NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION

Office of Public Affairs **Telephone: 301/415-8200**

Washington, D.C. 20555-0001 **E-mail: opa@nrc.gov**

Web Site: http://www.nrc.gov/OPA

No. S-05-009

Workforce Issues in the Nuclear Industry

Peter B. Lyons
Commissioner
Nuclear Regulatory Commission

Presented at:
ANS President's Special Session
Manpower for the Nuclear Industry – A Continuing Need
June 7, 2005

American Nuclear Society Annual Conference
The Next 50 years: Creating Opportunities
San Diego, California
June 5-9, 2005

When I spoke at the opening session yesterday, I listed human capital as one of the largest challenges facing the Commission. By this term, I mean the issues associated with industry-wide retirements outpacing incoming entry-level technical personnel, the transfer of knowledge from the very senior employees to those entry-level employees, the need for an expanded national workforce and increasing competition with other industries for qualified new graduates.

As I began my service with the Commission, this was one of the three major challenges that I identified – along with safety and security issues – for the future health, stability, and effectiveness of the Commission. From my experiences at Los Alamos and on Capitol Hill, I had already heard many concerns about this issue from federal agencies, academia, and industries utilizing nuclear technologies. As a Commissioner, I quickly learned that this concern for the NRC staff was not misplaced. Almost half of our current staff are 50 or older, and 36% of them are eligible to retire within the next 5 years.

A similar problem was identified by the Government Accountability Office when they recently studied the National Nuclear Security Administration's weapons facilities. They found that, of workers with a set of critical skills needed to maintain the weapons stockpile, about 37% are at or near retirement age.

The challenge of these figures is compounded by the fact that, with few exceptions, students do not graduate with the full range of knowledge and skills they need for full contributions to either the NRC or the NNSA. In many cases, years of training are required for an entry-level person to acquire the requisite skills.

Human capital in the nuclear arena is a subset of a much larger national issue. We should have serious concerns with the current state of our nation's workforce preparation for science and engineering in general. This issue was recently discussed in significant detail in a comprehensive report issued by the Task Force on the Future of American Innovation.

That report noted that the number of science and engineering positions in the U.S. workforce has grown since 1980 at almost 5 times the rate of the U.S. civilian workforce as a whole. But in contrast, the number of science and engineering degrees earned by U.S. citizens is growing at rate below the growth in the total U.S. civilian workforce. Further, our preparation of qualified science and engineering graduates is falling further behind other nations with each passing year.

One measure of this issue, collected in the compendium of Science and Engineering Indicators compiled by the National Science Board, is the ratio of first university science and engineering degrees to the population of 24 year-olds. In 1975, this ratio for the U.S. exceeded most of the surveyed nations, except Finland and Japan. By 2000, our ratio was exceeded by 16 nations, including again Finland and Japan, plus France, Taiwan, South Korea, UK, Sweden, Ireland, and Italy, to name a few.

To put this further into perspective, here this ratio has slowly increased over time. In the United States, it was 4.0 in 1975 and 5.7 in 2000. But the ratio in several countries showed dramatic growth, Finland advanced from 4.1 to 13.1 in the same time frame, and France went from 2 to 11.

Another perspective on this national issue arises from some enrollment statistics from our universities. While the foreign students in our science and engineering programs make tremendous contributions to our universities and enrich and broaden both our and their experiences, the fact remains that our universities have become more and more dependent on foreign student enrollment to sustain their programs in these vital areas.

Foreign students with temporary visas represent about half of all graduate students enrolled in U.S. universities in engineering, math, and computer science. And almost 70% of U.S. postdoctoral researchers in engineering and the physical sciences are foreign-born.

Universities in other countries have long overtaken our nation's production of students trained in science and engineering. In 2000, Asian universities produced 1.2 million such graduates, the Europeans produced 850 thousand. Our universities produced about 500 thousand.

Another point of concern for our universities is that about 30% of the faculty in science and engineering disciplines are 55 and older. The nation needs to be training a substantial number of new, highly qualified, candidates for these vital positions.

These statistics are all the more of concern when we remember that our nation no longer generates most of its wealth through manufacturing. The U.S. is simply not competitive for low-wage jobs. The strength of our economy depends on a stream of new, innovative, high technology products

and services that remain on the leading edge of available technologies. Without a suitably trained workforce, we will be less and less competitive in the global marketplace.

Turning from the broad perspective of high technology fields to nuclear technologies, the picture may be of even greater concern. Studies at the Oak Ridge Institute for Science and Education have shown alarming trends.

The number of programs to train students in nuclear technology fields has been falling. In 1975, there were 77 nuclear engineering programs in the country. In 2003, there were 33 as universities responded to reduced student interest. The number of university research reactors has fallen by about half since the mid-1980s.

The number of students attaining degrees in nuclear engineering, including B.S., M.S., and Ph.D. levels, was 448 in 2004. The lowest recent year was 345 in 2001, compared to the high point of 812 in 1995.

There are certainly some excellent and highly productive nuclear engineering programs. For example, Rensselaer Polytech Institute and Texas A&M lead the nation in bachelor level graduates, accounting for almost 25% of the nation's total. Similarly, MIT and the University of Michigan lead in Ph.D. graduates, with almost 30% of the nation's total. But the bad news is that too few other universities are producing graduates at levels rivaling these outstanding programs.

We simply are not convincing young people today that there is a challenging and exciting career awaiting their pursuit of this field. We need to be publicizing the fact that the Oak Ridge studies show that there are approximately two new job openings for every nuclear engineering graduate today.

Oak Ridge studies for health physicists also show similar trends. For this profession, "the number of job openings for new graduates will exceed the number of new graduates ... by more than 2 – 1 over the next ... four years."

In my limited time at the Commission, I've been very impressed with the range of staff development and recruiting programs that are underway within the NRC. The Commission has provided fellowships and scholarships, as well as a number of cooperative education programs.

We have strong participation in the Leadership Development Program, the Nuclear Safety Professional Development Program, and in the Senior Executive Service Candidate Development Program. With these programs, the Commission is meeting its current targets for staff recruitment. Legislation introduced by the U.S. Senate Environment and Public Works Committee would provide additional tools to develop and attract qualified new staff.

While recruiting goals of the NRC are being met today, it may be far more challenging in the future to do so. Factors such as retirements, optimism for a rebirth of construction of new nuclear plants, continuing cleanup of the legacy of past weapons work, and expanding applications of nuclear technologies in the medical fields will lead to immense competition for the small number of qualified students available.

I've noted that the Commission sponsors a wide range of programs to encourage new graduates in specialities appropriate to our needs. But the issues of workforce development and human capital

are hardly unique to the Commission. I noted earlier that the entire industry faces severe shortfalls, and if a rebirth of new plant construction does occur, there will be increased needs and increased competition for the requisite new staff. Any new plant construction would inspire more students to view nuclear technologies as a secure, long-term career choice, but it's unlikely that the supply of new candidates can increase very quickly.

The challenge of workforce development is faced by every industry and every organization represented in this room, from academia to government and industry. For that reason, every one of your organizations should be actively helping to develop interest in nuclear technology careers with students, starting even before they are of college age.

All of us need to redouble our efforts in conveying to students the excitement and opportunities that await them in science and technology in general, and in nuclear technologies specifically. From today's scientists and engineers, to our universities, to all of our companies that depend on advanced technologies, and to our nation's elected leaders, the message of workforce development needs to be heard and acted upon.