduction to Nuclear Security for the Health Physicist | 59th HPS Annual Meeting, Baltimore, Maryland, USA, 2014 | 8 | 40 |
| 3 Workshop on Strengthening Security of Radioactive Sources in Medical and Industrial Facilities | 4th Regional Congress of IRPA for Africa Region (AFRIRPA04), 2014 | 4 | 50 |
| 4 Physical Protection for Nuclear and Radiological Security | 60th HPS Annual Meeting, Indianapolis, Indiana, USA, 2015 | 2 | 25 |

# Methods – Professional Development Courses

| COURSE TITLE | VENUE, LOCATION, YEAR | DURATION (HR.) | COURSE PARTICIPANTS |
|---|---|---|---|
| 5 Terrorist Threat and Consequence Management in Radiological Security | 60th HPS Annual Meeting, Indianapolis, Indiana, USA, 2015 | 2 | 25 |
| 6 troduction to Nuclear nd Cyber Security for the Health Physicist | 60th HPS Annual Meeting, Indianapolis, Indiana, USA, 2015 | 2 | 25 |
| 7 Nuclear Security, Alternative Technologies and Consequence Management for the Health Physicist | MIT, Cambridge, Massachusetts, USA, 2015 | 20 (3 DAYS) | 25 |
| 8 Nuclear Security for the Health Physicist | 14th IRPA Congress, Cape Town, South Africa, 2016 | 4 | 50 |

Methods – Professional Development Courses

## TABLE II: Modules Taught in Nuclear Security Courses Offered to Radiation Protection Professionals from 2014-2016.

| MODULE | COURSE | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Basic elements & definitions of nuclear security | X | | X | | | | | |
| Introduction to nuclear security | | X | X | | | X | X | X |
| Interrelationships between safety, security and safeguards ($S^3$) | X | X | X | | | X | | X |
| International nuclear security framework | | | | | | | | |
| Threats by non-state actors & terrorism | X | X | | | X | | | |
| Planning nuclear security at the state level | X | | | | | | | |
| Role of the health physicist in nuclear security | X | X | X | | | X | | X |
| Design Basis Threat (DBT) | | X | | X | | | | |
| Physical protection systems | | X | | X | | | X | X |
| Consequence management | | X | | | X | | | |
| Facility, border and source security | | X | | X | | | | |
| Exercise on detection | | X | | | X | | | |
| IT/Cyber security | | X | X | | | | | X |
| US NRC and DOE nuclear security regulations | | X | | | | X | | |
| High Activity Sources and Alternatives in Medicine | | | | | | | X | |
| Alternative Technologies: Policies and Paths Forward | | | | | | | X | |
| Nuclear security culture | | | X | | | | | X |

# Methods – Lectures/Presentations

- HPS Annual Meeting (2014-2016, USA)
- HPS Midyear Meeting (2014, USA)
- NATC ISOE ALARA Symposium (2015, USA)
- AFRIRPA04 (2014, Morocco)
- 14th IRPA Congress (2016, South Africa)
- John Horan Memorial Symposium: Topics in Health Physics (2015, USA)
- INSEN Annual Meeting (2015, Austria)

# Methods – Nuclear Security Curriculum

- Purdue University was chosen in 2017 to implement the US Department of Energy (DOE) Defense Nuclear Nonproliferation (DNN) Office of Radiological Security (ORS) Nuclear Security Education (NSE) program.
  - Program joint between Health Physics, Nuclear Engineering, and Political Science
- Curriculum includes six courses
  - Introduction to Nuclear and Radioactive Source Security, Nuclear Security Threat Assessment and Analysis, Nuclear Security Science, Nuclear Detection Technologies, Nuclear Nonproliferation and Arms control, and Nuclear Security Systems Design.
  - New course in Alternative Technologies (and integrating RP with NS)

# Methods – Nuclear Security Curriculum

- Purdue University part of MiNS II program (sponsored by IAEA)
  - MS in Nuclear Security (through Bradenburg University of Applied Sciences)
    - Starting October 2017
    - Online course
  - Research in Nuclear Security Culture and assessing security with safety and radiation protection

# Results and Discussion

- A key emphasis that was presented in all of these endeavors was the importance of integrating nuclear and radiological source security with radiation protection (or more broadly, radiological safety)
- Overall, across several categories, the instructors and course content was generally viewed as “Excellent” or “Very Good”
- A consistent message that was relayed to the instructors was that the course participants were very pleased that a course in nuclear security was being offered to them in the context of health physics.
- Willingness of health physicists and others involved primarily in radiation protection to broaden their horizons and look beyond a “safety silo”.

# Future Work

- In addition to covering the more introductory topics, the authors intend to develop more advanced topics including:
  - Integration of nuclear security and radiation protection/safety culture;
  - Radiation protection roles in nuclear and radioactive source emergency management and insider threat;
  - Nuclear security management for the health physicist;
  - Radiation detection design and use for safety and security applications; and
  - Health physicist's role in safety and security design of facilities
- Target deliveries to specific sectors that use nuclear and radioactive materials.
  - Medical and educational/academic communities
- Research opportunities
  - Assessment of nuclear security and its integration with safety/radiation protection culture among different sectors (i.e. nuclear power, health care, academia
  - Alternative technologies in health care to evaluate the safety and security benefits and risks of source vs. device use.

# Conclusions

- Health Physicists and radiation protection professionals, with their diverse experience in radiological sciences, can play vital roles in nuclear security.
- To reach out to this community eight enrichment courses and several presentations were presented at both national and international professional society meetings since 2014.
- These courses were focused on giving the health physics professional a greater insight into the many challenging areas of nuclear security and how they might participate
- These courses were well received by the attendees.
- The authors acknowledge that a more active effort should be used to distribute and collect course evaluation.
- In the future, presentations and courses are being considered for more targeted audiences and with more specialized content.
- From an educational perspective, this content should be incorporated into both nuclear security and radiation protection programs and expanded to research activities for faculty and students.

# Acknowledgments


- Craig Marianno, PhD, Assistant Professor, Texas A&M University, Nuclear Science Security and Policy Institute (NSSPI), Department of Nuclear Engineering, College Station, Texas, USA
- IAEA Division of Nuclear Security
- INSEN

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# Thank you!

# Questions?