

# A Nuclear Bond

A Polish university partners with Oregon State to build clean-energy capacity

BY LEE SHERMAN



Malwina Gradecka (right) and Izabela Gutowska, Ph.D. students from Warsaw University of Technology, prepare the core block for installation at OSU's High Temperature Test Facility. (Photo: Karl Maasdam)

Soon after the 1986 Chernobyl meltdown in Ukraine, nuclear energy in neighboring Poland ground to a halt. As the disaster and its aftermath fueled fears of fallout around the world, Poland's first nuclear plant, then half-built, was scrapped. For the next three decades, Poland remained wedded to coal.

Now, that's about to change.

In January, Poland revived its nuclear-energy ambitions when the government pledged to build two nuclear reactors, bringing the first one online as soon as 2024. Oregon State University is a partner in realizing Poland's new nuclear energy initiative. Since 2010, OSU's Depart-

ment of Nuclear Engineering and the Warsaw University of Technology (WUT) have been exchanging faculty, students, computer power and expertise across the continents. A joint-degree program is in the works.

## Scaling New Heights

Like an acrobat in a hardhat, a young woman nimbly scales a narrow ladder to the top of OSU's High Tempera-

ture Test Facility, an electrically powered reactor model for testing safety without using live nuclear fuel. "We're stacking the core," she explains as she steps out onto the scaffolding two stories above ground. At this construction site, her shiny blue hardhat is mandatory. Mandatory too, are the safety rope and harness she buckles herself into before venturing onto the towering platform where 1,000-pound ceramic plates, or "slices," are being lifted by a crane, one atop another, like a stack of pancakes. When she's not climbing up ladders or balancing on girders, she's driving a forklift, grinding metal rods or operating the crane that hefts the giant, custom-made plates into place.

Harnesses and hardhats are not every student's dream gear. But for Malwina Gradecka, an engineering student from WUT, working on the nuts and bolts of nuclear power was exactly what she was looking for when she first visited OSU with a delegation from her university, known for its deep expertise in mathematical modeling and computational problem solving. So when Gradecka laid eyes on OSU's scale-model, light-water test reactor, she knew Oregon State was the place for her doctoral work. "You can actually stand on top of the model reactor and look down," she marvels in fluent English. "Here in the U.S., students have this opportunity for hands-on experience. In Poland, this is not available to us."

Gradecka is among the first WUT students to earn a Ph.D. in Corvallis. Her studies in OSU's Radiation Center — where she spent a year not only "stacking the core" in professor Brian Woods' one-of-a-kind lab on high-temperature, gas-cooled nuclear technologies but also running computer simulations on fluid dynamics — now are being put to use in Warsaw. She's back home helping to rebuild her university's nuclear engineering program, mothballed in the 1980s along with Poland's half-built reactor.

Poland's historic strength in the field may not be instantly obvious, given its setback after Chernobyl. But it's useful to rewind the story to the late-1800s, when a newfound radioactive element was named for its discoverer's homeland, Poland. That discoverer of polonium — and also radium — grew up in Warsaw as

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### Wanted: Strong Work Ethic



You might think the No. 1 quality professors seek in an undergraduate researcher is braininess. Yes, brains matter. But there's another valued trait, perhaps less obvious but at least as important: a strong work ethic. In the labs in Oregon State's Department of Nuclear Engineering and Radiation Health Physics, work ethic is often the deciding factor in hiring research assistants.

Take professor David Hamby, for example. He hired Andrew Child to work on projects funded by the U.S.

Nuclear Regulatory Commission and other agencies. "He came to me after his sophomore year asking to work with me, and now I pay him quite well because he has shown what a good work ethic he has — as well as being very bright," says Hamby.

Assistant professor Wade Marcum echoes Hamby. "The students I seek to fill undergraduate research assistantships tend to have sound work ethics," says Marcum, who employs undergraduate students with funding from the Idaho National Laboratory, U.S. Department of Energy and other sponsors. "They are very reliable and provide feedback if they run into issues that may prevent timely progress on a project."

These highly motivated, dependable undergrads do basic science and tackle projects with advanced applications for nuclear energy technology. One of Andrew Child's projects, for example, was to design a "graphical user interface" for the Comprehensive Test Ban Treaty Organization's international data center. "The interface will ultimately display critical information on radiation monitoring systems from around the world," says Hamby.

Marcum's projects on fluid interactions employ students to run computer simulations and conduct experiments on properties such as convection and flow in nuclear power plants. These issues are important unknowns as nuclear technology moves away from active fluid pumping toward natural or "passive" convection.

"Undergraduates who are research assistants become insightfully knowledgeable about the subject they are researching," Marcum says. "They also gain an appreciation of the level of rigor required in a sound research study. Plus, they can better determine whether research aligns with their ambitions as they look ahead to graduate school and employment."

Marie Skłodowska before moving to Paris, marrying a French physicist, and becoming known to the world as Madame Curie. Curie is one of only four scientists ever to win two Nobel prizes. (A second member of that exclusive club is OSU's most famous alumnus, Linus Pauling.) Arguably, the field of nuclear energy was born of Polish DNA.

"Poland has a very rich history in the nuclear sciences," observes OSU's Kathryn Higley, chair of the nuclear engineering department. "After Chernobyl, that expertise emigrated to other places, like the UK. But now the Polish people want to develop their own nuclear energy capacity."

## Renewables, Too

In a big white tent on the WUT campus, little kids in parkas and colorful wool hats crowd together in rapt clusters, their eyes barely clearing the display tables where university students demonstrate research projects in cool fields like aerospace. Just across a busy boulevard called Nowowiejska stands the university's Power Engineering School, where two faculty members sit at a small conference table recounting the history of their country's nuclear energy story and posting its future.

Izabela Gutowska attaches a ceramic block to a crane during core installation. (Photo: Karl Maasdam)



Konrad Swirski, the plenipotentiary for nuclear energy at WUT, was one of the last students in Warsaw to earn a Ph.D. in nuclear energy before Chernobyl. From where he sits, he has seen global attitudes about nuclear energy undergo an evolution. In the three decades since Chernobyl, he has seen fossil fuels muscle out radiation as the most cataclysmic threats to life on Earth. Wind, solar and hydropower are essential to a "balanced approach" to energy, he says. But nuclear, too, must be part of the mix.

"There is almost no sun in Poland," he says, gesturing toward the window where thick fog obscures the Warsaw skyline. "The wind is moderate, and we do not have big rivers. Looking toward the future, we have no choice than to diversify our power system and include nuclear power, which is a zero-emission technology."

The European Union, to which Poland belongs, has set ambitious goals for swapping wind, sun and other renewables for heavy CO<sub>2</sub> emitters like coal. Agreement on nuclear,



"Here in the U.S., students have this opportunity for hands-on experience," says Polish engineering student Malwina Gradecka (right). (Photo: Karl Maasdam)

however, has so far eluded the EU. France, for example, is 75 percent nuclear powered, while Germany is quickly phasing out its nuclear plants in reaction to Japan's 2011 Fukushima disaster. Swirski argues that nuclear, while not rated as a renewable in the EU, should indeed count if "zero emissions" is the gold standard. "The Europeans may argue about nuclear and renewables," Swirski says. "But everybody's against coal."

The second faculty member, Jan Alexander Blaszczyk, nods in agreement. The son of a Polish freedom fighter who sought asylum in the United States during the Solidarity movement, Blaszczyk grew up in Madison, Wisconsin. His comfort with America made him a natural to help spearhead the OSU-WUT partnership.

"A huge number of our coal plants are really old," says Blaszczyk, noting that nearly 90 percent of Polish power is coal-generated. "We need to have nuclear power plants as soon as possible."

Oregon State will be along for the transition. **terra**



Konrad Swirski (left), plenipotentiary for nuclear energy at Warsaw University of Technology, and WUT faculty member Jan Alexander Blaszczyk are spearheading the OSU-WUT partnership. (Photo: Lee Sherman)