

VCU program makes big strides in just five years

BY RICK MICHAL

THE NUCLEAR ENGINEERING program at Virginia Commonwealth University, which is not yet five years old, is an example of how cooperation between industry and academia can quickly turn an idea into reality. VCU now offers graduate and undergraduate degrees in nuclear engineering to a steady supply of students who largely are employed at nuclear power plants.

In 2007, Sama Bilbao y Leon, the director of VCU's nuclear engineering program, was employed as a nuclear engineer at Dominion Generation, the operator of seven power reactors, four of which—North Anna-1 and -2 and Surry-1 and -2—are located in Virginia.



Bilbao y Leon

For years, the demand for staffing at nuclear plants has been an important issue for the nuclear industry, and so Dominion was eager for VCU, in Richmond, Va., to start a nuclear engineering program to keep the workforce pipeline flowing. Early in 2007, representatives from Dominion, including Bilbao y Leon, met frequently with VCU administrators to discuss the idea of initiating a nuclear program. These conversations led “incredibly quickly” to action, Bilbao y Leon

The program has been focused on the power generation aspects of nuclear technology, but a goal is to open things up to expose students to other avenues.

said, and the new program was started in the fall of that year.

Leading up to the program's creation, VCU had no faculty to teach the courses, but Dominion helped identify experts from the industry who were willing to lead classes. The first class—on the fundamentals of nuclear engineering—was taught by James Kelly, a retired nuclear engineering professor from the University of Virginia, with assistance from Bilbao y Leon, who was still under Dominion's full-time employ. About 20 students were in the first class.

Funding for the program has come from various sources. Dominion has been extremely supportive, according to Bilbao y Leon, who added that the utility provided funds to help set up some needed laboratories for the program. VCU also received two grants from the Nuclear Regulatory Commission to develop the curriculum and to perform faculty development initiatives. VCU has submitted applications for additional grants from the Department of Energy and the National Science Foundation. Most recently, Huntington Ingalls Industries (formerly Northrop Grumman) provided funding to establish nuclear engineering scholarships. The program has an advisory board that includes representatives

from all of the major nuclear-related companies in Virginia, including Areva, Babcock & Wilcox, Dominion, and Huntington Ingalls, as well as GE Hitachi Nuclear Energy, Mitsubishi Nuclear Energy Systems, the University of Tennessee, Oak Ridge National Laboratory, and the NRC.

Initially, the program awarded only master's degrees in mechanical engineering with a nuclear concentration. It was geared toward nuclear professionals and those with science or engineering backgrounds who were seeking a career change. By 2009, however, with the necessary approvals from the state of Virginia, VCU began offering master's and undergraduate degrees in mechanical and nuclear engineering.

From the beginning, Dominion has been the primary provider of students to the master's degree program. Because the utility's nuclear plants are located over an hour away from VCU by car, Dominion employees are able to attend classes in real time from the North Anna or Surry nuclear plants through synchronized “beamed” video and audio signals. “We want these students to have the full feel of what it's like to be a normal master's student,” Bilbao y Leon said. “When we have labs or hands-on activities that need to be done face-to-



ANS President Eric Loewen (seventh from left) presented the VCU ANS Student Section with its official charter in October.



Among the first graduates of VCU's mechanical and nuclear engineering master's degree program were (from left) Brittany Poteet, Dennis Bried, Daniel Hunt, Mathew Lloyd, and Ryan Snell.

face and cannot be done remotely, we try to schedule them on weekends or when the students can come to the VCU campus in Richmond."

There is no other distance-learning component for the nuclear program, meaning that non-Dominion students are required to physically attend classes at VCU. Discussion is under way, however, about setting up remote classes for students from other Virginia-based nuclear companies. "We are exploring the possibilities about whether they would like us to beam these classes to their locations if they have potential students interested in pursuing master's degrees," she said.

The first master's degree class of 10 students graduated in December 2010. Bilbao y Leon said that these students, who are working professionals, normally took one class per semester, usually in the evening. Ten classes are required in the master's program to earn a degree. "Some more ambitious students have taken two classes a semester, but you cannot really carry a full load when you're working full time and expect to have all your classes in the evening," she said. "It's very difficult."

Dennis Bried, a nuclear engineer at North Anna who was part of the inaugural graduating class, noted that the courses he found most satisfying were those focusing on

practical aspects. "Reactor theory, fuel cycle, and radiation and shielding were of particular benefit because they had a clear, positive impact on my daily activities and knowledge of life at a nuclear power plant," he said. "I found the level of enthusiasm and knowledge of VCU's staff very enriching. They were confident and excited about the material they taught and were fully aware that they were part of a program that was the first of its kind here in Virginia."

Connie Wooldridge, who graduated from VCU in May 2011 with a nuclear master's degree, said, "The scheduling of the cohort classes was very convenient for me as I work full time as a teacher. I was able to teach during the day and take classes at night. Being a student myself, it helped me better relate with my own students. The professors were informative, and since they came from the industry, they were able to bring real-life examples to the classroom."

Today, the average number in the master's degree program is about 15 students, while the undergraduate program has 65 students distributed in the various class years. Although the nuclear engineering program is still young, it has already started up a Student Section of the American Nuclear Society. Meetings are held every two weeks, with a core group of 15 students attending. Up to 60 people show up when

speakers and special presentations are on the agenda, Bilbao y Leon said. ANS president Eric Loewen visited on October 6 to speak to the section and to present it with its official charter.

While VCU's program has so far been focused on the power generation aspects of nuclear technology, Bilbao y Leon said that a goal is to open things up in order to expose students to other avenues. "There are many more things than power in nuclear engineering," she said. "For example, we've scheduled a visit to Jefferson Lab, which is one of the DOE national laboratories in Virginia. Jefferson Lab is focused on accelerators and nuclear physics—more basic research." She added that speakers from Areva and B&W have been scheduled to come in and talk from the point of view of a nuclear designer and supplier.

While VCU doesn't have a research reactor on campus, a partnership with the University of Wisconsin at Madison has been established, although the process for allowing VCU students to remotely access Wisconsin's reactor has not yet been tested.

VCU has developed its own simulator, similar to the one at the North Anna plant. The simulator was largely student-developed, according to Bilbao y Leon. "We have 12 computer screens showing all the annunciators, all the indicators, and all the controllers for the control room," she said. "What the students have done is develop all the screens and the logic that goes into the computer to simulate the behavior of a nuclear reactor. It does essentially the same thing as a normal simulator for a nuclear power plant."

Bilbao y Leon, who has a doctorate in nuclear engineering and engineering physics from the University of Wisconsin and is one of four full-time professors in the program, had quite a journey to finally land at VCU. Although she was instrumental in helping to set up the program, she took a leave of absence from Dominion in February 2008 and went to Vienna, Austria, where she worked for the International Atomic Energy Agency for three years. During this time, she kept in touch with VCU's program. "It was like my baby," she said. "I was involved from the very beginning, and I wanted to make sure it was successful."

VCU made it known that it wanted Bilbao y Leon to come back and work for the program. Ultimately, she applied for a teaching position and was hired in January 2011 as the director of the nuclear engineering program. "It's been different, going from Dominion, to the IAEA, to academia," she said. "I'm hitting all the different aspects of the industry, but it's fun."

As for the future, Bilbao y Leon said that she wants to keep the student pipeline flowing and expand the program's research efforts so that students can aim for Ph.D.s in nuclear engineering from VCU. **■**