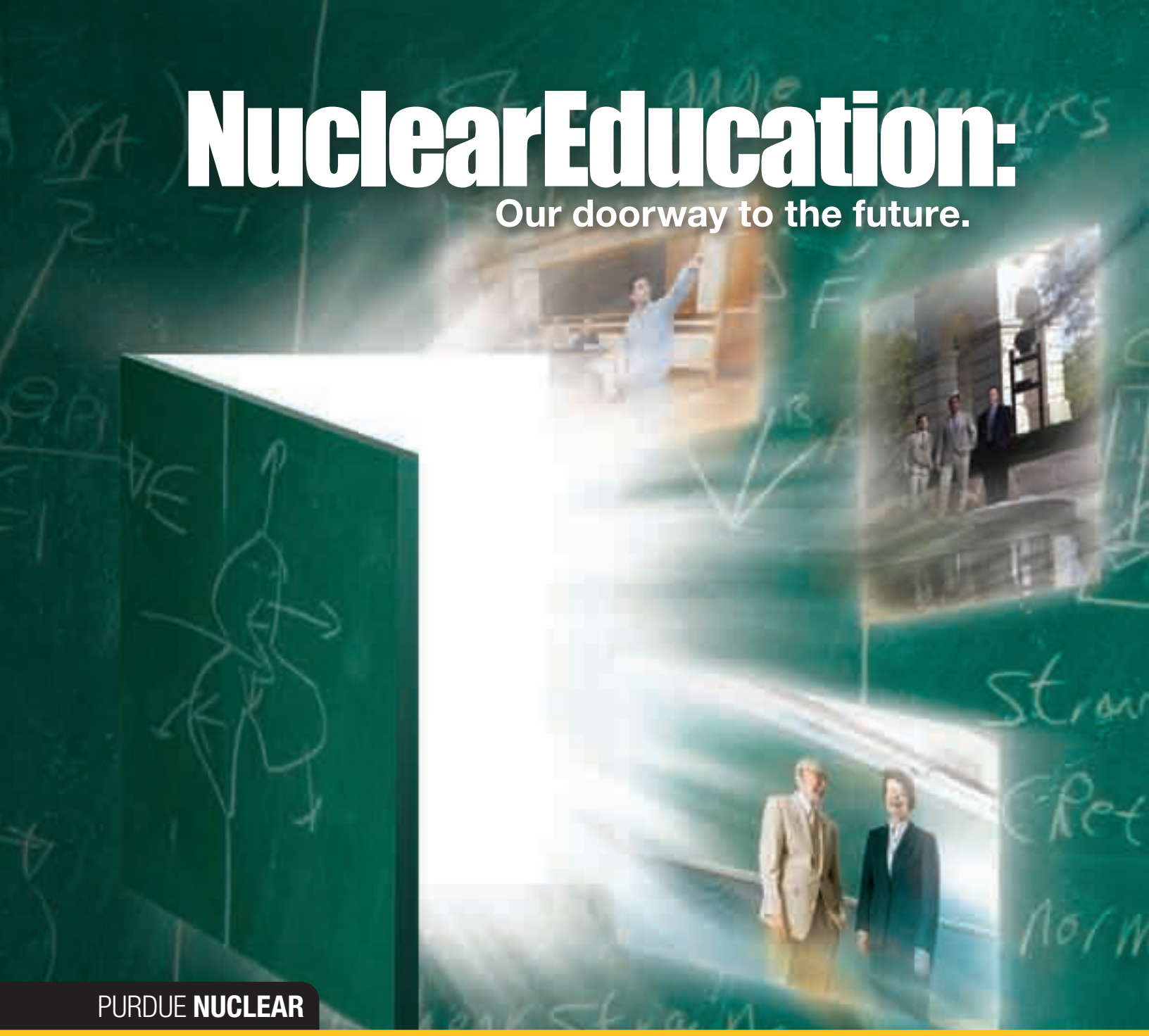
Nuclear Education:

Our doorway to the future.



PURDUE **NUCLEAR**

ENGINEERING IMPACT

WINTER 2007-08

New to NE
Faculty brings robust research, commitment to classroom.

Purdue to Penn State
Two alums in the academy at Happy Valley.

This Business of Education

Professors Franklyn Clikeman and Audeen Fentiman

As today's students look to become part of the third-generation nuclear workforce, their options are as wide as our responsibility is large.

By William Meiners

Vincent Walter

Academics face many pressures these days. The old slogan "publish or perish," however overstated, remains applicable, as do the calls for furthering technologies, making new discoveries, and raising research dollars. Lest we lose our collective ways, however, the education of tomorrow's nuclear engineers should be at the top of every professor's list of responsibilities. And delivering a solid education is a particular point of pride in Purdue's School of Nuclear Engineering.

Although it's one of the smaller schools within Purdue's College of Engineering, our school is one of the larger nuclear programs around the nation—and growing. The Class of 2007 included 42 undergraduates, eight master's students, and 13 PhDs. These young graduates will go to work in a variety of fields, including, but not limited to, nuclear power, medicine, and education.

For Lefteri Tsoukalas, the former head and a current professor of nuclear engineering, this educational responsibility is one he will never take lightly. "We are not just cheerleaders for technology," says Tsoukalas. "Professors adhere to and defend the highest standards of quality, ethics, and professionalism. Our role in society is to be a source of credible information. We are not limited by the ups and downs of the markets and the agonies of the day. So this business of education is really a business of trust."

And with no more important bottom line than the students themselves, Tsoukalas and colleagues are helping develop the technical experts who will work on some of the biggest challenges facing our society—how to maximize our energy production while eliminating greenhouse gases, how to safely treat and eradicate certain diseases, and how to train the next generation of nuclear scientists.

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John Underwood

Jean Paul Allain in the classroom.

We Can Rebuild It

Knowledge is indeed powerful; and with an increasingly younger group of freshmen entering the sophomore class each year (at least from their professors' perspectives, as now nearly all freshmen were born after Chernobyl), the need to demythologize the nuclear sciences becomes less stressed in the standard lectures. "With many technical issues solved, students are not burdened by the safety issues of the past," Tsoukalas says. "They also see nuclear power as an important part of the energy mix."

That wasn't the case 20 years ago. With images of mushroom clouds and nuclear destruction equated to nuclear power plants, students were leery of the nuclear sciences. After some 48 nuclear programs started up in the 1960s, many of them started shutting down in the 1980s and 1990s as construction on nuclear plants came to a halt in the United States. Purdue's program, one of the originals, is one of about 30 programs today. "It hit bottom in the late 1990s," says Audeen Fentiman, associate dean of graduate education and professor of nuclear engineering. "In 1999, there were about 500 students enrolled in nuclear engineering around the country. That number tripled by 2005."

Why the turnaround? "Students recognize where the jobs are," Fentiman says. And the job opportunities are plentiful. With many industry and academic professionals zeroing in on their golden years, young graduates are needed to step into those positions.

"The need for people with backgrounds in nuclear science and technology is very broad," Fentiman says. "The nuclear power industry primarily needs BS graduates to help run power plants. Vendors, who design plants, are looking for people with master's and PhD degrees."

In addition to renewed and building interests of nuclear power on our shores (see "Money Sinks to Moneymakers" sidebar), globalization is contributing to a booming job market for graduates. "There's a need for people to work internationally," Fentiman says. "China is buying four nuclear power plants from Westinghouse this year."

The Nuclear Regulatory Commission, ranked in 2007 as "the best place to work in the federal government," is hiring up to 300 new people a year. Similarly, state agencies, national labs (a work haven for PhDs), homeland security outlets, and hospitals are helping make a nuclear engineering degree a rather profitable piece of paper.

Education vs. Industry

In filling the need for human infrastructure in the nuclear pipeline, universities must also find this third generation of educators. "The

students could be like I was," says Franklyn Clikeman, professor emeritus of nuclear engineering. "The last thing I was ever going to do was teach."

With a 1962 PhD from Iowa State, Clikeman was certain he would be working in one of the national labs, "probably Los Alamos." He had earned his bachelor's degree in 1955 at Montana State College in the "Atoms for Peace" area as inaugurated by President Dwight Eisenhower. Instead of industry, though, he "made the mistake" of saying he wanted to work with neutrons. A presentation at the Massachusetts Institute of Technology led to post-doctoral, assistant, and associate professor positions. He eventually came to Purdue as a professor in 1970 and was in it for life.

Renowned for his student-centric focus, Clikeman, says Tsoukalas, was the "go-to professor." At the graduate level, he supervised or co-chaired 15 master's students and seven doctoral students in all. "I tried to do a good job of mixing the research and the teaching," Clikeman says. No small task within the aforementioned pressures of academia.

Today Clikeman advises students to determine what they want to do before deciding on how far to take their education. "The master's degree is very good in nuclear engineering," he says. "A PhD changes your whole path.

"There are lots of job opportunities and lots of decisions to be made with the PhD," he continues. "Some students continue through school because they're afraid to go to work. That's not the right motivation."

But with the potential dawn of a "new nuclear age," the tough choice of whether to teach or work could be a win-win for today's nuclear students, who will, in effect, make up the industry's third-generation workforce. And for those teachers assigned with their education, that's a lofty responsibility. ■

Money Sinks to Moneymakers

There was a time in this country when building a nuclear plant was a long and expensive process. Once plants were built, some U.S. utilities found they could not run them efficiently, and it became cheaper to sell plants rather than close them down and dispose of the wastes. Now, with a whole fleet of nuclear power plants (104 to be exact) running at more than a 90 percent capacity rate, that old money sink is looking more like a cash cow. And as an alternative to coal, nuclear power is also environmentally green.

"This country has not had a long-term energy policy," says Audeen Fentiman, associate dean of graduate education and professor of nuclear engineering. "It changes depending on who's been elected most recently. We're going to be forced into developing a policy that allows us to sustain our environment, which will bring nuclear power to the forefront."

So with new nuclear plants on the U.S. horizon, Fentiman points to four key building steps that will promote the long-term investment needed to cut loose from our dependence on foreign oil and reduce greenhouse gas production. The following will help streamline the process, lessening costs and leading to profits.

- The Nuclear Regulatory Commission (NRC) has to issue a license to build a nuclear power plant. A combined construction/operation license, however, saves time and money.
- The NRC must certify standard reactor designs. There are currently four to choose from, so the design need not be reinvented each time.
- Early site permits (often next door to existing nuclear plants) allow builders to pick an approved design on an approved site.
- In the 2005 Energy Policy Act, the federal government offered financial incentives to cover costs of unexpected delays for the first six reactors built. While they won't pay for delays attributable to company mistakes, the feds will pay, for example, if somehow the rules are changed. ■ **W.M.**