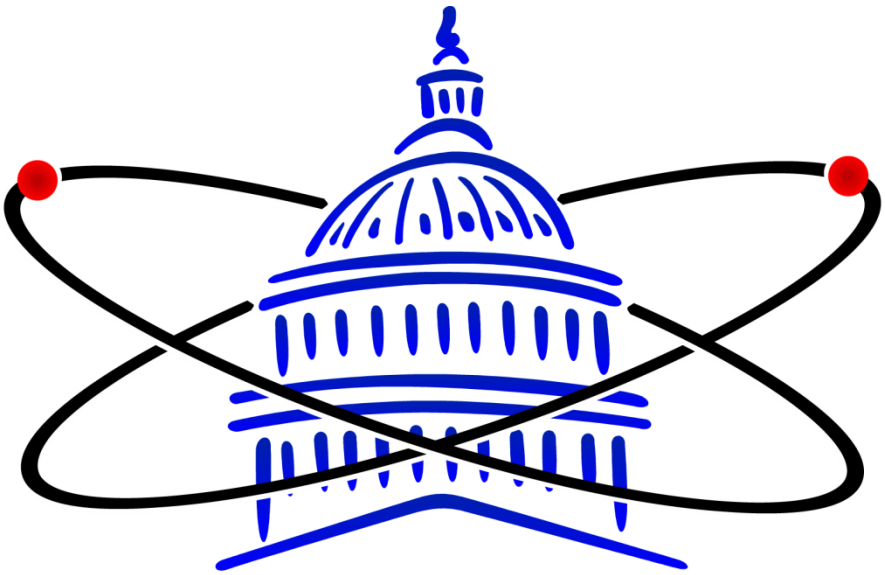

2009 NUCLEAR ENGINEERING STUDENT DELEGATION
WASHINGTON, D.C. JULY 11TH – 16TH

POLICY STATEMENT

Jacob DeWitte, Massachusetts Institute of Technology (Chair)
David Gennardo, University of Illinois at Urbana-Champaign (Vice-Chair)
Jason Andrus, North Carolina State University
Caroline Cochran, Massachusetts Institute of Technology
Marie Cronholm, Texas A&M University
Denia Djokic, University of California – Berkeley
Bryan Herman, Rennselaer Polytechnic Institute
Lenka Kollar, Purdue University
Nicholas Luciano, University of Tennessee
Michael Meholic, Pennsylvania State University
Lara Pierpoint, Massachusetts Institute of Technology
Rachel Slaybaugh, University of Wisconsin – Madison

EXECUTIVE SUMMARY

- The 2009 Nuclear Engineering Student Delegation strongly advocates the expansion of federal fellowship programs like NEUP but stresses the importance of striking the right balance between mission-driven and basic science research.

- Continuing and expanding programs like the Faculty Development program ensures a smooth transition to the next generation of nuclear engineers while easing the strain on departments.

- Federal funding levels must match those of previous years in order to maintain the few remaining research reactors. Additional investments in digital instrumentation and control upgrades are recommended.

- We recommend a comprehensive study be conducted to determine the demand for nuclear engineers along with all other Science, Technology, Engineering, and Mathematics (STEM) positions across all government organizations.

- A long-term federal commitment to nuclear development is needed. Movement forward on the loan guarantee program is strongly encouraged; new climate legislation offers another opportunity to support zero-carbon nuclear power.

2009 NESD POLICY STATEMENT

Fifteen years ago, the first Nuclear Engineering Student Delegation (NESD) to Washington, D.C. convened to reinstate funding for research reactors. Today, the Delegation continues to express the views of the student population on nuclear science, policy, and education. Each year, the Delegation comprises a diverse group of students from the nation's most prestigious nuclear engineering programs, representing various disciplines within the nuclear sciences. The students independently organize and run this trip to Washington, D.C. The Delegation does not represent any organization or university; the views expressed in this policy document are strictly those of the delegates.

For further information, please contact Jacob DeWitte at Jacob.DeWitte@nesd.org or visit the NESD website at http://www.nesd.org/.

Current Status of University Programs

Congress has appropriated $89M for integrated university programs, $69M distributed through the Department of Energy (DOE), and $20M through the Nuclear Regulatory Commission (NRC). The Delegation applauds Congress for this support, but encourages appropriators to recognize the importance of a predictable and continuous funding stream to university programs. Stable funding increases student enrollment and instills confidence of university leadership in the future of nuclear engineering programs. Currently, B.S., M.S., and Ph.D. graduates are at their highest level since 1988. There is a shortage of faculty at departments across the country, and high student to faculty ratios are beginning to overburden existing assets. The 2009 enrollment and graduation figures show the average undergraduate student to faculty ratio to be 11:1, and the average graduate student to faculty ratio to be 5:1. These ratios suggest some departments are reaching capacity, and student enrollment is increasing more quickly than faculty hires. Universities must hire more professors to accommodate this growth.

Future Funding

The recently-created Nuclear Energy University Program (NEUP) represents a good step toward supporting higher education for nuclear sciences and engineering. Secretary Chu announced $2.9 million for 105 undergraduate scholarships and 15 graduate fellowships. NEUP will thus be the most significant fellowship program existing for nuclear engineering, supporting 15 of about 40 federally-funded graduate fellows per year. These approximately 40 fellows are funded through fellowships which are not all explicitly for nuclear engineers. The 40 students represent a mere 3% of the approximately 1400 enrolled nuclear engineering graduate students nationwide. Most of these fellows are nuclear engineering PhD students; while one program specifically supports nuclear engineering master degree students.

The 2009 Nuclear Engineering Student Delegation strongly advocates the expansion of federal fellowship programs like NEUP. Fellowships allow students greater stability in their research pursuits. Fellowship programs also establish strong connections between students and government organizations and their objectives, ensuring better congruence between research products and national goals. Fellowships are vital for attracting students to the field of nuclear engineering, and thus are instrumental in assuring that nuclear workforce needs are adequately met by engineering graduates. Undergraduate scholarships are also invaluable in encouraging students to study nuclear engineering.

We are concerned about a potential gap in funding for fundamental scientific pursuits in the field of nuclear engineering. The DOE's Office of Nuclear Energy has an explicitly applied mission, and thus appropriately focuses on programs like the Advanced Fuel Cycle Initiative and Generation IV which are intended ultimately to work toward commercially viable technologies. Various divisions of the DOE Office of Science, including Basic Energy Sciences and the Nuclear Physics divisions, do contribute some funding for more fundamental nuclear research. However, this funding may not be adequate to solve some of the important basic questions that would further improve our ability to design and maintain nuclear power plants. The Delegation stresses the importance of striking the right balance between mission driven and basic science research.

Academia, like industry, faces a wide age gap between experienced, tenured professors, and young graduates of nuclear engineering. The health of the nuclear field depends strongly on successful transfers of knowledge between generations. The 2009 Nuclear Engineering Student Delegation applauds the inception of the NRC Faculty Development program, intended to attract young faculty to the field. Sustained support and expansion of this program is critical to the advancement of nuclear power. The NRC has begun awarding up to $150,000 (with $50,000 matching) per year to universities for young, tenure-track faculty members in the first 6 years of professorship. This money pays for any activities undertaken by new faculty in the pursuit of research career development. **Continuing and expanding programs like the Faculty Development program will ensure a smooth transition to the next generation of nuclear engineers.**

Research Reactors

Research Reactors are critical to education and research in all nuclear science and engineering disciplines on many levels, including:

- Training future energy workforce,
- Educating students in nuclear science fundamentals
- Producing valuable isotopes and materials for numerous industries.

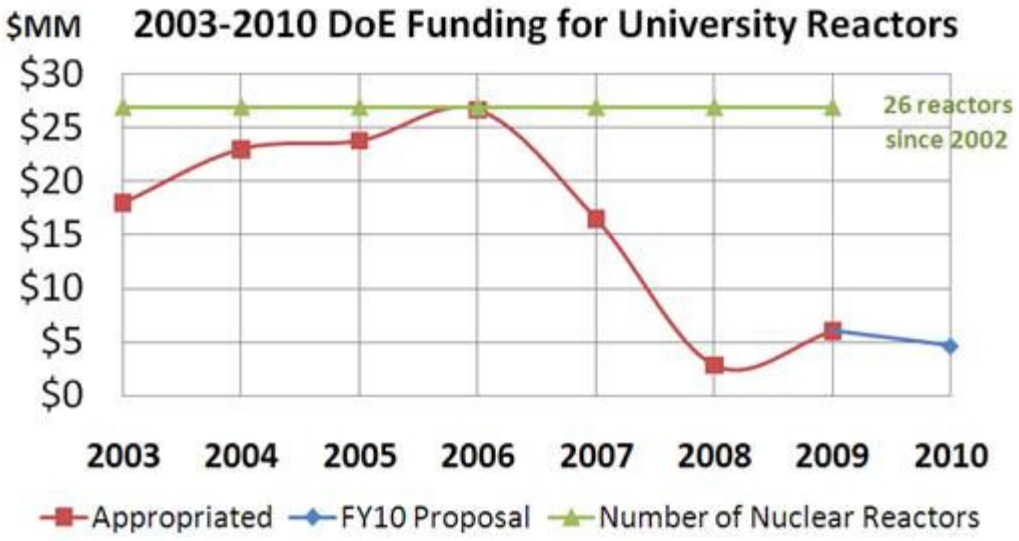

Figure 1: 2003-2010 DOE Funding for University Reactor Infrastructure in $MM USD

Unfortunately, funding from the DOE to support university research reactors has consistently dropped over the last decade and fell significantly from $6.1 million appropriated in 2009 to $4.7 million requested for FY2010. In order to raise enough operating funds, research reactors increasingly spend more time producing industrial materials and less time on education and research. While the revenue generating work is useful, the educational value of research is being lost. In the past, engineers had the benefit of hands-on research reactor training. There are now only 26 university-based research reactors in the U.S, compared to 65 in 1980. The loss of research time on the remaining reactors exacerbates the experience gap between retiring and graduating engineers.

All operating research reactors were constructed over 30 years ago and reflect the operating environment of the nation's oldest power stations. While the industry is updating their analog instrumentation and controls, all of these university reactors still use old instrumentation, and none have converted to updated digital equipment. In addition, industry and the NRC need university research reactors to test the new instrumentation. Instead of being at the forefront of technology, research reactors significantly lag behind the industry, are becoming increasingly ineffective training for students, and have no funds to achieve required upgrades. The University of Florida provides one isolated example to the contrary: Several industrial members have partnered with the University of Florida to complete a fully digital overhaul of the Florida research reactor. Industry groups, though necessary partners in these endeavors, are unlikely to repeat these investments throughout the entire research reactor fleet. Federal funding remains a strong requirement for research reactor upgrades.

Federal funding levels must at least match those of previous years in order to maintain existing reactors. The Delegation applauds the Senate's appropriation of $15 million this year, and recommends new funding for digital instrumentation and control upgrades. Further opportunities exist in modernizing control rods and other mechanical systems.

Workforce Demand and Future Growth

By 2012, the Clean and Safe Energy Coalition (CASEnergy Coalition) estimates that 47% of the nuclear utility workforce will be lost; 35% to retirement and 12% to miscellaneous workforce attrition. This represents a loss of approximately 25,900 employees. Assuming construction of 30 nuclear plants by 2024, further projections of nuclear industry growth indicate the creation of 12,000 to 21,000 new jobs at nuclear utilities. Utilities will need 27,900 to 46,900 total new employees to meet the growing demand for electricity in the U.S. According to the 2008 American Physical Society Panel on Public Affairs Committee Report, 16% of these available positions will require nuclear engineers. By 2009, about one fifth of the engineers and health physicists are eligible for retirement at the Nuclear Regulatory Commission (NRC), accounting for about 400 more highly skilled jobs. Workforce retirement, attrition losses, and growth requirements have not been fully characterized for reactor vendors, the DOE, and other government agencies. Additionally, predictions have not been made for growth in expanding and emerging fields such as nonproliferation, international safeguards, actinide chemistry, nuclear forensics, advanced recycling technologies, nuclear medicine, and others.

In 2009, 860 students graduated from nuclear engineering programs; 473 with B.S. degrees, 279 with M.S., and 108 with Ph.Ds. According to the 2009 Oak Ridge Institute for Science and Education Nuclear Engineering Enrollments and Degrees Survey, only 54% of students with BS degrees, 53% with Masters, and 88% with PhDs enter the workforce. In all, government employment and contracts currently account for 32% of these jobs, as shown in Figure 2.

Workforce demand for one third of graduating nuclear engineers is uncertain. **The delegation proposes a comprehensive study be conducted to determine the demand for nuclear engineers along with all other Science, Technology, Engineering, and Mathematics (STEM) positions across all government organizations.** A long-term nuclear and energy policy is needed in conjunction with this study in order to accurately model a future workforce. Combining a comprehensive study and a long-term plan will enable the continued funding and support commensurate with expected demand.

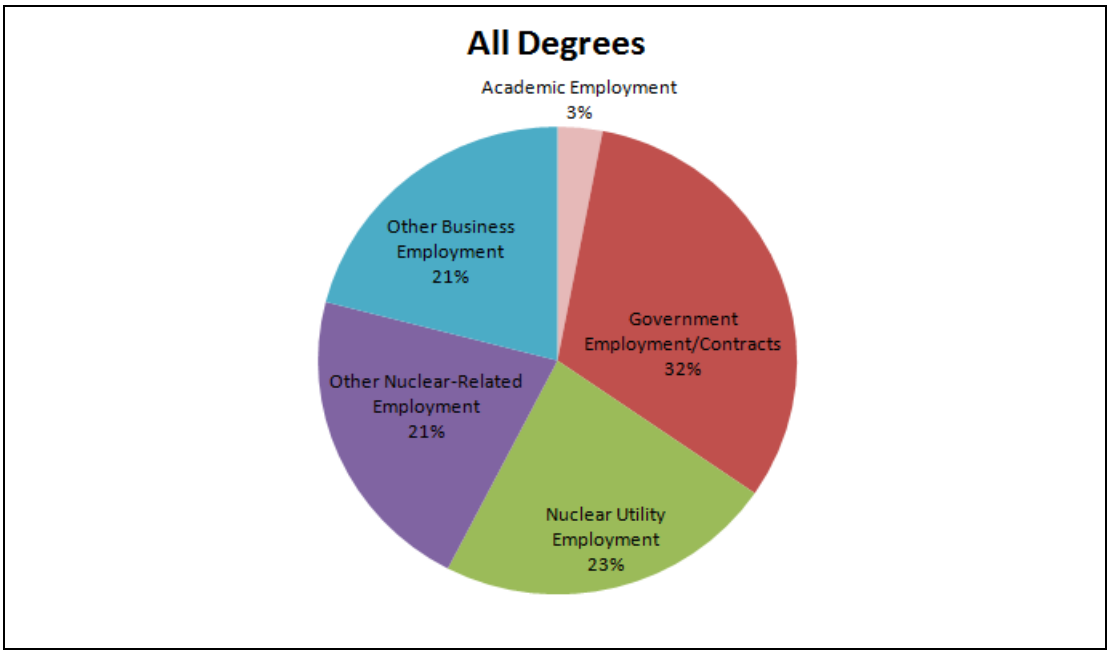

Figure 2: Workforce breakdown for all degree-holders in nuclear engineering, 2008 (Source: ORISE Nuclear Engineering Enrollments and Degrees Survey, 2009)

Long-Term Energy Policy

Nuclear engineering education is only valuable in the context of a healthy, sustainable commercial nuclear industry. It is thus extremely important to us, as students of nuclear technology, to see new nuclear plants built in the near term. It is further important for these new builds to be part of a long-term federal commitment to nuclear power development. Movement forward on the loan guarantee program would be a strong positive step in this direction. The new climate legislation, recently passed by the House of Representatives, offers another opportunity to support clean, carbon-free nuclear power. The Delegation strongly urges the Senate to add further incentives and provisions for the rapid scale-up of Generation III+ nuclear reactor builds.

Even more immediately, the federal government must act to ensure that faculty shortages and workforce gaps do not impair the renaissance of nuclear power. These actions are vital because the timescales of nuclear development span decades; decisions taken by the government today will determine the range of nuclear technology options available to us in 2050. Our generation demands that nuclear power remain viable through mid-century, so that we can call upon nuclear energy in our efforts to preserve our climate, our environment, and our economy. This is the opportune moment for our leaders in Washington, D.C. to enter into a deep and lasting partnership with the future nuclear workforce in order to enact a positive improvement in the quality of life for all Americans in the years to come.