



For Immediate Release
March 1, 2016

Richard E. Toohey is the Thirteenth Warren K. Sinclair Keynote Speaker

Dr. Richard E. Toohey has been selected to give the 13th Warren K. Sinclair Keynote Address at the 2016 Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP). The Address, entitled “WARP, an NCRP Initiative to Meet the Needs of the Nation for Radiation Protection,” will be a featured presentation at the 52nd NCRP Annual Meeting to be held April 11 and 12, 2016. The Address will be given at 8:30 a.m. on April 11, 2016 in the Crystal Ballroom, Hyatt Regency Bethesda, One Bethesda Metro Center, 7400 Wisconsin Avenue. The keynote speaker series honors Dr. Warren K. Sinclair, NCRP’s second President (1977 to 1991).



Dr. Toohey has been a member of the Council for 10 y and has served on the Board of Directors since 2010. He has served on the Budget and Finance Committee since 2006 and as Chair since 2007. Dr. Toohey was Chair of the 2012 Annual Meeting Program Committee on “*Emerging Issues in Radiation Protection in Medicine, Emergency Response, and the Nuclear Fuel Cycle,*” a member of the 2014 committee, and Co-Chair of the 2016 committee.

Dick Toohey is Chair of the Council Committee on “Meeting the Needs of the Nation for Radiation Protection” and Co-Chair of SC 6-9 on “U.S. Radiation Workers and Nuclear Weapons Test Participants Radiation Dose Assessment.” He was a member of the scientific committees that produced NCRP Report No. 164, *Uncertainties in Internal Radiation Dose Assessment* (2009); Report No. 163, *Radiation Dose Reconstruction: Principles and Practices* (2009); and Report No. 156, *Development of a Biokinetic Model for Radionuclide-Contaminated Wounds for Their Assessment, Dosimetry and Treatment* (2006); and was a participant in the 2013 workshop on “*Where are the Radiation Professionals?*”

Dr. Toohey received his PhD in physics from the University of Cincinnati in 1973. He spent the first part of his career at Argonne National Laboratory in both research and operational health physics. He is retired from Oak Ridge Associated Universities, where he served as director of the Radiation Internal Dose Information Center, as Senior Health Physicist for the Radiation Emergency Assistance Center/Training Site, Director of Dose Reconstruction Programs, and Associate Director of the Independent Environmental Assessment and Verification Program. He is currently a consultant with M. H. Chew and Associates of Livermore, California.

He is certified in comprehensive practice by the American Board of Health Physics, was the 2008 to 2009 President of the Health Physics Society, is Treasurer of the International Radiation Protection Association, and Chair of the Scientific Advisory Committee for the U.S. Transuranium and Uranium Registries. His specialties are internal radiation dosimetry, dose reconstruction, radiological emergency response, and litigation support. Dr. Toohey has 125 publications in the open literature, and is a retired Lt. Colonel, U.S. Army Reserve.

The theme of the 2016 NCRP Annual Meeting is “*Meeting the Needs of the Nation for Radiation Protection.*” Registration is free. The W.K. Sinclair Address and other sessions of the 2016 Annual Meeting are open to everyone with an interest in radiation protection, measurements, health and science.

The National Council on
Radiation Protection and
Measurements

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13th Warren K. Sinclair Keynote Address



Warren Keith Sinclair

1924 - 2014

Warren and **Joy** both died in 2014





13th Warren K. Sinclair Keynote Address

- Board of Directors since 2010 (Council 10 y)
- Budget & Finance Committee
- 2016 Annual Meeting Program Committee (Co-Chair)
- Co-Chair, SC 6-9, *Dosimetry for the Million Person Study*
- PhD in Physics from U of Cincinnati
- President Health Physics Society (2008)
- Treasurer of the International Radiation Protection Association (IRPA, Current)
- Formerly worked at Argonne National Lab and ORAU
- Specialties in internal dosimetry, dose reconstruction, and emergency response
- Chair, CC 2, *Meeting the Needs of the Nation for Radiation Protection*





Dick and a Few Friends





13th Warren K. Sinclair Keynote Address



Dr. Richard E. Toohey

**WARP, an NCRP
Initiative to Meet the
Needs of the Nation for
Radiation Protection**

Where Are the Radiation Professionals? (WARP)

13th Annual Warren K. Sinclair Keynote Address

Richard E. Toohey, Ph.D., CHP

M. H. Chew and Associates

Oak Ridge, TN 37830

April 11, 2016

Back to the future

- The AEC fellowship program started in 1948 with 20 students selected by NRC (not that NRC), with 10 at Oak Ridge National Laboratory and 10 at University of Rochester
- In 1949 the Oak Ridge Institute of Nuclear Studies (later Oak Ridge Associated Universities) took over administration of the program and extended it to 18 universities
- Between 1950 and 1973, 940 trainees completed the program
- PHS rad health training program ran from 1961 to 1972, expanded to 35 universities, and perhaps 1,800 trainees
- Source: Ziemer presentation IRPA 9, Vienna, 1996

Closer to the present

- In 1974, the AEC fellowship program was assumed by the Energy Research & Development Administration, and then in 1978 by the U.S. Department of Energy (DOE).
- In the 1980s only a few (~5) students per year were supported.
- In 1990, DOE's Office of Environment, Safety and Health began the applied Health Physics (HP) fellowship program at 17 universities and supported ~20 M.S. students annually.
- In 1990, the U.S. Nuclear Regulatory Commission (NRC) began its graduate fellowship program, supporting a few students annually and entailing a service obligation

Not a new issue

- In 1976, Dade Moeller and Rolf Eliassen predicted a 50 % shortfall in the number of HP graduates needed in the next 5 y [HP 31(1), 1-11].
- In 1988 Ken Mossman and John Poston published “Education and Training in Health Physics—a Look to the Future” [HP 55(2), 223-227] and noted that DOE “reports current shortages of professional health physicists in the civilian nuclear industry and predicts a high potential for shortages during the next 15 y.”
- In 2001 the Health Physics Society (HPS) issued Position Statement 15, “Human Capital Crisis in Radiation Safety,” which noted: “it is clear to the radiation safety community that the current imbalance between supply and demand will significantly worsen in the near term, after which it will soon become untenable.”

Not much progress

- In 2004, Kevin Nelson, chair of the HPS Human Capital Task Force reported that a crisis can occur when any of the four R's are neglected: Recruiting, Resources, Retention and Retirement (HPS News 32(9), 18-20).
- As of today, it seems that all four R's have not only been neglected, but have fallen on very hard times.
- Meanwhile, use of ionizing radiation has increased tremendously in medicine, and the increase in the number of procedures has followed the increase in the consumption of medical care by an aging population.

The NCRP WARP Initiative

- Workshop held in Arlington, 17-18 July 2013
- Representatives from government agencies, academia, professional societies and the private sector attended



Quad charts presented

- Mission (who we are)
- What we do
- How we do it
- What we need

Government: 12

Professional Societies: 9

Academia: 8

Private sector: 4

National Crisis: Where are the Radiation Professionals?

Government Organization: U.S. Food & Drug Administration



MISSION

- Protecting the public health by assuring the safety, effectiveness, quality, and security of human and veterinary drugs...and products that emit radiation
- Facilitate the development and availability of medical countermeasures
- Preparing for and responding to radiological emergencies
- Protecting human subjects in trials of radioactive drugs
- Protecting employees who work with radiation and radioactive materials

WHAT WE DO

Radiation Protection Regulations and Requirements

- Radiation Control Law (Federal FD&C Act)/ Radiation Control for Health & Safety Act of 1968
- Public Health Service Act
- Bioterrorism Act of 2002
- Homeland Security Act
- 21 CFR 361.1 (Radioactive Drug Research Committee)
- Pandemic & All-Hazards Preparedness Reauthorization Act of 2013 (PAHPRA)

HOW WE DO IT

- Civil Service, U.S. Public Health Service Commissioned Corps, and Contract Staff
- Inspectors, safety officers, compliance officers, medical and product reviewers
- Emergency responders (collateral duty)
- Physicists
- Health Physicists
- Medical Physicists
- Radiologists
- Nuclear Medicine specialists
- Nuclear pharmacists
- Radiochemists

OUR NEEDS!

- Impending retirements
- Program growth
- Program gaps
- HPs
- Surge capacity for emergency response

National Crisis: Where are the Radiation Professionals?

Professional Organization: Health Physics Society



MISSION

Promoting excellence in the science and practice of radiation protection

WHAT WE DO

- Support and promote best practices in radiation safety
- Conduct public information and outreach efforts
- Facilitate professional contacts and interaction
- Accredite academic programs (thru American Industrial Hygiene Association)
- Inform Congress and federal agencies on Radiation Safety issues
- Conduct continuing professional education programs

HOW WE DO IT

- Hold annual and midyear technical meetings
- Publish *Health Physics Journal*, *Operational Radiation Safety*, and *HP News*
- Provide continuing education opportunities
- Support 42 U.S. and 2 international chapters
- Recognize professional accomplishments
- Involve students through Student Support Committee activities, fellowships and grants
- Develop and maintain American National Standards Institute standards in rad safety
- Maintain relationships with vendors
- "Ask the Experts" and radiationanswers.org web page
- Employment exchange

OUR NEEDS!

Sustain the services of the Society to the HP profession by maintaining/increasing membership levels

- Recruitment and retention of Full members
- Attract student members and retain after graduation
- Identify and develop qualified volunteers for leadership positions
- Develop/deploy multimedia outreach program to appeal to younger radiation safety professionals
- Increase efficiency of delivery of professional/technical info to members



National Crisis: Where are the Radiation Professionals?

Accrediting Organization: Health Physics Academic Programs

MISSION

- To educate radiation safety professionals to meet the challenges of the future.

WHAT WE DO

- Programs specialize in many different areas including every facet of the nuclear fuel cycle (mining, enrichment, fabrication, power generation, recycling and disposal) to radiological control at national laboratories, hospitals, and research centers.
- Our students are engaged in every aspect of the nuclear industry ranging from radioanalytical surveillance, radioecology, dosimetry, and radiological engineering to radiation biology, and regulatory support.

HOW WE DO IT

- There are about 40 programs nationally which self-report a capability to provide some training/education in Health Physics.
- Perhaps 12 programs have sufficient faculty and staff to provide the numbers of newly graduated students at B.S., M.S., and Ph.D. levels to have an appreciable effect on the national needs for radiation professionals.
- Considering these programs, 7 are currently accredited by ABET Inc., at the M.S. or B.S

OUR NEEDS!

- The short term needs are evident: Federal funding of previously existing student scholarship and fellowship programs, cut recently in the administration's proposed budget, must be restored.
- Specific research programs aimed at improving current technology in Health Physics need to be developed.

National Crisis: Where are the Radiation Professionals?

Private Sector: M. H. Chew & Associates (CAI)



MISSION

- Provide high-quality and extremely credible analytical and technical services in the areas of radiological protection and health physics, industrial hygiene and toxicology, occupational safety and health, safety analysis, risk assessments, nuclear facility design and engineering, and professional staffing services.

WHAT WE DO

- Support federal agencies and their contractors including DOE, National Nuclear Security Administration (NNSA), NRC, Center for Disease Control & Prevention (CDC), National Institute for Occupational Safety & Health, and National Aeronautics & Space Administration, and state and local governments.
- Provide consulting and staffing services to the private sector, including nuclear power plants, licensees, and manufacturers

HOW WE DO IT

- Small disadvantaged business (minority-owned) headquartered in Livermore, CA
- Branch offices in Richland, Idaho Falls, Las Vegas, Arvada, Cincinnati, Oak Ridge
- Virtual office network
- Minimal bureaucracy
- Frequent and comprehensive information exchange
- Internal quality assurance reviews

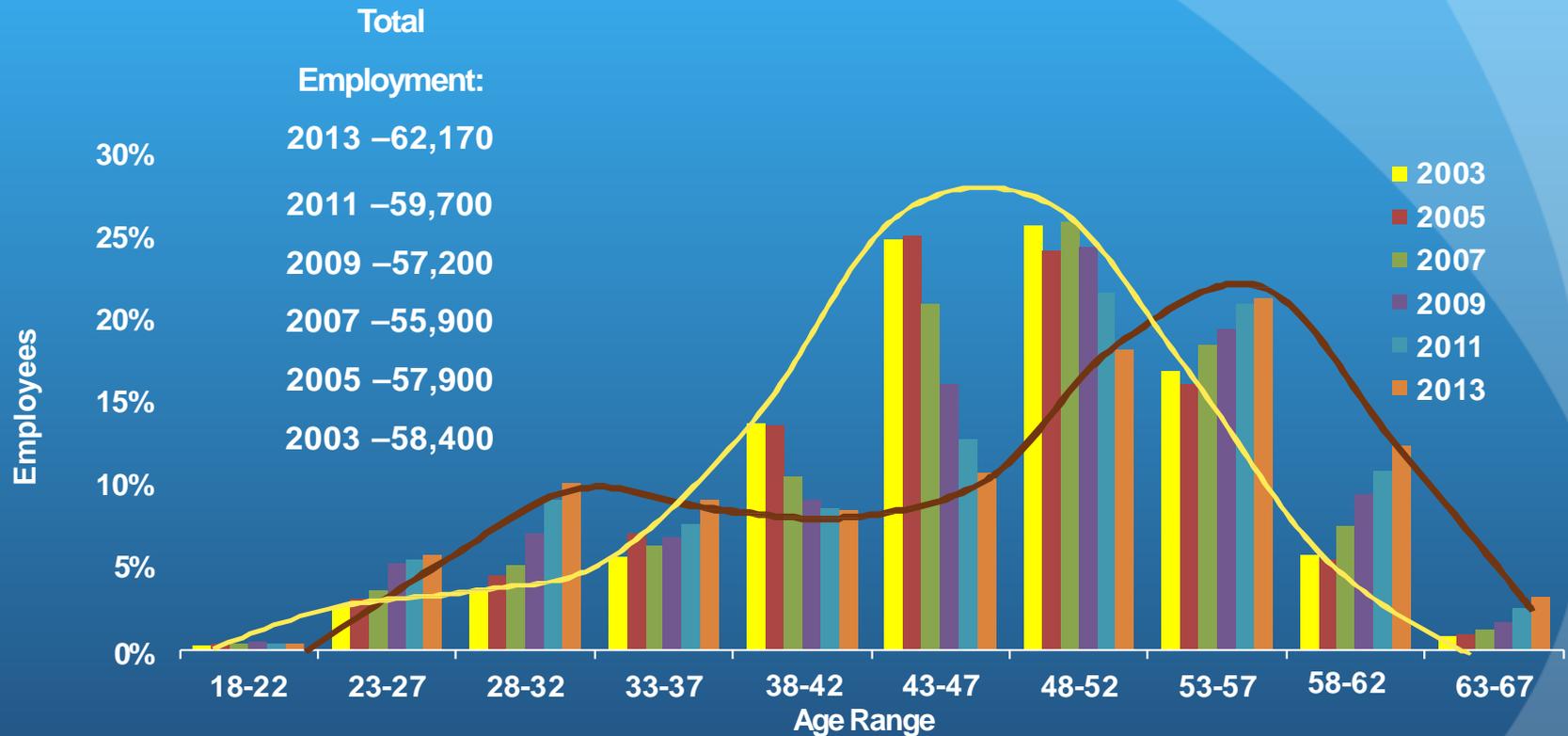
OUR NEEDS!

- Staffing for the future
- Long-term, stable government policy and funding (ain't happenin', but would be nice)
- A different model for funding ES&H support:
 - Maintain the bomb squad between bombings
 - Direct vs. overhead funding
 - Social vs. economic model

What new data are available?

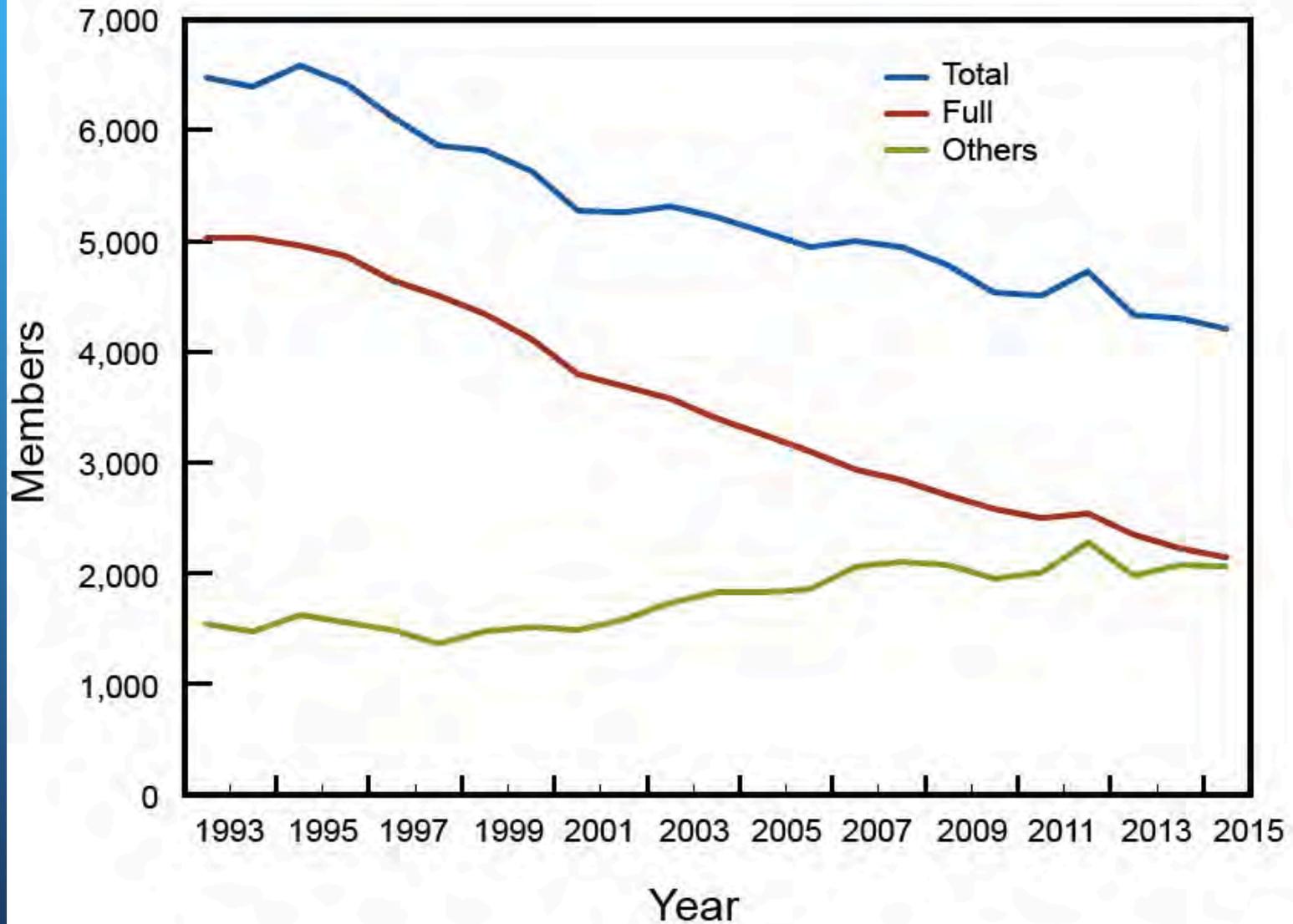
- Professional society membership
- Student enrollment and graduation rates
- Education and training grants
- Research funds
- Fukushima Dai-Ichi accident
 - U.S. support to Japan
 - Impact on new and existing nuclear power plants (NPPs)

Nuclear Industry Employment Distribution by Age

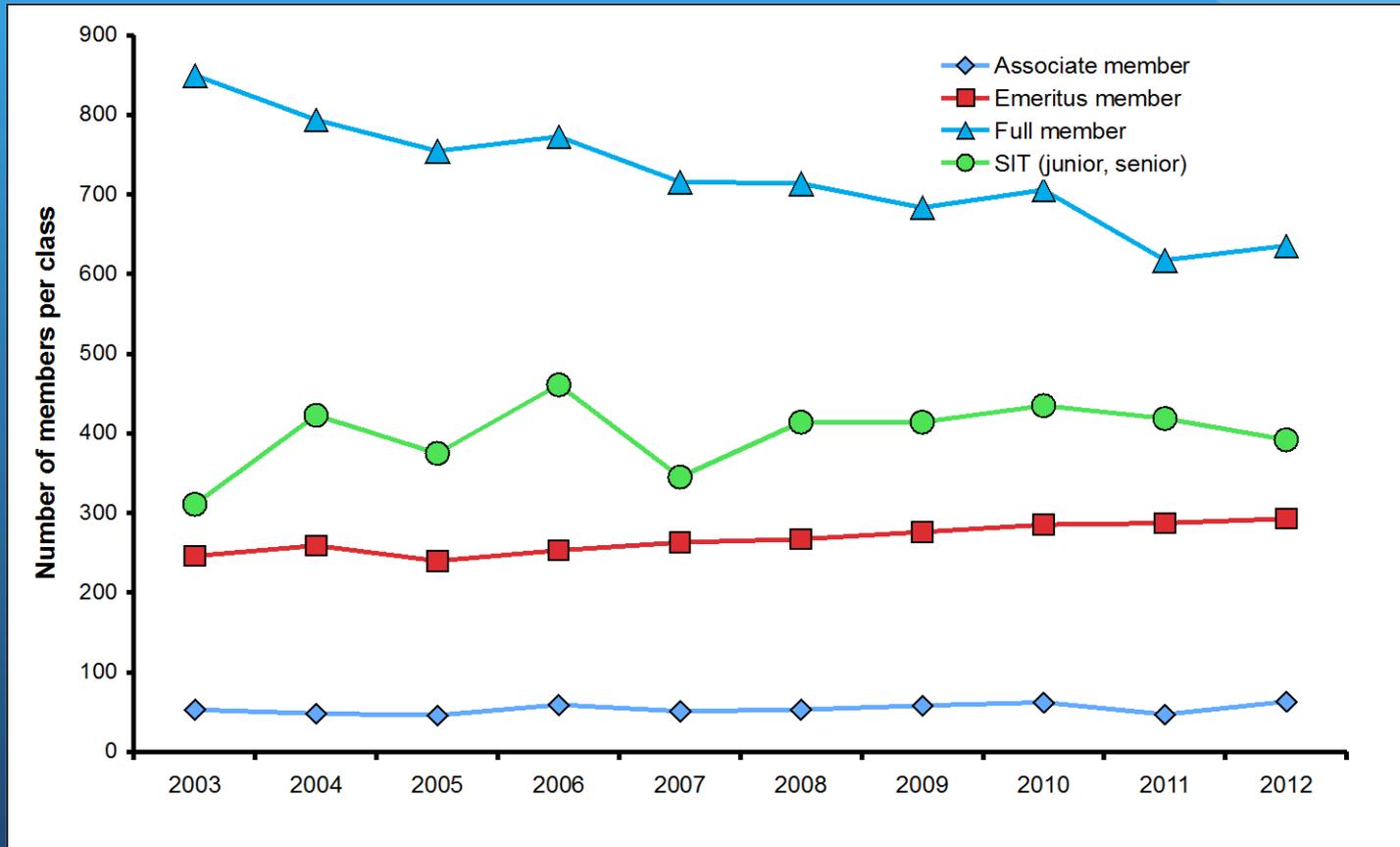


Source: 2013 NEI Pipeline Survey Results, Contractors and vendors not included

Health Physics Society



Radiation Research Society

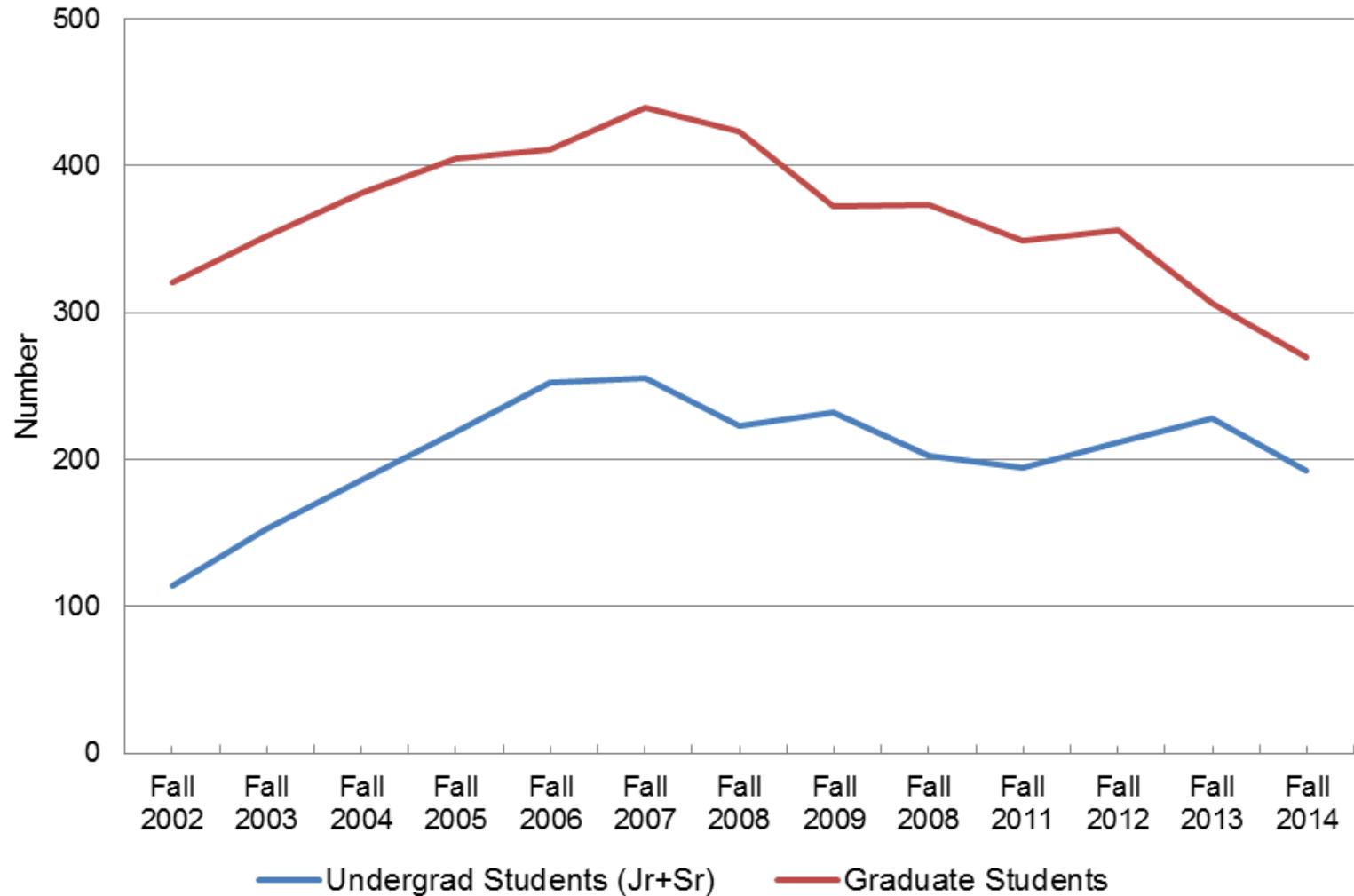


Academic funding

- Nuclear fellowship program not in President's budget, but restored by Congress
- DOE low-dose radiation research program funding diverted to clean energy (may be restored by Congress)
- State funding for university programs dwindling
- University support for small enrollment programs dwindling (12 programs graduate <6 students/year)
- Only 12 academic programs in HP appear to be viable in the long term.

Student enrollment

Figure 1. Health Physics Enrollments Trends
Fall 2002 - Fall 2014



Fukushima Dai-Ichi

- “The response to an accident 8,000 miles away stretched the capabilities of the U.S. government to, and in some cases beyond the breaking point.” C.W. Miller, CDC, 2012 NCRP annual meeting.
- Derailed the “nuclear renaissance” but decontamination and decommissioning operations of closed NPPs may require more HP coverage than routine operations.
- However, NPPs remain the only proven, large-scale, continuous method of centralized electricity production that is largely free of carbon dioxide emissions.

And it's not just us

- The GAO (2014) estimates that 31 % of the federal workforce will be eligible to retire by September 2017, and the percentage of engineering and technical professionals eligible to retire by September 2017 is even higher at 41 %.
- Similarly, a survey of the Conference of Radiation Control Program Directors (directors of state agencies that regulate the use of radioactive materials and radiation-producing devices within their states) predicted that over 50 % of the technical staff in the states' Radiation Control Programs will need to be replaced in the next 10 y.
- The National Academy of Sciences has expressed concern about the future supply of radiochemists (NAS, 2012).

Other considerations

- Although the supply of medical physicists seems adequate for the near term, limited slots are available in accredited clinical training programs
- State radiation control programs face increasing needs for regulation of external beam radiotherapy and radiopharmaceuticals (agreement states)
- Waste disposal is still an issue
- Spent fuel still needs to go somewhere

Issues needing immediate attention

- Federal workforce: essential government functions cannot be performed by contractors
- Research support needed to ensure junior faculty become senior faculty to teach the next generations of health physicists
- Professional societies are an 18th century model trying to recruit millennials
- Radiological sciences need to take their proper position in STEM initiatives
- There is no public understanding of radiation

Issues still a little ways down the road but will need HP expertise

- TENORM in fossil fuel production
- Radiation risks to astronauts beyond low earth orbit
- Radiological emergency response
 - Rapid exposure screening
 - Radiation countermeasures
 - Community resilience
 - Managing competing risks
- Stakeholder empowerment, not just engagement

What to do?

- Grow your own
 - Industry supported training programs at local community colleges for technician-level training
 - Seamless integration of all education levels from 2 y programs to 4 y and graduate programs (Texas A&M, South Carolina State)
 - Use the military-to-civilian transition pipeline

What else to do?

- Create a joint program support office in the Office of Personnel Management (OPM)
 - Coordinate recruiting and career management of radiation professionals in the federal civil service
 - Centralize and provide better visibility for the function of radiation professionals
 - Monitor federal staffing levels and needs;
 - Enhance mechanisms for interagency collaboration;
 - Broaden expertise through rotation among agencies
 - *e.g.*, PHS commissioned officers already detailed to the Environmental Protection Agency, Food & Drug Administration, etc.

More education

- Establish basic and advanced competency profiles to serve as guidance upon which to base the education, training, qualification and appropriate use of radiation professionals
 - *e.g.*, require graduation from an ABET-accredited program, require CHP for a licensee RSO
 - Use the Nuclear Energy Institute (NEI) Nuclear Uniform Curriculum Program
- Internships, practicum and co-op appointments, pre- and post-doctoral fellowships at national labs, medical centers, federal agencies should be funded and guaranteed for the long-term, so that prospective employees can expect career stability

A Great Example

- NNSA Stewardship Science Academic Programs
- Sharing research initiatives through the NNSA Office of Research, Development, Test, & Evaluation
- Promoting networking, collaboration and community among students, faculty, NNSA labs and the scientific community

More to do

- Provide research support in the radiological disciplines, including HP, radiation biology, radiochemistry, radioecology, nuclear engineering, etc.
- Focus research support on low-dose and dose-rate effects, validity of linear nonthreshold (LNT), biomarkers for dose, etc., etc.
- Establish a robust surge capacity for radiation emergency response; the Medical Reserve Corps is a good start, but may not be adequate for a major event

And still more

- Capture the hard-earned knowledge of retiring professionals
- Continue to monitor the situation and adjust management emphasis as needed (NCRP Council Committee 2)
- Keep Congress advised of the situation – likely to get worse before it gets better

Not just USA, either

- Similar efforts underway in Europe
- National Education Association report on Nuclear Education and Training: from Concern to Capability (2015)
- 12 recommendations, along the same lines as WARP:

Recommendation 10

Governments should strongly encourage and support international initiatives and programmes, which foster consistent quality of the education and training being delivered in different countries and overall contribute to enhancing human resource development capacities.

Sounding the alarm gong



Where are the Radiation Professionals (WARP)?

NCRP Statement No. 12, December 17, 2015

Since the discovery of x rays and radioactivity in the 1890s, sources of ionizing radiation have been employed in medicine, academia, industry, power generation, and national defense. To provide for the safe and beneficial use of these sources of radiation, the United States developed a cadre of professionals with the requisite education and experience. Unfortunately, their numbers have diminished alarmingly (AAAS, 2014; GAO, 2014; HPS, 2013; NA/NRC, 2012).

Methods

To study the decline in radiation professionals and potential national crisis, the National Council on Radiation Protection and Measurements (NCRP) sponsored a workshop in June 2013 in Arlington, Virginia to evaluate whether a sufficient number of radiation professionals exist now and into the future to support the various radiation disciplines essential to meet national needs. Attendance at this workshop included professionals from government, industry, academia, medicine, and professional societies. Presentations from over 30 groups (NCRP, 2013) resulted in the recommendations found in this Statement.

Findings

Evidence presented at the workshop revealed that the country is on the verge of a severe shortfall of radiation professionals such that urgent national needs will not be met. Factors contributing to the downturn include the economy, attrition, redirected national priorities, and decreased public funding.

Thank you for your attention!



A Clarion Call

A National Effort is Needed