THE *NUCLEAR NEWS* INTERVIEW

Audeen Fentiman: NEDHO and nuclear engineering education

The Nuclear Engineering Department Heads Organization provides a forum for addressing issues affecting nuclear education programs in the United States.

Audeen Fentiman is the current chair of the Nuclear Engineering Department Heads Organization (NEDHO), an alliance formed in 1982 to provide a forum for discussion, coordination, and collaboration among university nuclear engineering department chairs on issues concerning nuclear and radiological engineering programs. Among the issues that NEDHO deals with are the accreditation of academic programs, funding for scholarship and fellowship programs, research funding and opportunities, and funding for training and research reactors.

Fentiman, whose one-year term as the NEDHO chair runs from June 2010 to June 2011, has been involved with NEDHO since 2001, when she became chair of the nuclear engineering program at Ohio State University, in Columbus, Ohio. Before joining the faculty at Ohio State in 1990, she worked at Battelle Memorial Institute, primarily on projects related to radioactive waste management.

In 2006, Fentiman moved to Purdue University, in West Lafayette, Ind., where she is currently a professor of nuclear engineering and the associate dean of Engineering for Graduate Education and Interdisciplinary Programs.

Fentiman, an American Nuclear Society member since 1983, talked about NEDHO's activities with Rick Michal, *NN* senior editor.

Fentiman: "We have no shortage of students who are interested in studying nuclear engineering."

What is the state of the NEDHO organization?

We have very strong participation in NEDHO. There are 30 dues-paying member institutions that have been involved for some time. And there are 12 relatively new or small programs that have not yet begun to pay dues. NEDHO membership is open to all nuclear engineering programs in the United States.

Is NEDHO satisfied with the current student enrollments at universities that emphasize nuclear and radiological engineering?

I have not polled all members of the organization to see what they would say, but it is my impression that most of the established and larger programs have as many students as they can handle with their current faculty size. I'm sure that some of the newer programs that are growing would like to have more students.

Are you satisfied with the Department of Energy's participation in funding scholarships and fellowship programs, research opportunities, and training reactors?

At the last NEDHO meeting, which was held in November during the ANS Winter Meeting in Las Vegas, John Gilligan—who is the director of the DOE's Nuclear Energy University Programs (NEUP) Integration Office and a nuclear engineering professor at North Carolina State University—presented information on NEUP. For each of the past two years, federal dollar amounts coming to the universities for nuclear activities have been quite impressive, considerably larger than in recent years. So I'd have to say yes, we are satisfied with the participation from the DOE. Pete Miller, an ANS member, until recently was the DOE's assistant secretary for nuclear energy, and he was very supportive of nuclear research and development at universities. His successor at the DOE, Peter Lyons, another ANS member, addressed the NEDHO group at the November meeting. He indicated that he and Miller were in agreement on the importance of funding nuclear engineering education.

Does NEDHO make suggestions to the DOE about where to focus the funding?

Yes. The NEUP Integration Office has an executive committee that advises Gilligan, and the NEDHO chair and the chairs of other university nuclear engineering groups serve on that committee. So there is a very clear avenue for feedback from the univer-

Table 1. Nuclear Engineering Degrees, 2002–2009

Year	Degrees		
	B.S.	M.S.	Ph.D.
2009	395	233	87
2008	454	260	127
2007	413	227	89
2006	346	214	70
2005	268	171	74
2004	219	154	75
2003	166	132	78
2002	195*	130	67

*Three programs were discontinued/out-of-scope after 2002 and not included in the 2003 survey. These three programs reported a total of 17 B.S. degrees in 2002. (Tables: ORISE)

sities if there is a perceived need to suggest some changes in NEUP.

I want to mention that the Nuclear Regulatory Commission also has a program for funding scholarships, fellowships, and junior faculty development in trade schools that are preparing people for the nuclear engineering workforce. It's a $15-million program that was run by the NRC's John Gutteridge, who retired at the end of 2010. Before moving to the NRC, Gutteridge was instrumental in managing the DOE's university program. We are very appreciative for all the work that he's done for nuclear engineering education. At our NEDHO meeting in November, we presented him with a plaque, and a letter from NRC Commissioner Bill Magwood was read, thanking him for his service. [See following article, page 48.]

What transpires at a NEDHO meeting?

Almost all of the universities in the United States with nuclear engineering programs are represented at our meetings, where we typically get updates on programs that are of interest to nuclear engineering departments from representatives of the NRC, the DOE, the Institute of Nuclear Power Operations, and the Nuclear Energy Institute (NEI).

At our last meeting, we set aside some time to talk about other topics of interest to nuclear engineering department heads. Two topics came to the forefront: First, there is a growing need for nuclear engineering faculty members. Many of the current faculty members are approaching retirement age, and I think that many of the NEDHO members will agree that we need to do something to encourage some of our Ph.D. students to consider faculty positions. We also need to help these students prepare for those positions.

The second topic was how to develop a stronger working relationship with the nuclear industry. We work very well with the federal agencies, but we think it would be good to look at how we might work more effectively with the nuclear industry on workforce development and perhaps collaborate on research projects that are of interest to the industry. And when I say industry, I don't mean just the nuclear power industry or the utilities, but the broader nuclear industry.

Does your group collaborate with ANS, NEI, and other societies or organizations?

We work closely with ANS to coordinate our biannual meetings, which are held during the ANS Winter and Annual Meetings. As far as the NEI, it has a position on its board of directors for a representative from the university community. I'm currently serving on that board, and Lee Dodds, a professor in the Department of Nuclear Engineering at the University of Tennessee at Knoxville, served the previous three-year term. So NEI ensures that it has somebody to provide the university perspective on its board.

What do you do to educate lawmakers?

This is actually another way that NEI and NEDHO collaborate. Typically, in February or March, NEI hosts a nuclear research and development summit in Washington, D.C., and NEDHO members are invited to participate. During the summit, we often make a visit to Capitol Hill, where we call on the offices of the legislators from our states. That gives us the opportunity to talk about nuclear engineering education and the work that is going on at our universities in the legislators' home states.

In 1998, NEDHO published Nuclear Engineering in Transition, *in which a recommendation was made to transition from a curriculum dominated by nuclear power to one that had a wider focus. Has that happened since the document was published?*

These are always university-by-university decisions. In general, most of the nuclear engineering programs of which I'm aware are much broader than just nuclear power.

Table 2. Nuclear Engineering Degrees, 2009, by Curriculum

Curriculum	B.S.	M.S.	Ph.D.
Nuclear Engineering Major	374	226	74
Nuclear Engineering Option	21	7	13

There is an emphasis on medical applications, in some places on radiation protection and environmental considerations, and there is a lot of interest in detection and applications to national security. There is a good deal of work being done at several schools on nonproliferation. The focus is very much broader than it used to be.

Regarding the more recent NEDHO report, Manpower Supply and Demand in the Nuclear Industry, *is there still what some referred to as a crisis?*

I would say that over the past five years, the enrollment in nuclear engineering programs in the United States has approximately tripled, and it has now begun to level off. But the number of students in the programs comes close to meeting the demand.

Over the past five years, the enrollment in nuclear engineering programs in the United States has approximately tripled, and it has now begun to level off.

A 2009 report from the Oak Ridge Institute for Science and Education (ORISE) indicates that a total of 715 nuclear engineering B.S., M.S., and Ph.D. degrees were earned in 2009. According to ORISE, the number of juniors and seniors enrolled in nuclear engineering programs in 2009 stood at 1500, which is 15 percent higher than the number reported in 2008 and the largest undergrad enrollment reported since the mid-1980s. ORISE also said that the 2009 graduate enrollment of nearly 1300 students was

Table 3. Citizenship, Gender, and Race/Ethnicity of Degree Recipients,[1] 2009

	B.S.		M.S.		Ph.D.	
	Female	Male	Female	Male	Female	Male
Non-U.S. Citizens	2	7	8	23	3	30
U.S. Citizens						
Black/African Americans	2	11	2	2	0	0
American Indians	0	0	0	0	0	0
Asian/Pacific Island Americans	7	15	8	10	2	8
Hispanic Americans	4	8	2	8	0	1
White/Caucasian Americans	49	235	31	137	11	31
Other or Unknown	1	17	0	2	1	0
Totals	**65**	**293**	**51**	**182**	**17**	**70**

[1]Citizenship, gender, and race/ethnicity data was not available for 37 bachelor's degree recipients.

TABLE 4. NUCLEAR ENGINEERING DEGREES, 2009, BY ACADEMIC INSTITUTION
(ALPHABETICAL BY STATE AND THEN UNIVERSITY)

State	Name of Institution	Degrees Sept. 1, 2008 – Aug. 31, 2009		
		B.S.	M.S.	Ph.D.
CA	University of California, Berkeley	11	9	5
FL	University of Florida	23	19	12
GA	Georgia Institute of Technology	32	24	1
ID	Idaho State University	8	2	0
IL	University of Illinois at Urbana-Champaign	17	2	4
IN	Purdue University	20	11	6
KS	Kansas State University	13	1	2
MA	Massachusetts Institute of Technology	15	24	15
MA	University of Massachusetts, Lowell	2	0	0
MD	University of Maryland	0	4	0
ME	University of Maine	0	0	0
MI	University of Michigan	37	21	8
MO	Missouri University, Columbia	0	3	2
MO	Missouri University of Science & Technology	25	6	0
NC	North Carolina State University	24	12	6
NM	University of New Mexico	6	9	2
NV	University of Nevada, Las Vegas	0	2	1
NY	Rensselaer Polytechnic Institute	30	3	0
NY	United States Military Academy	10	0	0
OH	Air Force Institute of Technology	0	7	0
OH	Ohio State University	0	7	0
OH	University of Cincinnati	5	7	0
OR	Oregon State University	6	5	1
PA	Pennsylvania State University	35	11	3
SC	South Carolina State University	2	0	0
SC	University of South Carolina	0	5	0
TN	University of Tennessee	24	9	4
TX	Texas A&M University	32	13	8
TX	University of Texas	4	2	0
UT	University of Utah	0	3	0
VA	Virginia Commonwealth University[1]	0	0	0
WI	University of Wisconsin	14	12	7
Totals		**395**	**233**	**87**

[1]New B.S. and M.S. nuclear engineering program; first B.S. degrees expected spring 2013, and first M.S. degrees expected spring 2010.

an increase of about 5 percent from 2008, continuing a steady growth trend since 2001. [More information about ORISE's 2009 data is available online at <http//orise.orau.gov/media-center/news-releases/2010/fy10-35-nuclear-engineering-degrees-report.aspx>.]

Is there still enthusiasm on the part of students about a nuclear renaissance happening in the United States?

Students are quite enthusiastic about it. We have no shortage of students who are interested in studying nuclear engineering, or who are interested in learning about it, even if they aren't studying it as a degree program.

There are institutions now that offer two-year degrees and train technicians for the nuclear industry. These institutions almost guarantee that their students will have jobs at nuclear power plants once they graduate. How is the job market for fresh nuclear engineers?

Our students typically can find jobs. Prior to the economic downturn, it was much easier than it became after the economy slowed down. There are a couple of reasons for that. First, there was going to be a huge need for new nuclear engineers to replace those who were retiring. But with the economic downturn, particularly the stock market drop and the drop in the values of 401(k) savings plans, many of the people who had planned to retire didn't. So those jobs were not available for students coming out of school. Second, some of the new construction that was expected in the industry has also been slowed down by the economy, and companies aren't hiring as many people as had been expected. Our students, however, are still finding jobs with the national labs, the NRC, and other government agencies. They're also finding jobs with utilities and vendors that are going to be building new power plants. So while there aren't as many jobs as we had thought there would be, most graduates are finding jobs. NN